Theodore N. Vail and the role of innovation in the modern Bell system

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Abstract (Document Summary)

The record of long-term innovation at the American Telegraph and Telephone Company seems to defy conventional economic and social theories. A high level of innovation is not expected in monopolies. Under CEO Theodore N. Vail, however, the modern Bell System became one of the most technically advanced firms in the US. Vail made this possible by transforming the Bell System's orientation to innovation, structure, and culture. He gave the System a cadre of leaders who followed his strategy of blending adaptive and formative innovations to promote network efficiency.

Full Text (11021 words)

The record of long-term innovation at the American Telegraph and Telephone Company seems to defy conventional economic and social theories of the firm. The following essay, based on extensive research in the AT&T Archives, argues that CEO Theodore Vail made this possible by transforming the Bell System's orientation to innovation, its structure, and its culture. He also gave the System a cadre of leaders who sustained over the long term Vail's strategy of blending adaptive and formative innovations to promote network efficiency.

In 1907, Theodore Newton Vail became chief executive officer of the American Telephone & Telegraph Company and thus of the Bell System for which AT&T was the central holding company. As CEO he developed for the System a new and enduring corporate strategy that balanced several sometimes conflicting components. Vail sought, for instance, to achieve a high degree of control over Bell's political and economic environments. Indeed, by 1919 (when Vail retired as president), AT&T had managed to acquire a new monopoly of U.S. long-distance service and a dominant position in the markets for telephone equipment and for local telephony. But Vail also wove into the strategy of this very large, regulated, corporate bureaucracy a long-term dedication to technological innovation, and therein rests the central problem of this essay. We do not usually expect to find a high level of innovation in monopolies, or in giant corporate bureaucracies, or in regulated firms.

To the contrary, the theory of the firm alerts us to anticipate that monopolies will be sluggish innovators. Their ability to appropriate most of the results of their research may encourage monopolies to spend more on R&D than firms in atomistic industries. But, lacking the pressure of competition, monopolists should be slow to explore and even slower to introduce new technologies; they should sit back on their haunches and enjoy the fruits of their market power.(1) This should particularly be true when the monopolist's position is shielded from entry by public policy, as was the case for the modern Bell System during much of its history.(2) One of the objectives of the recent deregulation movement has been to encourage innovation, and the same rationale has from the early years of the twentieth century been one of the justifications for antitrust policy.(3)

The social theory of bureaucracy similarly leads us to believe that regulated business bureaucracies will be slow to incur the risks of innovation. In this regard, they should behave like public bureaucracies, which are notorious for throwing up barriers to change. The bureaucratic structure of authority, with its elaborate hierarchy and stultifying procedures, should impede innovation. Moreover, because the managers of corporate bureaucracies lack price signals or the opportunity to reap large personal gains, they should resist the intrusion of new technologies with the same vigor that public bureaucrats display in protecting their turf from other government organizations. If the leaders of these private bureaucracies maximize on something, it should not be on technical progress.(4)

Under Vail, however, the modern Bell System became an innovative business--certainly one of the most technically advanced firms in the United States.(5) Although there is no way to measure directly the degree to which a firm is innovative, there is considerable indirect evidence suggesting that the System's performance in this regard was extremely good over the long term. A narrative approach that enumerates and evaluates major technological breakthroughs produces a Bell System list that is very long and very impressive, including the electronic repeater, the transistor, and various fundamental developments in switching.(6) Another approach is to use data on productivity growth as a proxy for innovation. The only total factor productivity (TFP) study that permits an evaluation of a vertically integrated organization like the Bell System covered the period 1947-79 and indicated that Bell was still doing very well in this aspect of its business during the post-Second World War era. Between 1947 and 1979, Bell System productivity (TFP) increased by 3.8 percent per year, compared to 1.8 percent for the private domestic economy; in 1972-79, the figures were 4.9 and .7 percent, respectively. Output per employee increased at an annual rate (1951-79) of 6.8 percent in the Bell System and 2.3 percent in the private business sector.(7) This spotty evidence suggests to me that over the long term the modern System was able to remain innovative.

The tension between this evidence and our socio-economic theories also indicates to me that the changes Vail introduced in the management of the Bell System deserve careful attention. The problem is to explain how Vail shifted the System to a new course and why it continued on that path for such a long time. My subject is thus the managerial context that fostered innovation over the long term. Much of that innovation involved science and engineering, but my concern is less with the technology itself than with the successful management of technological change in a very large corporation.

When Vail stepped in as AT&T's CEO in 1907, the company had already experienced three decades of technological progress, a history in which Vail had played a substantial part. His hands-on, operating knowledge of the business would be a crucial factor in his reorientation of the System. He had served as Bell's first general manager (1878), had later become the president of AT&T (1885) when it was solely the System's long-distance subsidiary, and had briefly headed the important New York licensee, the Metropolitan Telephone and Telegraph Company. Metropolitan and Bell's other licensees enjoyed considerable autonomy in matters technical as well as economic; the System was complex and was loosely coordinated through stock ownership (see Fig. 1) and by dint of the interest all parties had in preserving their monopoly. (Figure 1 omitted)

Through most of his period (that is, until 1894), the Bell interests enjoyed a relatively secure patent monopoly and, in the absence of competition, were able gradually to make progress in standardizing and improving the industry's technology. Because the System had evolved along highly decentralized lines, many of the local telephone exchanges had developed different kinds of equipment and wires, making it difficult for AT&T to link the exchanges for long-distance calls. As Vail saw the situation, however, Bell had to gird itself for competition by strengthening its long-distance service and thus maintaining an advantage over the new firms that were likely to enter the industry when the patents expired in the 1890s. Although he had no training in engineering or science, Vail vigorously promoted the technical standardization essential to the creation of what he hoped would eventually become an integrated national telecommunications network.(8)

From 1894 through 1906, this style of technical progress continued, but it was overshadowed by other more pressing considerations. During these years, a great wave of new firms entered the industry and fostered intense price competition and rapid expansion. Bell licensees had slightly more than 300,000 phones in use in 1895; ten years later the figure was 2,284,587. Vail missed the early years of competition, having left the Bell enterprise in 1887 to promote his fortune in a number of other ventures.(9) Out of the country much of the time, he lost contact with the industry. By the time he returned to AT&T, first as a director and then as the firm's president, telephony had experienced a dramatic change. About half of the telephones in service were supplied by independents--that is, non-Bell companies.

In an effort to meet this competition, AT&T (now the central holding company for the entire System; see Fig. 2) had overextended itself financially without, however, having succeeded either in blocking the progress of the independents or in maintaining a particularly high quality of service.(10) The struggle against the independents had further tarnished the Bell System's public reputation and weakened its political position (which was already precarious insofar as federal antitrust policy was concerned). In 1907, when AT&T was unable to sell its bonds, a J. P. Morgan-led banking group took control of

the company and gave Vail the task of putting the Bell System back on its feet. Vail was thus under considerable pressure to develop a new firm strategy.

THE VAIL STRATEGY

Two of the three major elements in that strategy are well documented and understood. Under Vail's forceful and intense leadership, AT&T gradually strengthened its position in its two primary markets: those for local and for long-distance telephone service. Along the way, the firm's manufacturing subsidiary became the dominant producer of telephone equipment in the United States. Initially, this drive for monopoly (or as Vail often put it, "control") came at the price of a further weakening of AT&T's political position, but Vail made peace with most of the public officials who were concerned about developments in this important industry. Accepting state regulation of prices, profits, and service, Vail stymied the incipient movement for municipal ownership.(11) He compromised with federal authority, warding off an antitrust suit by accepting certain constraints imposed by the Department of Justice. This 1913 agreement--known as the Kingsbury Commitment--imposed limits on AT&T's acquisition of independents, required the Bell System to provide toll and long-distance service to any independents requesting interconnection, and forced the firm to divest itself of the Western Union Company, which it had bought in 1909.(12)

A third and equally important aspect of the Vail strategy involved a new emphasis on and qualitative changes in the Bell System's style of technological development. What emerged, gradually, was a more dynamic concept of how the firm would develop and introduce new technologies. This strategy and its implementation have not, I think, been fully understood from a managerial perspective. The focal points of Vail's new concept were thorough-going standardization, the internal development of science-based innovations, and the introduction of new technologies on a carefully phased, system-wide basis. As this strategy evolved, the expectational horizon of the enterprise pushed far into the future; eventually it came to be assumed within the Bell System that there would never be a time when technical innovation would no longer be needed or even when it would pay diminishing returns.(13) One of the institutions crucial to this new strategy was the industrial laboratory, but the structural and ideological components of the new approach were much broader than the lab.(14) They involved all of the operating companies. The Western Electric Company--Bell's manufacturing subsidiary--played a central role in this transformation. Together these organizations and ideas gave the Bell System a momentum that would last long after Theodore Vail had retired as AT&T's president in 1919.(15)

TWO MODES OF INNOVATION

In spite of Vail's extensive experience in telephony, neither the new ideology nor the new institutions emerged full grown in 1907. They developed slowly, shaped by circumstances inside and outside AT&T--first by the fact that the Bell empire was tottering. The costs of rapid expansion had been too high, the returns too low to continue on that course over the long term. Vail began immediately to cut costs.(16) He abandoned the effort to occupy the entire field of telephony, promoting instead a selective policy of expansion and consolidation that would leave to Bell-connected independents the task of developing many of the country's less lucrative rural and semi-rural areas. These independents were for the first time given the opportunity to buy Bell telephones and apparatus manufactured by Western Electric.(17) Meanwhile, Vail attempted to eliminate competition in the long-distance and the major urban markets.(18) The toll and long-distance business was the centerpiece of his business strategy. In order to control the industry, as Vail saw it, Bell had to do a better job of linking the various exchanges than any of its competitors; that goal would decisively shape the System's process of innovation.(19)

As he refinanced and brought the Bell System under control, Vail began to promulgate a new ideology that stressed technical achievement. To some extent these ideas were part of a service-oriented public relations campaign, but Vail's message was the same inside the System as it was outside. The message was repeated so frequently and forcefully that no one connected with the Bell System could have had any doubts about what the new president of AT&T wanted to accomplish. Bell facilities were beneath the standards that Vail wanted to uphold, and it was essential, he said in 1908, to accumulate "enough surplus to provide for and make possible any change of plant or equipment made desirable, if not necessary, by the evolution and development of the business."(20) He admonished the president of Western Electric: "...it is necessary that the Western Electric should have apparatus that in every respect is equal to that offered by the independent manufacturers." He thought that some of Western Electric's equipment was "in every way inferior...If this is true, it must be remedied before any attempt to enter the field on your part is made."(21) He emphasized the need for efficiency as well as economy in operations.(22)

Initially, Vail stressed the sort of standardization and interconnection that had been major themes of Bell development since the 1880s. It was this concept of technical change that was the under- pinning for Vail's credo of "One System, One Policy, Universal Service." No collection of separate companies could give the public the service, he said, that Bell's "interdependent, intercommunicating universal system could give."(23) Through Western Electric, properly managed, the System would be able to "control the development of the apparatus and the kind of apparatus that was to be made, standardize it in other words."(24) It was this type of technical standardization that had initially enabled Bell to develop the long-distance service that played a crucial role in Vail's corporate strategy.(25)

Important as it was to the early Bell System, standardization along these lines had an essentially static quality.(26) As a mode of innovation, it lacked the dynamic element that would come to characterize the Bell System in subsequent years. Instead of the development of new technologies, it envisioned the perfection through standardization of the existing array of equipment and lines in the various local exchanges. The same approach was applied to routine aspects of operations. This

style of standardization would reduce risk, improve efficiency, and increase the System's income. But it was essentially an "adaptive" strategy of eliminating uncertainty in the process of producing equipment and providing services.(27)

This type of systematization, which was extremely popular in turn-of-the-century U.S. business, was soon to be supplemented at AT&T by a strategy that would also emphasize the kind of "formative" innovations that introduce new technologies, shift production functions decisively, and thus normally increase risk. Vail's concept of formative innovations would, however, emerge very slowly. In 1908, he described development in the telephone business as "continuous." He said that "the whole business suggests changes and stimulates inventions...." The Bell System's engineering department "takes all new ideas, suggestions and inventions, and studies, develops, and passes upon them."(28) He was then still assuming that the innovations would come from outside the System, but shortly he would look to internal generation of new products and processes. A year later, he was extolling Bell's bureau of "research and information," which consisted of "technical, electrical and mechanical operating experts," who knew "all that had gone before and all that was being done here and elsewhere."(29) By 1910 he could point to "extensive laboratories and experimental departments with technical staffs competent to keep abreast of modern progress...."(30) The Bell System was now generating its own fundamental innovations and was capable, Vail said two years later, "of continuing to grow indefinitely not only in size but in constantly increasing efficiency and usefulness."(31)

AT&Ts scientific and engineering success (by 1914-15) in establishing transcontinental service capped this development in Vail's business strategy.(32) The company's work on the electronic repeater, a crucial element in transcontinental service, was clearly formative, not adaptive, innovation. Now Vail conceived of the System as "an ever-living organism." Its development involved "unceasing effort, continually improving and upbuilding...," never "standing still." Formative innovations were produced by the System's "comprehensive and effective engineering, scientific development and manufacturing organization...." Bell's scientific research, he later noted, "has grown into one of the largest laboratories of the application of science to industrial development in the world...."(33)

In Vail's strategy these two modes of innovation had to be carefully coordinated, and the relationship between adaptive and formative efforts became a critical feature of the revamped Bell System. With the national network potentially complete, Vail laid the foundation for what would become the network mystique, the ideology of systems engineering. As Vail saw it, there should be no false steps in the process of technical change. "The plant and methods of each company must be co-ordinated with those of all of the other companies, because each is but a part of the unified structure...." As he explained: "A good idea may spring up in the mind of man anywhere, but as applied to such a complex entity as the Bell System, the countless parts of which cover the whole United States, no individual unaided can bring the idea to a successful outcome." What was needed were the System's substantial scientific and engineering resources. The innovations they produced were essential to the System's improvement, but they had always to be "co-ordinated and carried on in connection with the practical operation over... the entire! system...."(34) By this time, the Vail concept of innovation--a blend of science-based formative research with adaptive development work under systems engineering constraints--was fully articulated.

RESTRUCTURING THE SYSTEM

To be sustained over the long term, however, this corporate strategy had to be embodied in the firm's structure. Vail's initial step as AT&T president appears at first glance to have been in the wrong direction. In the course of consolidating the System's R&D resources, Vail cut back sharply on the staff.(35) But by centralizing the research and development operations, by bringing them closer to manufacturing and by placing them under new, vigorous leadership, Vail laid the foundation for the subsequent expansion and improvement of these operations.(36) Before that transpired, however, he turned his attention to the fundamental organization of the System.

Vail consolidated and reorganized AT&T, the long-distance service, Western Electric, and the several operating agencies and companies. The hardest to change were the operating companies, most of which were long accustomed to a high degree of autonomy. In 1906 (before Vail became CEO), AT&T's chief engineer Hammond V. Hayes had sent the company's president a depressing report on the efforts to upgrade and coordinate the technology at the operating company level: "The general relations of the AT&T! Engineering Department to the telephone interests at large is unsatisfactory...." As he explained, "our relations with the operating companies are dependent upon personal good will and the influence and prestige that comes from men well equipped and doing good work...." But still, "many of the operating firms'! engineers disregard recommendations and specifications which we consider proper and substitute others on the same subject many of which are improper and do not operate to the best interests of their own company nor of the business at large." Hayes had, nevertheless, been hesitant to wrest authority from the local engineers.(37) Vail was not. After taking the helm and putting the System's finances in order, he began to increase AT&T's financial stake in the operating companies, pushed their managers to reorganize along functional lines, and set his number one operating officer, the quiet but tenacious Henry B. Thayer, to work on this problem.

Thayer was president of Western Electric and, after 1909, a vice-president of AT&T. Under his direction, members of AT&T's Engineering Department began to work closely with their counterparts in the operating companies and to develop a reporting system that facilitated comparative analyses of company performance. Thayer and AT&T's engineers used these reports to drive the process of standardizing equipment and practices.(38) What emerged from this process was a more centralized structure organized along functional lines. The highest degree of centralization was in the area of technology. Political and financial affairs were still relatively decentralized in the modern Bell System. Clearly this new arrangement made for better coordination of policy: as Vail said, "we are harmonizing our different companies...."(39)

The focus during this first stage of reorganization was on adaptive change but, directly and indirectly, the new structure would also encourage formative innovations.(40) In the course of reorganizing the horizontal component--that is, the operating level--of the Bell System, Vail revised and standardized the license contracts so that eventually all of the Bell operating companies paid 4.5 percent of their gross revenue to AT&T for the central administration of the System, including its research and development activities. As Vail explained:

In the reconstruction of switchboards and Central apparatus, the value of this connection with the American Telephone and Telegraph Company is very great....In the past few years the interior apparatus and the interior operation of the Central Office has radically changed, and it is probable that the changes in the next few years will be still greater. All of these changes have been necessary to increase the efficiency, the distance and the certainty of the exchange service, and particularly the toll service which has increased in a marked degree.(41)

Once this fiscal relationship was built into the license contracts and accepted by the state regulatory commissions--of which there were forty by 1913--the funding for research as well as for development was on a relatively secure basis.(42)

This was the solid foundation on which Vail gradually built up the new institutions that would ensure over the long term that the System could sustain a high level of innovation and would always have on board advocates for investments in new technology.(43) In addition to Thayer, the new technical elite in the Bell System included John J. Carty, who replaced Hammond V. Hayes in 1907 as head of the Engineering Department. Hayes had for some time maintained that AT&T should concentrate on "the practical development of instruments and apparatus. I think the theoretical work can be accomplished quite well and more economically by collaboration with the students of the Massachusetts! Institute of Technology and probably Harvard College."(44) Hayes explained in 1906 that "no one is employed who, as an inventor, is capable of originating new apparatus of novel design. In consequence of this it will be necessary in many cases to depend upon the acquisition of inventions of outside men...."(45) It would be expensive and "probably unproductive," Hayes said, to try to employ men with unusual scientific attainments...."(45) When Hayes wrote this timid report, Carty, Frank B. Jewett, a Ph.D. physicist, and several other scientists and science managers who would lead the System's R&D into the new era were already working for Bell.(46) Vail brought this sort of leadership to the top, and as soon as he and Thayer had made substantial progress in reorganizing the System, they gave Carty the financial support he required to ensure that the business would have all of the scientific and engineering personnel needed to conduct internally its theoretical research as well as its practical efforts in developments.(47)

R&D was reorganized as well as redefined, along lines that stressed functional subdivision and thorough coordination within the System's vertical structure. One wing of the new operation was at AT&T in New York, where Carty ran the Engineering Department under Thayer's careful control. Some of the department's work was of the sort that I have identified as "adaptive": it promoted standardization and searched for "the most economical and efficient methods" of both construction and maintenance; it devised "plans for the more economical use of toll lines, local lines and operating economies..."(48) Other work of the refurbished Engineering Department--especially after 1909 and 1910--involved a search for formative innovations: for instance, the development of new means of improving long-distance transmission and explorations into wireless telephony.(49) The AT&T department's chief role in this work might best be termed "R&D Planning": it decided exactly what the System needed and what the specifications of the innovation should be; then it turned over the tasks of both research and development to the Western Electric Company (WECo). In effect this setup placed R&D planning and R&D operations under two specialized organizations, much as Du Pont and other firms would later separate strategic decision making from operations.(50)

The manner in which R&D was organized and positioned within the System had a significant effect on the balance between adaptive and formative innovation. Western Electric's separate Engineering Department was the major center for the operational aspects of research and development work in the entire Bell System. Organizationally this placed R&D close to manufacturing and would normally have been expected to favor the short-term developmental side--that is, the adaptive mode of innovation. In this case, however, geography triumphed over organization, because both the WECo and the AT&T engineering departments were in New York, and their work was closely aligned. All orders from the Bell System for supplies or equipment were now funneled through AT&T. From WECo's perspective, that made AT&T its largest "customer" and justified locating the Engineering Department in New York.(51) In effect, this arrangement ensured that the adaptive work would be coordinated with, but would not overwhelm, the nascent efforts at formative innovations.

This new structure created a fault line, however, between R&D and manufacturing, a problem that also arose in other high-technology firms. In the Bell System the problem became serious enough by 1915 to prompt Western Electric's management to organize its first "Manufacturing and Engineering Conference"--held for obvious and symbolic reasons in Chicago near the firm's Hawthorne manufacturing plant. Although the conference and the changes in procedure that it prompted probably eased tensions between the engineering and the manufacturing operations, they appear not to have altered the balance between adaptive and formative efforts in WECo's R&D.(52)

During these years, Western Electric's emphasis on basic research and formative innovations steadily increased. In 1911, the firm organized a special research branch within the Engineering Department, and the following year Frank Jewett moved over from AT&T to direct some of the more significant research projects. By 1915, when Thayer returned to the presidency of WECo, there were forty to forty-five people, including seven Ph. D. scientists, working in the Research Branch.(53) By that time, as well, the two engineering departments had produced the sort of formative innovation that had become one of their

primary goals. The work done on the audion, the triode amplifier, and the electronic repeater made transcontinental long-distance service possible for the first time (1915). This technical accomplishment was perfectly suited to the Vail business strategy. It broke down the last technological barrier to "universal service" and provided the Bell System with a formidable advantage over any firm attempting to enter the business.(54)

The WECo style of innovation in the Vail era was tightly focused and paced with System-wide considerations in mind. The balance was never allowed to tip very far toward either adaptive or formative innovation. The transmission problems that were of central concern to the Vail business strategy received top priority, and resources that could have been used in other ways (for instance, to introduce automatic switching as soon as possible or to satisfy customer demand by developing a successful hand set, the so-called French phone) were concentrated on improving long-distance service.(55) WECo's adaptive programs were also attuned to Vail's strategy. Hence WECo standardization routinely called for more expensive apparatus than an independent manufacturer might have produced, on the grounds that it would achieve operational economies for the integrated network. The process of innovation was therefore more focused, probably slower, and no doubt steadier than it would have been under more competitive conditions.(56) As Frank Jewett explained to the 1915 conference of engineers and manufacturers, the utility of their elaborate and time-consuming trial installations of new equipment had frequently been questioned. But, he said, these trials had always uncovered "some serious trouble...":

With multipliers such as those in The Bell System and with reactions throughout the telephone plant which it is impossible to foresee, the results of mistakes and errors are too serious to warrant taking chances with. It requires little imagination to picture the chaos which would obtain if we introduced a new multiple jack which was to develop serious trouble at the end of a year or fifteen months. By the time the defect could come to light in ordinary service and a change be made, there would be literally hundreds of thousands of defective units scattered broadcast through the system like so many foci of disease.(57)

The WECo Engineering Department was determined to keep the network as free as possible of technical "disease," and it paced both formative and adaptive changes accordingly. Vail's newly restructured Bell System successfully managed the inherent tension between these two modes of innovation.

CONTINUITY, CADRES, AND COMMUNICATION

Effective as this new structure was, the modern Bell strategy of innovation might not have lasted as long as it did had Vail not given serious thought to the need for continuity of personnel, from the top to the bottom of the business, and for improved communications within the System. As we have already seen, Vail quickly promoted to positions of authority a new cadre of technically oriented officers. Thayer was Vail's lieutenant, whether he was a vice-president at AT&T or the president of the Western Electric Company. He was the archetypal operations man, with his finger on the pulse of the business, including the process of innovation. Directly under Thayer was J. J. Carty, who became the chief spokesman at AT&T for systematic technological development and basic research. It was Carty who worked up the regular reports on the dollars saved through effective R&D; these estimates found their way to the top of the corporation and then into Vail's annual reports to the stockholders.(58) Others on the Vail-Thayer fast track included Frank B. Jewett, who became WECo's chief engineer in 1916, and Walter S. Gifford, who moved in 1908 from Western Electric to AT&T, where he served as chief statistician from 1911 to 1916. Since Vail's tenure as president lasted from 1907 to 1919, he had time to nurture this new managerial elite, all of whom were well schooled in the modern Bell strategy of innovation.

As Vail prepared to retire to the chairmanship in 1919, he carefully positioned this cadre of managers to take over the company and to carry forward the work he had begun. The two CEOs prior to Vail had been lawyers, familiar with Bell's legal problems but not with its technical operations.(59) Vail wanted a telephone man, an internal appointment, and he chose the experienced Henry B. Thayer. As Vail explained, "In the manufacturing he has had more intimate connections with the actual operations of the system than any one man connected with the system. He has had a more intimate acquaintance with the personnel of the system than any other one man, and has had a more intimate acquaintance with the problems to be solved than almost any other man."(60) Vail--who might have been describing himself as of 1907--would thus ensure that the reorganized Bell System would stay on course.(61) To support Thayer, he appointed J. J. Carty a vice-president of development and research, a new position (heading a now separate department) that accurately reflected the new corporate strategy. Jewett stayed in his crucial role at WECo's engineering operation, while Gifford became vice-president in charge of accounts and finance.

The quest for continuity actually reached from the boardroom to the shop floor and the switchboard. The newly reorganized operating companies became training grounds for the technically oriented officers who would manage the System in the future. These companies now had "uniform sets of officers," and Vail closely watched their performance. As he observed in 1911, "With such a body of men, educated in technicalities and theories, which by practical experience, they have subordinated to usefulness with a trained capacity for taking responsibility--steadily moving upwards--there will always be a body of fit men to choose from...."(62) Vail and Thayer included blue-collar as well as white-collar workers in the new dispensation. By cutting turnover and ensuring that employees were loyal to the System, they could be more certain that the new ideology of efficiency, high-quality service, and technological innovation would persist. In this spirit, AT&T instituted pensions (1913), a disability plan (1913), and a stock purchase program (1914) for Bell System employees.(63) Western Electric provided hospital services and athletic facilities and set up a training division for new employees.(64) Managers who could not reduce turnover were given pointed instructions from AT&T headquarters to improve their performance.(65)

Vail also intensified communications throughout the System and, in so doing, helped to transform his ideology into a lasting

corporate culture. He believed in learning by repetition. All of the troops heard his message--again and again. He began to hold meetings of the chief managers throughout the country.(66) Thayer later transformed these gatherings into regular and more formal conferences of the top executives of AT&T, Western Electric, and the operating companies.(67) Under Vail, the several companies in the System began to issue more numerous and lengthier bulletins on technical and legal affairs; in 1912, Western Electric began to publish a monthly newsletter for its employees. The woof of the Western Electric News consisted of personal items, pictures, reports on athletic events, poems, and cartoons, but the warp lay in the themes of efficiency and technological innovation. Articles on "Engineering Development Work," "Untechnical Talks on Technical Topics," and "Eight Messages Over One Wire" were woven together with pieces on "Lon Dillon" (one of WECo's oldest foremen), "The Fine Art of Saving," and the "Women's Page. Even these lighter items embodied a moral, of course, and a typical article on the "Women's Page" reported that "five hundred girls were in this department and one girl said she soldered on 3,600 tips a day. You can judge by this that they have things down pat in this shop.(68)

Did these efforts at socialization matter at all? Did they have any impact on either managers or shop-floor workers? Apparently they did. In combination with the procedural changes in employee relations, they seem to have produced a formidable culture throughout the Bell System. Efficiency and technological innovation became central elements in the network mystique. As one manager noted in 1915, he worked in "an organization whose business it is to apply the knowledge of science to supplying facilities for the communicating of intelligence in the service of the public....We all of us take pride in the part which this company has taken in the growth of the art of telephony.(69) Nor were pride and a positive attitude toward technical progress manifested only by managers. Blue-collar adaptive innovations were important to WECo; they were described in Western Electric News and lauded. "The suggestions come from all the employees through the works....By prompt attention to the suggestions that have been received, by taking pains to let the individuals know that some attention is given to their ideas and that some use is made of them, we have doubled the number of suggestions that we are receiving...(70) From the top down and from the bottom up, the culture of innovation pervaded the modern Bell System.

When Thayer replaced Vail as president of AT&T, the new CEO held the System on the same course that his mentor had charted. If anything, Thayer was even more of a hands-on executive, and he stayed especially close to J. J. Carty and the process of technological innovation.(71) Under Thayer, the Bell System launched the Technical Reprint Series and in 1922 started two new publications, the Bell Telephone Quarterly and the Bell System Technical Journal. The development of radio during these years posed threats and promised major benefits to the Bell System. Thayer made certain that AT&T stayed on the front edge of this technology.(72)

In December of 1924, Thayer pushed functional specialization forward one additional step by organizing the Bell Telephone Laboratories as a separate corporate entity under president Frank B. Jewett.(73) Bell Labs was the organizational embodiment of the ongoing quest for formative innovations. The main locus of adaptive change continued to be Western Electric, but the balance between the two modes of innovation was preserved: Western Electric--along with AT&T---owned Bell Labs and provided the new organization with most of its top research and engineering managers (as well as its building in New York).

Thayer meticulously cultivated the culture of innovation, and in 1925 he ensured that this process would continue by selecting Walter S. Gifford as his successor.(74) Gifford was a Vail-trained and Vail-inspired telephone man. During his unusually long tenure as CEO (until 1948), Gifford further strengthened the R&D structure and deepened the organization's commitment to technological progress.(75) By the end of Gifford's presidency, the institutional and cultural orientation of the business was so strong that the Bell System would hew firmly to the Vail strategy until the crisis of the 1970s.(76)

Theodore Vail's success in reorienting the Bell System's posture on technical innovation can be explained, I believe, by several characteristics of his managerial style. The industry was of course one with considerable technological potential. But it had that same potential before 1907, when Bell System service and R&D were sagging, as it did after Vail became president. Leadership mattered. It was important that Vail's corporate strategy arose out of his direct experience in operations; he was a hands-on manager who understood and was interested in the System's technology and its applications. Out of that experience, he derived a strategy that looked far into the future and measured progress in decades instead of years. His vision was well attuned to the developing market for telecommunications services in the United States. It was as well a coherent strategy for all of the constituent parts of the Bell System. Thus he centralized control of the technology and tightened the vertical integration of the System while leaving the operating companies (and for that matter Western Electric) considerable autonomy in dealing with other issues on a day-to-day basis. The Vail strategy was also holistic. It embraced all who worked in the System, from top management to the telephone operators, installers, repairmen, and mechanics.(77)

Vail's achievement was as much a socio-political as it was an economic or a technological phenomenon. Essential to the task was his selection of a new cadre of managers to implement and sustain the strategy of technological progress. They carried the word throughout the System, as did the conferences and new publications. Many of the values embraced in the Vail ideology--the service concept, for example--resonated with American social views, and this too helped to transform that ideology into a deepset corporate culture. The Bell culture and the network mystique were significant factors in keeping the System innovative over the long term.

What the System sustained was a fruitful blend of adaptive and formative innovations. Vail created--and his hand-picked succesors improved--a corporate structure capable of achieving that goal. As Frank Jewett noted, standardization was "a process of mediating the tension between innovation, on the one hand, and best accepted practice that is, efficiency! on the other...."(78) Western Electric's Engineering Department was the central "mediating" institution, and it was strategically

situated, organizationally and geographically, to encourage both modes of innovation while preventing either one from overwhelming the other. In the modern Bell System, they appear for the most part to have been mutually supportive.

These developments in the Bell System and Vail's experiences as CEO suggest some conclusions about the economic theory of the firm, about the sociological theory of bureaucracy, and about the history of modern corporate management. Insofar as the theory of the firm is concerned, the Vail saga clearly is more compatible with recent developments in transfer cost (or market failure) analysis than with the traditional body of neoclassical thought. The traditional theory can be used to good effect in explaining certain important aspects of the Bell System's development prior to 1907. It as well helps explain why the 1907 shift in leadership and strategy took place; competitive pressure unseated a weak management and provided Vail with a strong incentive to chart a new course for the Bell System. But the theory of the firm provides little insight into the corporate transition that Vail engineered or into the long-run implications of that change. The transfer cost theory is more useful because the Bell System was vertically integrated, and the ⓘAT&T-Western Electric--operating company link played a crucial role, as we have seen, in the R&D process. But even the transfer cost theory provides little help in analyzing the dynamic aspects of Vail's new corporate strategy or many of the ideological and cultural components that helped to make it a success over the long term. As William Lazonick has suggested, we need a theory of the innovative firm.(79)

One aspect of that theory should be a recognition that internal forces within the corporation can take the place of short-term market forces. These internal forces are dependent on effective corporate leadership in the development and implementation of a business strategy attuned to long-run market developments and to the firm's political and social setting. To be sustained, this sort of strategy must provide the organization with a compelling ideology rooted in values consistent with the firm's social, economic, and political environments. That ideology must be transformed into a corporate culture. It must be built into the firm's structure as well. The Vail strategy met those tests and achieved a power in shaping System development akin to those competitive pressures that are central to the economic theory of markets.

A similar conclusion can be advanced in regard to the social theory of bureaucracy. In that theory, public and private bureaucracies are usually distinguished because the former seldom face the sorts of market pressures that private bureaucracies encounter. But here too an effective organizational strategy seems capable of substituting for short-term market pressures as a means of encouraging innovation and effective performance on a day-to-day basis.(80) The structural components of bureaucratic authority are not inherently antithetical to either innovation or efficiency. Recognition of this possibility should help us analyze those government agencies that seem to function unusually well and to understand why regulation need not always produce unfortunate economic performances.

In relation to the history of modern corporate management, the Vail saga helps us see how business leaders of this era were able to link two sets of emerging institutions: the corporate combine and the scientific and engineering professions. These institutions, their personnel, and the special forms of knowledge associated with them provided Vail and other contemporary executives with opportunities, as well as with some of their thorniest problems. To solve these problems and to capitalize on their opportunities, they had to ease business through a major transition from a highly individualized style of innovation to the organized style that characterizes the economy--and indeed all aspects of professional life--in the late twentieth century.(81) This was an extremely important transition, because the success of the economy in the twentieth century has depended in great measure on the ability of U.S. businesses to develop and implement technological and organizational innovations of the sort generated by the Bell System.(82)

Finally, this episode in business history suggests a new way of distinguishing routine corporate leadership from the type of innovative leadership that recasts corporate development over the long term. All chief executive officers perforce balance their firm's need for control of its relevant economic and political environments against its need for innovation and for operating efficiency.(83) The normal CEO devises and continually adjusts trade-offs in these three aspects of firm behavior. But a business leader like Vail shifts the basic nature of all three of the functions, creating a new equilibrium. When he is as successful as Vail was, his successors enjoy the luxury of routine corporate leadership (as did Thayer and Gifford). In the case of the Bell System, that quality of leadership would suffice for many decades to keep an innovative firm on the course originally charted in the years 1907-19 by Theodore N. Vail.

1 Frederic M. Scherer, Industrial market Structure and Economic Performance (Boston, Mass., 1980), 407-38. See also David C. Mowery, "Economic Theory and Government Technology Policy," Policy Sciences 16 (1983): 27-43; Richard R. Nelson, "The Simple Economics of Basic Scientific Research," Journal of Political Economy 67 (June 1959): 297-306; and Kenneth J. Arrow, "Economic Welfare and the Allocation of Resources for Invention," in National Bureau of Economic Research, The Rate and Direction of Inventive Activity: Economic and Social Factors (Princeton, N.J., 1962), 609-625.

2 This element is stressed in Gerald W. Brock, The Telecommunications Industry: The Dynamics of Market Structure (Cambridge, Mass., 1981).

3 See Stephen Breyer, Regulation and Its Reform (Cambridge, Mass., 1982), esp. 36-59.

4 Anthony Downs, Inside Bureaucracy (Boston, Mass., 1966); Martin Albro, Bureaucracy (New York, 1970); Michel Crozier, The Bureaucratic Phenomenon (Chicago, Ill., 1964).

5 Throughout, I am dating the beginnings of the modern Bell System from 1907. During the period 1876-1906, the Bell interests performed in ways that were markedly different from the corporate behavior after Vail became president of the

parent company. There were of course trends in company development that predate 1907, and I discuss some of these later; but in every case that relates to AT&T's technical development, there was a significant break in the trend after 1906.

For a different evaluation of innovation at Bell, see David C. Mowery, "Assessing the Predictions of the Effects of Divestiture on Bell Telephone Laboratories," draft presented to the Business History Seminar, 22 Feb. 1988, Harvard University Graduate School of Business Administration. See also Kenneth Lipartito, "Innovation in the Telecommunications Industry, 1891-1990: An Overview and Case Study," Business History Seminar, 16 Dec. 1991.

6 For abundant detail, see vols. 1 through 7, A History of Engineering and Science in the Bell System (Bell Telephone Laboratories, 1975-985).

7 "Bell System Productivity Study" (done in September 1980 by AT&T's economic analysis section; in AT&T Archives), covers the years 1947-79. The post-Second World War figures for the Bell System are comparable to those for the "communications and public utilities" group in the period 1909-48; see John W. Kendrick, Productivity Trends in the United States (Princeton, N.J., 1961), table 34, p. 137. See also Arthur D. Little, "The Relationship between Market Structure and the Innovation Process" (Jan. 1976), AT&T Archives.

8 See Robert W. Garnet, The Telephone Enterprise: The Evolution of the Bell System's Horizontal Structure, 1876-1909 (Baltimore, Md., 1985), 55-127. See also Neil H. Wasserman, From Invention to Innovation: Long-Distance Telephone Transmission at the Turn of the Century (Baltimore, Md., 1985), 31-125. On Vail's early career in telegraphy and the railway mail service, see John Brooks, Telephone: The First Hundred Years (New York, 1976), 67-160; Albert Bigelow Paine, In One Man's Life: Being Chapters from the Personal & Business Career of Theodore N. Vail (New York, 1921); and Robert Sobel, "Theodore N. Vail: The Subtle Serendipidist," in Robert Sobel and David Sicilia, The Entrepreneurs: Explorations within the American Business Tradition (New York, 1974), 194-246.

9 Vail seems to have left Bell under unpleasant circumstances. He had apparently objected vigorously to what he thought was the short-sighted business strategy of the Boston investors who then controlled the System. Brooks, Telephone, 84-85.

10 On the competitive era, see Federal Communications Commission, Investigation oft Telephone Industry in the United States (Washington, D.C., 1939), part 1, 129-46; and Brock, The Telecommunications Industry, 109-25. Vail's presidency marked the end of the dominance of the Boston investors in the Bell enterprises.

11 See, for example, Vail's first Annual Report of the Directors of American Telephone & Telegraph Company to the Stockholders for the Year Ending December 31, 1907, 18: "It is not believed that there is any serious objection to such public! control, provided it is independent, intelligent, considerate, thorough and just, recognizing, as does the Interstate Commerce Commission in its report recently issued, that capital is entitled to its fair return, and good management or enterprise to its reward." See also T. N. Vail to P. Henry Woodward, W Feb. 1908, AT&T Archives: " ...I am and always have been strongly in favor of public supervision, provided it is intelligent and reasonable." (Unless otherwise noted, all manuscript materials cited are in the AT&T Archives.) On the threat of municipal ownership, see Kenneth Lipartito, The Bell System and Regional Business: The Telephone in the South, 1877-1920 (Baltimore, Md., 1989), 177-85.

12 The agreement was set forth in a letter from AT&T vice-president N. C. Kingsbury (hence the name "Kingsbury Commitment") to the attorney general, 19 Dec. 1913; in J. C. McReynolds, attorney general, to N. C. Kingsbury, 19 Dec. 1913, the government accepted the terms "without litigation." See also Woodrow Wilson to James C. McReynolds, 19 Dec. 1913. All reprinted in Annual Report...American Telephone & Telegraph Company...1913, 24-27.

13 In this regard the business strategy was similar to the ideology of the modern academic professions, all of which assume that progress in the development of their particular body of knowledge will continue forever. The spirit of this ideology was later captured by Vannevar Bush in his famous report, "Science: The Endless Frontier" (U.S. Office of Scientific Research and Development, 1945).

14 The development of the industrial laboratories in he Bell System is described and analyzed in Leonard S. Reich's excellent book, The Making of American Industrial Research: Science and Business at GE and Bell, 1876-1926 (New York, 1985).

15 The idea of technological momentum is discussed in Thomas P. Hughes, Networks of Power: Electrification in Western Society, 1880-1930 (Baltimore, Md., 1983).

16 See, for instance, Reich, Making of American Industrial Research, 151-52. Reich emphasizes more than I do the role of J. P. Morgan in directing the reorientation of AT&T. Vail was clearly Morgan's choice to run AT&T, and during the fiscal crisis that accompanied the change in leadership, Vail stayed in close touch with Morgan. The records in AT&T's archives suggest, however, that Morgan's input was general rather than specific, transitory rather than lasting. In part, this outcome was n0 doubt a result of the decisive manner in which Vail took hold of the Bell System. On the Vail-Morgan ties, see the following letters from Theodore N. Vail: to John I. Waterbury, 18 July, 13 Aug. 1907; to J. P. Morgan, 11 Nov. 1907, with enclosure; to Charles Steele, 19 Nov. 1907; to Robert Winsor, 12 March 1908; to Messrs. J. S. Morgan & Co., 12 March 1908; to Charles W. Amory, 19 March 1909, with accompanying list. I could not find in the AT&T Archives the letter from Morgan to Vail that Reich cites on p. 151.

EARLY TELEPHONE #2

17 On this new policy, see the following letters from T. N. Vail: to E. M. Barton, 16 Aug. 1906; to E. C. Bradley, 23 Aug. 1907; and to N. C. Kingsbury, W Feb. 1908. To protect its all-important position in long distance, AT&T did not extend this policy to include loading coils and repeaters. T. N. Vail to H. B. Thayer, 24 June 1909. AT&T used sublicense agreements--contracts between licensees and independent firms in their territory--to achieve the same objective; see FCC, Investigation of the Telephone Industry, 153-55.

18 See, for example, the following letters, all sent by T N. Vail: to F. A. Pickernell, 8 July 1907; to H. M. Watson et al., 11 Oct. 1907; to L. G: Richardson, 17 March 1908; to George B. Fiske, 2 July 1908; to E. C. Bradley, 25 May and 1 June 1909. See also Annual Report...American Telephone and Telegraph Company...1909 hereafter, Annual Report!, 12. FCC, Investigation of the Telephone Industry, 137-41.

19 See, for instance, T. N. Vail to Edward B. Field, 16 Nov. 1907. See also T. N. Vail, "Testimony in Western Union Telegraph Company et al., v. American Bell Telephone Company," Circuit Court of the United States, District of Massachusetts (copy in AT&T Archives; the testimony took place on 1 April 1908), 1549.

20 Annual Report...1908, 5-6.

21 T. N. Vail to E. M. Barton, 16 Aug. 1907.

22 Annual Report...1907, 8.

23 Ibid., 1909, 18.

24 Vail, "Testimony in Western Union," 1556.

25 See T. N. Vail to Edward B. Field, 26 Nov. 1907; and Garnet, The Telephone Enterprise, 66-69, 136-37.

26 See, for instance, the remarks in Annual Report...1903, 6-7; and Annual Report...1905, 7-9.

27 The difference between adaptive and innovative strategies is developed in William Lazonick, Business Organization and the Myth of the Market Economy (New York, 1991), esp. 213-27. I have used several of Lazonick's highly original ideas, but I have twisted them to fit my own analysis of the Bell scenario. My apologies to their author.

28 Annual Report...1908, 1-18.

29 Ibid., 1909, 19.

30 Ibid., 1910, 27.

31 Ibid., 1912, 22. See also T. N. Vail to E. C. Bradley, 6 Aug. 1912; and T. N. Vail to Mr. Scott, 24 July 1912. In the latter, Vail pointed out the value of AT&T's "large experimental and developing departments...." Comparing "the state of the art ...even five years ago,...with the present, the gain in every respect--efficiency and economy of operation and possible distance of transmission--has been enormous, all the result of the central organization and the engineering and experimental departments."

32 Both Reich, Making of American Industrial Research, 159-64, and Lillian Hoddeson, "The Emergence of Basic Research in the Bell Telephone System, 1875-1915," Technology and Culture 21 (1981); 529-37, stress the importance of this achievement and the work done to accomplish it.

33 Annual Report...1914, 18-20; 1915, 22-25. See also T. N. Vail, "Some Observations on Modern Tendencies," in Views on Public Questions: A Collection of Papers and Addresses of Theodore Newton Vail, 1907-1917 (privately printed, 1917), esp. 251-54. Theodore N. Vail to John A. Moon, 30 Dec. 1918 ("Wire System: Discussion of Electrical Intelligence"), AT&T Archives.

34 Annual Report...1914, 1820; 1915, 22-25. See also Theodore N. Vail, Policy of Bell System (New York, June 1919).

35 Reich, Making of American Industrial Research, 151, emphasizes this cutback. On the effort to economize, see T. N. Vail to E. J. Hall and other Bell company presidents!, 1 May 1907.

36 Reich, Making of American Industrial Research, 151-53; also J. J. Carty to E. J. Hall, 17 July 1907.

37 Hammond V. Hayes to F. P. Fish, 31 Dec. 1906.

38 See, for instance, H. B. Thayer, Memorandum for T. N. Vail, 27 May 1909; J. J. Carty, Memorandum for Mr. Thayer. 9 Oct. 1909; H. B. Thayer to George E. McFarland, 11 Nov. 1913; H. B. Thayer to W. T. Gentry, 1 June 1914. Some degree of centralization also took place in legal and rate-making matters; see T. N. Vail to H. M. Watson and other Bell company presidents!, 30 April 1908. By 1916, after a year's study in the field, AT&T's comptroller reported: "We have a strong centralized administration of engineering...." Charles G. DuBois to U. N. Bethell, 26 May 1916.

39 T. N. Vail to William A. Childs, 25 Feb. 1908. See also T. N. Vail to B. E. Sunny, 6 April 1909 The "harmonizing" in operations was done less aggressively than in matter involving technology, but gradually System-wide standards for operations were devised and implemented.

40 The Bell System's three-column structure is discussed in Garnet, The Telephone Enterprise, 135-46. The functional organization replaced a territorial structure. See also George David Smith, The Anatomy of a Business Strategy: Bell, Western Electric, and the Origins of the American Telephone Industry (Baltimore, Md., 1985), 135-38; and FCC, Investigation of the Telephone Industry, 185-204.

41 T. N. Vail to E. C. Bradley, 6 Aug. 1912; See also T. N. Vail to Mr. Scott, 24 July 1912.

42 The protracted controversy over this aspect of the license contract and its resolution by 1918 are described in FCC, Investigation of the Telephone Industry, 149-51.

43 Several recent studies of corporate R&D have stressed this political dimension--that is, the need for effective R&D spokespeople within the firm--of the process of innovation. See, for instance, David A. Hounshell and John K. Smith, Science and Corporate Strategy: Du Pont R&D, 1902-1980 (New York, 1988); Margaret B. W. Graham, RCA and the VideoDisc: The Business of Research (New York, 1986); Reich, Making of American Industrial Research.

44 As quoted in Wasserman, From Invention to Innovation, 19. For Hayes's career, see Roger B. Hill and Thomas Shaw, "Hammond V. Hayes: 1860-1947," Bell Telephone Magazine, Autumn 1947, 151-73. On AT&T's relationship with MIT, see also David F. Noble, America by Design: Science, Technology and the Rise of Corporate Capitalism (New York, 1977).

45 Hammond V. Hayes to F. P. Fish, 31 Dec. 1906.

46 "Organization. Engineering Department. American Telephone and Telegraph Company, January, 1905."

47 AT&T continued to support some university theoretical work; see T. N. Vail to Richard C. Maclavrin, 18 Feb. 1913; Harold Pender to J. J. Carty, 18 June 1913; Charles G. DuBois to J. J. Carty, 28 July 1913; and Nicholas Murray Butler to T. N. Vail, 27 Feb. 1914. But Carty decisively opted for internalizing the R&D function; see J. J. Carty to T. N. Vail, 27 July 1915, enclosing "Industrial Research Laboratories in Universities." Thayer ultimately terminated the MIT work in 1924; H. B. Thayer to Everett Morss, 11 Dec. 1924.

48 J. J. Carty, Memorandum for H. B. Thayer, 8 April 1909; H. B. Thayer, Memorandum for T. N. Vail, 27 May 1909.

49 J. J. Carty, Memorandum for H. B. Thayer, 8 April 1909.

50 See Alfred D. Chandler, Jr., Strategy and Structure: Chapters in the History of the Industrial Enterprise (Cambridge, Mass., 1962), 52-113.

51 See Western Electric Company, Manufacturing and Engineering Conference, Chicago, Illinois, 24-28 May 1915 (the pages in this report are not numbered consecutively so I have not used page numbers). The R&D organization in WECo was about four times the size of AT&T's Engineering Department.

52 Ibid. Also see Hounshell and Smith, Science and Corporate Strategy, for numerous examples of this type of organization tension.

53 Hoddeson, "Emergence of Basic Research," 534.

54 See H. S. Sheppard, Memorandum for Mr. Gifford (with enclosure from J. J. Carty), 1 June 1921; Hoddeson, "Emergence of Basic Research," 515-16, 531-40; Reich, Making of American Industrial Research, 160-76. The competitive aspects of Bell's technological innovations are laid out especially in J. J. Carty, Memorandum for H. B. Thayer, 8 April 1909.

55 On automatic switching, see Kenneth Lipartitos excellent analysis in "Innovation in the Telecommunications Industry, 1890-1990," esp. 19-52. On the French phone, see H. B. Thayer to J. Epps Brown, 23 Feb. 1915. A somewhat similar situation arose in regard to certain private branch exchanges; see H. B. Thayer to P. L. Spalding, 21 April 1913, and H. B. Thayer to W. T. Gentry, 21 Oct. 1914.

56 See also Reich, Making of American Industrial Research, 246-47. These aspects of corporate innovation may well explain some of the anomalies in the empirical data discussed in Scherer, Industrial Market Structure and Economic Performance, 433-38.

57 F. B. Jewett, "Development of New Apparatus for Manufacture," in Western Electric Company, Manufacturing and Engineering Conference, 1915. See also the remarks of E. B. Craft on cutting costs.

58 See, for example, Annual Report...1911, 24, and 1912, 25. See also Theodore N. Vail to John A. Moon, 30 Dec. 1918 ("Wire System"), 10. Carty was an advocate of basic research, but he meant by that expression research into the basic

scientific concepts needed to solve specific technological problems. The research and development efforts were all tightly focused.

59 Since I am not counting Alexander Cochran's temporary appointment (1900-1901), the reference is to John E. Hudson (1889-1900) and Frederick P. Fish (1901-7).

60 T. N. Vail to Major Higginson, 18 June 1919.

61 Jameson w. Doig and Erwin C. Hargrove, Leadership and Innovation: A Biographical Perspective on Entrepreneurs in Government (Baltimore, Md., 1987), stresses similar aspects of successful entrepreneurship in public life; see esp. 8, and John Milton Cooper, Jr.'s interesting essay on "Gifford Pinchot Creates a Forest Service," 63-95.

62 T. N. Vail's letters: to William A. Childs, 25 Feb. 1908; to H. J. Pettengill, 31 Jan. 1908; to L. G. Richardson, 17 March 1908; to George E. McFarland, 16 March 1909; to B. E. Sunny, 3 June 1909; to H. M. Watson, 31 Aug. 1909; to Major Higginson, 18 June 1919; Annual Report ...1911, 28-29.

63 Annual Report...1912, 17-19; as Vail explained, "Perfect service is only to be found when fidelity and loyalty are reciprocal in employer and employee" (19). Annual Report...1914, 29-32.

64 Western Electric News 8 (July 1919): 10-15; (Nov. 1919): 29. At this time, hardly any Bell System employees were unionized, and one of the goals of these programs may have been to prevent the development of independent unions.

65 See, for instance, H. B. Thayer's thirteen-page letter to George McFarland, 24 Dec. 1913.

66 T. N. Vail to John Waterbury, 13 Aug. 1907; Connie Jean Conway, "Theodore Vail's Public Relations Philosophy." Bell Telephone Magazine, Winter 1958-59. 44.

67 "Notes of Certain Talks at Presidents' Conference Held in New York," 8-10 Dec. 1919; H. B. Thayer to M. B. Jones, 3 June 1920; "Yama Farms Conference," 4-9 June 1921.

68 Western Electric News 1 (March 1912): 9-10; 2 (Aug. 1913): 26-27 the subject was "The Telephone Induction Coil and How It Is Used"!; 4 (April 1915): 1-6; ibid., 28; 5 (Nov. 1916): 5; 2 (April 1913): 25.

69 These remarks were by R. L. Jones at Western Electric Company, Manufacturing and Engineering Conference, 1915.

70 P. J. Gilman in ibid.

71 See, for example, J. J. Carty to H. B. Thayer, Oct. 1920; L. F. Morehouse to G. A. Campbell, 7 Dec. 1922; J. J. Carty to H. B. Thayer, 21 Nov. 1924.

72 See Hugh G. J. Aitken, The Continuous Wave: Technology and American Radio, 1900-1932 (Princeton, N.J., 1985); and Reich, Making of American Industrial Research, 218-38.

73 Neither M. D. Fagen, ed., A History of Engineering and Science in the Bell System: The Early Years (1875-1925) (1975), 52-56, nor Reich, Making of American Industrial Research, 182-84, nor Hoddeson, "Emergence of Basic Research." 541-42, discusses in any detail the managerial decision to organize the labs in this manner. For some insight into the problems that had arisen in handling R&D costs and the impact this seems to have had on the decision, see N. T. Guernsey to W. S. Gifford, 14 Dec. 1921; A. H. Griswold to E. S. Bloom, 25 Aug. 1922; C. G. DuBois to E. S. Bloom, 18 July 1923; and E. S. Bloom to H. B. Thayer, 24 March 1923.

74 See H. B. Thayer to Henry S. Howe, 19 Dec. 1924. Thayer emphasized "the desirability of providing for a succession from within the organization." He said, "Since the election of Mr. Jewett on Tuesday, I can say that in our headquarters' organization there is either a younger or an older man technically qualified and experienced, who could carry on, at least temporarily, the work of any department if that department's chief were removed." He might have said, too, a man steeped in the values of Theodore N. Vail.

75 Gifford, in fact, narrowed the focus of the Bell System, a change in policy that Thayer had started by selling Western Electric's international operations. Thayer and Gifford thus stressed economies of scale and system while curtailing efforts to achieve economies of scope. For example, Gifford took ⓘAT&T out of radio broadcasting and motion pictures, two businesses in which the firm had established strong technical positions.

76 See Peter Temin, with Louis Galambos, The Fall of the Bell System: A Study in Prices and Politics (New York, 1987), for an analysis of that crisis. See also Alvin von Auw, Heritage and Destiny: Reflections on the Bell System in Transition (New York, 1983); and Steve Coll, The Deal of the Century: The Breakup of ⓘAT&T (New York, 1986).

77 Richard S. Rosenbloom and Michael A. Cusumano find some the same characteristics among contemporary executives who are successful in managing innovation: "Technological Pioneering and Competitive Advantage: The Birth of the VCR Industry," California Management Review 29 (Summer 1987): 51-76.

78 Western Electric Company, Manufacturing and Engineering Conference, 1915. On the tension between innovation and efficiency, see Paul R. Lawrence and Davis Dyer, Renewing American Industry: Organizing for Efficiency and Innovation (New York, 1983), esp. 1-16, 238-90; and Louis Galambos, "What Have CEOs Been Doing?" Journal of Economic History 48 (June 1988): 243-58. On the balance between adaptive and formative innovations, I have benefited from Margaret B. W. Graham and Bettye H. Pruitt, R&D for Industry: A Century of Technical Innovation at Alcoa (New York, 1990).

79 Lazonick, Business Organizations and the Myth of the Market Economy.

80 Doig and Hargrove, Leadership and Innovation, breaks new ground in studying public bureaucratic behavior from a Schumpeterian perspective--hence moving the analysis of public administration closer to the position outlined here.

81 This transition is discussed in Louis Galambos and Joseph Pratt, The Rise of the Corporate Commonwealth: United States Business and Public Policy in the 20th Century (New York, 1988), esp. 28-36, 71-99.

82 Moses Abramowitz and Paul A. David, "Reinterpreting Economic Growth: Parables and Realities," American Economic Review 63 (May 1973): 428-39; Moses Abramowitz, Thinking about Growth: And Other Essays on Economic Growth and Welfare (New York, 1989).

83 See Galambos, "What Have CEOs Been Doing?"

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The Telephone Problem and the Road to Telephone Regulation in the United States, 1876–1917

Between 1876 and 1917, government philosophy toward telephone regulation began moving away from laissez-faire and toward some kind of involvement in economic affairs. However, while some early studies of regulation suggest business hostility to that policy, AT&T actively sought regulation, jogging government and the public in that direction. But this study is not just a restatement of the interest-group-capture theory, as offered by such economists as Stigler or historians as Kolko.[1] Regulation resulted from the convergence of interests of many affected players, including residential and business telephone subscribers, the independent telephone companies that competed with AT&T, and the state and federal governments, as well as AT&T. I employ a multiple interest theory to account for telephone regulation, but unlike other studies using such a framework, I suggest that government is an independent actor with impact on the final policy outcome, and not merely an arena where private interests battle for control over policy outcomes, as is so common among other multiple interest studies of regulation.[2]

I begin the story of the establishment of telephone regulation by focusing on AT&T. As the story unfolds, the interests of other actors enter—government, business and residential telephone users, and AT&T's competitors. Once in place, the complex interrelationships among the various interests are revealed.

This section develops the basic theoretical perspective of the telecommunications policy in terms that will allow a framework for understanding the government-industry nexus. The policy subsystem is always trying to

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reach a kind of stability or balance, whereby the interests and preferences of the government and the industry intersect.

AT&T began as a profit-making enterprise. By controlling at least some of the market for communications, AT&T could protect some of its profit potential. However, markets are unsettling for competitors. Therefore AT&T, as a competitor with real or imagined (potential) competitors, sought ways to limit or restrict competition. In other words, it sought to control and stabilize the market. With control established, profits could be secured and enhanced. Thus the first dimension of the initial model is AT&T's preferences concerning control over and stability within the market for telecommunications.

The second major player at this intial point is the government. The government acts as the guardian of the public interest. The "public interest" can be viewed as expressed justifications by differing interests for certain government policies. Usually we will notice a strong relationship between the group's "public interest" preference and its own self-interest. Primarily, two definitions of the public interest vie for policy supremacy: social efficiency and equity.[3]

Social efficiency addresses the question, How much of society's resource will be spent in providing a service or product to its citizens? Ideally, efficiency affords high levels of goods provision at a low cost in the aggregate. Social efficiency, however, does not address the question of the distribution of goods and services or how fair or well balanced that distribution is. This is the second important definition of the public interest: fair or equitable distribution. The more a good takes on a public goods character, the more public pressure mounts to ensure an equitable distribution.[4]

Social efficiency and equity differ in policy implementation. Social efficiency requires a market implementation strategy. Only by allowing the laws of supply and demand to determine cost and investment can society provide a good at its most efficient level. Markets, however, are inherently unfair. Market mechanisms ensure that there will be losers as well as winners. Hence, governmental regulations are often used to ensure an equitable distribution. In effect, governmental regulations that promote equity try to ensure that there are no losers.

Government policy rides between two poles, with government control anchoring one end and unfettered competition the other. Along the government dimension of low to high levels of control we can envision four ideal types of policies. At the extreme low end is laissez-faire, or no government involvement in the economy. This policy maximizes social efficiency over equity. Also placing social efficiency over equity, but not

so glaringly, is the next state, antitrust. In this state modest levels of government regulation occur, but to ensure a socially efficient outcome, not necessarily an equitable one. Equity begins to supersede efficiency in value at the next stage, regulation. Finally, in the fourth position, nationalization, government control is maximized in the name of equity. The government prohibits the market from functioning, asserting that equity is the only desirable goal for activities treated in this way. When we cross these two dimensions, government control over the market and AT&T's preferences for its level of market power, we can describe the nature of government-industry relationships.

Over time, the intersection of government policy and AT&T preferences have changed because of (1) changing preferences along the government dimension and (2) AT&T's (dis)satisfaction with its level of market power and security. The issue at hand for the government and AT&T is to reach a position that satisfies both. This has not always been easy or possible, and often it has led to conflict between the government and AT&T.

We can now specify more fully the implications of equity and efficiency arguments as they relate to the provision telephone communications. Social-efficiency arguments suggest that society invest in the aggregate no more of its resources in a good or service than society can use. Surpluses are socially inefficient and wasteful, requiring more than necessary investment, while shortages are also looked upon as undesirable, as socially productive demand is not met. In the provision of telecommunications, this usually translates into consumers of telecommunications services being offered services and goods from providers in a competitive market, whereby consumers can buy their desired type and level of service at the price they are willing to pay.

The problem with the social-efficiency argument, according to the equity proponents, is that some goods and services may be required for everyone, but some may not be able to afford the service if they have to pay for it at the lowest level that a provider can offer it, that is, at its true market cost. Therefore society as a whole must redistribute, often in the form of cross-subsidies, whereby some pay more than the cost of providing the good to supplement others who cannot afford the service at its market cost. In telephone provision, this often means that business is charged more for service than consumers, and that urban areas pay more than rural areas. In the business-consumer situation, it is also assumed that business values telephone access more, and hence is willing to pay more for service. Thus the equity argument often bases its pricing structure on reasonable charges and value of service pricing, whereas socially efficient pricing schemes use cost of provision to determine price.

AT&T, however, did not react only to governmental policy change. AT&T's actions and market position also led to changes in government policy preferences. Further, the behavior of AT&T's competitors, as well as consumers, must be entered into the equation. Thus, there is a subtle interaction and, over time, mutual adjustment of all of these parties to each other.

Most studies of telephone regulation begin with the Communication Act of 1934. That act created the Federal Communications Commission, which was granted the power to regulate all forms of interstate communications, including broadcasting and the telegraph as well as the telephone. However, telephone experience with government antedated this comprehensive federal act.

Most telephone historians identify three major periods or epochs of competition prior to 1934.[5] Here I will rely on that conceptualization but relate it to the model.

The first period spanned the earliest years of telephony, 1876–80, and was considered a period of strong competition. Western Union challenged Bell interests for control of telephony, while government activity, except for patent protection, was generally nonexistent. It is fair to call this a period of laissez-faire,[6] but it was also a time when Bell was dissatisfied with its market position. Bell's patent protection kept the company from sliding too far into a poor market position, though Bell faced strong competition. Still, Bell's market position was fragile; Western Union was a much larger enterprize with vast resources. Hence, Bell felt competitively insecure and somewhat dissatisfied with its market position, compelling it to look for a more stable solution to its threatened competitive status.

The next period, from roughly 1880 to 1894, was one of monopoly. State and federal government policies remained laissez-faire, but Bell's market position changed, moving toward a secure posture—monopoly control. However, since its monopoly position was determined by patent control, and those patents would expire, its monopoly status would not remain unchallenged. Bell thus anticipated great competition after its patent protection expired.

The third period, from the mid-1890s to 1914, was one of intense competition. Some divide this period into two subperiods—1894–1907 and 1907–14. The first subperiod was one of unbridled and often predatory competition, leading to a drop in Bell's (now AT&T) competitive position, nearing, though never reaching, a poor competitive posture. Thus Bell was highly dissatisfied with its competitive posture. In the

second subperiod, Bell altered its policies to improve its competitive security. Government policy remained laissez-faire.

During the second subperiod, both Bell and the government changed their behavior and policies. Government policy began to move beyond laissez-faire and antitrust, settling at regulation, and not reaching nationalization. However, some nationalization sentiment was aired during these years. This subperiod witnessed the rapid spread of state regulation and the beginnings of federal regulation of telephony. Also, AT&T's competitive position improved, in part because the company changed its policies regarding its competitors. AT&T began to trade off monopoly control for a strong competitive position, coupled with government protection. AT&T began to cooperate with competitors, trying to find an accommodation that would provide a stable market. It also aimed to use government regulation to compel all competitive parties to maintain the new relationship. While allowing competitors a share of the market, AT&T was able to secure the bulk of the market for itself.

From 1914 until 1933, the foundations of federally regulated monopoly were set. AT&T's competitive position remained strong, verging on dominant, but government policies were in flux as advocates of antitrust, regulation, and nationalization began to compete for direction of government policy. The regulators won, but AT&T's relationship with the government would be plagued throughout the rest of its history as the antitrust proponents periodically challenged the company. AT&T was satisfied with its market position and sought a stable government regime to protect that position. By the end of the period, AT&T also was satisfied that its strategy toward the government had been successful.

AT&T, Government, and Public Policy

Period 1: 1876–80. Early after the invention and marketing of the telephone, Bell's interests were threatened by the corporate giant Western Union. Western Union developed alternate telephone devices and challenged Bell patents in the courts, which Bell defended vigorously.[7] Bell, however, as a fledgling company, did not possess the capital resources to compete with Western Union, one of the largest companies in the nation. Competition raced along during these early years, but it appears that Bell's strong patent position and Jay Gould's challenges to Western Union, with his own telegraph network, led Western Union to back away from direct head-to-head competition with Bell. In a complex agreement, Bell absorbed Western Union's telephones, Western Union agreed to

support Bell's patent rights, and the two agreed to divorce operations: Bell was to operate telephony exclusively and Western Union would operate only telegraphy.[8] Thus Bell's first contact with government came from patent protection, and that patent protection led to the creation of a monopoly. This period was one of market insecurity but lack of government involvement. As Bell entered the next period, however, its market position improved, and the seeds of change in government policy also began to germinate.

Period 2: 1880–94. Bell's early years as a monopoly occurred as other industries were also monopolizing. During this period the public perception of AT&T changed, and this change was to plague the corporation throughout its history. Once considered the David that slew the Western Union Goliath, Bell was transformed in the public's mind into just another combine, an image that it would never shake, and would in later years be symbolized as "Ma Bell."

During these monopoly years, Bell's financial situation stabilized,[9] telephone equipment improved, long-distance technology developed, and telephony diffused, but not at the pace of the earlier competitive years or of the next wave of competition. From 1877 to 1880, the number of telephones expanded by 416 percent, or about 139 percent a year. Between 1880 and 1894 the pace of expansion slowed to 33 percent a year. The reintroduction of competition in 1894 increased expansion rates to 78 percent a year until 1907.[10]

One reason for Bell's conservative growth policies during this period was to prepare for the onslaught of competition that it expected when its patents would expire in the mid-1890s. By growing more slowly, AT&T hoped to limit its corporate debt and thus be in a better financial position to compete. Thus, though Bell created a monopoly during these years, the monopoly was not secure or permanent. Bell interests would ride a rough period before the company learned that government protection in another form—regulation—could protect it.

(Sub)Period 3a: 1884–1907. Two important developments occurred between 1884 and 1907. One was AT&T's plan for an integrated network from supply to service; the other was competition.

Vertical integration of the telephone network and the desire to offer end-to-end service can be viewed as the rationale behind the need for a monopoly. More cynical observers might view monopoly as a state that all capitalists desire. However, the logic of network integration in telecommunications is powerful, and in the future would lend itself easily to cooperation with the government via regulation. Vertical integration required that AT&T provide itself with all that it needed, from equip-

ment to end-to-end customer service. Further, as the value of telephone service was considered to be in part a function of the number of people connected to the network, the rationale and incentive for long-distance operations developed. However, to ensure that a long-distance network could be built and that the local companies could interconnect with it required centralized control. Hence, AT&T began to control the operations and standards of the locals. Bell established an integrated network that would reduce transactions costs among interacting components and create uniform standards of operation and service. This network would become a mainstay of corporate ideology until the divestiture threat of the 1980s.[11]

Competition came swiftly to AT&T after its patents had expired, and while one would expect AT&T's control over the market to decline, it seemed to decline more precipitously than expected. By 1900, barely six years after the patent expirations, almost one-third of the market was owned and operated by nonconnecting, non-Bell companies. By the early 1900s these nonconnecting competitors had peaked in market share with about 40 percent.[12]

Independent telephone company competition met AT&T head on, often competing directly in AT&T markets. According to Herring and Gross: "[I]n almost every city in which Bell exchanges existed, rival exchanges were established by independent companies."[13] These rivals hoped to feed on dissatisfaction with Bell services and rates. The independents also ventured into areas untapped by AT&T—the small towns and rural communities of the nation. In these more agrarian areas, the independents became powerful rivals to Bell.[14] Gable reports figures on the extent of the head-to-head urban competition between Bell and its independent rivals. In 1902, of 1,051 cities of more than 4,000, 1,021 had telephone service. Of those, 414 (41.3 percent) were served by Bell exclusively, 137 (13.7 percent) were the exclusive territories of the independents, and 451 (45.0 percent) were served by Bell and at least one independent.[15] Thus, even in its core market, urban areas, Bell was faced with strong challenges by the independents.

An early Census Bureau report provides figures on the expansion of the independency movement and its penetration as of 1907, the earliest year such figures are available on a state-by-state breakdown. Regionally, AT&T and its affiliates were strongest in New England, with 89.3 percent of telephones in that region in 1907. Its other areas of greatest market control were the Middle Atlantic states, the Pacific states, and the mountain states (mostly Colorado), where AT&T controlled 70 percent of the market or better. In the southern states, AT&T usually controlled

about half of the market, but it was in the midwestern states where the independents were strongest. For instance, in the western north-central Plains states (Iowa, Kansas, Nebraska, Minnesota, the Dakotas, and Missouri), the independents controlled over three-quarters of the telephones, and in the Great Lakes states, the independents controlled almost 60 percent of the market.[16]

One factor accounting for this regional distribution was the combination of the relative affluence of the midwestern grain states and their sparse population. AT&T preferred controlling urban areas, for which the cost of service provision was lower and traffic was greater, leading to a greater potential to recoup investment.[17] However, the relative affluence of the midwestern states created a great demand for telephony. This is contrasted by the South, a much poorer region, where AT&T gained entry into some urban areas relatively easily and often with the support of state governments, which tried to promote telephony's expansion. But the rural areas were so desperately poor that the independency movement, though valiant, was not successful in penetrating the South.[18]

The rest of the market was controlled by non-Bell companies that connected to Bell. Connecting non-Bell telephones to the Bell network represented a change in policy at Bell, which President Theodore Vail instituted in 1907. It also represented a policy change among some of the independents, many of whom had contracts and licenses expressly forbidding interconnection with Bell. As we will observe, this new AT&T policy was important in the larger aim of creating market stability. Coupled with regulation, it would provide AT&T with a secure market for generations.

AT&T's market loss occurred even in areas that it had entered first. Most competing firms felt that getting into a market would preclude competitors from entering because of the capital costs of building networks, laying lines, and securing rights-of-way. And as the value of individual subscription to the service was based upon how many people subscribed, late-entering competitors were at a disadvantage because they could not offer subscriber lists comparable to those of earlier service providers. Further, many cities offered exclusive franchises to the telephone companies, often precluding entry of competitors within their territory. Price competition resulted in many cities where both independents and AT&T operated. The independents offered lower rates, but often with disastrous results. These companies began with less money behind them and price competition often led to their poor service and maintenance and even bankruptcy.[19]

Prices declined greatly during the competitive era. Between 1894 and

1909, Bell's prices for businesses and residents dropped by 47.5 percent and 64.9 percent in competitive areas, and by 47.1 percent and 57.6 percent in noncompetitive areas.[20] While competition clearly affected prices in competitive areas, the threat of potential competition may have depressed prices in noncompetitive areas. Innovation and product development also depressed prices. More efficient, better equipment reduced the costs of operations, which could be passed on to the customer. It is likely, too, that competition spurred on these innovations.

The independents' major weakness, though, was the lack of a long-distance network. Realizing that pooling their resources would enable them to compete with AT&T more effectively, they created, in 1897, the National Association of Independent Telephone Exchanges. Its major goals were to establish a long-distance network and present united resistance against AT&T.[21] United action seemed to work so well that in 1909 a merger of independent telephone companies was planned with an initial capitalization of $100 million, a hug sum at the time.[22] Not surprisingly, AT&T charged that such capitalization was excessive and that it alone could offer all the telephone service that the nation required.[23]

Competition not only drained AT&T's market share but drained the company coffers as well. AT&T assumed large debt financing in 1902. In 1901 Bell's debt had amounted to $15 million. By 1906 it had ballooned to $128 million.[24] The policies of the early period of competition (1895–1907)—patent purchases, expansion, and refusal to interconnect and/or sell to competitors—gave way to a new set of policies that included product development, absorption of competitors, interconnection, sales to competitors, and regulation.[25]

The rapid pace of competition and AT&T's eroding position led to the giant's acquiescence and support for monopolistic regulation. AT&T's flirtation with regulation was tentative at first. The policy of free-market competition was sapping the company, as it had done to the railroads twenty years earlier. Government was also beginning to change its attitude about the telephone industry. A telephone began to be viewed as a necessity of life, a public utility that everyone should have. Thus the first rousing of a public-interest equity argument appeared, challenging the older prevailing idea that social efficiency in the provision of telephony was best.

(Sub)Period 3b: 1907–14. By the early 1900s, public forces began to alter the long-standing governmental preference for laissez-faire. A number of policy options existed, including regulation and nationalization. This section addresses the question of who supported and opposed the various

policy options and why. The debates that ensued illustrate how the differences between social efficiency and equity affected policy approaches.

A full complement of interests can now be identified: residential and business subscribers, independent telephone companies, AT&T, and the government, each seeking a solution to its telephone problem. The theoretical framework is more complex than early public-interest theories of regulation that argued regulation or simple interest-group-capture theories.[26] Rather, the framework has more in common with the multiple interest approach.[27] However, the interests, preferences, and resources of government officials also have important implications for policymaking, factors not considered in the multiple interest model.

In the early 1900's neither the federal government nor most state governments had developed an active policy regarding telephones. Rather, they were just beginning to decide whether or not to adopt a telephone policy.

1. *Residential Users.* Residential users almost always favor policies that promote equity over social efficiency. They usually feel that their interests are better served by equitable distribution than by social efficiency. Social-efficiency policies often disadvantage many consumers, even though society in the aggregate may be better off. Further, in modern democracies, the equity argument tends to be quite potent and is a major weapon used by public figures and demagogues to mobilize the public. Thus residential users tended to prefer either regulation or nationalization of the telephone.[28] The generally pro-market ethic of American culture, however, is not a habitable environment for nationalization policies. Therefore residential consumer preferences tended to settle on the regulatory option.

A number of conditions in telephone service at the time seemed to breed fairly broad public support for regulation. Three issues were primary: rates, complaints, and service.

Many residential users felt rates were too high. This seems especially to be the case in areas where monopolies were providing service. In 1909, for instance, residents in New York City noticed that telephone rates were lower in neighboring Brooklyn. Brooklyn was served by an independent company trying to gain entry into the New York City market, which the AT&T subsidiary, New York Telephone, served. By offering lower rates, the independent hoped to convince public and city officials to allow it entry into the market.[29] Residential users felt that if the independent could offer low rates, why could not the government force New York Telephone to follow suit. They felt that New York Telephone was charging monopolistically high prices. Residential users felt that the monopolis-

tic telephone companies were not accountable. Routinely, telephone companies did not offer itemized billings, and they rarely responded when residential users complained about possible overcharges. Customers' refusal to pay until the problem was settled often led the telephone company to disconnect service. Hence, users wanted some kind of regularized system where they could make a complaint without fearing company retribution.

Haphazard wiring was also a problem that concerned the residential user. Early pole wires were made of iron and were strung overground, often hither and thither over people's yards, along with electric power and other lines, presenting a crazy-quilt pattern. Wiring was unprotected and often was downed due to rust, weather, or fire (which sometimes was caused by telephone and power lines touching). This led some municipalities to require underground wiring, but it was not until the mid-1910s that safe insulation and pulled copper wire were available, thus minimizing the danger.

2. *Business.* The complaints of business resembled those of residential users, but they were probably more intensely held. While both business and residential users valued adding subscribers to the telephone network, businesses had a greater stake in expanding the lists of subscribers. Telephone competition, however, meant that business would have to subscribe to both competing telephone services. Many businesses felt that they were thus doubly charged, and such perceptions of overpayment fueled resentment toward the telephone companies.[30] However, as noted above, multiple subscriptions did not necessarily increase costs to business because of the price-dampening effects of competition. Business preferred a system that would require interconnections between telephone systems or provide for some sort of intersystem integration, thereby allowing business to attach to one company and receive the benefits of connection to all subscribers. Two policy options could fulfill businesses desires: nationalization and regulation.

Business tended to oppose nationalization. Setting a precdent of nationalizing one industry might lead to nationalizing others. Rather, the option preferred by business was regulation by an independent, bipartisan commission. Thus, business-policy preferences converged with those of residential users.

3. *The Independent Telephone Companies.* In general, the major opponents to regulation were the independent telephone companies. Independent reluctance for regulation was based in part on a fear that regulation would freeze them and Bell at their current status. As Bell enjoyed market superiority, regulation would governmentally sanction that superiority.

Further, as the independents were expanding rapidly, they felt that their market share could expand as well. From 1895 to 1905, nonconnecting independents grew rapidly (1885–1900, 313 percent a year; 1900–1905, 44 percent a year). In contrast, Bell grew at a slower rate (1895–1905, 34 percent, 1900–1905, 35 percent). From 1895 to 1907, AT&T added 2,703,009 telephones to its systems, the nonconnecting independents added 2,249,578, and the connecting independents added 826,489. Together, the combined independents surpassed Bell's total additions of telephones. Thus the rate and accumulation of telephones led many of the independents to believe that they could beat Bell.

The independents thought that AT&T was vulnerable in other respects as well. Not only were they competing successfully against the giant, but they witnessed AT&T absorb great debt financing to stave off their competitive threat. Further, the counterorganization of independents—first into associations, then into proto-combines, and finally into a planned interstate merger that would rival Bell's resources—made many of the independents giddy with the possibility of beating the giant. (Reorganizing into another combination, however, would undo the nature of the independency movement, which was built on small, locally owned and operated companies. To match AT&T's resources, many of the small companies had already begun merging or pooling by the early 1900s.)

We get a good sense of the attitudes of the independents from this exchange between one independent and the Joint Assembly–Senate state legislative committee that toured New York State in 1909 investigating its telephone and telegraph companies:

> Q. Do you think that if your company installed its system in the city [New York] that you could reach that 25 percent of the people south of Fourteenth Street?
>
> A. Yes, I think we could reach a very large proportion of them, and under the plans that we have outlined—our policy rather—I think we could practically force the use of our system in practically all of the business houses in New York.
>
> Q. That is, you would have your telephones in 100 per cent of the business places south of Fourteenth Street?
>
> A. We should make an effort. We might succeed.
>
> Q. You think you could accomplish that?
>
> A. We think we could force it in order to protect the business interests.
>
> Q. What effect would that have on the business of the New York Telephone Company [an AT&T company] in that territory?

A. That would force them to meet our rates and furnish equally satisfactory service or they would gradually recede as we progressed with our installation.
Q. So that eventually they would be forced out of business as you accumulated business?
A. Well, that is a rather strong statement to make here, though there has been a number of places where that has been accomplished in quite large territories.
Q. So that if that happy result obtained here, you would then have the field to yourselves so far as the lower end of the island [Manhattan] is concerned?
A. Well, so far as the whole island is concerned.
Q. So far as the whole island is concerned?
A. Providing we met the entire satisfaction of the public.
Q. And if that time should arrive, then the people of New York City would find that they have exchanged one monopoly for another.
A. Well, we haven't crossed that bridge yet.
Q. You are willing to, I suppose?
A. We are willing to approach it.[31]

Rarely do we find such an honest monopolist.

The independents were not completely united on this matter, and the independency movement itself was highly decentralized. In 1910 Frank H. Woods, president of the national association of independents, suggested that they change their policy prohibiting interconnection with Bell and enter into a system that would legally supervise the relationship between the independents and Bell, preferably by the Interstate Commerce Commission.[32] One reason for this change in attitude on the part of leaders in the independency movement was the realization of Bell's superior resources, which were enhanced when the Morgan banking interests began to take over AT&T around 1907, and the weakness of the independents' association, which had no power to force member cooperation and pooling of resources to build a competitive national network. Competition among the independents plagued them as well.[33] Thus by 1910 cracks in the wall of independent opposition to regulation began to appear. Also, AT&T's policies changed: the giant began to interconnect with some of the independents on a case-by-case basis and to purchase others. These AT&T policies weakened the resources of the independents and their resolve to compete with AT&T.

In these early years of the twentieth century, the aggressive, expansionist, and successful independents were not ready for regulation and certain opposed nationalization. But they did not want to maintain the laissez-faire status quo either. Instead, they preferred antitrust, which would give them a weapon to use against Bell, a weapon they would invoke, though with only minimal success, as Bell countered with a regulatory strategy and a well-designed publicity campaign to mobilize public support for regulation.[34]

4. *AT&T.* AT&T's position is surely the most complex. Of the possible policy options, AT&T preferred regulation.

Nationalization: Clearly the profit-motivated capitalists that ran the company did not want to see their highly profitable enterprise nationalized, but nationalization sentiment did exist. As early as the turn of the century, critics of telephone companies were calling for nationalization.[35] These critics often charged that rates were higher in the United States than in European countries, where governments often owned the telephones. They also charged that service in the United States was poorer and that the government could operate the system more efficiently and less costly because it would not be in the business of making money. Further, they suggested that service would be provided to areas that did not appear profitable enough to receive service. Eliminating competition would also eliminate the waste created by duplication of service and plant. And last, they argued that telephone service was similar to mail service, differing only in that it was spoken as opposed to written.

While various government officials had offered proposals to nationalize the telegraph in the years between 1867 and 1873, none was taken seriously. However, with the rise of the progressive movement and its belief that government could bring the principle of business and scientific management to government administration, the idea of operating all the electronic communication media through a civil-service operation began to gain credence and some support. This culminated with a major report by Postmaster General Albert Sydney Burleson in 1913 arguing for the postalization of both the telephone and telegraph.[36] The Burleson Report was based on the statistical comparisons of rates and services between the United States and European nations with public ownership of the telephone. Also, in December 1913 Representative David John Lewis of Maryland read into the *Congressional Record* a long report arguing for the absorption of the telegraph and telephone into the Postal Department, relying on data similar to Burleson's.[37] Thus, on the eve of World War I, credible sources with some influence within the government began to talk earnestly in favor of government ownership. Further, the fact that such

proposals came from the Wilson administration, which had a reputation for progressivism and an ability to get its programs enacted by Congress, heightened the prospects for nationalization.[38]

The specter of nationalization was gaining momentum, a fact often lost on historians of telephony during this era.[39] As we will see, Bell's acceptance of regulation was in part motivated to avoid stricter forms of government control.[40]

Antitrust: Bell's entire history until divestiture can be thought of as an attempt to evade antitrust laws. Bell showed its antipathy to the antitrust conception during its monopoly period by strongly defending its patents and by purchasing other patents to preclude competitors from legally entering the telecommunications market. The first significant antitrust law, the Sherman Antitrust Act, was passed in 1890, shortly before the Bell patents were to expire. As Bell faced stiff competition in the first decade after the patent expirations, the Sherman Act had little relevance to the company. However, upon the accession of Theodore Vail to the presidency of the company in 1907, with the support of the Morgan banking interests, Bell began a strategy of beating the opposition by purchasing them. Such a policy clearly was an affront to the intent of the Sherman Act. Thus Bell was clearly no friend of antitrust.

Antitrust acceptance would also weaken Bell's market position, a major reason for Bell's antagonism and disregard for such policies. In later years Bell would create a company ethic of public service, one that included equitable distribution of telephone services, thereby creating an organizational structure that viewed antitrust and its attendant policy of social efficiency as a threat, a view that would last until divestiture.

Regulation: Since the continuation of laissez-faire, nationalization, and antitrust were abhorrent to Bell interests, Bell reconciled to government control through regulation. The company thus hoped to maintain its market position under government protection and fend off attackers that would nationalize or use antitrust laws against the company. Of the different varieties of regulation, Bell preferred the commission form directed by the states more than federal regulation.

AT&T perhaps preferred state regulation over federal regulation because interstate communication played little part in telephone operations of the day. Federal regulation thus would have little impact on the industry. For instance, as late as about 1930 Bell estimated that only .47 percent of its exchange service was interstate; the rest was intrastate. Of its toll service, 19.5 percent of messages were interstate. Of all services, only 1.36 percent of messages and 9.9 percent of revenues came from

interstate traffic as of the 1930s.[41] Twenty years earlier, when state regulation began to diffuse, interstate traffic was considerably less.

State regulation was looked upon as the more appealing alternative because it was thought to be the most conservative form of regulation and would be least onerous, especially compared to municipal regulation, which was often seen as radical.[42] it would also avert the nationalization movement. Further, state regulation was aligned with the then-strong progressive movement. Bell's support of these progressive ideals could also help the company's image. And last, the experience of other regulated industries had proved not to be too onerous, though Bell balked somewhat at strict rate regulation. As Norton Long says about AT&T's preferences for regulation; "The commissions would serve as a buffer between the Bell system and both the state legislatures and the public. As permanent bodies they would both be less amenable to the changing gusts of public opinion and more susceptible to a stable system of sympathetic contact."[43] It is almost as if Bell anticipated the regulatory capture that might occur. At least regulation would provide a stable environment, something then lacking in the competitive atmosphere and something that other political solutions might not avail either.

During the first dozen years of the century, new and greatly empowered public utility commissions sprang up around the nation. In the few short years after Bell's turnabout in 1907 accepting regulation, Bell found itself regulated in most states. Also, in 1910 federal regulation began in a small way, but it was not until 1934 that federal regulation was set in the form that it would assume for the next fifty years.

The Spread of State Regulation

Before 1907, eight states, mostly in the South, regulated telephones to some extent (see Table 1).[44] Then an outburst of state regulation commenced, and from 1907 until the Kingsbury Commitment in 1914 another thirty states and the District of Columbia began regulating telephones. Four more stragglers (Minnesota, Utah, West Virginia, and Wyoming) had instituted regulation by the end of the decade. Thus, by 1920 forty-two states and the District of Columbia were regulating telephones. Sporadically over the years the remaining six continental states also adopted regulation, ending in 1976 with Texas's adoption of regulations.[45]

The historical record on early state regulation is far from complete, but a report issued by the New York State legislature in 1910 gives us a good

Table 1: The Diffusion of Telephone Regulation Across the States

State	Garnet Date	NARUC, 1984 Rate Setting	NARUC, 1911 Findings
Alabama	1907	1921	Jurisdiction, no rules
Alaska		1960	
Arizona		1912	no jurisdiction
Arkansas		1935	no jurisdiction
California	1908–11	1912	no jurisdiction
Colorado		1913	no jurisdiction
Connecticut	1908–11	1911	no jurisdiction
Delaware		1949	
Disctrict of Columbia		1913	
Florida		1913	jurisdiction, no rules
Georgia		1906	jurisdiction, no rules
Hawaii		1913	
Idaho		1913	no response
Illinois		1913	no jurisdiction
Indiana	1885	1913	no jurisdiction
Iowa		1963	no jurisdiction
Kansas	1908–11	1911	no jurisdiction
Kentucky		1935	no response
Louisiana	1898	1921	jurisdiction and rules
Maine		1914	no jurisdiction
Maryland	1908–11	1910	investigating
Massachusetts		1851	investigating
Michigan	1908–11	1913	no jurisdiction (1911)
Minnesota		1915	no jurisdiction
Mississippi	1892	1956	no response
Missouri		1913	no jurisdiction
Montana		1913	no jurisdiction
Nebraska	1907	1909	jurisdiction, no rules
Nevada	1907	1920	no jurisdiction
New Hampshire	1908–11	1911	no jurisdiction (1911)
New Jersey	1908–11	1911	some powers
New Mexico	1908–11	1912	
New York	1908–11	1910	jurisdiction, no rules

Table 1: The Diffusion of Telephone Regulation Across the States *continued*

State	Garnet Date	NARUC, 1984 Rate Setting	NARUC, 1911 Findings
North Carolina		1893	jurisdiction, no rules
North Dakota	1908–11	1919	no jurisdiction (1911, no rules)
Ohio	1908–11	1913	no jurisdiction (1911)
Oklahoma	1907	1917	jurisdiction, no rules (1911)*
Oregon	1908–11	1911	no jurisdiction
Pennsylvania		1913	investigating
Rhode Island		1969	no jurisdiction
South Carolina	1904	1912	jurisdiction, no rules
South Dakota		1909	jurisdiction, no rules
Tennessee		1913	no jurisdiction
Texas		1976	no jurisdiction
Utah		1917	
Vermont	1908–11	1923	no rules, but tariffs must be filed
Virginia		1902	jurisdiction, no rules
Washington	1908–11	1909	investigating
West Virginia		1915	no response
Wisconsin		1907	jurisdiction and rules
Wyoming		1915	no jurisdiction

*Court case pending.

sense of the scope and extent of regulation across the states.[46] The report compiled all of the statutes in the states concerning telephone regulation as of 1910 and found that thirteen states had placed telephone companies under the jurisdiction of a railroad or public utility commission (sometimes also called a public service commission). They tended to be located in the South and West (see Table 2). Only Massachusetts and Vermont were so organized in the East. Slightly more states (fifteen) allowed regulation of rates. Again, this set is comprised mostly of the states with commission-style regulation, but Florida, Maryland, and North Dakota regulated rates to some extent without commissions, and of the commission states, one, Massachusetts, was not granted regulatory power over

Table 2: Summary of Statutes Regulating Telephone Companies in 1910

State	Commission	Rate	Inter-connection	Anti-discrimination	Local Citing
Alabama					
Arkansas	x	x		x	
Arizona					
California					
Colorado					
Connecticut			x	x	x
Delaware					
District of Columbia					
Florida		x			
Georgia	x	x			
Idaho					
Illinois					
Indiana				x	
Iowa				x	
Kansas					
Kentucky					
Louisiana	x	x		x	
Maryland		x	x	x	
Massachusetts	x		x	x	x
Michigan			x	x	
Minnesota					
Mississippi	x	x		x	
Missouri			x	x	
Montana				x	
Maine					
Nebraska	x	x			
Nevada					
New Mexico					
New Jersey					x
New York			x	x	
North Carolina	x	x			
North Dakota		x		x	x
New Hampshire					
Ohio					

Table 2: Summary of Statutes Regulating Telephone Companies in 1910 *continued*

State	Commission	Rate	Inter-connection	Anti-discrimination	Local Citing
Oklahoma	x	x	x	x	
Oregon					x
Pennsylvania					
Rhode Island					x
South Carolina	x	x	x		
South Dakota					
Tennessee				x	
Texas					
Utah					
Vermont	x	x	x	x	x
Virginia	x	x		x	
Washington	x	x	x	x	
West Virginia					
Wisconsin	x	x		x	
Wyoming					

Source: State of New York, *Report of the Joint Committee of the Senate and Assembly of the State of New York Appointed to Investigate Telephone and Telegraph Companies,* 1910, Appendix B. Transmitted to the Legislature, 21 March 1910.

rates. Vermont's rate regulations were quite forward looking, requiring the same rates for the same service anywhere in the state, a forerunner of statewide rate averaging that was to prove so popular. Virginia prohibited short-haul—long-haul distinctions, the much maligned practice of the railroads prior to their regulation.

Another seven states granted broad regulatory powers, mostly ceding control of placement of utility wires, poles, and other establishments to the localities. Of these states, five were in the Northeast: only North Dakota and Oregon allowed local control in the West. A number of states began to require interconnection between telephone companies and telephone and telegraph companies. Ten states had explicit interconnection requirements. Half of these were in the East and half were also commission-regulated states.[47]

One common form of regulation was antidiscrimination clauses, which required service to be offered to anyone who could pay for it and in the

order that the service was requested. Nineteen states, spread evenly across regions, provided for such regulation. Nine of the thirteen commission states had antidiscrimination regulations.

A few states had other unique regulations: California allowed abandonment of lines, Massachusetts required insulation of wiring for safety purposes, Montana and Texas had strong antimonopoly regulations, New York required underground laying of cables in large cities, Ohio and Wyoming specified regulations for poles, and Ohio and Pennsylvania required yearly reports by the telephone companies to state agencies for other than tax purposes.

A rough index of state regulation can be computed by noting how many of the four major forms of regulation the states provided: commission control, rate regulation, interconnection, and antidiscrimination. Three states had all four regulatory provisions (Oklahoma, Vermont, and Washington), none of which is commonly thought of as an innovator in regulatory policy. Another eight states granted three regulatory powers to their commissions—Arkansas, Louisiana, Maryland, Massachusetts, Mississippi, South Carolina, Virginia, and Wisconsin. What is striking about these eleven regulatory leaders is the strong representation of southern states. Five of the eleven are from the old confederacy. The other six are divided among the eastern and midwestern-western states.

Another perspective on these data is to look at the regulatory laggards. Twenty-five states did not have even one such regulatory power as of 1910. Again we see the regulatory advances of the South. Only two southern states lacked any of these regulations, while eight states, including the District of Columbia, were to be found in the East and nine in the West. (The West is somewhat overrepresented here because of the territorial governments of Arizona and New Mexico, which were among the regulatory laggards.) The remaining six were located in the Midwest.

What accounted for this regional pattern of southern leadership? Part of the answer seems to be happenstance. The South engaged in railroad regulation quite early and extensively. Thus it had in place the government organizations to regulate other utilities. But then so did the rest of the nation by 1910. The South seemed more prone to regulation of big business at the turn of the century, which may be due in part to the populist, anti-big-business movements that affected those states (along with the grain Midwest) so strongly. Further, strongly associated with southern regulation is the propensity to use regulation as a means of promoting industry. The south being much poorer than the rest of the nation, these governments took on the duty of helping to build the infrastructure.[48] Viewed this way, southern regulation is less of a regulator

and more of a stimulator for telephony. While telephone companies were regulated in the South, regulations acted more to promote and protect than to control.

Period 4: 1914–34: The Early Federal Regulation. In 1910 the federal government, under the jurisdiction of the Interstate Commerce Commission, tentatively began to regulate telephones. Through the 1910 Mann-Elkins Act, Congress gave the ICC the first federal regulatory power to regulate telephones. Under that act, the ICC was granted the power to regulate rates for interstate telephone traffic. Oddly, congressional action on Mann-Elkins did not originally consider telephone matters. The thrust of the law was to grant appellate jurisdiction over railroad matters that appeared before the ICC's Commerce Court. On floor action, however, the bill was amended to include telephone, telegraph, and cable companies under ICC jurisdiction. Both Bell and the independents supported the provision, though they did not make their positions public. It is reasonable to assume, however, that if regulation was coming, AT&T would want to affect its form.[49]

Just what impact this new ICC power had over telephone rates is not clear. In the years that the ICC regulated AT&T interstate rates, only four rates cases were brought before the commission, none of which was considered important. Never did the commission investigate telephone rates. Any ICC action about rates was initiated only if rate complaints were made.[50] The most important regulatory actions that the ICC made during the years before telephony was brought under FCC regulation were to promulgate a uniform system of accounts and to require reports from AT&T.[51]

Lack of strong regulatory action by the ICC led the independents to bring their complaints to the attorney general. The independents' major concern was AT&T's policy of buying independent companies and merging them into the AT&T network. The Justice Department was more hospitable to their "social efficiency" arguments than was the ICC, which was more disposed to the regulatory-equity policy regime. The Justice Department filed a suit against AT&T charging that it violated the Sherman Antitrust Act when it acquired a small long-distance company in the Pacific Northwest. Fearing restrictive action from the federal government, AT&T Vice-President N. C. Kingsbury signed an accord with Attorney General George Wickersham on 13 December 1913, commonly referred to as the Kingsbury Commitment.[52]

The main features of the commitment required AT&T to dispose of its Western Union holdings, to stop the practice of purchasing competing telephone systems, and to allow all other telephone companies toll

access on its long-distance system.[53] Significantly, the commitment did not prohibit AT&T from buying noncompeting exchanges. It defused antitrust actions against AT&T but did not alter fundamentally the protective regulatory umbrella that AT&T had built around itself through the ICC and the state public utility commissions. In effect, AT&T successfully used equity arguments to fend off social-efficiency attacks.

The Kingsbury Commitment did not stop AT&T's absorption of independents. Again propelled by agitation from independents, Congress amended ICC powers with the Willis-Graham Act in 1921. This act gave the ICC the power to oversee mergers and acquisitions of telephone companies. Willis-Graham abrogated the Kingsbury Commitment, at least according to AT&T, by allowing AT&T acquisitions of competitors under ICC supervision.[54] As ICC supervision had been so lacking in rates cases, AT&T began an aggressive policy of acquiring competing exchanges. This further agitated the independents, who had many friends in Congress. Again in anticipation of stronger federal action against it, AT&T notified the independents formally that it did not intend to acquire competitors.[55] Still, federal regulation of telephone company purchases seemed far from effective. From 1921 to 1934, the years that the ICC had power to regulate AT&T's acquisitions, it approved 271 of 274 such acquisitions.[56]

Animosity between the independents and AT&T cooled as AT&T began to build a nationally integrated network, of which the independents, who now controlled only about 20 percent of local exchanges, were to become an important part. During this period, as the threat from AT&T subsided, the independents began to adopt the equity argument of AT&T and jettisoned the social-efficiency arguments that they had used as a weapon against AT&T. While not able to grow at AT&T's expense, the independents did learn that they could prosper financially under the regulatory regime that AT&T preferred.

Thus the experience of AT&T under federal regulation prior to the creation of the FCC suited the giant well. Rarely was the company prohibited from doing what it wanted. Federal regulatory protection allowed AT&T to build the monopoly that it had always sought but that had eluded it except for a few short years in the 1880s and 1890s. In the process AT&T also adopted the government policy of equitable distribution of telephone service. AT&T would stay committed to that policy until divestiture forced it to abandon it as government policy shifted to that of social efficiency.

The early history of telephony is a tale of industry and government both seeking a stable solution to the telephone problem. AT&T's goal was to acquire and maintain a stable market. The government's problem was to decide how that market would relate to the general populace. As the telephone market was new and government interference in the economy rarely practiced, the early period was one of shifting positions, arrangements, and policies among the active participants.

Over time, pressure on government mounted, demanding that it control the distribution and operation of telephone service. That pressure shifted government policy away from the traditional laissez-faire doctrine to one of regulation. Though some pockets of opinion in the nation proposed nationalization, and the government flirted with the idea, it never took hold. Similarly, AT&T began to see the advantages of regulation. Not only did regulation defuse nationalization sentiment, but it provided more stability than laissez-faire, and it could be used to counter antitrust, the major policy weapon that AT&T's competitors possessed. Further, regulation opened the door to amicable relations between the government and AT&T. While regulation did have strings attached, and while periods of friction did develop between AT&T and the government, regulation was never intended to do harm to the company but only to ensure its profitable operation toward the public interest. Thus after much fumbling, government at all levels and AT&T, along with the independents, created a stable regulatory regime.

This case also illustrates the multiple interests concerned with telephony and how their policy advocacy, often in the name of the "public interest," related to their own self-interest. Regulation occurred because it was the best possible outcome for all concerned. However, the seeds of contradiction were planted in government policy at the federal level. The government never decided definitively the role of antitrust toward telephony and AT&T. That the government reposited antitrust protection in the Antitrust Division of the Justice Department and regulation in the FCC set the basis for conflict over jurisdiction and proper policy goals as applied to telephony. Time and again, AT&T would fend off antitrust threats, and usually would do so successfully, that is, until the threats of the late 1970s and 1980s, which culminated in divestiture, the triumph of antitrust over regulation—of social efficiency over equity.

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Notes

1. George J. Stigler, "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science* 2(1970):3–21; Gabriel Kolko, *Railroads and Regulation, 1877–1916* (Princeton, 1965), and idem, *The Triumph of Conservatism* (Glencoe, IL, 1965).

2. For instance, see Thomas W. Gilligan, William J. Marshall, and Barry R. Weingast, "A Reconsideration of the Railroad Problem: The Economics and Politics of the Interstate Commerce Act," Working Papers in Political Science P-86-4, the Hoover Institution and Stanford University; and Joseph Pratt and Louis Galambos, *The Rise of the Corporate Commonwealth* (New York, 1988).

3. Alan Stone provides a good discussion of the role of changing conceptions of the public interest with regard to telecommunications in *Wrong Number: The Breakup of AT&T* (New York, 1989).

4. A good discussion of the trade-offs between social efficiency and equity, discussed in terms of competition versus universal service, in the postdivestiture period can be found in Ithiel de Sola Pool, "Competition and Universal Service: Can We Get There from Here?" in Harry M. Shooshan III, ed., *Disconnecting Bell: The Impact of the AT&T Divestiture* (New York, 1984), 112–31.

5. There are a number of major histories of the period, all relying on roughly the same time scheme. The seminal work is Warren J. Stehman, *The Financial History of the American Telephone and Telegraph Company* (Boston, 1925), who first offered the tripartite period breakdown. Others employing it or variants of it include N. R. Danielian, *AT&T: The Story of Industrial Conquest* (New York, 1939), which is based heavily on the FCC; idem, *Proposed Report: Telephone Investigation* (Washington, D.C., 1938); Horace Coon, *American Tel and Tel: The Story of a Great Monopoly* (New York and Toronto, 1939; rpt. Freeport, N.Y., 1971); John Brooks, *Telephone: The First Hundred Years* (New York, 1976); and Robert W. Garnet, *The Telephone Enterprize: The Evolution of the Bell System's Horizontal Structure, 1876–1909* (Baltimore, 1985). See also Kenneth Bickers, "The Problem of Governance and Institutional Change in the American Telecommunications Industry, 1876–1984," paper presented to the 1986 Conference Group on Political Economy in conjunction with the American Political Science Association, esp. 4–30; Richard Gable, "The Early Competitive Era in Telephone Communication, 1893–1920," *Law and Contemporary Problems* 34(1969):340–59; Robert Bornholz and David S. Evans, "The Early History of Competition in the Telephone Industry," in David S. Evans, ed., *Breaking Up Bell: Essays on Industrial Organization and Regulation* (New York, 1983), 7–40; and Stone, *Wrong Number*, 34–58.

6. It should be clear here that laissez-faire refers to policy at the state and/or federal government levels. Prior to the onset of commission regulation of telephony, municipalities often held wide powers under their local franchise and certificate of public convenience and necessity powers. Sometimes those powers were used to regulate rates and issue exclusive franchises to operate, but nationally, local regulation presented a crazy-quilt pattern. On the variance of local regulation of telephones prior to the onset of state and federal regulation, see Kenneth Lipartito, *The Bell System and Regional Business: The Telephone in the South, 1877–1920* (Baltimore, 1989), esp. chap. 6.

7. During the early years of telephony Bell defended its patents in some 600 lawsuits against various claimants. James M. Herring and Gerald C. Gross, *Telecommunications: Economics and Regulation* (New York, 1936), 47. In 1888 a case combining five patent suits against Bell reached the Supreme Court, and the Court, by a vote of 4–3, affirmed Bell's patent rights, thereby securing the patent strategy of the monopoly period (126 U.S. Reports 1). See Bickers, "The Problem of Governance," 13.

8. Garnet, *The Telephone Enterprise*, 44–54, and Stone, *Wrong Number*, 36–37.

9. Gable, "The Early Competitive Era," 351–52, estimates Bell's net earning during those years at 46 percent.

10. The figures are calculated from Garnet, *The Telephone Enterprise*, 160–63. See also Gable, "The Early Competitive Era. Gable (350) offers other figures but the same story of rising and falling expansion timed to the industry's competitive structure.

11. Stone, *Wrong Number*, 38–39, 69–71. On the details of building an integrated network, see Garnet, *The Telephone Enterprise*. For the history of vertical integration, see George David Smith, *The Anatomy of a Business Strategy: Bell, Western Electric, and the Origins of the American Telephone Industry* (Baltimore, 1985). On long-distance operations, see John V. Langdale, "The Growth of Long Distance Telephony in the Bell System, 1875–1907," *Journal of Historical Geography* 4(1978):145–59.

12. These figures are computed from Garnet, *The Telephone Enterprise*, 160–63.

13. Ibid., 61.

14. The major history of the independent movement is Harry B. MacMeal, *The Story of Independent Telephony* (Chicago, 1934). This study, however, was financed by the Independent Telephone Association and hence is a self-serving history. One good study of the structure of competition between AT&T and the independents, as well as among the independents themselves, in the years between 1900 and 1917 is William P. Barnett and Glenn R. Carroll, "Competition and Mutualism Among Early Telephone Companies," *Administrative Science Quarterly* 32(1987):400–421. They found that the noncommercials, the small mutual companies, exhibited a mutualism structure, that is, their fortunes were tied together as a group (the death and survival rates of mutual companies were related). However, commercial companies—Bell and the larger urban independents—engaged in strong competition with each other. And they also found that symbiotic mutualism existed between the commercials and the mutual companies. Little competition existed between these two market segments. Lipartito, *The Bell System and Regional Business*, is useful on these points.

15. Gable, "The Early Competitive Era," 345.

16. Bureau of the Census, Department of Commerce, *Telephones and Telegraphs and Municipal Electric Fire-Alarm and Police-Patrol Signalling Systems, 1912* (Washington, D.C., 1915), 35–36.

17. Actually, the cost of service provision in urban areas was higher than that in rural areas, but that was due mainly to the higher quality of service offered in urban areas. In fact, one reason why the independents competed so successfully in the nonurban areas was that they offered a lower-quality product at a lower price than AT&T, a product-price combination more in demand in the rural areas than AT&T's offering. On this see Lipartito, *The Bell System and Regional Business*.

18. On the promotional activities of southern governments and commissions toward utilities, see Kenneth Lipartito's "The Telephone in the South: A Comparative Analysis, 1877–1920," *Journal of Economic History* 48(1988):419–21; "System Building at the Margin: The Problem of Public Choice in the Telephone Industry," *Journal of Economic History* 49(1989):323–36, esp. 331–35; and *The Bell System and Regional Business*.

19. Herring and Gross, *Telecommunications*, 61–62.

20. Gable, "The Early Competitive Era," 346.

21. Herring and Gross, *Telecommunications*, 63.

22. "Plan Big Telephone Merger," *New York Times*, 11 July 1909, 3.

23. "Competition Really Hurts," *New York Times*, 15 July 1909, 9.

24. Garnet, *The Telephone Enterprise*, 117–18.

25. Gable, "The Early Competitive Era," 349–56.

26. These approaches are reviewed in detail in Barry M. Mitnick, *The Political Economy of Regulation: Creating, Designing, and Removing Regulatory Forms* (New York, 1980), 84–154.

27. Gilligan, Marshall, and Weingast, "A Reconsideration of the Railroad Problem."

28. Some procompetitive sentiment among residential users existed, but it was concentrated in rural areas that the independent telephone companies served. See Lipartito, *The Bell System and Regional Business*.

29. Much of this discussion and that to follow is based upon an investigation of telephones by the New York State legislature in 1910. State of New York, *Documents of the Senate of the State of New York,* 133d sess., 1910, vol. 23, no. 37, part I (hereafter Senate Document—Compilation); and William E. Mosher, "Public Utilities and Their Early Regulation," in *History of the State of New York in Ten Volumes,* ed. Alexander C. Flick (New York, 1935), 8:225–26.

30. Gable, "The Early Competitive Era," 348.

31. Cited from the Senate Document, 277–78, on 2 December 1909.

32. MacMeal, *Story of Independent Telephony,* 183.

33. Bickers, "The Problem of Governance," 18.

34. The best study of AT&T's public campaign in support of regulation is Norton Long, "Popular Support for Business Policy: The Bell System as a Case Study," in Norton Long, ed., *The Polity* (Chicago, 1962), 109–22.

35. The earliest article in the popular periodical press was by W. Clark, "Telegraph and Telephone Properly Parts of the Post Office System," *Arena* magazine, March 1892, 464–71. A series of articles in *Arena* in the early 1900s by Clark and Frank Parsons also advocated nationalization and merger with the postal system. A useful compendium was compiled by Katherine B. Judson, *Selected Articles on Government Ownership of the Telegraph and Telephone* (White Plains, N.Y., 1914).

36. Excerpts from the Burleson Report can be found in Judson, *Selected Articles,* 115–19, as well as the actual research conducted by the Post Office department committee, 88–114. The research is well documented and relies heavily on statistical comparisons of rates and service between the United States and nations with government ownership of the telephone. Burleson was not the first postmaster general to suggest that the telephones be regulated. Taft's Postmaster General Hitchcock also did so, but the Burleson Report was taken more seriously.

37. The date of the speech is 13 December 1913; it is reprinted in Judson, *Selected Articles,* 41–87.

38. It should be noted that President Wilson did not support nationalization. See his comments on government regulation more generally as reprinted in Judson, *Selected Articles,* 166–67.

39. For one exception, see Bickers, "The Problem of Governance," 23.

40. The government did experiment with nationalization during World War I. AT&T, under the direction of Postmaster General Burleson, cooperated with the government's war efforts, but disputes arose over rates. Soon after the war ended, however, AT&T reverted back to private control. While not a failure, government nationalization never again surfaced as a policy option. For more on this experience, see Bickers, "The Problem of Governance," 24–25, and Brooks, *Telephone,* 150–51, 156–57.

41. Herring and Gross, *Telecommunications,* 213.

42. Garnet, *The Telephone Enterprise,* 130–31. There is some debate over AT&T's preference for state versus federal regulation. Garnet suggests that AT&T preferred state regulation, but Bickers, "The Problem of Governance," 23, argues that it preferred federal regulation in order to avoid nationalization. My reading is that AT&T preferred state regulation but did not oppose federal regulation. For instance, in 1908 AT&T issued a public statement that it did not object to federal supervision but objected to a commission (the ICC) having the power to fix rates and tariffs and to prescribe fixed forms of accounting ("Federal Control of Telephones," *New York Times,* 20 December 1980, 16). As it happened, by 1910 AT&T was beginning to be supervised by both government levels.

43. Long, "Popular Support for Business Policy," 115.

44. It is difficult to determine definitively when states began regulating telephones and the nature of that regulation. For instance, the 1984 National Association of Regulatory Utility Commissioners (NARUC) report on carrier says that Massachusetts began regulating telephone rates in 1851, which is impossible, as the telephone was not invented until 1876. See NARUC, *1984 Annual Report on Utility and Carrier Regulation* (Washington, D.C., 1985), 437. Further, Holmes states in an 1890 essay that "the telephone business [is] not yet under the supervision of commissioners, but selectmen and mayors and alderman may establish reasonable regulations" (1890, 423). What we do know is that the early Bell companies were incorporated in Massachusetts and therefore came under the general corporation regulations noted above. The 1911 NARUC study noted that Massachusetts was then investigating only whether or not to regulate telephones (see NARUC, *Proceedings* (Washington, D.C., 1911), 211–18). The 1910 New York State compilation of statutes relating to telephones and telegraphs found that Massachusetts regulated telephones under the authority of the Highway Commission. That authority, however, was not granted rate-making power and much local control still prevailed in the state at that time (see Senate Document—Compilation, 113–25).

One last major study of early state regulation is Lipartito, *The Bell System and Regional Business;* also idem, "System Building at the Margin." Lipartito focuses on the South, especially Virginia, North Carolina, Georgia, and Florida, and a few scattered northern states: Vermont, Illinois, and Massachusetts. While his studies are useful, his concern is regional (southern), while mine is national. Also, he focuses on the role of regulation in promoting the corporate policy of an integrated network, I am more interested in the motivations and preferences of the various actors involved in setting a regulatory policy course.

45. The six comprise a varied lot: Arkansas, 1935; Delaware, 1949; Iowa, 1963; Kentucky, 1935; Rhode Island, 1969; Texas, 1976.

46. The succeeding paragraphs are based on that report, Senate Document—Compilation. Another valuable source is the National Civic Federation. 1913. *Commission Regulation of Public Utilities: A Compilation and Analysis of Laws of Forty-three States and of the Federal Government for the regulation by Central Commissions of Railroads and Other Public Utilities.* New York: National Civic Federation, Department on Regulation of Interstate and Municipal Utilities. The Federation report compiled all statutes as of 1913 concerning regulation of utilities by commission. It is well indexed and cross-referenced.

47. Bickers reports that by 1919 thirty-four state legislatures had passed laws requiring interconnection between competing companies (21).

48. There is little about promotion of telephony, but Du Boff does a good job describing southern promotion of the telegraph. As telegraphy and telephony are so closely intertwined during the era, it is quite likely that programs similar to those for telegraphy were used to promote telephony. Mostly they tended to be grants of right-of-ways arrangements with railroads, sometimes subscribing to stock issuances. See Richard B. Du Boff. 1984. "The Rise of Communication Regulation: The Telegraph Industry, 1844–1880," *Journal of Communication,* 34:52–65, especially 60–64. Also of relevance are Lipartito, "The Telephone in the South," "System Building at the Margin," and *The Bell System and Regional Business.*

49. Gable, "The Early Competitive Era," 357.

50. Ibid.

51. Herring and Gross, *Telecommunications,* 64.

52. Much of this discussion of the Kingsbury Commitment is taken from Peter Temin with Louis Galambos, *The Fall of the Bell System* (Cambridge, 1987), 9–11; Herring and Gross, *Telecommunications,* 65; Stone, *Wrong Number,* 48; Gable, "The Early Competitive Era," 353; Robert Britt Horwitz, "For Whom the Bell Tolls: Causes and Consequences of the AT&T Divestiture," *Critical Studies in Mass Communications* 3(1986):11–54, esp. 123; Bickers, "The Problems of Governance," 27; Brooks, *Telephone,* 135–36.

53. Herring and Gross, *Telecommunications,* 65.

54. Horwitz, "For Whom the Bell Tolls," 123.

55. Gable, "The Early Competitive Era," 353.

56. Stone, *Wrong Number,* 48. State PUCs also tended to approve of AT&T acquisition policy.

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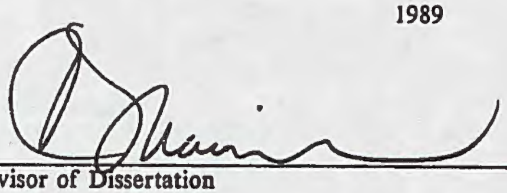

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ABSTRACT

THE TELEPHONE WAR:
INTERCONNECTION, COMPETITION, AND MONOPOLY
IN THE MAKING OF UNIVERSAL TELEPHONE SERVICE, 1894-1920

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The dissertation is a historical and theoretical study of competition between the Bell and independent telephone systems between 1894 and 1920. It is concerned with the historical origins of telephone monopoly in the U.S., and with the unique dynamics of competition between unconnected or incompatible communications networks. The study focuses on the competing networks' refusal to interconnect with each other, exploring the economic and communicative consequences of fragmented telephone communications. Two bodies of theory provided the foundation for the study's method: the "network externality" literature in Economics and the probabilistic models of interdependent demand developed by W. Brian Arthur. The dynamics of network competition are illustrated by means of an urn model. Unlike previous efforts, this urn model incorporates the possibility of nonuniform calling patterns and user duplication. In order to display the actual scope of telephone competition and to evaluate theories about the role of long distance connections in the competitive struggle, maps of the telephone access universes of three cities at various points in time were constructed.

The conclusions of the study conflict with many standard assumptions about telephone history. Bell's refusal to connect with the independents stimulated and broadened the scope of competition rather than thwarting it. The concept of "universal service," first formulated at this time, denoted an end to competitive fragmentation rather than a telephone in every home. The universality of the U.S. telephone system had its roots in the competitive era rather than in subsequent regulatory policies. A telephone monopoly was created not because it realized supply-side economies of scale, but to achieve demand-side economies of scope. The decisive ingredient in Bell's success was not its ultra-long distance transmission technology but its ability to offer near-universal connections within a 100 mile region.

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Chapter 1:
Introduction

This is the story of how telephone communications in the United States went through a remarkable upheaval which fundamentally changed its character. Although the events recounted here began over 90 years ago and reached their denouement in 1921, the issues that were faced and resolved at that time will seem strikingly familiar to the inhabitants of the 1980s: the questions of monopoly vs. competition in telecommunications networks and of universal service.

The events with which this study is concerned began in 1894, eighteen years after Alexander Graham Bell invented the telephone. Until then, the telephone business had been under the exclusive control of the American Bell Telephone Company of Boston, the corporate predecessor of AT&T.[1] American Bell enjoyed a monopoly because the courts had construed the inventor Bell's patent rights so broadly that they had made it illegal for anyone else to manufacture a telephone. Once Bell's fundamental patents expired, however, anyone with capital and a municipal franchise could enter the business. After 1894, thousands of new telephone operating companies sprang into existence. The Bell organization referred to them as "the opposition." To the rest of the country, they were

known as "the independents." For the next twenty years, Bell and the independents waged an intense battle to link America by telephone.

The independents took root in the small towns and rural areas neglected by Bell, but soon spread to many of the cities already served by the Bell Company. At the peak of its strength, from 1902 to 1907, the independent movement controlled roughly half of the telephones in the U.S. Fueled by a populist ideology of localism and antimonopoly, they developed their own manufacturers, technical publications and state, regional and national organizations. In their attempt to remain competitive with the increasingly interconnected Bell system, they built long distance lines and began to consolidate into regional networks spanning hundreds of miles.

This is not a business history of Bell or the independents, nor is it a social and political history of how populist localism and a nationwide corporation came to terms with each other. It is a study of how relations of social communication shape our institutions. The outcome of the telephone war was one of the world's biggest and most long-lasting monopolies. For the 70 years preceding the AT&T breakup, the telephone company was the largest private institution in the country, and the telephone industry was the most thoroughly monopolistic utility. Why telephone communication should create such a huge and monopolistic organization is a question that has occupied the minds of economists (and antitrust authorities) for many years. This study takes a new and, it is hoped, more fruitful approach to the problem. Unlike most previous accounts of the competitive era, it

explores the subject of telephone competition and monopoly from the standpoint of communications as well as economics. That is, it contrasts the ways in which competitive and monopolistic organization affected the ability of people to communicate with each other by telephone.

The focal point of the study is interconnection policy and its economic consequences. Interconnection is central to the story because for most of the period, the Bell system and its rivals refused to connect their networks. Competition took the form of two separate telephone systems in the same area vying with each other for subscribers and for connections to other localities. "Dual service" was the contemporary name for competing, noninterconnected telephone exchanges in the same community. Because it diverges so radically from our current experience with a universally interconnected telephone system, it is hard to appreciate just how widespread and long-lived the phenomenon was.

Dual service existed in some form for thirty years, from 1894 to 1924. From 1900 to 1915, at least 40 percent of the telephone exchanges in U.S. cities with populations over 5,000 competed with another exchange in the same location. During the peak of the independent movement's strength, between 1902 and 1910, this percentage remained over 50 percent. Some of the nation's largest cities had dual telephone systems for many years: Cleveland, Minneapolis-St. Paul, St. Louis, Los Angeles. Telephone competition of this kind meant that the customers of one exchange couldn't call the customers of the other. Anyone who wanted to be able to call (or be called by) all telephone users had to subscribe to both systems. Duplicate subscribers literally had two separate

telephone instruments, Bell and Independent, on their walls. Even when there was only one exchange in a community, dual service divided subscribers; if it was a Bell exchange it could not make connections with the subscribers of competing independent exchanges in other cities, and vice-versa. As of 1914 Bell subscribers in Louisville, Kentucky,, for example, a dual service city, could call the nearby towns of Jeffersontown and Taylorsville, but not Elizabeth or Lanesville, where there were only independent exchanges.

Data about the nature and extent of dual service has never before been systematically collected and published. Its existence raises a number of intriguing historical questions. How many and what type of users took out duplicate subscriptions? To what extent did the division of subscribers into two systems correspond to other social divisions, such as social class or ethnic groups? How frequently were users unable to reach desired parties due to competition? To what extent did the availability of long distance connections affect the choice of a local subscription? The study explores these economic and communicative features of dual service in detail. It concludes that in the context of a still-developing network used by a minority of the population, its advantages outweighed its drawbacks. By maintaining separate, noninterconnected networks, Bell and the Independents were forced to compete on the basis of the most important determinant of their product's value: how many subscribers and locations they reached. This led to vigorous price competition and relentless efforts to extend exchanges and toll connections to every community. The result was the most rapid and extensive development of telephone

service in the world. The problems of a divided network were overcome by methods such as duplicate subscriptions, the segregation of subscribers into communities of interest and relaying messages.

The alternative to dual service was "universal service." At the time, universal service did not mean a telephone in every home, but the interconnection of all telephone users in a single system under centralized management. The policy was advocated forcefully by AT&T President Theodore Vail, and of course it eventually prevailed. As telephone service penetrated more deeply into business and social life, the fragmented access structure of dual telephone systems came to be seen as a nuisance by many subscribers, especially business users who had to maintain two subscriptions. The competitive process also pushed the contestants themselves away from fragmentation. Bell relaxed its interconnection policies in order to gain access to communities served by Independents, and many Independent exchanges chose to interconnect with Bell to gain long distance connections to other cities. Since a newly-invented institution, the public utility commission, seemed to provide a way to regulate rates and service without market competition, the country embraced a policy of monopoly.

The decisive factor in the move to monopoly was its ability to interconnect all telephone users. Considerations of access and interconnection far outweighed the economic factors normally invoked to explain monopoly. The study demonstrates that supply-side economies of scale were not a decisive factor in the emergence of monopoly. The growth of "sunk costs" and shortages of

capital, while limiting new entry in the later stages of the battle, were not by themselves sufficient to explain the outcome. Ultimately, telephone monopoly must be interpreted primarily as a communications phenomenon, i.e. as a structure that gave all telephone users access to each other.

In the course of advancing this historical interpretation, the dissertation argues for a new approach to the understanding of competition and monopoly in communications systems. Until very recently, economists confined their search for the cause of monopoly to the production costs of the firm. According to this viewpoint, telephone service is no different from any other product. The industry's organization is a function of how firms' costs respond to changes in the scale of production or to the number of other firms participating in the market. If it is possible for multiple firms to produce for the market with no loss of efficiency, the industry is considered to be competitive; if economies of scale, cost subadditivity or other factors dictate that a single firm can supply the whole market at the lowest cost, the industry is said to be a natural monopoly. Most contemporary attempts to explain the presence of monopoly or competition in telephone service follow these lines. Indeed, the literature often forces the issue into this mold despite a rather embarrassing lack of supporting empirical evidence and some disturbing theoretical anomalies.[2]

A new and growing body of theory, however, suggests that other factors can control industrial organization. This literature is concerned with the demand interdependence of communications and standards. Interdependent demand means that the value of a product

to one person depends upon how many other people (or which other people) also choose to use it. The choice of one telephone system over another, or competence in one language rather than another, for example, will limit one's range of communication to those using the same network or language. If everyone adopts the same network or language the result will be universal, reciprocal communications access. In this framework, monopoly is approached not as a product of supply-side cost efficiencies but as a coordination process which allows users to achieve demand-side economies of scope.

In markets with interdependent demand, competition has peculiar characteristics. For a variety of reasons, competition between coordinative standards or networks tends to be transitory. Once a decisive competitive advantage is attained by one of the networks it can become self-reinforcing, because more and more of the people one wants to communicate with come to be found on the dominant network. Also, because of the interdependence of demand, the control of communications access to one individual, group or location will affect the choices made by people in other groups or locations. Thus, competition is not just a matter of cutting costs and improving service; it also involves the strategic use of access. The tendency is to compete for control of all of the market rather than for a profitable share of the market as in normal economic competition.

This kind of "monopoly" and "competition" can characterize communications systems whether or not they are commercial products. Human speech is a readily apparent example. A single language usually prevails in a given territory because speakers must employ a common grammar and vocabulary to be able to understand each

other. The presence of two languages in the same community follows much the same pattern as did dual service in telephone communications. Dual service made heavy users subscribe to both systems and prevented nonduplicating subscribers from calling each other. Similarly, in the public areas of bilingual countries, signs must be in both languages and many speakers must be bilingual. For unilingual people, day-to-day activity tends to flow within the barriers to communication created by the separate language groups. For this reason most languages, like most telephone systems, have evolved into territorial monopolies. Still, in many parts of the world two or more languages overlap and "compete" for status as the dominant communications medium.[3]

The next two chapters define the theoretical constructs used in the study. Chapter 2, a literature review, traces the evolution of economic and historical thinking about telephone competition and monopoly. Chapter 3 defines the theoretical concepts on which the study rests. It shows how demand interdependence gives special characteristics to competition between incompatible or noninterconnected networks. It observes that interdependent demand can be modelled using probabilistic methods, and explores some of the implications these methods have for analyzing network competition. The Chapter also advances the idea that each link in a communications network is a separate product. This view solves many of the theoretical problems encountered by economists who have grappled with issues of interconnection, competition and monopoly in the telephone industry. It highlights economies of <u>scope</u> rather than scale as the critical factor giving the telephone industry its unique organization. Economies of scope are defined as the ability

to achieve efficiencies by combining multiple outputs in a single product. The analysis in Chapter 3 demonstrates that the source of these scope economies is the user rather than the producer.

Chapters 4 through 10 constitute the historical narrative. The narrative focuses on the following four empirical issues:

1) It attempts to map the changes in telephone access for selected Bell and independent exchanges during the period. That is, it attempts to show how many subscribers and locations could actually be telephoned from the Bell and independent exchange in a given city. This information is important because the relative scope of Bell and independent access was one of the most important factors affecting their competitiveness.

2) The study quantifies the rise and decline of dual service between 1894 and 1921. It attempts to show how many cities had two competing exchanges, as well as the total population affected. Complete information is only available for cities over 5,000 in population.

3) The third empirical goal of the dissertation is to accumulate data on the unique dynamics of competition between noninterconnected networks. The narrative explores how noninterconnection affected users, rates, and development, and examines the use of both connection and the refusal to connect as a competitive tactic.

4) The fourth goal is to accurately trace the evolution of law, public policy and business policies regarding the interconnection of separate telephone systems.

NOTES TO CHAPTER 1

[1] Between 1878 and 1880 the Bell Telephone Company competed with a telephone enterprise of Western Union, but this brief competitive phase was ended by a settlement that ceded the telephone business to Bell and the telegraph business to Western Union.

[2] See Chapter 2.

[3] Ronald Wardhaugh. Languages in Competition: Dominance, Diversity and Decline (Oxford: Basil Blackwell) 1987.

Chapter 2

The Riddle of Monopoly: Economic and Historical Approaches to the Telephone.

Judging from the literature on the subject, telephone monopoly is an insoluble riddle. There are those who insist that monopoly is natural and benign, others who condemn it as an illegitimate product of business predation. Some writers appear to take both positions at once. The tendency of public authorities or economic theorists to line up on opposite sides of this question can have bizarre consequences. Between 1913 and 1921 the U.S. tried to prohibit and promote telephone monopoly at the same time. State public utility commissions went about encouraging the consolidation of competing companies and actively suppressing new competition, while the federal government's trustbusters were prohibiting further consolidations and attempting to preserve competition.[1] A 1921 law exempting telephone companies from the antitrust statutes put an end to this policy standoff for the time being. But the resolution was more apparent than real, for over the next six decades the officially sanctioned Bell monopoly was twice the target of antitrust actions.[2] One hundred and twelve years after the invention of the telephone, the status of monopoly is still controversial.

The following chapter reviews the literature that attempts to explain and interpret telephone competition and monopoly. Its exposition follows the actual evolution of thinking on the subject. For most of the sixty five-year span covered by this review, there has been a sharp split between explanations of monopoly derived from history and those based on economic theory. The two lines of analysis share a common origin, however, in the utility politics of the Progressive era. Thus, the review begins with J. Warren Stehman's history of AT&T, written in the early 1920s. Since then, natural monopoly theory and historical investigations of the telephone monopoly followed separate paths. For the sake of continuity, a review of the historical literature is held off until the second section and the narrative follows the evolution of natural monopoly theory and its application to the telephone industry. The next section surveys the historical studies of the competitive era and their interpretations of the rise of the AT&T monopoly. Section 3 looks at body of economic theory that developed independently of the natural monopoly tradition and brought new insights to the monopoly-competition question. This new theory analyzes the unique demand characteristics of networks and compatibility standards. The chapter concludes with a critical overview that also serves as an introduction to the method and rationale of this study.

I

The Natural Monopoly Tradition

J. Warren Stehman's Financial History of AT&T (1925) is the first comprehensive, scholarly history of the American telephone

industry.[3] Though published as a book in 1925, it was actually written in the years 1920-22, just as the developmental stage of the industry was drawing to a close. Stehman's book could just as well be treated as part of the final chapter of the narrative rather than as a part of the literature about it. The book thoroughly embodies the attitudes and theories underlying the transformation of the telephone business from a competitive enterprise to a regulated monopoly, and illustrates the new role of academically trained experts in rationalizing governmental control of industry. It is noteworthy, then, that in this work there is little ambiguity about the origins and purpose of telephone monopoly.

As a permanent proposition, Stehman believed that "the ideal condition for telephone service is that of complete monopoly." The justification for monopoly in the telephone industry was recognized to be different from that of other public utilities, however:

> ..the telephone industry is, perhaps to a greater degree than any other public utility, essentially monopolistic in character. In the telephone industry competition involves an added expense, through the duplication of certain parts of the plant, just as it does with gas, electric and other public-utility companies. But there is an additional and more important peculiarity of the telephone industry: that is, that the efficiency and value of the service depend upon the number of persons with whom the subscriber can communicate. Two telephone systems in a community are a source of great inconvenience and usually of expense to the subscribers. An individual who desires to talk to people on each of the two systems is compelled either to install telephones of both companies or to go, from time to time, to some other place than his residence or place of business to use the telephones of the system to which he is not a subscriber.[4]

The argument against "wasteful" duplication of facilities was being

applied to the utility infrastructure with few exceptions during the Progressive era. The need for universal interconnection, however, was recognized as a separate and even stronger reason for preventing competition. Competing companies could be required to interconnect and exchange traffic, Stehman knew, but this was rejected as an adequate solution to the problem. While it eliminated the barriers to communication created by competition, interconnection required the competing companies to make joint financial arrangements and to work so closely together that the result was tantamount to monopoly anyway.[5]

The Progressive era was thus quite clear about the reasons for telephone monopoly: it was required to bring about universal interconnection, or what at the time was called "universal service." If rates and service could not be controlled by means of competition, they would have to be set by regulation. The telephone was classed with a growing number of urban infrastructures (natural and artificial gas, street railways, electric power, waterworks) as a public service corporation subject to regulation by commission.

By classing the telephone system with other utility monopolies, Stehman took a stand with a growing number of academic political economists who believed that regulation rather than socialism or laissez-faire was the best response to the new problems posed by large-scale, modern industry. Since the 1880s, business regulation had gained acceptance by virtually all of the states. The thinking behind it was the product of a new school of political economy, born in the populist turmoil of the 1880s, which held that in certain industries competition was destructive and

inefficient and ought to be superseded by government regulation. In their attempt to come up with a scientific definition of which industries should be regulated, they developed the concept of natural monopoly.

One of the simplest and most straightforward theories was articulated by Henry Carter Adams, an influential professor who was also the recipient of the first doctorate in Economics awarded by Johns Hopkins University. Adams divided industries into three classes: those with constant returns to scale, those with diminishing returns to scale, and those with increasing returns to scale. Businesses in the first two categories, he believed, could be left to the regulatory pressures of competition. In industries characterized by economies of scale, however, competition was disruptive, inefficient, and temporary. A firm became more efficient as it controlled more of the market. "The control of the state over industries should be coextensive with the application of the law of increasing returns in industries," Adams wrote.[6]

Other theorists concluded that there was no single characteristic defining natural monopoly, though scale economy was always an important factor. Thomas Henry Farrer, the Secretary of the British Board of Trade, listed five separate factors defining inherent monopolies, four of them pertaining to the peculiar fixity of utility infrastructures.[7] The "natural monopoly" label was coined by Richard T. Ely, a contemporary of Adams's. Ely was a professor of political economy at Johns Hopkins University and the founder of the American Economic Association. Like Farrer, he saw monopoly as the product of a conjunction of factors, including scale economies, a high proportion of fixed to variable costs, and

physical obstacles to the multiplication of competing facilities. Ely's articles and books "disseminated and popularized the notion of natural monopoly" from the late 1880s on.[8] His textbook of 1937, Outlines of Economics, became a standard reference in the field.[9]

In the natural monopoly tradition, the explanation for utility monopolies was to be found in supply-side phenomena. It concentrates on the production costs of the firm, and asserted that scale economies were decisive. Even at this early date, the seeds of the split between historical and economic treatments of telephone monopoly had been sown. The new political economy had developed primarily from observations of the railroad and gas industries in the 1880s. The telephone was like these industries in that monopoly, once controlled, was thought to possess certain benefits. But the source of monopoly clearly did not conform to the rationales of the academic economists. Electric power was a paradigmatic case of scale economies: the larger generating plants became, the lower their average costs dropped. Universal interconnection, on the other hand, was not a case of increasing returns to scale. Even Stehman, steeped as he was in the new doctrine, recognized it as a separate and distinct justification for monopoly. Aside from that, everyone familiar with the telephone industry at that time thought that it did not possess decreasing costs. On the contrary, it was generally believed that the average cost of providing local exchange service increased with the number of subscribers.[10] Despite these disparities, the telephone system was incorporated into an institutional and theoretical bundle that included gas, electric power, railroads and

streetcars. In doing this, the Progressive era created conditions which effectively smothered theoretical recognition of the interconnection issue, and instead subsumed the telephone industry's peculiar problems under the general rubric of "economies of scale."

This did not happen instantly. The earliest books about public utility regulation, textbooks for commissioners and students of the regulated industries, contained detailed and specific discussions of the peculiarities of the telephone system. Jones and Bigham's Principles of Public Utilities, published in 1931, recognized that subscriber growth produced diseconomies rather than economies, and made the important (and still neglected) observation that our inability to define the unit by which increasing scale is measured makes it tricky if not impossible to determine whether scale economies exist in telephone exchange service. The ultimate justification for monopoly, they maintained, was not scale economies but "the necessity of a unified service." The authors go on to draw an important qualitative distinction between telephone service and other utilities:

> To one who uses electricity, gas, water and street railways it matters not whether he be served by the same company as his friends, but to the user of the telephone it is highly important that he be on the same system with them and with all those with whom he might wish to get in touch.[11]

Similar arguments were made in other utility manuals published before 1940.[12]

In the utility textbooks published after 1940, however, a subtle but important change took place. Gradually and

unconsciously, the basis of telephone monopoly in universal interconnection was forgotten. Natural monopoly acquired a purely economic construction: it meant industries with economies of scale over the whole market. The telephone was no longer treated as in any way exceptional to this principle. The concept of natural monopoly was given formal definition as a downward sloping average cost curve. The bulk of the books were consumed with the task of using economic theory to establish efficient rates in the absence of market competition. With one or two exceptions, historical background disappeared altogether. One indication of the change was expressed in the way the books were labelled. Prior to 1940, this genre of work referred to its subject as utility industries or utility regulation. From then on, the subject was utility economics.

It would be presumptuous to imply that post-1940 regulatory economists were unaware of the issue of interconnection. What occurred, rather, was a general acceptance of economic theory as the most valid, scientific method of analyzing and explaining industrial organization. Economic theory is concerned with demand, costs, prices and the quantity of supply. Those are the tools of its trade, the fundamental categories with which it confronts the social world. Since interconnection did not fit comfortably into this framework, it was usually ignored in discussions of industrial organization (though not in treatments of telephone history). The economics of the telephone system were lumped together indiscriminately with other utilities. A 1941 book states forthrightly that the telephone is subject to decreasing cost;[13] another, published in 1947, includes it with gas, electricity and

water in a laundry list of industries in which "duplication is not economical [because] the amount of fixed capital is so greatly increased that the only possible outcome is higher prices or poorer service."[14]

By 1960, the issue of monopoly organization had been fully absorbed by the economic paradigm. Economists had, it is true, become more sophisticated about it. They no longer equated natural monopoly with economies of scale, but recognized that a single firm could be the most efficient supplier even when the expansion of output resulted in increases in average cost.[15] The accepted definition of natural monopoly was that it exists "when one firm can supply the entire market at less cost than two or more firms."[16]

The emergence of the "contestable markets" school of industrial organization after 1978 refined and elaborated this observation.[17] In the new theory, "cost subadditivity" replaced scale economies as the recipe for natural monopoly. This formulation vindicated Bonbright's observation that a monopoly could be the most efficient supplier in the absence of decreasing costs. At a given output, scale economies are sufficient to make cost functions subadditive, but cost functions can still be subadditive when average costs are increasing.[18] Although more precise than before, the basic conception of natural monopoly remained unchanged. The theory still concentrated on the supply side. It examined the average costs of a firm to see how they are affected by the number of other firms supplying a market. Sharkey's verbal definition is almost identical to that employed before the new theory was developed.[19] The revamped industrial

organization theory simply formalized and mathematicized the definition of natural monopoly. Gone are the clumsy, descriptive lists of special features set out in the works of Ely and Farrer and the early utility textbooks. Gone, too, is any reference to "unifying the service" or interconnecting subscribers.

In those rare cases where the interconnection issue was recognized, economists went to great lengths to bend, hammer and twist the phenomenon into the familiar shape of a decreasing cost curve. The most notable example is provided by Alfred Kahn's classic two volume treatise, The Economics of Regulation.[20] In the course of arguing for a definition of natural monopoly as a product of long-run decreasing average costs, Kahn was forced to recognize the peculiarities of the telephone system:

> There are cases of natural monopoly that would seem at first blush not explicable in terms of long-run decreasing costs. We have already observed, for example, that as the number of telephone subscribers goes up, the number of possible connections among them grow more rapidly: local exchange service is therefore believed to be subject to increasing, not decreasing unit costs, when the output is the number of subscribers. And yet, it seems clear that this service is a natural monopoly: if there were two telephone systems serving a community, each subscriber would have to have two instruments, two lines into his home, two bills if he wanted to be able to call everyone else. Despite this apparent presence of increasing costs, in short, monopoly is still natural because one company can serve any number of subscribers (for example, all in a community) at lower cost than two.[21]

This passage bears close analysis. Kahn recognized that the requirements of connecting telephone users forces a competitive system to completely duplicate the network of its rival, and that subscribers in such a competitive market would be forced to pay

twice for essentially the same service. But for him, the simple observation that one company can interconnect "any number of subscribers...at lower cost than two" is sufficient for it to qualify as a traditional natural monopoly. The argument appears to be persuasive, and in fact it is often cited by others. Actually, it is closer to being an open confession that natural monopoly theory is an inappropriate and even misleading tool with which to approach the roots of telephone monopoly.

Several anomalies in Kahn's passage jump out at the reader immediately. The first is that the rationale for monopoly he advances is entirely independent of the level of output. The elimination of the need for duplicate subscriptions occurs whether we are talking about a telephone system of 100 subscribers or 100 million subscribers. Another quirk is the subtle way the argument relies on demand-side rather than supply-side efficiencies. In natural monopoly theory, a telephone monopoly is supposed to be able to charge less because its average costs are lower than they would be if it divided the market with a competitor. In Kahn's argument, however, monopoly is more efficient not because it makes telephone service cheaper to produce, but because it makes telephone service cheaper to consume by eliminating the need for duplicate subscriptions. Indeed, Kahn even admits that the unit costs of the monopoly producer may increase.

Kahn's passage makes a case for an entirely different kind of monopoly than that with which the theory of natural monopoly is concerned. Economic theory attempts to explain why all of the production for a market comes to be concentrated in a single firm, a single company. Yet the rationale for telephone monopoly

advanced here does not require putting all telephone service into the hands of one company; the costs of duplicate subscriptions could also be avoided by dividing the market among many interconnected companies, assigning each one an exclusive territory. The same end could also be accomplished by interconnecting networks which overlapped and even competed with each other.

A more important argument is that the basic categories of natural monopoly theory--and particularly the notion of the scale of output--are simply inapplicable to networks. In essence, natural monopoly theory compares the average costs of one firm supplying all the output demanded by society to the costs incurred by many firms who together supply the same quantity of output. This type of economic analysis can only be applied to commodities that are homogeneous and fungible, like wheat, chairs or electric power. Economists say that these commodities are "homogenous" because any unit is a substitute for any other unit. To increase the supply of these goods simply adds identical units to the output. To introduce competition divides this homogenous output among several different firms.

Communications networks lack this homogeneity. The most important output dimension of a telephone network is the people or locations it connects, and no two locations or subscribers are identical. A group of subscribers in Chicago is not a substitute for, or in any way comparable to, a group of subscribers in Los Angeles or Atlanta. A telephone network that adds new subscribers, or extends its network to new locations, is not producing more "units" of the same service, it is supplying a different service.

By the same token, introducing competition into the market for telephone access does not apportion different shares of a homogenous output to separate firms, but fundamentally changes the character of the service by dividing network users into two or more inaccessible groups. As Jones and Bigham had recognized back in 1931, if half of a city's population buys electric power service from one company and the other half buys it from a competitor, the product consumed by the customers of either system is the same. But if part of the population subscribes to one network and another part subscribes to a separate one, and the two are not interconnected, the competing networks are completely different economic goods. This inherent lack of homogeneity in networks defeats any attempt to explain the organization of the telephone industry solely in terms of natural monopoly theory. The whole conceptual framework developed to analyze the response of average costs to the quantity of output in other industries is simply inapplicable.

As if to confirm the essential irrelevance of natural monopoly theory to the issue of telephone monopoly, the AT&T divestiture debate of the late 1970s and early '80s led to several empirical, econometric studies of cost functions and scale economies in the Bell system. The results were remarkably inconclusive. Some of the most comprehensive studies rejected the hypothesis that there were economies of scale and scope across all telecommunications services.[22] Other studies, using different statistical techniques and different measures of output, concluded that there were significant economies of scale and scope.[23] In his review of empirical studies of returns to scale in telecommunications,

Littlechild (1979) observed that the only obvious scale economies are in long distance tranmission, which is, ironically, where new competition has taken root, whereas the least clear pattern of scale economies is in the local exchange, which largely remains a monopoly.[24] The inability of sustained, rigorous economic analysis to resolve the question should give us pause, because the telephone industry was the most clear-cut case of monopoly in the U.S. It becomes less strange when one realizes that monopolistic organization never was a product of cost functions to begin with, but was a historical consequence of the need to interconnect subscribers.

II

Competition and Monopoly in the Historical Literature.

The historical literature, of course, approaches the phenomena of competition and monopoly from an entirely different angle. "Average costs," and "subadditivity" do not appear as dramatis personae. Each historical interpretation, however, does contain implicit or explicit theories of how and why monopoly was achieved. The following survey focuses on each work's approach to the central questions with which this study is concerned: What was the source or cause of monopoly? Was competition or monopoly more desireable? Why did the independents fail? How is AT&T's achievement of preeminence characterized and evaluated? What role did interconnection play in both the competitive and monopoly phases?

To begin at the beginning, let us return for a moment to Stehman's history, written in the early 1920s, in order to set out his attitude toward the independents and the causes of AT&T's

success. Stehman's approach was that of the progressive economic historian. He chronicles how the methods of providing efficient telephone service at reasonable rates and of raising the huge amounts of capital needed to finance the growth of the system were improved by trial and error until, by 1920 or so, the system took its "final" and (he implies) most rational form: that of the privately owned utility monopoly whose rates, service and finances are regulated by public service commissions. Independent competition was considered to be one of the errors along the way. It may have improved service and increased the use of the telephone in those areas where Bell service was poor and its management discourteous. In communities with good service and reasonable rates, however, the presence of dual telephone systems was a net loss for all concerned. In general, competition resulted in overcapitalization, "ruinously low rates," inadequate maintenance of telephone plant, and a lack of universal communication between subscribers.[25]

In contrast to the FCC Investigation only 15 years later, Stehman tends to be pro-Bell, stressing the conservatism and rationality of its financial practices and the public-spiritedness of its management during the Vail years. Its independent competitors, on the other hand, are mostly cast as financial manipulators who entered the business to make quick profits without adequate knowledge of what was required to provide good service over the long term. Like many modern writers, Stehman's Financial History gives long distance interconnection a crucial role in determining the outcome of the competition. The independents failed to win the struggle, according to Stehman, because the Bell

System's long distance lines constituted "an almost insurmountable obstacle to competition."[26]

Since the Progressive era, there have been two distinct waves of historical interest in the phenomenon of telephone competition. The first occurred in the 1930s, when the New Dealers in federal regulatory agencies were attempting to come to grips with the dominance of monopolies and large corporate enterprises in the national economy. Three separate publications emerged out of this concern: the FCC Report (1939) summarizing its five-year investigation of AT&T, and books by Coon (1939) and Danielian (1939) popularizing aspects of the FCC's investigation.[27] An insider's history of the independent telephone movement by MacMeal (1934) also was published during this period.[28] The extensive documentary and statistical data compiled by the FCC Investigation are still highly informative, and until the opening of the AT&T archives in the 1980s all of the historical studies which followed relied heavily on them.

The FCC investigation had its origins in a growing sense that the AT&T monopoly operated free of effective federal regulation. The reports and data that came out of it must be understood as a determined effort on the part of the Commissioners, and particularly Paul Walker, the FCC Telephone Division Chief, to justify and expand its powers to regulate the telephone giant. The attitude toward telephone monopoly taken by the Commission investigation is highly critical, but also fundamentally ambiguous. The entire thrust of the report was to document the attempt of the Bell system to "gain control over the larger part of telephone communications in the U.S." The clear implication was that AT&T's

dominance was accomplished through ruthless business tactics and was vaguely threatening to public welfare. AT&T's efforts to thwart independent competition were described in a reproving tone. Danielian's book characterizes the rise of AT&T as "industrial conquest," and expresses a powerful sense of alarm at the implications of the emergence of the large-scale business corporation and the phenomenon of "management control."

And yet the force of these objections was dissipated by the authors' willing acceptance of the idea that telephone service should be a monopoly. The report wrote off dual service as "wasteful from the viewpoint of investment and [a] burden on both the telephone operating companies and the rate payer."[29] A book published by men affiliated with the FCC makes it clear that they thought long distance service, too, was best provided by a single company.[30] Despite their solicitude for the embattled independents, in other words, they were no more interested in preserving competition than Theodore Vail himself.

In this manner the FCC inaugurated what was to become a longstanding tradition in America: a policy of official schizophrenia toward telecommunications monopoly. The rationalizing progressives of the 1920s had embraced monopoly unambiguously. To the New Dealers, monopoly was something to be both feared and desired, both prosecuted and encouraged. Had the FCC investigators been defenders of competition, fragmentation, localism, autonomy and variety in telephone communications their hostility toward AT&T would be understandable. But they were not. They supported universal service, exchange monopoly, nationwide long distance interconnection, and large, well-financed research

and development efforts. That is, the Commission wholeheartedly embraced all the things that logically pointed in the direction of a vertically integrated telephone monopoly, yet seemed extraordinarily uncomfortable with the size and power of the resulting institution. This two-sided attitude toward telephone monopoly persisted through fifty years and two antitrust cases.

The Investigation report places most of the responsibility for the independents' failure on their inability to raise enough capital to expand.[31] It adduces some disturbing evidence that the Bell system helped bring about this "financial strangulation" through its ties to influential New York capitalists, particularly the Baker-Morgan interests. The assumption of control over AT&T by the Morgan interests in 1907 is recognized as an important turning point in the system's development. Aside from marking the ebbing of the independent tide, the advent of "banking control" led to sweeping changes in AT&T's competitive policy, management and organization.

As a historical account of the Bell-independent battle, the FCC report correctly delineated the broad outlines of the story. There are, however, some holes and inconsistencies in its treatment, particularly regarding interconnection. The report states that the Bell system sought to stop competition by refusing to interconnect with the independents, and that this policy did not change until 1907, with the advent of banking control. This refusal to connect, the report implies, was an effective means of "curbing the independent movement." It also asserts, in direct contradiction with another statement in the report, that Bell's refusal continued until action by State legislatures and federal

antitrust authorities forced it to connect with noncompeting independents. These assertions about the competitive role of interconnection are still widely accepted, and were passed down essentially unaltered until the early 1980s.

In fact, Bell began to interconnect with noncompeting independents in 1900. By then, refusal to interconnect had proven to be a completely ineffective way to contain independent growth; the policy actually hurt Bell and stimulated independent long distance development. Bell's liberalized (but still selective) interconnection policy, on the other hand, brought many independently-owned exchanges into the Bell system and thus helped to preempt local and long distance competition. The implicit theory of the relation between interconnection and competition handed down by the FCC almost inverted the truth.

The FCC report also devoted a lot of attention to the failure of the Telephone, Telegraph and Cable Company to develop a nationwide long distance alternative to the Bell system from 1898 to 1902. By placing great emphasis on this isolated event, the report left many readers with the impression that the independents never developed their own long distance networks.[32] Bell's long distance facilities, the report states, were its "principal advantage" over its competitors, and its refusal to interconnect "confined [the independents] within the limit of the particular territory served." This aspect of the report understated the amount of independent toll line development, and overstated the importance of making telephone connections to locations over 100 miles away at a time when American society was far more localized than it is today.

The FCC investigation remained the principal economic history of the American telephone industry for the next forty years. Researchers began to take a second look at the Bell - independent rivalry after 1969, concurrent with the revival of telephone competition. The outstanding contributions from this era are Richard Gabel (1969), Langdale (1978), Bornholtz and Evans (1983) and David Gabel (1986). There are also a growing number of social, technological and business histories pertaining to the telephone which, while not directly concerned with the issue of competition and monopoly, provide useful supplementary insights and data.[33]

Richard Gabel was the first since the 1930s to reassess the value and feasibility of telephone competition.[34] The Federal Communications Commission was embarking on a series of policy debates over the value of new entry in telecommunications markets. Gabel weighed in with an influential reminder that competition had existed before, and emphasized its benefits: lowered rates, extended and improved service, and upgraded technology. His analysis of Bell's competitive strategy and his account of the failure of the independents to achieve long distance interconnection relied heavily on the FCC investigation. In some cases, the piece reproduces verbatim entire sentences from the investigation text.

Gabel added, however, a new and fateful twist to the interpretation of interconnection issues. In his view, competition could have been preserved indefinitely had Bell and the independents been required to interconnect sooner:

> had there been full interconnection during the early years

> of competitive rivalry, it may be hazarded that the structure of the telephone industry would have been more equally balanced. There is little question but that interconnection would have relieved subscribers of the burden of dual instruments and separate directories and lessened the public demand for forced consolidations. The Bell System watchword "Universal Service" could have been achieved without "One System, One Policy."[35]

Gabel's comment contained the germ of a new theory of regulation. Both Stehman and the FCC before him had recognized that the value of a telephone network increased with the number of people it linked, and therefore that an established network reaped a certain advantage by refusing to interconnect with a smaller competitor. But prior to this interconnection was viewed as a way to eliminate one of competition's undesireable consequences (fragmentation of subscribers), not as a way to promote competition. More often, it was treated as inimical to competition.

Gabel's analysis was based on the interpretation of interconnection issues contained in the FCC report, which as we have seen was flawed and incomplete. Nevertheless, the philosophy toward interconnection and competition expressed in his short article became the basis of the procompetitive telecommunications policy that culminated in the divestiture of AT&T.[36] The new policy appeared to offer regulators a way to capture the benefits of competition without the problems of fragmentation.

As a piece of scholarship, John V. Langdale's "The growth of long-distance telephony in the Bell System: 1875-1907"[37] represents an advance in telephone historiography. Langdale's research was the first to move beyond the FCC investigation data into the primary sources. It also marked the beginning of a shift

in emphasis in the interpretation of the causes of telephone monopoly, a change based on parallel developments in economic theory.[38]

One of Langdale's purposes was to examine "the use of long distance telephony by the Bell System as a competitive strategy." He concluded that Bell's dominance resulted in part from the "system wide interconnections which the Bell System provided through its long distance network."[39] Langdale thus initiated a new tendency to emphasize long distance interconnection as the source of Bell's success, as against the earlier tendency to give primacy to financial issues. Langdale asserted that the independent network "was fragmented by the Bell System's policy of taking over strategically located companies whose removal disconnected important parts of the independent network," and that a growing number of independents chose to connect with Bell. In the context of the late 1970s, his analysis tended to support the view of interconnection advanced by Gabel. If the exploitation of system advantages was the source of Bell's monopoly power, then requiring interconnection with competing companies could open the door to smaller competitors.

In making this argument, however, Langdale was the first to call attention to the Bell policy of "sublicensing" (i.e. interconnecting with) noncompeting independent exchanges, and to give some indication of its deleterious effects on independent attempts to construct a competing system. The large number of independent exchanges that chose to connect with Bell after 1907 was a major factor in the decline of competition. Langdale hypothesized that the growth of connecting independents was

produced by the superiority of Bell's long distance facilities. Like Stehman and the FCC before him, Langdale placed a heavy explanatory load on long distance interconnection.

A chapter on "The early history of telephone competition" by Bornholtz and Evans (1983) was published in the aftermath of the AT&T divestiture agreement.[40] Its treament of the subject was shaped by the post-divestiture debate over extending competition to the local exchange. Bornholtz and Evans's treatment of interconnection issues was the one of the most interesting and historically accurate up to that time. The authors were critics of the AT&T monopoly, but unlike the FCC investigators based their attack on a consistently pro-competition position. Consequently, they did not dismiss dual service as irrational, but made use of primary sources to examine its characteristics at both the local and long distance levels. They were also the first to accurately characterize Bell and independent motives for opposing or supporting interconnection in various situations.

What their account lacked was an appreciation of the special economic features of networks. Their stated aim was to prove that there is nothing inherently monopolistic about telephone service. This argument was based on a sophisticated, but false, attempt to deny that interconnection adds a unique dimension to the industrial organization of communications networks. This failing undermined the validity of both their historical explanation of telephone monopoly and the policy prescriptions they derived from it.

The authors argued that there is no fundamental economic difference between competing telephone systems and competing department stores:

> Macy's, Bloomingdale's and Brooks Brothers could economize on duplicate facilities by merging. You might even be able to purchase your Brooks Brothers suit for less after the merger. But other consumers may have to pay more for their polyester leisure suits, video games, and fine china. Merger may thereby raise the aggregate cost of supplying the services offered by these stores. Two telephone systems could possibly economize on duplicate wires and duplicate telephones for subscribers who desire to reach subscribers on both systems. Duplicate subscribers gain from this merger. Nonduplicate subscribers who have little demand for reaching subscribers on the other system lose from this merger. In both cases one would expect the competitive process to reveal the socially desireable configuration of businesses.[41]

This is an effective answer to a rationale for telephone monopoly based solely on uneconomical duplication of facilities. There may be no difference between telephone service and any other economic good in this respect. The argument does, however, overlook important differences between communications networks and polyester leisure suits (or any other homogenous commodity). The nature of a polyester leisure suit is not affected by where other people consume it, or even whether other people consume it. A communications network, in contrast, is defined by who or what it connects. Two people can go to different stores and get the same suit, but if they subscribe to different networks they will not get the same kind of communications access that they will get if they both subscribe to the same network.

Bornholtz and Evans' attempt to normalize network competition did strange things to their treatment of interconnection issues. They wanted to argue that a competitive market will provide whatever level of interconnection the public desires. At the same time, they correctly observed that the actual competition took the

form of rivalrous system-building, and that both the Bell System and the independent movement used their control of the subscribers on their system as "bargaining chips in obtaining franchises and in enticing subscribers onto their systems."[42] The contestants' refusal to interconnect was a logical extension of this policy; each of them hoped to win the competitive battle and emerge as the dominant system to the exclusion of the other. The authors are thus forced to explain away these aspects of the history by claiming that it was an imperfect or illegitimate or avoidable form of competition.[43] They suggested that "more" competition would have occurred if the local exchanges had been structurally separated from long distance telephony (a policy that just happens to resemble the AT&T divestiture settlement).

To someone who recognizes the unique economic features of networks (see Chapter 3), these aspects of the Bell-independent competition were perfectly predictable. A network with exclusive control of access to a location or person with whom others wish to communicate differentiates itself from its rival and attains a special kind of leverage over the subscription decisions of people who want to call that location or person. Noninterconnected networks cannot offer perfect substitutes, so they must compete on the basis of who they reach as well as price and service. By the same token, a network becomes more valuable as it becomes more universal; hence rivalrous networks are propelled into a system-building race. These are not accidental or avoidable features of network competition; they are the essence of network competition.

The Bornholz-Evans piece shows that the monopoly riddle can

induce schizophrenia in free market economists as well as in New Deal-era regulators. In their desire to undermine the case for natural monopoly in telephone service, such economists assume that communications networks are no different from any other economic good. When the differences that they deny the existence of result in deviations from the market structure that would be expected of a normal, homogenous commodity, they assert that there is something wrong with the market and propose highly interventionist policies (such as separating exchange from interexchange service) to make the market structure conform to their initial assumption.[44]

Although confined in scope to a single state, David Gabel's Ph.D. dissertation (1986) was the most detailed investigation of the Bell-independent competition since the FCC investigation.[45] Its theme was the origin of telephone system regulation in the state of Wisconsin. Gabel's explanation of monopoly emphasized sunk costs and economies of scale and thus conformed to the natural monopoly tradition. Nevertheless, the study contained an excellent descriptive treatment of the relationship between interconnection, competition and monopoly. Gabel traced the history of physical interconnection laws in Wisconsin (a leader in this area) and independent toll line development in the state. He accumulated detailed evidence about the extent and effects of Bell's sublicensing policy. His analysis of the debate over the telephone regulation bill of 1907 showed that independent leaders, and to a certain extent the state legislators, saw the lack of interconnection between the competing systems as a spur to system development. Both groups supported competition and noninterconnection even when they thought the process eventually

would culminate in interconnected monopoly. Most importantly, Gabel examined the effects of the legally-mandated interconnection of the competing systems in Janesville and La Crosse after 1912. The implications of his case studies will be discussed in the narrative.

III

Theories of Interdependent Demand.

Beginning in the mid-1970s, a new branch of economic theory devoted to the special features of the demand for communications networks developed. This theory developed independently of the natural monopoly tradition and in the opinion of the writer represents a more promising approach to the issues of telecommunications monopoly, competition and interconnection. The literature began with attempts to model the demand for telephone service. Later, similar issues turned up in economic analyses of standardization and technology adoption. As of now, no single label covers this literature and its subject. Some refer to it as the "network externality," while others refer to "standardization" or "interdependent demand." The subject of the theory is the way one consumer's demand for a product is affected by the behavior of other consumers. It is particularly concerned with cases in which a product becomes more valuable as more people use it.

As long ago as the 1880s, the promoters of the telephone had remarked that the value of an exchange increased as more people joined it, and that the demand for telephone service by one person depended upon who else also subscribed.[46] This observation, in fact, formed part of the basis of Vail's argument for universal

service.[47] The literature on interdependent demand gave these intuitive observations formal definition in the language of economic theory. It began in connection with attempts to model the demand for telephone service.

In 1973, Artle and Averous showed that the extra value created by adding new subscribers to a telephone system can generate continuous subscriber growth in a fixed population with stationary income levels.[48] A year later, the Bell Labs economist Jeffrey Rohlfs published what must be considered the definitive economic model of interdependent demand.[49] Artle and Averous's model had been based on the simplifying assumption that each telephone subscriber is equally likely to call any other subscriber (the uniform calling pattern). When this is assumed, the value of service depends on the number of subscribers but not their identity. Rohlfs' model was based on the more realistic assumption of a nonuniform calling pattern: an individual's demand for telephone service depends on who subscribes, not just the number of subscribers. His treatment of the subject is based on the notion of an "equilibrium user set." This is defined as the set of telephone subscribers consistent with all individuals (both subscribers and nonsubscribers) maximizing their utility.

Rohlfs derived several important observations about the behavior of network demand from his model. He showed that at any given price, there can be many different equilibrium user sets. The actual set one ends up with depends on "the disequilibrium adjustment process;" i.e., the specific historical events leading up to the equilibrium. Different starting points or different sequences of events will lead to completely different levels of

telephone subscribership. The final result is path-dependent. Rohlfs' model also called attention to the importance of the "start-up problem," that is, how to attain a desired level of subscription starting from a small or null user set. Even if a group of a certain size can be served profitably at a given price, a completely different price may have to be charged to acquire enough subscribers to attract a user set of that size. Rohlfs' paper also supports the nonhomogeneity argument made in Section 2.[50]

The early economic models were concerned with optimal pricing, not industrial organization. They assumed a single telephone system and did not assert or imply that there was any relationship between the monopolistic character of the telephone industry and demand interdependence. The analysis of interdependent demand took on significance for industrial organization indirectly, via the economic analysis of standards. Standards are a broad and fascinating topic, encompassing everything from the adoption of a uniform railroad gauge,[51] money and units of measurement,[52] and the technical compatibility specifications coordinating product design. Economists began to take an interest in the process of standardization in the late 1970s. The immediate motivation was the study of the strategic manipulation of compatibility relations.

Many industrial products consist of separate components which must work together: e.g., cameras, lenses and film, or CDs and CD players. By deliberately designing products so that they do not work with the components or systems of other manufacturers, a producer can attempt to lock buyers into his product line and shut other producers out of the market. In his history of the U.S.

computer industry, Gerald Brock showed how IBM repeatedly made its mainframe computer CPUs incompatible with the peripheral devices of other manufacturers in order to protect its dominance of the computer peripheral market.[54] James Brock uncovered a similar pattern in the photography industry.[55] These two works underscore the extent to which theories of compatibility, unlike the highly formalized natural monopoly theory, were grounded in empirical or historical research.

Compatibility standards possess the same interdependent demand characteristics as communication networks.[56] A standard's ability to coordinate product design or behavior improves as more people adhere to it, just as the communications value of a given network improves as more people join it. In both cases, value depends not on the use of the standard as such, but on its use by everyone else as well. As an isolated piece of equipment, a telephone is basically useless; what matters is who it connects one to. Likewise, the QWERTY keyboard arrangement is not the most efficient one available; it just happens to be the one that everybody learns to use. The process of standardization shows the same properties Rohlfs, Artle and Averous identified in networks. There is a "start-up problem" that may require deviations from cost-based pricing. The equilibrium reached is path-dependent, and once a certain critical mass is attained, adoption can take on a momentum of its own.

Unlike the works on telephone demand, the standards literature has devoted a lot of attention to the impact of demand interdependence on the competitive process. Gerald Brock's The Telecommunications Industry, written in 1981, explored the

competitive uses of interdependent demand throughout the 135-year history of the telegraph and telephone.[57] As a work of history, the book is a synthesis of readily available secondary sources. Its importance lies in its reinterpretation of the established sources in the light of new economic theories about demand interdependence (he used the term "systems effects"), regulation and barriers to entry. Brock's treatment of the subject cemented the conceptual link between communications networks and standards by treating interconnection as a compatibility relation. He showed that interconnection in telecommunications markets is the direct analogue of compatibility in equipment markets.[58] Once interconnected, networks can be used as complementary products. Competitors need not duplicate the entire network of their rival to be able to compete. In a firm's competitive strategy, the denial of interconnection rights will occur under the same conditions and for much the same reasons as the strategic selection of incompatibility. A producer with a large market share has less to gain from interconnection (compatibility) than one with a small market share and limited capital resources. The refusal to interconnect can signal an intention to monopolize the market, for it means that all consumers must join the dominant network if they are to obtain access to most other customers.

Brock stopped short of attributing the monopolistic character of the telephone system to demand interdependence per se. In his view, telephone monopoly was a product of economies of scale in "final distribution," the last mile of wire into the customer's premises. He also asserted that systems effects cannot operate as barriers to entry by themselves if there are no other barriers to

entry.

Later works drew more explicit links between compatibility relations and the convergence of the market toward a single system or standard. Farrell and Saloner (1987) outlined several unique characteristics of competition with interdependent demand.[59] In conventional competition there is typically a stable outcome with multiple product designs produced by separate firms in optimal proportions. In standards-oriented competitions, "the typical outcome is for one good or the other to take over the market." The competitive process is often characterized by what they called "bandwagon effects:" the emergence of one standard or system as a clear leader will cause consumers to flock to it, making its success self-reinforcing. They also noted that once a standard has become established it acquires a certain amount of "inertia." People may not change to a new system or standard even if it is more efficient, because they are reluctant to sacrifice the benefits of universal compatibility, and the coordination problems involved in organizing a large-scale change are too forbidding.[60] The persistence of the QWERTY keyboard design is the quintessential example of what Farrell and Saloner call "excess inertia." A better design exists, but despite the efforts of its promoters and institutions as powerful as the U.S. Navy, it has never been able to establish itself.[61]

All of the economists involved in this work cling to the notion that standardization occurs because it leads to economies of scale. Katz and Shapiro (1985, 1987), Kindleberger (1983), David (1985), and Farrell and Saloner (1987), to cite the most important cases, all describe standards as either having, or resulting from,

what they call "demand-side scale economies."[62] A demand-side economy of scale would mean that the product would become less expensive to consume as more of it is consumed.

However, an alternative language of coordination has begun to creep into the vocabulary of economists. This is most evident in Farrell and Saloner's recent survey of the literature. Among other things, they use human language as an example of a "standard" and discuss the effects of imperfect information and various levels of uncertainty on the ability of large groups to arrive at a common standard. Many of their examples of the "economics" of standardization really involve a logic of coordination or communication.[63]

One of the most successful attempts to model the process of standardization, in fact, dispenses with the normal economic apparatus altogether and relies on a probabilistic model. W. Brian Arthur (1983) was the first to use a Polya urn scheme to mathematically model the process of technology adoption.[64] Arthur formulated the problem in this way:

> We consider an infinitely large number of managers adopting some new technology which occurs in two types, A and B. We assume that each manager is guided by the following considerations: he analyzes which technology has been adopted by r randomly selected managers and if not less than m of them use A, then he also selects A, otherwise he selects B.

Arthur was specifying the interdependent demand condition, in which technological standards or networks are more likely to be selected as more people use them. He showed that these kinds of processes can be described by imagining an urn of infinite capacity

containing white and black balls. The urn is sampled with replacement, and every drawing of a ball of a specified color results in a second ball of the same color being returned to the urn. The probability that a ball of one or the other color will be added is therefore an increasing linear function of the proportion in which the colors are represented in the urn.

A probabilistic approach to network externalities was elaborated further in Arthur's "Competing Technologies, Increasing Returns and Lock-in by Historical Events" (1989).[64] This work explored the way random events affect societal adoption of one of two competing technologies when the returns associated with using a particular technology increase as the number of users increases. The meaning of Arthur's "increasing returns" is basically the same as the network externality: utility increases as more users adopt the same technology. The concept has broader implications, though: Arthur is also concerned with the efficiencies that occur when general social adoption of one technology increases the level of knowledge about its operation. In both cases the benefits derived from adoption depend on the number of other people who have adopted the same technology. The use of the "increasing returns" label is unfortunate because it is easy to confuse Arthur's "increasing returns" with the "increasing returns to scale" of traditional natural monopoly theory. In fact, they represent distinct economic phenomena. (This confusion seems to underlay economists' decision to label standardization as a product of "demand-side economies of scale.")

When there are no "increasing returns" to technology adoption, either technology can end up with a stable share of the market.

The presence of increasing returns, according to Arthur, makes the market converge on one technology. In this case, the essentially random events that control the sequence of adoption can "lock" users into one technology even if it is not the most socially efficient from a classical economic point of view. "Increasing returns" create "positive feedback" that magnifies random variation and pushes it in the direction of one of the two technologies. "Insignificant circumstances become magnified by positive feedback to tip the system into the actual outcome selected. The small events of history become important."[65]

Arthur's work characterizes the process of technology adoption with increasing returns as a "random walk with absorbing barriers." The "absorbing barrier" is the point at which the number of users adopting one of the two technologies exceeds the number adopting the other by a large enough number to attract all users. Arthur showed that the difference in the number of adopters of two technologies must eventually cross one of the barriers: "therefore the two technologies cannot coexist indefinitely: one must exclude the other."[66]

Arthur's approach provides a formal, probabilistic demonstration of many of the same properties of network competition described by economists. Arthur's "lock-in" is the equivalent of Artle and Averous's "self-sustaining growth," Rohlfs' "critical mass" and Farrell and Saloner's "bandwagon effect." His "increasing returns- absorbing barrier" model confirms Farrell and Saloner's observation that standards competitions lead to the exclusion of one standard by the other rather than an apportionment of the market. And his demonstration that the process is

influenced by random factors such as the sequence of decision making confirms Rohlfs' finding that the arrival at any given equilibrium user set is path-dependent. In Chapter 3, a probabilistic model that elaborates on and modifies these conclusions is constructed.

IV

Overview.

The dominant interpretation of telephone monopoly has gone through three phases. In the first phase, it was abundantly clear that monopoly was brought about to achieve universal interconnection. Monopoly was an essentially pragmatic response to the problems of subscriber fragmentation and the difficulties inherent in the financial and administrative coordination required to interconnect competing companies. There was also a feeling that competition, as in other utility industries, was economically wasteful and destabilizing. From the 1930s to the 1970s the economic aspect of the progressive rationale for monopoly totally displaced the emphasis on universal interconnection. Monopoly became a product of "scale economies" or a related supply-side cost characteristic of the telephone business. The '70s and '80s brought a revival of interest in competition and the beginnings of an analysis of the role of interconnection in telephone history. The treatment of interconnection effects that has emerged from this period, while insightful and valid in many respects, stands in an uneasy, ambiguous relation to economic theory. Interconnection of people within a communications network was discussed within the framework of a theory of interdependent demand by some, as an

economy of scale by others, as part of a theory of barriers to entry by still others. At other times economists relied on metaphors of communication or coordination. Of these theoretical approaches, probability-based models of group coordination appear to have the most validity. Yet these theories point beyond economics to a much broader range of social phenomena. The monopoly riddle arises from its refusal to conform to disciplinary boundaries. We have an essentially noneconomic force--the relation of reciprocal compatibility required by social communication--exerting a powerful influence over the structure of industry and the nature of competition.

The historical literature has always been attentive to interconnection issues, but here the problems are empirical as well as theoretical. "Interconnection" has been made to carry a heavy explanatory load in the absence of systematic knowledge of who was connected to whom at any given time. With the exception of D. Gabel's study of Wisconsin, none of the histories of the competitive era adequately lay out the changes in interconnection arrangements and laws during the period. There is little information in the literature about the functioning of dual service at the local exchange level. Assertions about the strategic advantage of Bell's long distance connections are not backed up with information about how many people actually made long distance calls, to whom they generally made them, and how the connections available through the independent network and the Bell system compared. The same problem confronts various theories about the competitive effects of Bell's interconnection policies. The literature contains assertions to the effect that Bell's refusal to

connect and its agreement to connect helped to thwart the competition. The apparent inconsistency makes it clear that the strategic power of interconnection depended upon very specific conditions. The study's use of access mapping is intended to provide the empirical basis for addressing these issues.

NOTES TO CHAPTER 2.

[1] Under antitrust pressure from the federal government, the Bell System in 1913 made an agreement (the "Kingsbury Commitment") not to acquire any more competing independent exchanges. From about 1910 on, state regulatory commissions were using certificates of public interest, convenience and necessity to prevent companies from setting up competing exchanges in towns with an established exchange. In cities with competing exchanges, utility commissions and city councils encouraged consolidation. See Chapter 9.

[2] The Justice Department filed a Sherman Act antitrust suit against AT&T and Western Electric on January 14, 1949. The suit was based on the evidence gathered in the FCC Investigation of 1934-1939. The 1956 Consent Decree ending the suit restricted AT&T to regulated activities and required it to license its patents to others on request. In late 1974 the Justice Department filed a new suit against AT&T. This suit led to the agreement to divest its operating companies and the Modified Final Judgment of 1982.

[3] J. Warren Stehman, The Financial History of the American Telephone and Telegraph Company (Boston: Houghton Mifflin, 1925).

[4] Ibid, p. 234.

[5] Ibid.

[6] Henry Carter Adams, "The Relation of the State to Industrial Action," Publications of the American Economic Association, Vol. 1, No. 6 (January, 1887), p. 465-549.

[7] Farrer's criteria of monopoly were: 1) What they supply is a necessity. 2) They occupy peculiarly favored spots or lines of land. 3) The product or service they supply is used at the place where and in connection with the plant or machinery by which it is supplied. 4) The product or service can be increased in supply without a proportionate increase in plant and capital. 5) The business requires a "certain, and a well defined harmonious arrangement, which can only be attained by unity." Cited in Lowry (1973), n. 8, p. 18-19.

[8] Thomas Lowry, "Justification for Regulation: The Case for Natural Monopoly." Public Utilities Fortnightly, November 8, 1973, p. 19.

[9] Richard T. Ely, Outlines of Economics (New York: ----, 1937).

10] The average cost of telephone exchanges in large cities was double that of smaller cities. Within a city, however, growth in the number of stations resulted in decreases in per station expenses when the additional subscribers led to more efficient utilization of outside plant. Such growth also increased the average costs associated with switching. See "Cost of Exchange Telephone Service," memo from Joseph P. Davis to Frederick Fish, October 14, 1902, AT&T archives. For a history of the diseconomies of growth in switching technology, see Milton Mueller, "The Switchboard Problem," Technology and Culture, July 1989.

[11] Jones and Bigham, Principles of Public Utilities, (New York: MacMillan, 1931), p. 89-90.

[12] G. Lloyd Wilson, James M. Herring, Roland B. Eutscher, Public Utility Industries (New York: McGraw-Hill, 1936); James M. Herring and Gerald C. Gross, Telecommunications: Economics and Regulation (New York: McGraw-Hill, 1936) p. 189.

[13] C.W. Thompson, Wendell R. Smith, Public Utility Economics (New York: McGraw-Hill, 1941), p. 91.

[14] Herman Trachsel, Public Utility Regulation (Chicago: Irwin, 1947).

[15] James Bonbright, Principles of Public Utility Regulation (New York: Columbia University Press, 1961), p. 14-16.

[16] Lowry, n. 8 above, p. 22. See also Richard Posner, "Natural Monopoly and its Regulation," Stanford Law Review, 21:548-643 (February 1969).

[17] William Baumol, John Panzar and Robert Willig, Contestable Markets and the Theory of Industry Structure (New York: Harcourt, Brace, Jovanovich, 1982); William Sharkey, The Theory of Natural Monopoly (Cambridge: Cambridge University Press, 1982).

[18] David S. Evans amd James J. Heckman, "Natural Monopoly," in Breaking up Bell (New York: North-Holland, 1983).

[19] "There is natural monopoly in a particular market if and only if a single firm can produce the desired output at lower cost than any combination of two or more firms." W. Sharkey, n. 17 above, p. 54.

[20] Alfred Kahn, The Economics of Regulation: Principles and Institutions Volume 2 (New York: Wiley, 1971).

[21] Kahn, n. 20, p. 123.

22] Melvyn Fuss and Leonard Waverman, The Regulation of

Telecommunications in Canada Technical Report No. 7, Economic Council of Canada, March 1981; David Evans and James Heckman, "A test for subadditivity of the cost function with an application to the Bell System," American Economic Review 74, 1984 p. 620.

[23] Baldev Raj and H.D. Vinod, "Bell System scale economies from a randomly varying parameter model," Journal of Economics and Business February 1982, pp. 247-252; J.B. Smith and V. Corbo, "Economies of Scale and Economies of Scope in Bell Canada," Working Paper, Department of Economics, Concordia University, March 1979.

[24] Stephen C. Littlechild, Elements of Telecommunications Economics (London: Institute of Electrical Engineers, 1979).

[25] Stehman, n. 3 above, pp. 80-104.

[26] Stehman, p. 65.

[27] Federal Communications Commission, Investigation of the Telephone Industry in the United States (Washington: GPO, 1939; reprinted by Arno Press, New York, 1974); Noobar Danielian, AT&T: The Story of Industrial Conquest (New York: Vanguard Press, 1939; reprinted by Arno Press, 1974); Horace Coon, American Tel & Tel: The Story of a Great Monopoly (Freeport, NY: Books for Libraries Press, 1939).

[28] Harry B. MacMeal, The Story of Independent Telephony (Chicago: Independent Pioneer Telephone Association, 1934). MacMeal's book consists mainly of extracts from Telephony Magazine and presents no coherent interpretation of the events. For that reason it is not discussed in the literature review although it is used as a source throughout the narrative.

[29] FCC Investigation report, n. 27 above, p. 133.

[30] James Herring and Gerald C. Gross, Telecommunications: Economics and Regulation (New York: McGraw-Hill, 1936), p. 189-190, where the authors state why they believe that both exchange and long distance service are best provided by one system. Herring was a member of the FCC staff.

[31] FCC Investigation, n. 27 above, p. 139. See also Danielian, n. 27.

[32] Gerald Brock, for example, states that the "acquisition of the Telephone, Telegraph and Cable Co. together with the acquisition of the Pupin patent rights at about the same time stopped interest in a competitive long distance company." Gerald Brock, n. 53 below, p. 120.

[33] Claude Fischer, "The Revolution in Rural Telephony, 1900 - 1920," Journal of Social History (Fall 1987) pp. 5-26; Robert W. Garnet, The Telephone Enterprise: The Evolution of the Bell System's Horizontal Structure (Baltimore: Johns Hopkins, 1985);

George David Smith, The Anatomy of a Business Strategy: Bell, Western Electric and the Origins of the American Telephone Industry (Baltimore: Johns Hopkins, 1985); Neil H. Wasserman, From Invention to Innovation: Long Distance Telephone Transmission at the Turn of the Century (Baltimore: Johns Hopkins, 1985).

[34] Richard Gabel, "The Early Competitive Era in Telephone Communication," Journal of Law and Contemporary Problems 34:340-359 (1969).

[35] Ibid, p. 354.

[36] I do not mean to imply that Gabel was personally responsible for creating and implementing this philosophy, only that he was expressing and reinforcing a new view about interconnection and competition, a view that eventually became the basis of new regulatory policies.

[37] John V. Langdale, "The Growth of Long Distance Telephony in the Bell System, 1875-1907," Journal of Historical Geography 4:2 145-159. I have cited the title as it appears, although the first date in the title must be a typographical error. AT&T began long distance development in 1885; the telephone itself had not been invented in 1875.

[38] Langdale's article was nowhere near as influential as Gabel's. It was published in a journal of historical geography and never came to the attention of economists and policy analysts. Langdale is not cited by Brock (1981) or by Bornholz and Evans (1983).

[39] Langdale lists five reasons why the independents failed, four of them related to interconnection. First, price competition prevented them from making enough profit to be self-financing. Second, they failed to obtain access to key cities such as Chicago, New York, and Boston. Third, the independent network "was fragmented by the Bell System's policy of taking over strategically located companies whose removal disconnected important parts of the independent network." Fourth, the Bell System continuously improved the technical quality of its long distance lines in response to competition. Last, a growing number of independents chose to connect with Bell.

[40] Robert Bornholz and David S. Evans, "The Early History of Competition in the Telephone Industry," Chapter 2 in Breaking up Bell (New York: North-Holland, 1983).

[41] Ibid, p. 32.

[42] Ibid, p. 33.

[43] Bornholz and Evans claimed that the scope of competition was "extremely narrow" because there was usually no more than two exchanges in a town (as if there could have been five or six).

They argued that the competing companies "failed to interconnect because there was too little rather than too much competition."

[44] A network's use of its control of subscribers as a "strategic bottleneck" can occur at the local exchange level as well as at the local-long distance interface. For an approach to telecommunications competition similar to that advanced by Bornholz and Evans, see John T. Wenders, The Economics of Telecommunications: Theory and Policy (Cambridge, Massachusetts: Ballinger, 1987), pp. 171-183.

[45] David Gabel, "The Evolution of a Market: The Emergence of Regulation in the Telephone Industry of Wisconsin, 1893-1917." Ph.D. Dissertation, University of Wisconsin-Madison, 1987.

[46] See, for example, George Bartlett Prescott, The Electric Telephone (New York: Appleton, 1890), p. 236: "the experience of the various telephone exchanges in the larger cities throughout the country shows that as the number of subscribers increases, the number of their communications increase in a two-fold ratio."

[47] "The value of any exchange system is measured by the number of the members of any community that are connected with it." Theodore N. Vail, AT&T Annual Report, 1907. p. 17.

[48] S. Artle and C. Averous, "The Telephone System as a Public Good: Static and Dynamic Aspects." Bell Journal of Economics 4:1 (Spring 1973) pp. 89-100.

[49] Jeffrey Rohlfs, "A Theory of Interdependent Demand for a Communications Service." Bell Journal of Economics and Management Science 5:1 (Spring 1974) pp. 16-37.

[50] "A general theory of interdependent demand cannot be developed in terms of the sum Q. It is necessary to work with the individual qi. The basic analytical concept is not the demand curve...but rather equilibrium user sets." Rohlfs, Ibid, p. 21.

[51] George Rogers Taylor and Irene D. Neu, The American Railroad Network, 1861-1890 (Cambridge, Massachusetts: Harvard, 1956); Alfred D. Chandler, The Visible Hand: The Managerial Revolution in American Business (Cambridge, Massachusetts: Belknap, 1977).

[52] Charles Kindleberger, "Standards as Public, Collective and Private Goods." Kyklos 36: 377-396.

[53] Gerald Brock, "Competition, Standards and Self-regulation in the Computer Industry," in Richard Caves and Marc J. Roberts, eds., Regulating the Product (Cambridge MA: Ballinger, 1975).

[54] James W. Brock, "Market Control in the Amateur Photography Industry," Ph.D. dissertation, Michigan State University, 1981.

[55] Michael L. Katz and Carl Shapiro, "Technology Adoption in the Presence of Network Externalities," Journal of Political Economy; Michael Katz, "The Economics of Standardization in Networks Industries," paper presented before the 14th Annual Telecommunications Policy Research Conference, Airlie Virginia, April 28, 1986.

[56] Gerald Brock, The Telecommunications Industry (Cambridge, Massachusetts: Harvard, 1981).

[57] Brock did not recognize an important distinction between equipment compatibility and network interconnection, namely the lack of homogeneity in networks. When equipment interfaces are standardized, the competing but compatible products (e.g., an IBM computer printer and an Epson printer) are complete substitutes for each other. This is not true of networks. Interconnected networks (e.g., the MCI and AT&T long distance networks) give users the appearance of being substitutes, in that one can communicate with the same set of subscribers over either system, but their physical facilities are really being used as complements rather than as substitutes.

[58] Joseph Farrell and Garth Saloner, "Competition, Compatibility and Standards: The Economics of Horses, Penguins and Lemmings," in H. Landis Gabel, ed., Product Standardization and Competitive Strategy (New York: North-Holland, 1987).

[59] Ibid.

[60] Paul A. David, "Understanding the Economics of QWERTY: the Necessity of History," in Economic History and the Modern Economist, W.N. Parker, ed. (Oxford: Basil Blackwell, 1986).

[61] In Kindleberger (n. 52 above, p. 377), standards allow economies of scale to be realized: "The more producers and consumers use a given standard, the more each gains from use by others through gains in comparability and interchangeability." In Farrell and Saloner (n. 58 above, p. 7) and in Katz and Shapiro (n. 55 above, p. 824), standardization is a form of "demand-side economy of scale." As Katz and Shapiro put it, "a given product is more attractive the larger is the in-place base of consumers using that product." In David (n. 60 above, p. 41-42) economies of scale drive the process of system use toward a single standard: "the overall user costs of a [standardized system] would tend to decrease as it gained in acceptance relative to other systems. ...These decreasing cost conditions--or system scale economies--had a number of consequences, among which was the tendency for the process of intersystem competition to lead toward de facto standardization."

[62] In explaining the basis for excess inertia, Farrell and Saloner use the example of cowboys who tied their horses together while they camped for the night, noting that even though the group of horses was free to go wherever it wanted they would not wander

far, whereas a single horse would. "The horses difficulty in coordinating just where they would move at any given instant prevented them from moving effectively." They note that standards can acquire inertia in an analogous way, because users who are "tied together" via compatibility will be reluctant to sacrifice that compatibility. The point is insightful, but is it economics? If so, it is an economics entirely devoid of prices, costs and monetary transactions. Farrell and Saloner's use of language as a case of standardization is really the reductio ad absurdum of the position that network unity or universal compatibility are a product of "scale economies," for linguistic "standards" emerged long before there was a money economy and in a context in which "reduced costs" is at best a bad metaphor for improved cooperation.

[63] W. Brian Arthur, "On Generalized Urn Schemes of the Polya Kind," Cybernetics 19 (1983) p. 61-71.

[64] W. Brian Arthur, "Competing Technologies, Increasing Returns and Lock-in by Historical Events." The Economic Journal 99 (March, 1989) pp.116-131.

[65] Ibid, p. 127.

[66] Ibid, p. 121.

Chapter 3:

Theory and Method

The following chapter elaborates the theoretical constructs on which the dissertation's treatment of the history is based. The Chapter will take up three fundamental ideas: the notion of demand-side economies of scope; access competition as a form of rivalry with its own distinct characteristics; and probabilistic models of interdependent demand. The concluding section explains the method of access mapping used by the study.

I

Network monopoly as an economic phenomenon: Demand-side economies of scope.

The most important theoretical problem raised in Chapter 2 was that of defining the output of a communications network. The literature review exposed a major anomaly surrounding this issue in the existing theory regarding telephone monopoly. Natural monopoly theory and the newer theories of standardization both rely on the concept of scale economies to explain the emergence of a single system. In natural monopoly theory, telephone monopoly arises due to supply-side economies of scale. Scale economies in the supply of a good exist when the producer's average cost (AC) declines as the quantity of output (Q) increases. For the theorists of standardization, on the other hand, a single system is a product of demand-side scale economies. This means that the average cost of consumption decreases as more of the product is consumed.

Both of these analyses share a fundamental flaw. In the context of communications networks the whole notion of "scale" is suspect because it rests on the assumption that the product remains the same when the quantity of output changes. The analysis makes the product a constant and then examines the effects on AC when Q is increased or decreased. The assumption of a constant product is not valid when applied to communications networks. The most important output dimension of a network is the people or places it connects. From an economic point of view, network participants are not homogenous, interchangeable units like automobiles or kilowatts of electric power; they are all unique and none of them can serve as a substitute for the other. Adding subscribers or locations to a network does not give you more of the same product; it changes the product itself. This fact makes it impossible to understand network externality phenomena as being related in any important way to the scale of production. There is no commensurate output scale on which networks with different user sets can be arranged.

This problem can be overcome by conceiving of changes in the output of communications networks as changes in the <u>scope</u> rather than the scale of consumption and production. In this view, a network is not a single product, but a combination of many different products (connections between subscribers).[1] A telephone directory can be viewed as a gigantic menu listing all the different products that a local subscriber can "order" by picking up the phone. The growth of a network or of product compatibility involves an enlargement of the product's scope--the addition of new capabilities--rather than an increase in the scale of production or consumption. The difference in value between a

network with more or less subscribers (or a language with few or many speakers, or a computer that is or is not compatible with many other computers and software products) turns on the advantages or disadvantages of combining many different functions or uses in one tool. Thus, the idea of "economies of scope" becomes the handle with which one can begin to grasp the reasons for the unique structure of the telecommunications industry.

Normally, "economies of scope" refers to supply-side efficiencies that are achieved by deriving multiple outputs from a single production process. The concept is used, for example, to describe the benefits that may arise from the joint use of facilities by different services (such as the use of telephone lines to supply fire and burglar alarm services) or from exploiting the byproducts of one production process to produce another salable commodity (as when the slaughter of cows for meat also produces hides and other marketable items). In both cases there is an economic synergy between separate products such that producing them in combination is more efficient than producing them separately.

My use of the concept differs from this norm in two important ways. First, I apply the concept of scope economies to communications networks in a far more thoroughgoing sense than is usual. I am asserting that <u>every</u> pairwise connection between telephone stations represents a separate and distinct output. Economists who analyze the scope economies of multiproduct firms generally deal with three or four different outputs. A modern telephone system, in contrast, would have hundreds of millions of separate outputs according to my analysis. The second difference is that the economies of scope I am interested in occur on the

demand side rather than the supply side. Under certain conditions, the ability to access all other users through a single network can be more efficient for the user whether or not a single network is cheaper to construct and operate. In fact, demand-side scope economies can lead to integration or unification even when there are significant diseconomies of scope on the supply side.

Distinguishing between scope and scale economies and between demand and supply side efficiencies makes it possible to simply explain what in natural monopoly theory was a paradox: one telephone system can be more efficient than two when the average cost of one large system exceeds that of two or more smaller systems. This can be illustrated by a very simple model. Assume a population of N people, and assume that the cost/subscriber of supplying telephone service increases as the number of subscribers approaches N. The population is equally divided among two competing networks, A and B, who each charge $4 for telephone service. Assume that all N subscribers want access to all other telephone users and convince A and B to consolidate their operations into a single system. Because of the additional costs imposed by enlarging the systems' scope, the consolidated system must charge $5 for a subscription. Although the subscription price goes up, there is still a significant economy of scope on the demand side. One cannot directly compare the $4 price before consolidation with the $5 price afterwards, because a universally interconnected system offers a larger scope of service. To obtain the same service scope under a dual system subscribers had to pay $8 before ($4 for A and $4 for B). Thus, consolidation allowed subscribers to pay less for universal access.

The model may make it appear as if a monopoly or fully interconnected system is prima facie more efficient than the alternative. Not so; the realization of demand-side economies of scope in this simple example depended on two strong assumptions:

a) All subscribers had to value access to all other subscribers more than the additional cost created by expanding the scope of the network; and

b) The increased average cost created by enlarging the system's scope had to be less than the sum of the cost of subscriptions to two or more nonconnected networks.

Some important qualifications center on assumption a) above. Not everyone wants or needs a system that is universal in scope. Each individual's orders from the "menu" offered by a telecommunications network are different, some being highly extended and others localized and restricted. Under these conditions the elimination of dual service may save money for some groups (essentially, those who took out duplicate subscriptions) while raising the costs for many others, who may or may not reap net benefits from the expanded scope of service. The structure of demand and the politics of the transition are important empirical issues. Also, the existence of a monopoly can restrict the scope of communication as much as, if not more than, the fragmentation caused by competition. This can occur in a number of ways. The monopoly can charge higher prices for access than it would if faced with competition, and thus restrict the number of users. It may be unwilling or unable to

raise the capital needed to expand as fast as the market demands, or unwilling to risk its money on marginal markets. In general, a system exempt from competitive pressures can be indifferent about increasing the scope of its service.

The most important contribution of an analysis that equates output with scope is its ability to explain the unique features of network competition. Once it is understood that the output of networks is defined by who joins them and that adding users makes a network a different product we can see why the competitive process deviates from the standard economic models of competition.

In the perfect competition model of neoclassical theory, the quantity of a good demanded by society (Q) is divided up among numerous competing firms. The output of each firm is a perfect substitute for the output of other firms, and the sum of each firm's output (Qi + Qj...Qn) = Q. In contrast, in markets with interdependent demand each communications linkage represents a separate output, and the competing firms assemble different combinations of these outputs. The result is not the division of a homogenous output into additive "shares," but a market structure in which each competitor offers a different output that is not a true substitute for the output of its competitors. The sum of the output of multiple competing networks is <u>not</u> equal to the output of a single network connecting all users. To cite an extreme example, if half of all users choose network A and the other half choose network B, each network does not have a 50% "market share;" rather, each supplies access to completely different user sets and hence is a different service--so different that some consumers may purchase both of them. Competition exists--the networks may have

facilities in the same location and engage in intense rivalry for adoption by the same users. As long as they are not interconnected, however, the rivalry involves a choice between imperfect substitutes.

To be perfect substitutes, unconnected networks must offer the same subscriber sets. Every user, in other words, would have to join all of the competing networks. This outcome (universal duplication) is virtually impossible, not only because of the diseconomy of scope involved but also because it is self-negating. If all users joined two or more networks any user would be able to access all other users on any one of the networks and there would be no need to duplicate. This is a paradoxical feature of network competition: the greater the percentage of duplication the closer the networks come to being perfect substitutes; but the closer the outputs come to being identical the less need there is for duplication. As a matter of logic (as well as empirical fact), separate networks or incompatible standards are never perfect substitutes. There will always be groups of users who are exclusive to one of the competing networks or standards. Choosing only one competing net involves losing access to the exclusive users of other nets. This is one of the reasons why the competitive process tends to converge on a single, dominant system or standard. Imperfect substitution choices set in motion a coordination game in which users try to assure themselves of access to all desired parties through joint consumption of the same network.

Interdependent demand means that control of access to some persons or locations gives a firm leverage over the choices of

other users in other locations. A network that enjoys exclusive control of access to a certain group of users has a competitive advantage over other networks when it comes to attracting customers who wish to communicate with that group. Economists almost unanimously frown on this practice. Exclusive control of access is given the pejorative "bottleneck" label, and the exploitation of this "bottleneck" for competitive advantage is denounced as an exercise of monopoly power.[2] In reality, network competition based on the exclusive control of access represents a qualitatively different kind of competition rather than a perversion or suppression of competition. In this form of competition, rivalry takes place over the scope of the product, not just its price. Throughout the thesis, I will use the label "access competition" to denote this process.

That access competition does not conform to the neoclassical model of perfect competition does not necessarily mean that it is socially undesireable. One of the most important determinants of a network's value is its scope. In the absence of interconnection or compatibility, firms have a strong incentive to broaden the scope of their products, because superior scope is the source of a crucial competitive advantage. Connecting rival networks can diminish or even eliminate the competitive advantages obtainable by increasing the network's scope. Access competition allows firms to benefit from superior scope, just as normal economic competition allows them to benefit from lower production costs, improved technology or more efficient management.

Rivalry on the dimension of scope produces two incentives that can stimulate and reward enlarging the scope of a network:

1) The incentive to be the first to discover and tap new user groups. Being the first to develop new markets increases the scope of the product relative to its rival and thus makes it more valuable to others.

2) The incentive to match the scope of one's rival as much as possible. In access competition, a firm cannot allow its rival to have uncontested control of too many users. A firm that cannot rely on interconnection with another company to obtain access to subscribers must construct duplicate facilities. The presence of separate facilities can lead to more intense price competition and technological innovation. It also has the effect of giving rivalrous networks an incentive to extend competition to everyone, not just a few heavy users.

There are corresponding disadvantages to access competition. It is often a transitory process--someone wins the competition and ends up with a monopoly, posing problems of inertia and regulation. Once a certain level of development has been achieved, the existence of separate networks can restrict rather than expand the scope of the system. The substitution choices users face are inherently imperfect.

The line of anlaysis developed here also can provide the basis of an economic analysis of competition between interconnected networks. Interconnection makes the scope of competing networks identical and therefore shifts all rivalry to the dimensions of price and service quality. Access becomes a homogenous good. A

network derives no competitive advantages from larger scope and there are no disadvantages associated with possessing a smaller scope. It allows disaggregation of the combination of products comprising a network. By disaggregating the product's scope, interconnection allows perfect substitution to take place along the individual outputs that together make up the network. A firm can offer a substitute for one output--for example, a long distance link between one pair of cities--without necessarily offering a substitute for the entire network. Any competitor can benefit from a larger network's facilities while invading any one of the routes or subscriber markets that looks profitable.

Interconnected networks have a strangely dual status: they are both complements and competitors. Part of their value is derived from the links to the other network; yet at the same time they present themselves to users as substitutes for each other. Interconnected nets can offer the same user set and hence are perfect substitutes for each other, yet their physical facilities are not perfect substitutes. As a result of this dual status, the issue of what interconnected but competing networks charge each other for access becomes the central economic issue.

II

Network monopoly as a communicative phenomenon: Probabilistic models of interdependent demand.

While the notion of demand-side economies of scope captures the economic logic behind network monopolies, the application of the concept is conditioned by how wide a scope of communication the

group in question actually desires. The existing models of standardization and network demand proceed from the simple assumption that networks or standards become more valuable as more people use them. This assumption is at best a rough approximation of the truth. To any given network participant, the issue is not really which of two systems has a larger scope, but which system includes more of one's desired group of communication partners. The communicative scope demanded by each network user is different from that demanded by every other user. Communication patterns are never uniform. In both linguistic and telecommunications networks, users interact with some points very frequently, others rarely, others not at all. Access to some users and locations is very important, while access to others is dispensable. To complicate matters further, one can never know in advance with whom or with what locations one will need communications access. Access to a remote part of Idaho may seem unimportant to a resident of New York city, but if a friend moves there or one's car breaks down nearby a communications link may become very important. At best, one can say that the need for communications access to certain points is very unlikely. Another limitation of the existing models of network externality phenomena is that they do not incorporate any concept of duplication. They assume that users are confronted with a choice between two mutually exclusive networks or standards. Given these two critical assumptions, uniform demand and complete exclusivity, the tendency has been to stress the inevitability of convergence on a single system or standard, even when the outcome is economically irrational.

What happens when probabilistic models of interdependent

demand reflect the heterogeneity of communication patterns and also incorporate the possibility of duplicate users? How is the modelling of network growth and competition affected by these altered asssumptions? What, in particular, happens to the tendency to converge on a single network or standard? In order to answer these questions, this section constructs a probabilistic model of interdependent demand. It modifies the classical Polya urn scheme to reflect nonuniform communication patterns and to make duplicate users a possibility. A verbal description of the model is followed by a more formal elaboration of its properties.

The model assumes a population of 20 members. Each population member can have one of four values. It can be a member of one of two competing networks (NET1 or NET2), a nonsubscriber (NS), or a duplicate subscriber (DUP). Any initial state can be specified. For each individual member, the rest of the population is sampled a specified number of times. The composition of the sample determines whether that individual will be returned to the population at the end of the sampling cycle as NS, NET1, NET2, or DUP. As in the classical urn model, this process is repeated and the changing composition of the population is observed.

The urn population can be thought of as representing a city, country or neighborhood with a distinct communication pattern. The sampling process represents their actual need for telephone access at a given moment, which is generally predictable but is also subject to random variations. The composition of each member's sample determines whether it joins or quits one of the networks, switches from one to the other, or remains the same. The model allows one to experiment with the way the possibility of

duplication and various assumptions about the way communication patterns are distributed affect the viability of two networks. It does not incorporate price or cost differences but is intended to isolate the properties of demand interdependence as such.

The crucial difference between this model and the urn scheme used by Arthur concerns the sampling process. The classical urn scheme relies on a uniform sampling distribution: there is an even chance that one will select any individual bead in the population. Translated into the terms of telephone demand, this corresponds to the "uniform calling" assumption, i.e., the assumption that any user is equally likely to call any other user. In this model, the heterogeneity of communication patterns is captured by means of a nonuniform sampling distribution. Though randomly selected, each population member's sample is controlled by a probability distribution that makes it more likely to select some members than others. This nonuniform sampling probability is intended to represent the fact that each person communicates with some people more frequently than others, or attaches more importance to access to some people than others. The model relies on a 20 by 20 matrix to fix the frequency with which any two population members will sample each other. Any values can be put into this matrix, as long as each row adds up to 1. The probability of sampling another member can be very large or very small. It cannot, however, be zero. This is intended to reflect the fact that while there are certain people and locations with which one is unlikely to communicate, it is always possible that one will need to communicate with such people or locations.

The status of any population member (NS, NET1, NET2, or DUP)

is determined by decision rules based on a simple principle: the individual selects whichever status would have maximized its communications access to the sample that was drawn. If the majority of its sample consisted of nonsubscribers, for example, it will become a nonsubscriber for the next sampling cycle. If its sample consisted of 3 members of NET1 and 2 nonsubscribers, it will be returned to the population as a member of NET1.

Of course, when two networks exist a duplicate subscription will usually afford access to the most people. At the same time, duplication is not always an option for many people because of its cost. Although the model is not intended to incorporate notions of cost, it does handle the problem of duplication in a way that reflects the reality that duplication may be an option for only part of the population. The model allows any sample size between 1 and 20 to be set for each population member. If its sample size is greater than 6, the population member is eligible to be a duplicate subscriber; if it is 6 or less, that member is ineligible to duplicate. Thus, large-sample members choose whichever of the four options (NS, NET1, NET2, DUP) maximizes their contact with the sample drawn, while small-sample members are restricted to the options NS, NET1 or NET2. Thus, the model allows one to experiment with various assumptions about what levels of duplication are economically possible. A population member will duplicate only when it can increase the scope of its communications access by doing so. If a sample consists of four duplicate subscribers and one member of NET1, for example, the individual obtains the same access scope by choosing NET1 or DUP. The person will therefore join NET1.

The model can be described more formally as follows. Population P has N members. An individual population member P(i) draws a sample from the group P(j,k,l...N) a specified number of times. The frequency or probability with which P(i) will draw any other member of P is controlled by a MATRIX file M(N,N). The value in cell M(i,j) represents the probability that P(i) will call P(j). If M(i,j) = .60, for example, P(i) will on average draw P(j) 6 times for every ten times it samples the population. If the cell value equals .05, P(i) will on average draw P(j) once every twenty times it samples the population. Because they represent probabilities, the cells must sum to one across rows. The matrix values can be as concentrated or as uniform as the user of the model cares to make them, subject only to the rule that the probability that any two subscribers will call each other is greater than zero.

The model user also specifies the size of the sample V(i) taken by each population member. If V(i) is greater than 6, P(i) is eligible to be a duplicate subscriber. If V(i) is less than 6, P(i) cannot be a duplicate subsciber.

After P(i) samples the population V(i) times, the program counts the number of times P(i) sampled nonsubscribers (NS), users of Network 1 (NET1), users of Network 2 (NET2), and duplicate subscribers (DUP). The decision rules governing the network status of P(i) are based on these values. The decision rules are as follows:

1. If NS > (NET1 + NET2 + DUP) then P(i) will be returned to the population as a nonsubscriber (NS) at the end of the entire sampling cycle. In this case the number of Nonsubscribers sampled

exceeds the combined total of the number of users of both networks sampled. In other words, P(i)'s communication activity brought him into contact with nonsubscribers more often than with the subscribers of both networks combined. Since most of his communication is with nonusers, he will not subscribe to either network.

2. Decision rule 2 applies only if the first Decision rule does not apply, i.e., if NS < (NET1 + NET2 + DUPS), and only to population members who are eligible to duplicate, i.e., for whom V > 6. In this case the status of P(i) is determined by whichever of the following three values is largest:

a) NET1 + DUP

b) NET2 + DUP

c) NET1 + NET2 + DUP

If a) is largest, P(i) is returned to the population as a subscriber to NET1 at the end of the sampling cycle. If b) is largest, P(i) is returned to the population as a subscriber to NET2 at the end of the sampling cycle. If c) is largest, P(i) is returned to the population as a duplicate subscriber (DUP) at the end of the sampling cycle. The idea behind this decision rule is that P(i) selects whichever status would have maximized his communications access to the sample that was drawn. A subscriber to Network 1 would be able to communicate with all NET1 users and all duplicate subscribers in the sample. A subscriber to NET2 would be able to communicate with all NET2 subscribers and all duplicate subscribers in the sample. A duplicate subscriber (DUP)

would be able to communicate with all NET1, NET2, and DUP sample members. Thus, P(i) will join NET1, NET2 cr will duplicate depending on whether a), b) or c) is greater.

Note, however, that if both NET1 and NET2 = 0 in the sample and all of the networks users sampled were duplicate subscribers then a), b) and c) will be equal. In this case P(i)'s communications access will be the same whether he subscribes to NET1, NET2, or both. As the user does not gain access to additional users by duplicating, the program contains a special check which randomly assigns these cases to either NET1 or NET2.

3. Decision rule 3 applies only if the first two Decision rules are inapplicable. In these cases, NS < (NET1 + NET2 + DUPS) and V < 6. When both of these conditions are true, the status of P(i) depends on whichever is larger in the sample, NET1 or NET2. If NET1 is larger, P(i) is returned to the population as a member of NET1 at the end of the sampling cycle. If NET2 is larger, P(i) is returned to the population as a member of NET2 at the end of the sampling cycle. This rule is based on the simple principle that a network user who is unable to duplicate will choose the network whose users made up a larger portion of its sample. As with rule #2, if the values are equal in the sample the user is randomly assigned to one of the two networks.

The value of P(i) is not changed until all other members have sampled the population also. Then all of the new values of P are substituted for the old ones, the results are output, and a new sampling cycle can begin. It should be noted that the subscriber status of the population at any given moment reflects their sample of the <u>previous</u> population values.

The model can be used to demonstrate several interesting points about network growth and competition. One of the first issues a model of interdependent demand must confront is that of network growth. If the value of a network depends on who else uses it, how does one ever get started? A chicken-and-egg conundrum appears to present itself. In the early stages of network growth, the majority of the population is bound to be composed of non-users. Thus, probabilistic models based on uniform sampling will always return samples in which nonsubscribers greatly outnumber subscribers, and therefore all population members will elect to quit the network. This problem is closely related to the problem of "excess inertia" raised by Farrell and Saloner. If a group of users has already converged on a single network or standard, an urn model would suggest that it is impossible for them ever to get out of it.

The only way to overcome this problem is to ensure that certain population members are more likely to sample some members than others. In order to generate self-sustaining growth, networks must begin with the most regular and most frequently used communication linkages. They must tap into loci of concentrated demand before they can spread. The conditions which can and cannot generate network growth are illustrated by Figures 3.1 and 3.2. In both of these runs of the urn model only a minority--four population members--are specified as initial users. In both cases, the communication pattern is not uniform: each population member has two other favored population members, and these two favored members are different for each individual. The same communication pattern is used in both cases. In Figure 3.2, however, the

sampling probabilities are more highly concentrated on the favored parties than in Figure 3.1. In 3.1, the probability that the population member will sample one of the two favored parties is .350, whereas in Figure 3.2 the probability is .966. As the diagrams show, in 3.1 both networks die out completely after three cycles. In Figure 3.2, NET 1 dies out after 10 cycles but NET 2 continues to spread. The system reaches an equilibrium after 26 cycles, when NET 2 includes all but four members of the population.

This could be seen as a "trickle down" theory of network growth. Networks take root at the top of communications hierarchies, where usage is frequent and the need for a link certain, and gradually spread to embrace less concentrated, less probable acts of social communication. This aspect of the model accords with some intuitively obvious empirical features of the adoption of new communications networks. New networks have begun where there were established links between users with a known, regular need to communicate with each other. The first telephone lines, for example, were set up between retailers and their wholesale suppliers and between stock brokers and their clients. Of course, once a network is in place it changes the communications probabilities by opening up access to users with whom communication may have been impractical or difficult before. One of the weaknesses of the model is that it does not account for the fact that joining a network does not merely fulfill preexisting demands for communication but also redefines that demand in unpredictable ways.

Figure 3.1:

No network growth with evenly distributed communication probabilities.

Figure 3.2:

Network growth with concentrated communication probabilities.

FIGURE 3.1

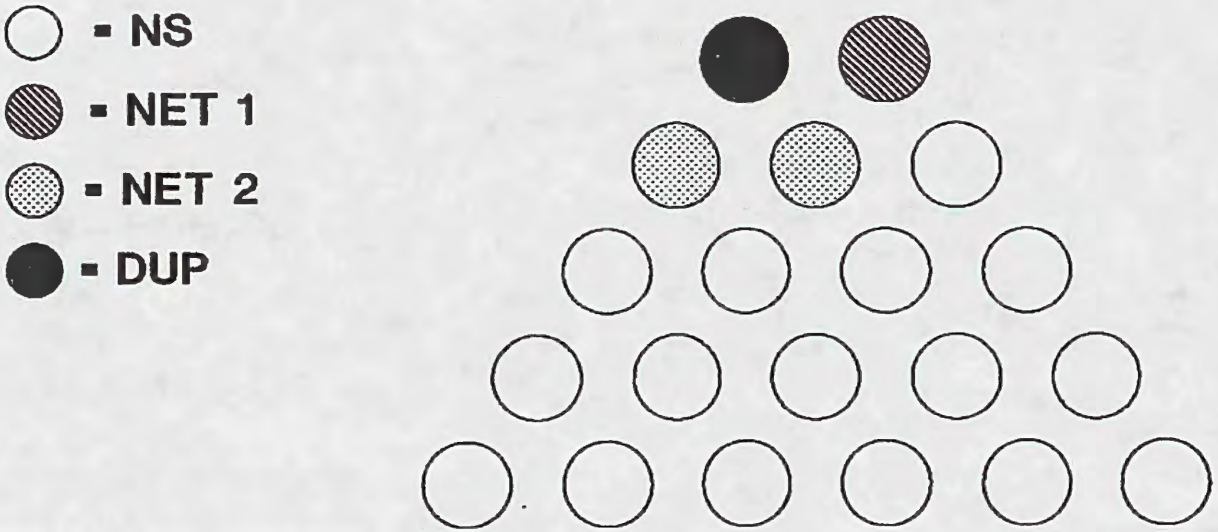
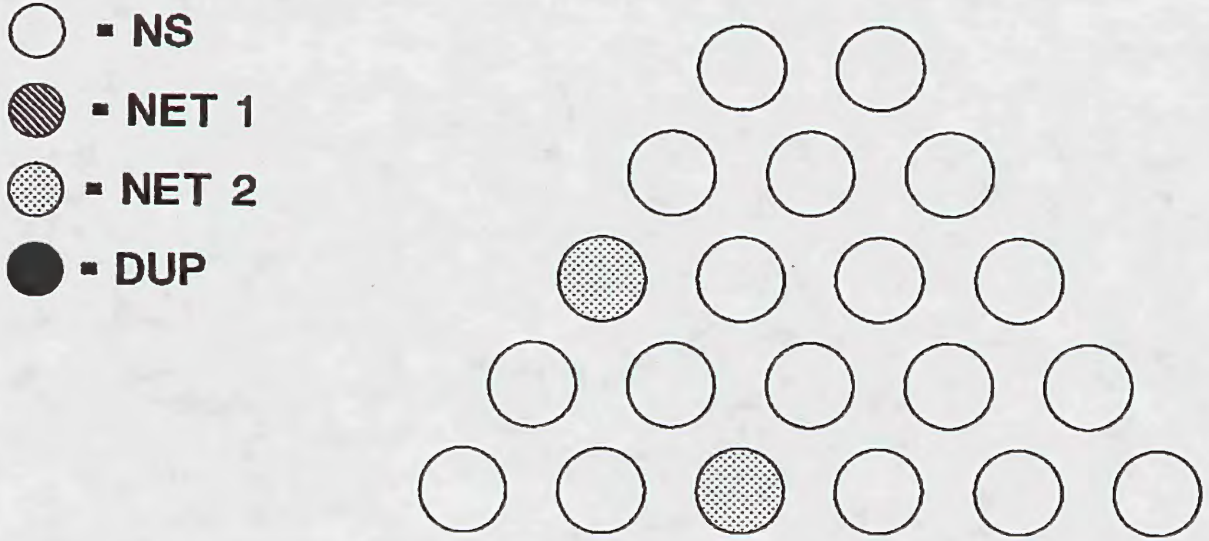


FIGURE 3.1



CYCLE #__1

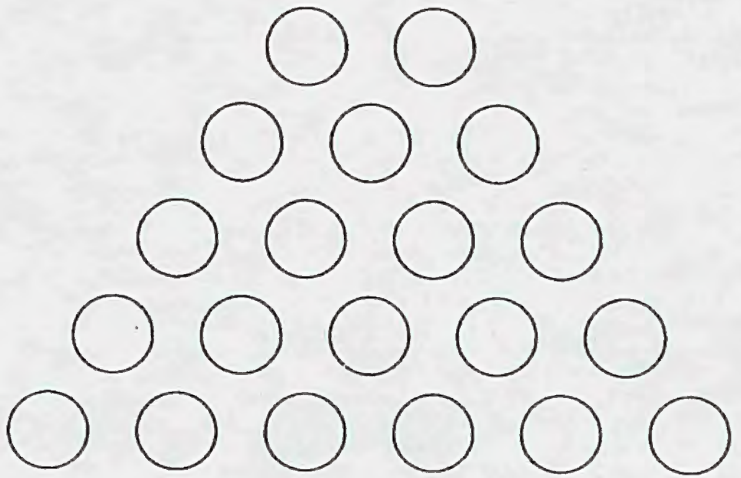
FIGURE 3.1

○ = NS

● = NET 1

○ = NET 2

● = DUP



CYCLE #__2__

FIGURE 3.2

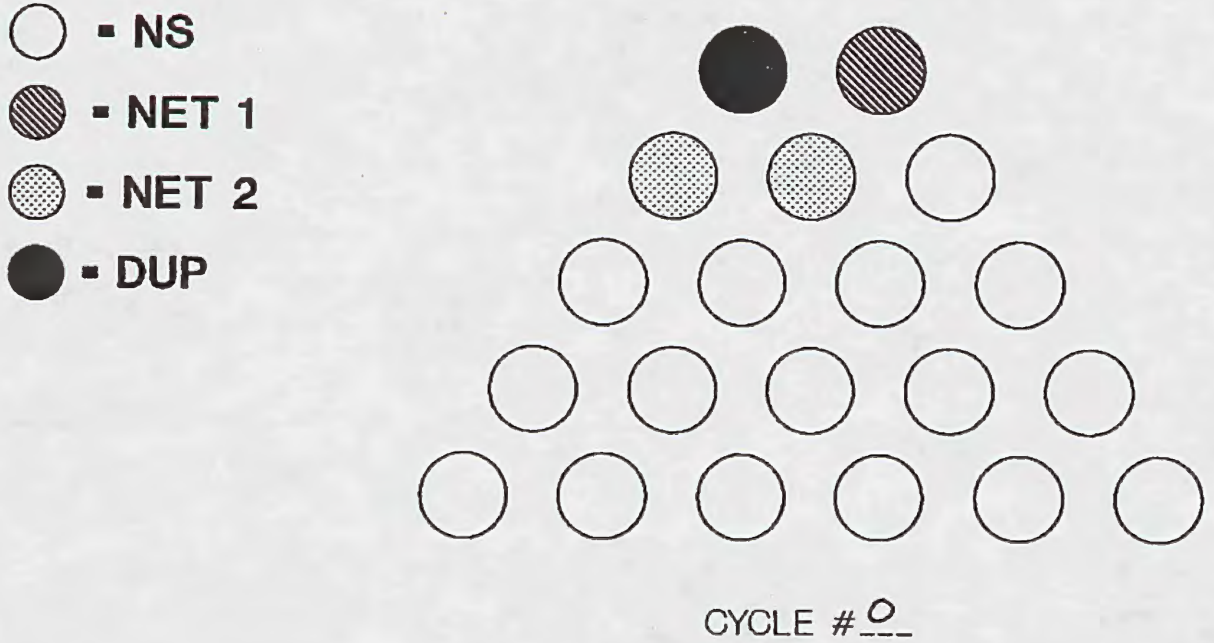
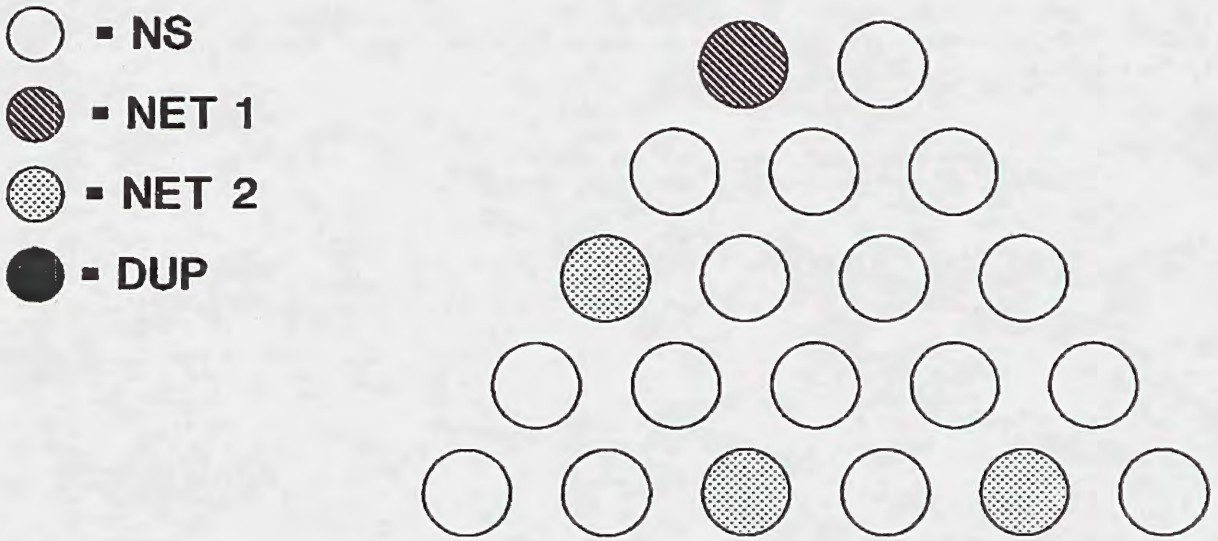
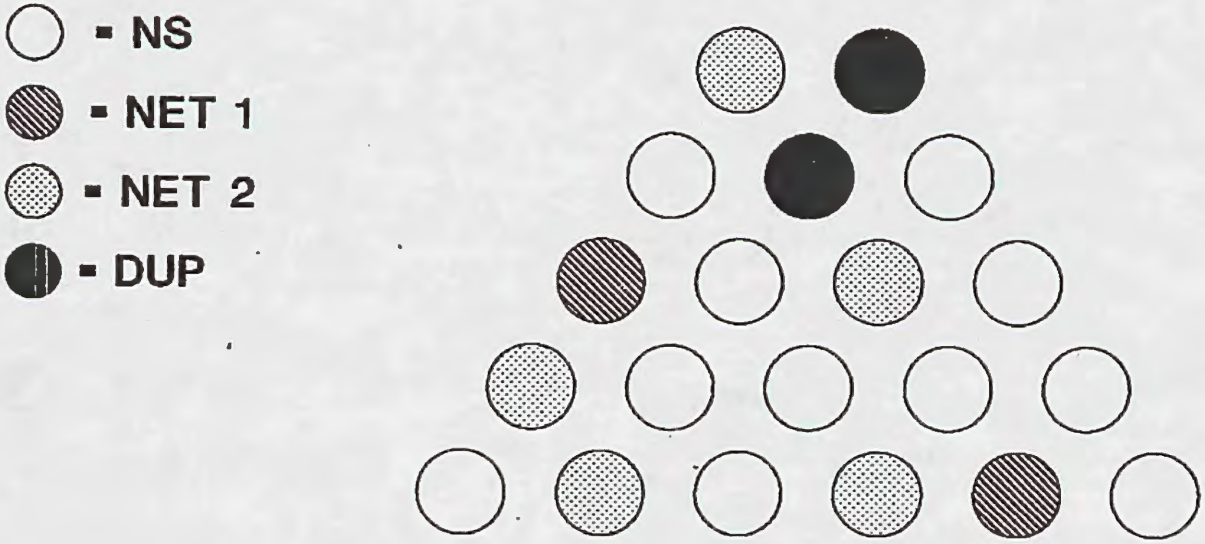


FIGURE 3.2



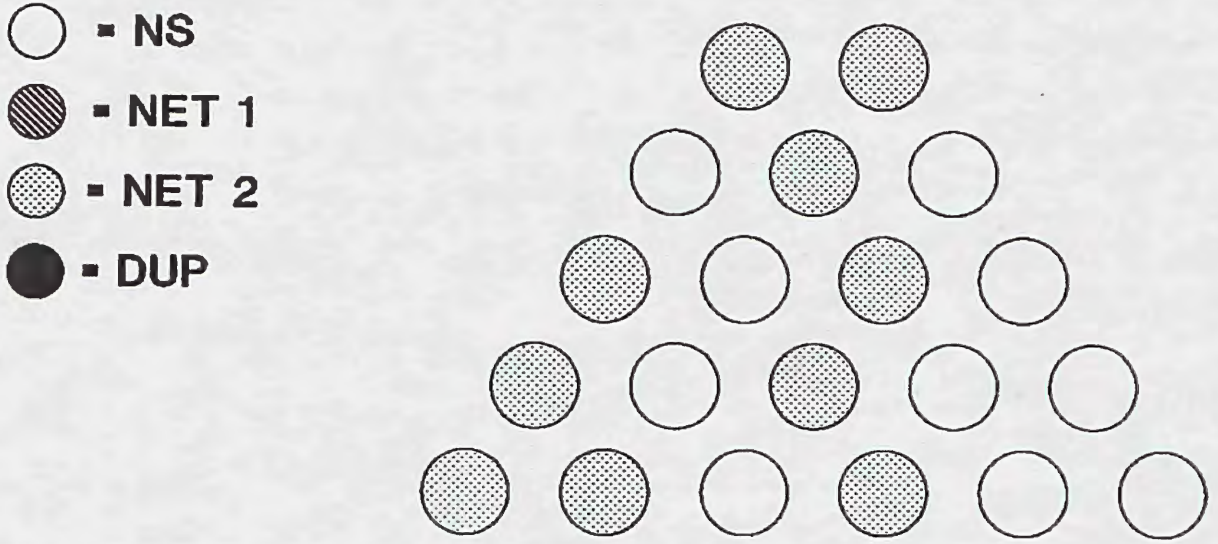
CYCLE #3

FIGURE 3.2



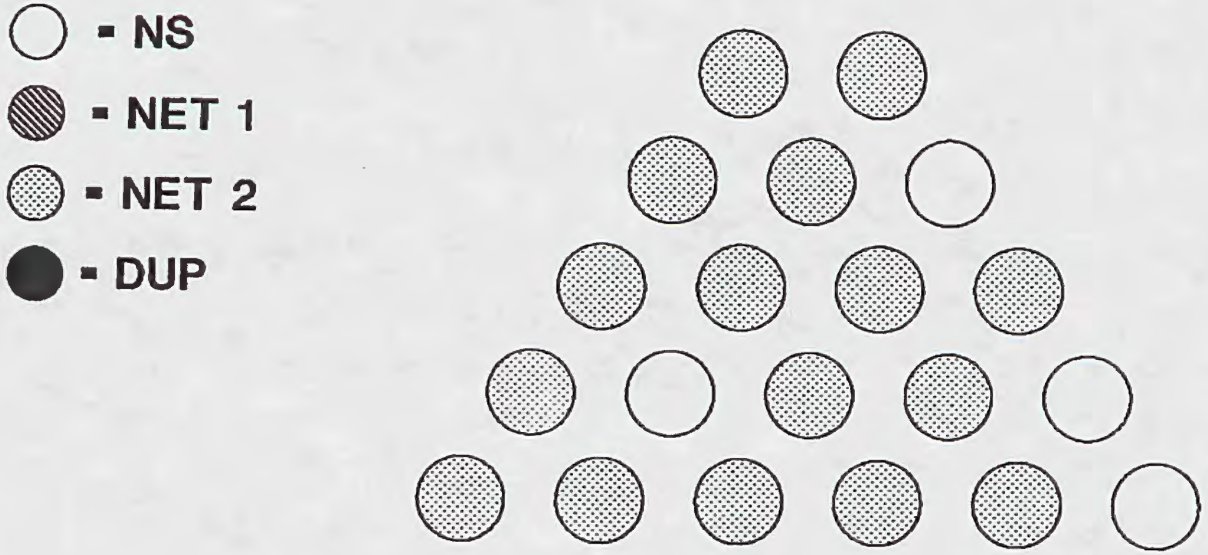
CYCLE #6

FIGURE 3.2



CYCLE # 12

FIGURE 3.2



CYCLE #26-50

The distinction between concentrated and evenly distributed communication probabilities has important implications for the viability of dual service competition, too. Figures 3.3 and 3.4 begin with the population evenly distributed betwen NET 1 and NET 2. There are four duplicate subscribers, five exclusive subscribers to NET 1, five exclusive subscribers to NET 2, and five nonsubscribers. Only four subscribers (#1-#4) are eligible to duplicate. The same matrices used in Figures 3.1 and 3.2 were used for Figures 3.3 and 3.4. Every population member has two other members who are favored in its sampling, but in Figure 3.3 the probability that one of these two will be sampled is .350 and in Figure 3.4 it is .996. The diagram of the results shows that despite the possibility of duplication, the more evenly distributed calling probabilities of Figure 3.3 lead to convergence on NET 1 after only 8 cycles. In Figure 3.4, however, the two networks appear to be able to coexist indefinitely. With the demand for communication concentrated heavily on specific partners the tendency to converge on one network dissipates in favor of an unending series of unstable combinations.

Figure 3.3

Convergence with evenly distributed communication probabilities

Figure 3.4

No convergence with concentrated communication probabilities

FIGURE 3.3

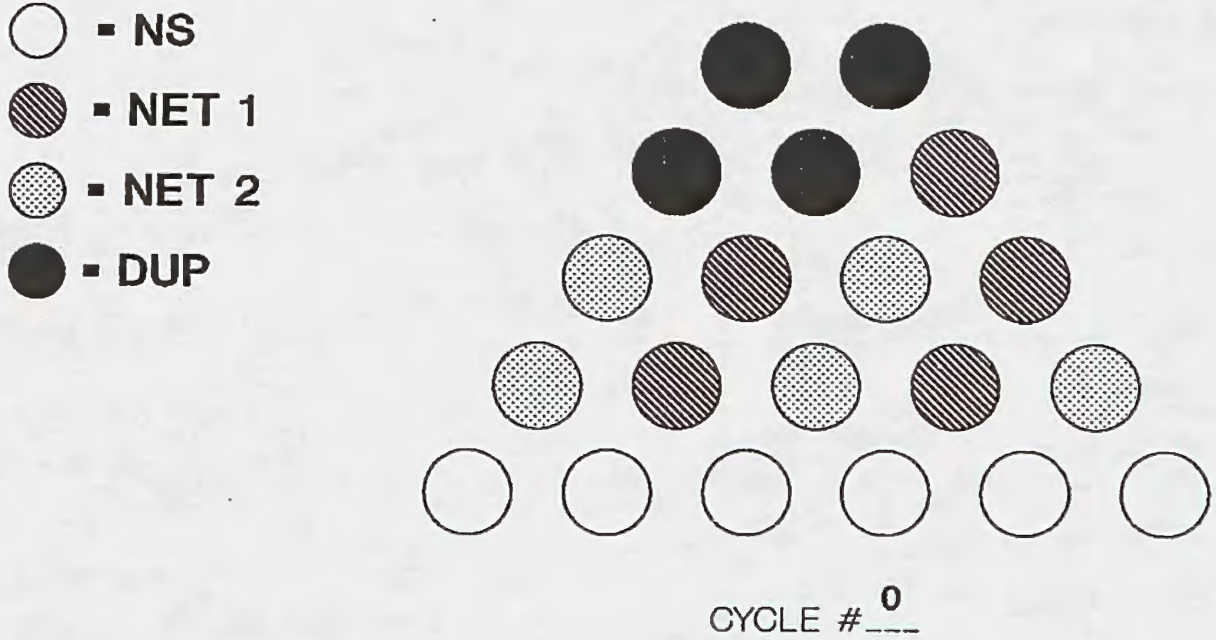


FIGURE 3.3

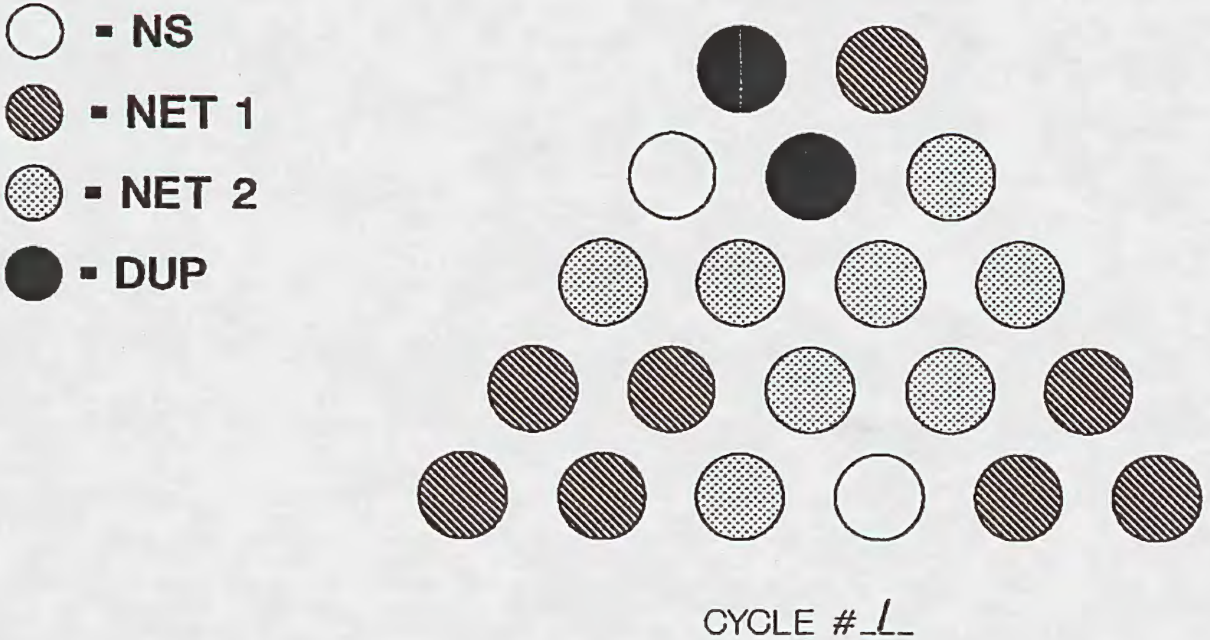


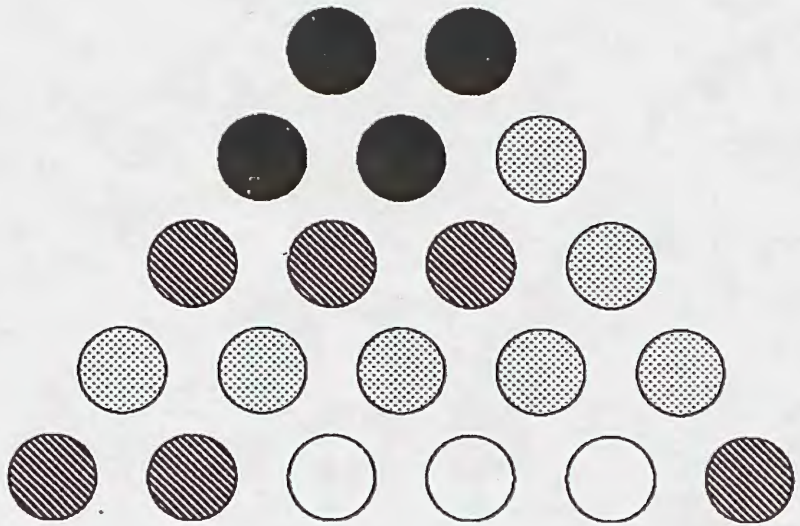
FIGURE 3.3

○ = NS

▨ = NET 1

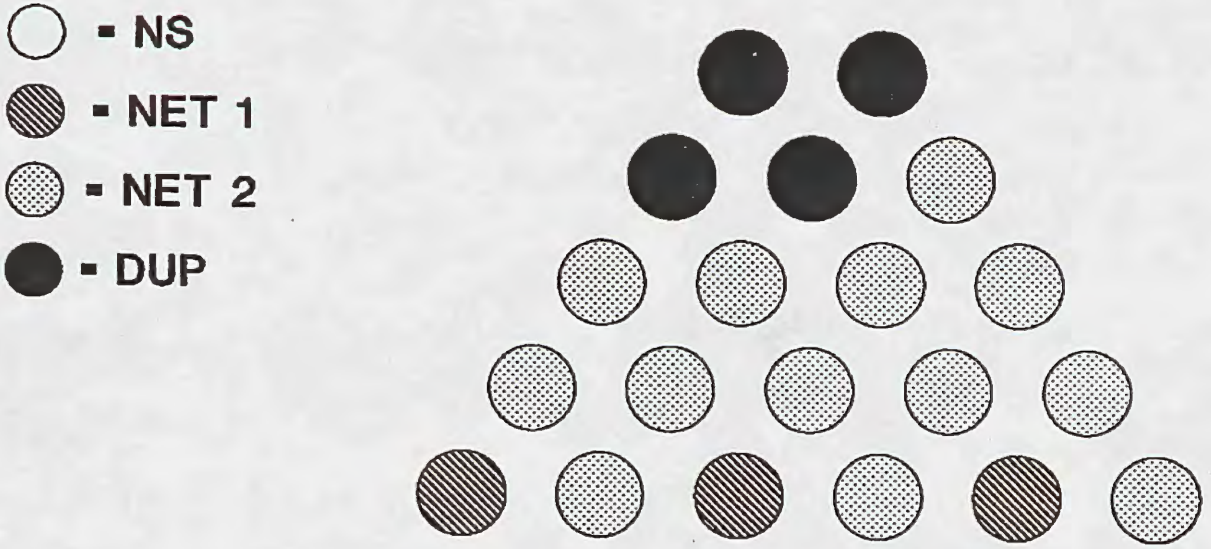
▩ = NET 2

● = DUP



CYCLE #2

FIGURE 3.3



CYCLE #3

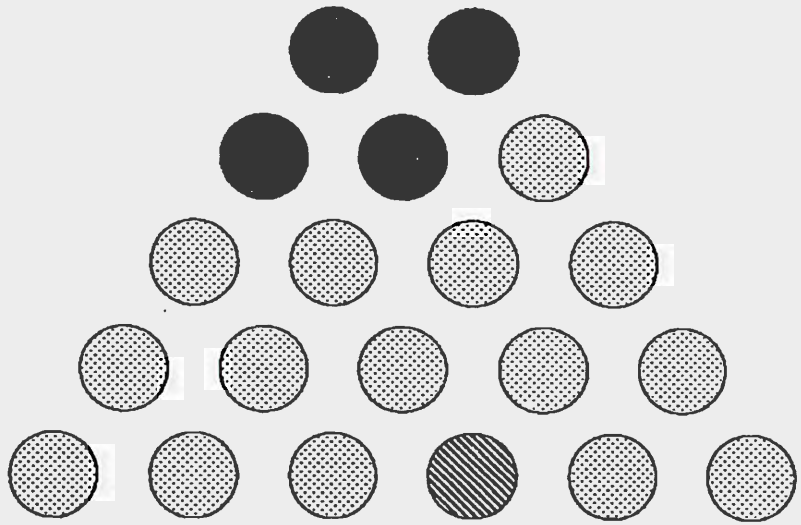
FIGURE 3.3

○ = NS

▨ = NET 1

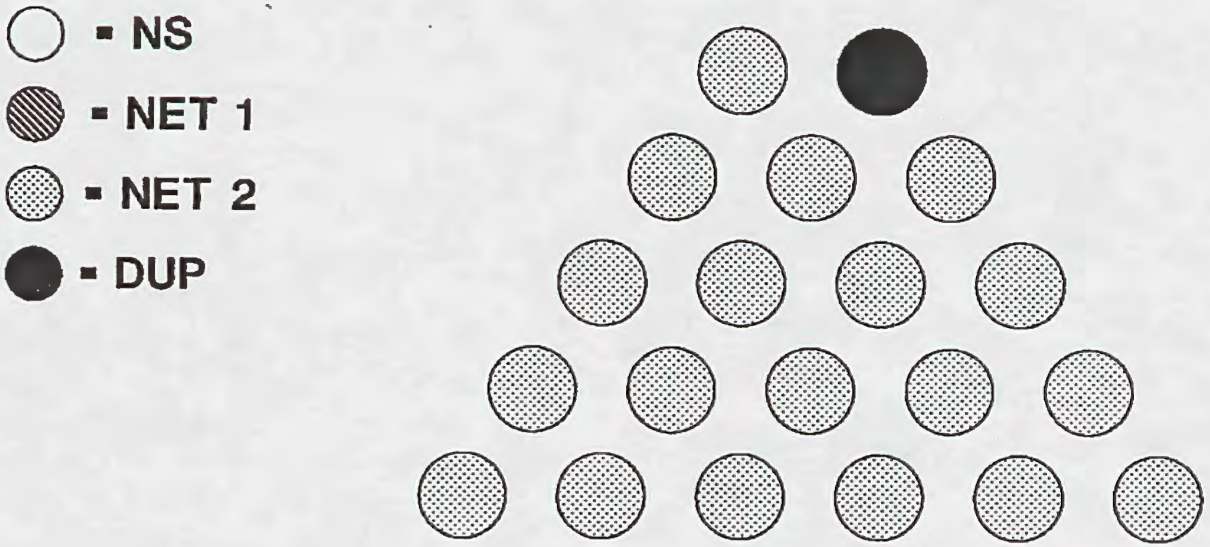
▒ = NET 2

● = DUP



CYCLE #4

FIGURE 3.3



CYCLE #_5_

FIGURE 3.3

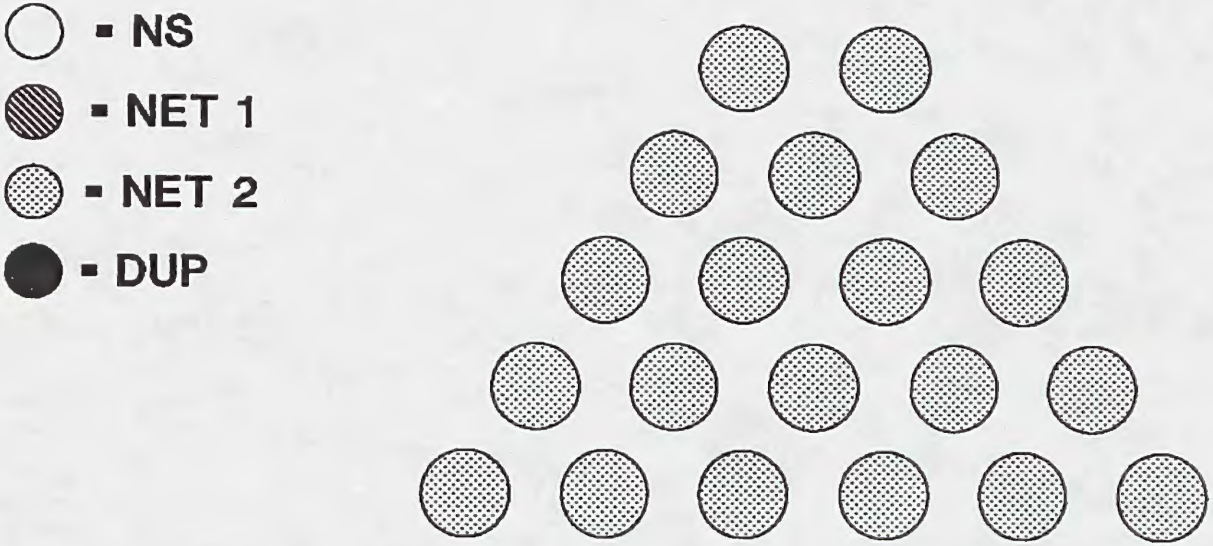


FIGURE 3.4

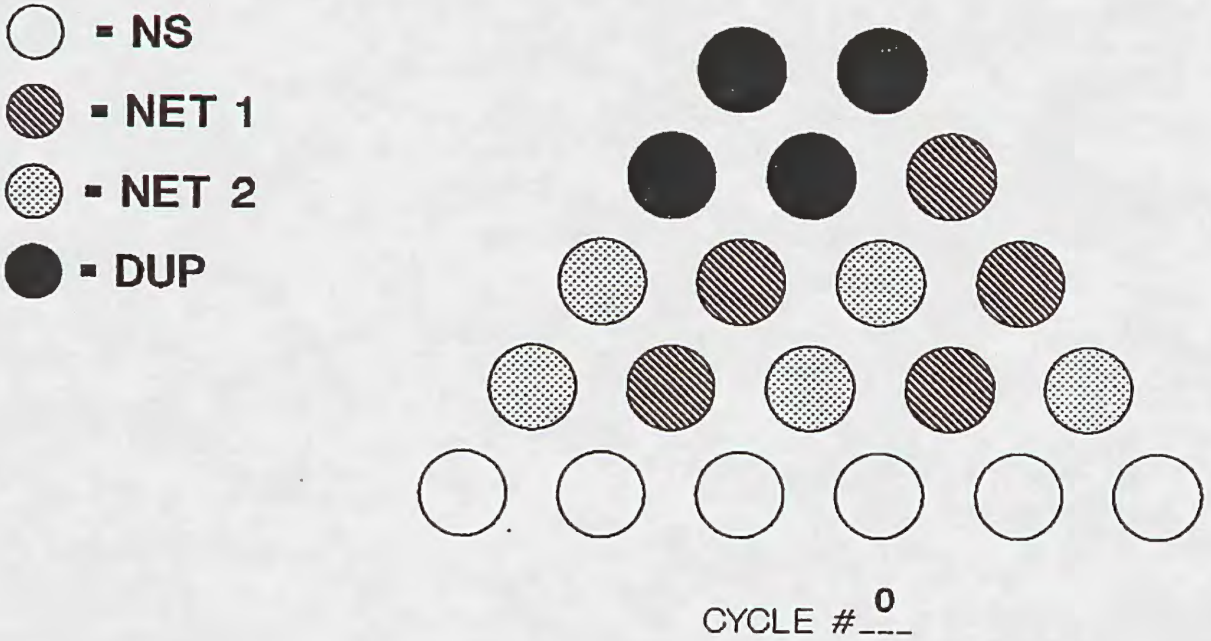
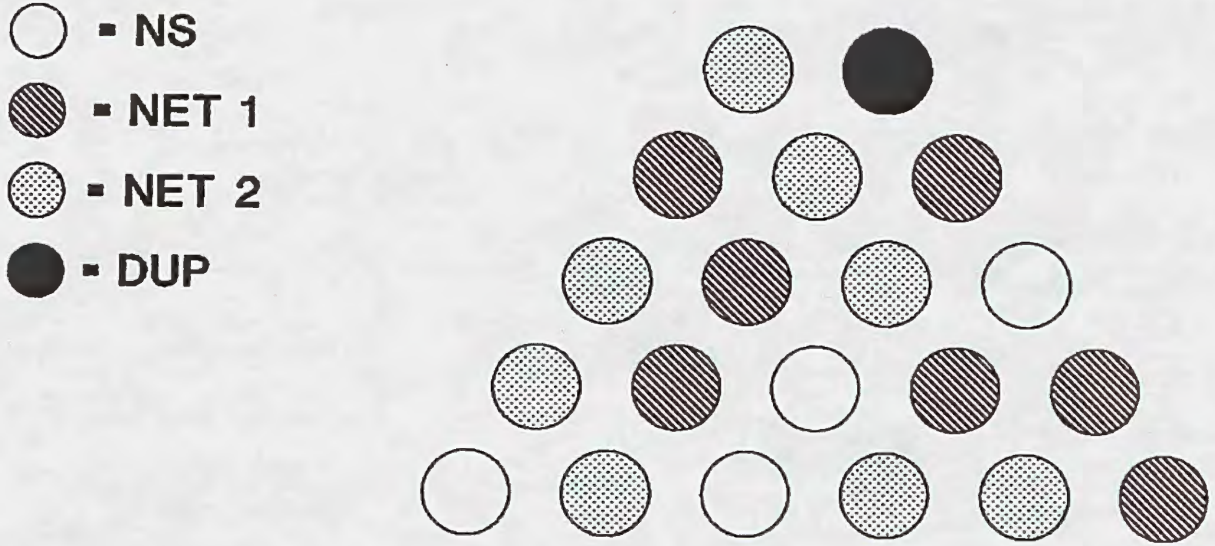
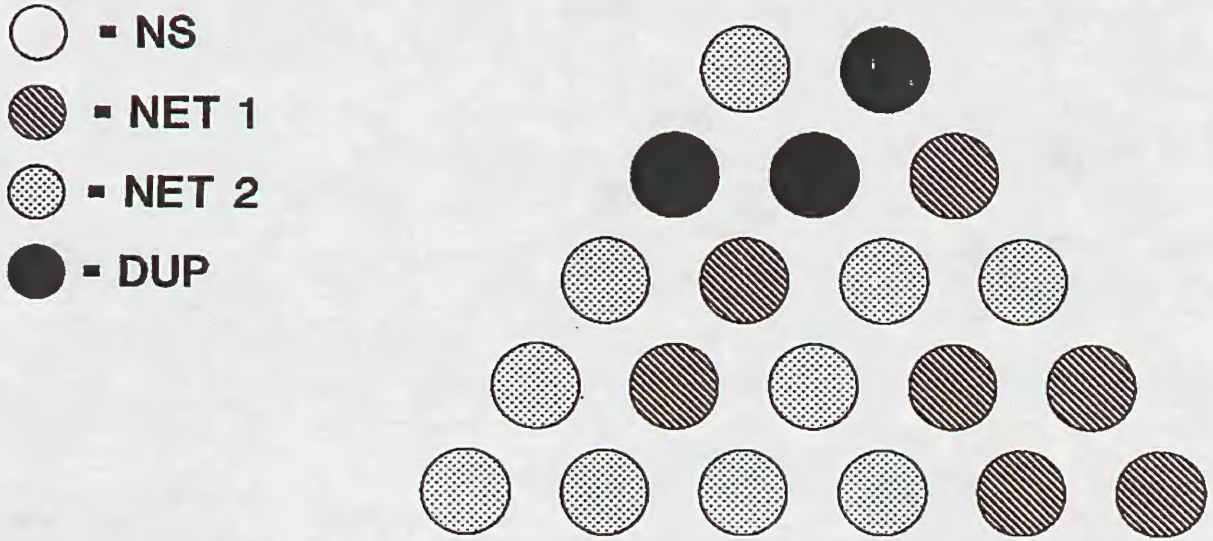


FIGURE 3.4



CYCLE #_6_

FIGURE 3.4



CYCLE #12

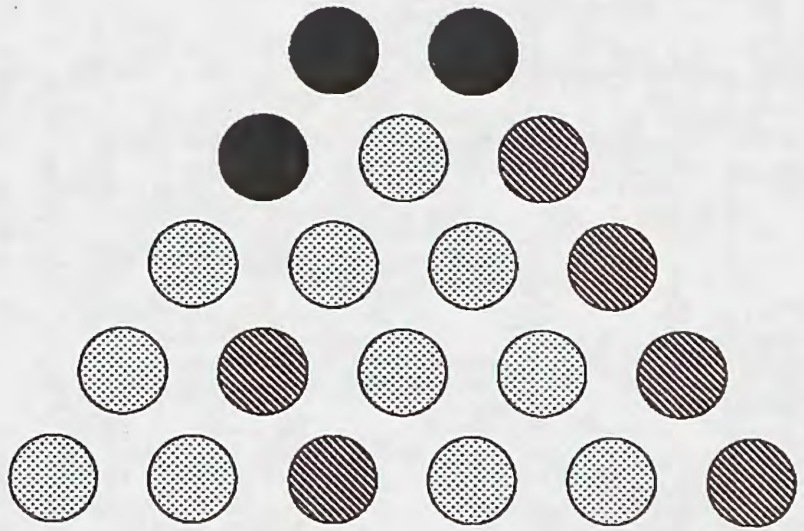
FIGURE 3.4

○ = NS

▨ = NET 1

▩ = NET 2

● = DUP



CYCLE #45

(No convergence)

Figures 3.5 and 3.6 explore the effects of duplication on convergence. In this case, the population has been divided into three different groups, A, B and C. Groups B and C, which both have 8 members, are fairly self-contained: they sample their own members 77 percent of the time and the other group only 1.5 percent of the time. Both B and C, however, sample group A 22 percent of the time. Group A, with four members, samples B and C with equal probability. The complete distribution is set out in the Table below. The communication pattern between A, B, and C might be likened to residential users in different neighborhoods (B and C) who communicate with the other neighborhood infrequently but are both in fairly frequent contact with the same city businesses (A). Or B and C might be compared to two cities which communicate with each other infrequently but call the same third city fairly often.

Table 3.1

	A	B	C
A	.024	.488	.488
B	.216	.768	.016
C	.216	.016	.768

In this run of the model, all of group B was assigned to NET 1 and all of group C to NET 2, and A was evenly divided among both. With these initial values, two different outcomes can occur depending upon whether or not duplication is allowed. If no users are eligible to duplicate, the whole population eventually converges on one of the two networks. (Figure 3.5) In this case, group A assumes the decisive role. Although it samples B and C

with the same probability, random variations will sometimes make its sample unbalanced, and hence its members will not always be evenly divided between NET 1 and NET 2. If by chance a majority of A swings to one of the networks the sample of the minority network can be influenced enough to make it lose some of its members. As Arthur demonstrated, random variations tend to be reinforced by positive feedback until the system converges on one value.

If group A is allowed to duplicate, however, the system does not converge on either NET 1 or NET 2. All of group B remains on NET 1, all of group C remains on NET 2, and all of A duplicates. This pattern is extremely stable. Random variations at most produce an occasional movement of one population member from one network to the other for one cycle. (Figure 3.6) Dual service can be maintained indefinitely under these conditions.[3] The duplication of the strategically placed A group neutralizes the positive feedback that would otherwise lead to convergence. Small variations in the samples taken by the members of group A do not change its members' status. Only in the extremely improbable event that A's sample included no members of NET 1 or NET 2 would it cease to be a duplicate subscriber and throw its weight in with one of the two networks. This event is so unlikely that even if it did happen it would remain an isolated event. Thus sample variations in A cannot affect the sample of the B and C groups.

Figure 3.5:

Convergence on a single network when no duplication is possible.

Figure 3.6:

No convergence when duplication is possible.

FIGURE 3. 5

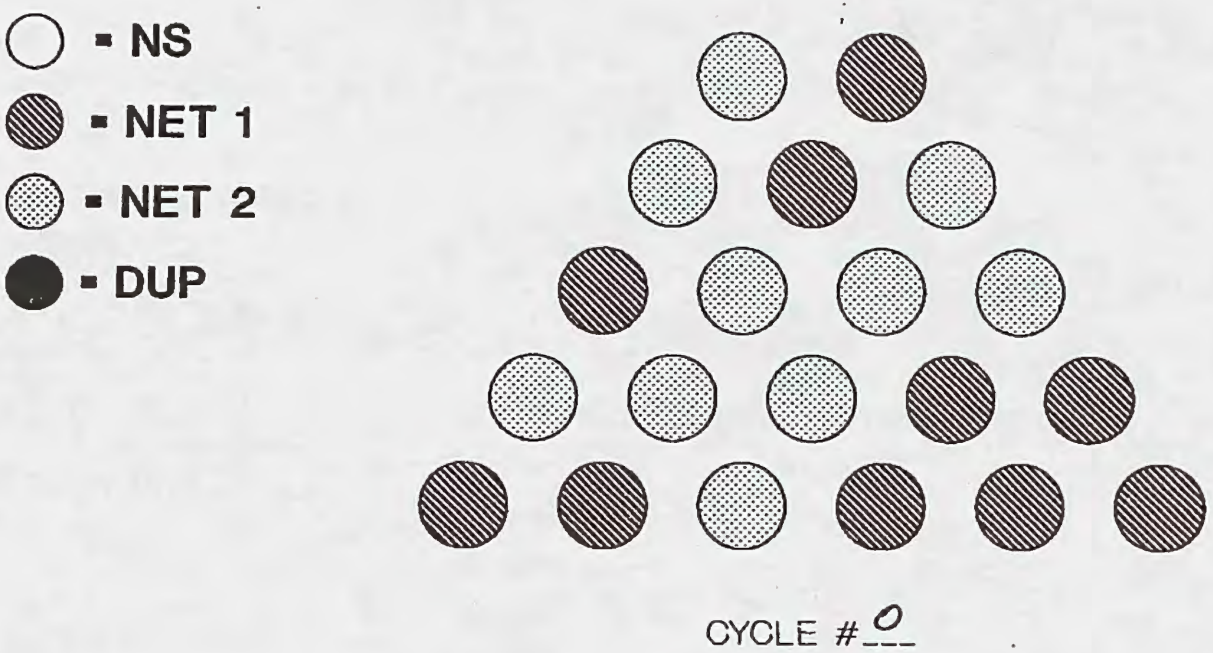
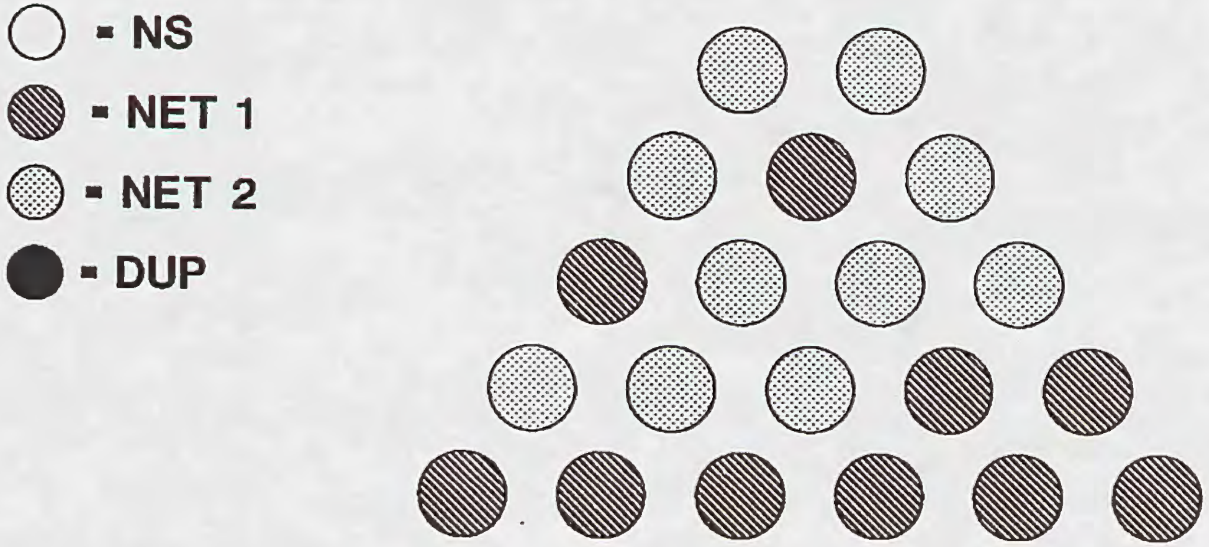
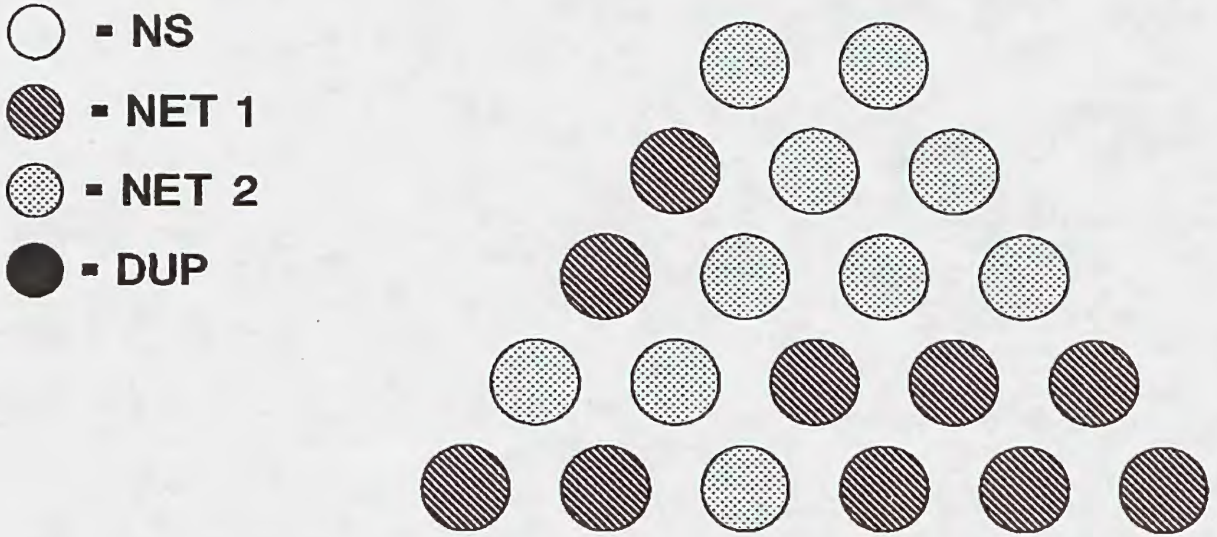


FIGURE 3. 5



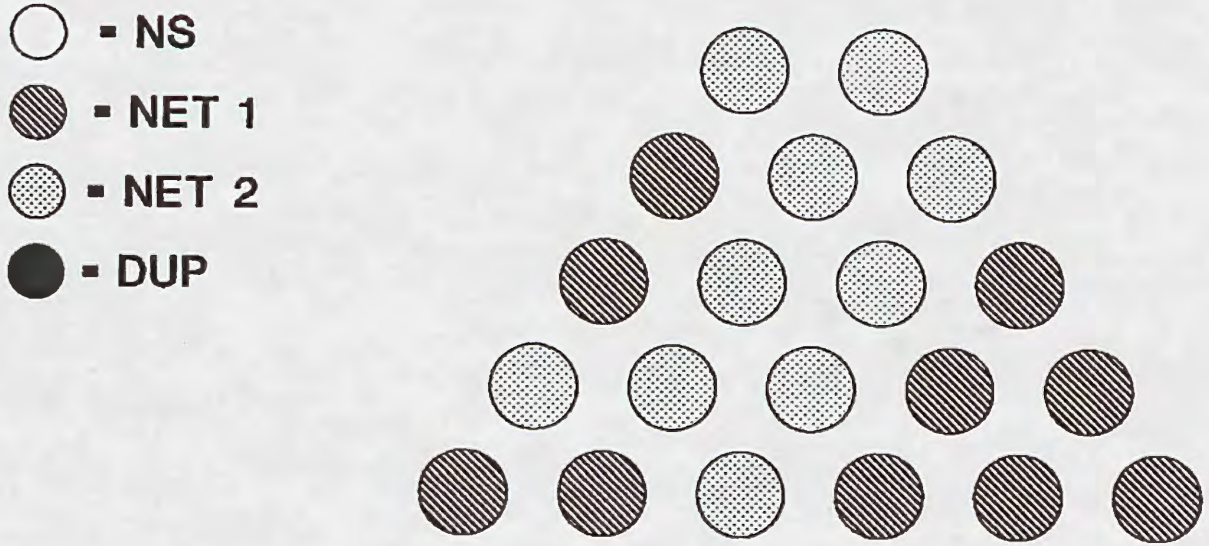
CYCLE #20

FIGURE 3. 5



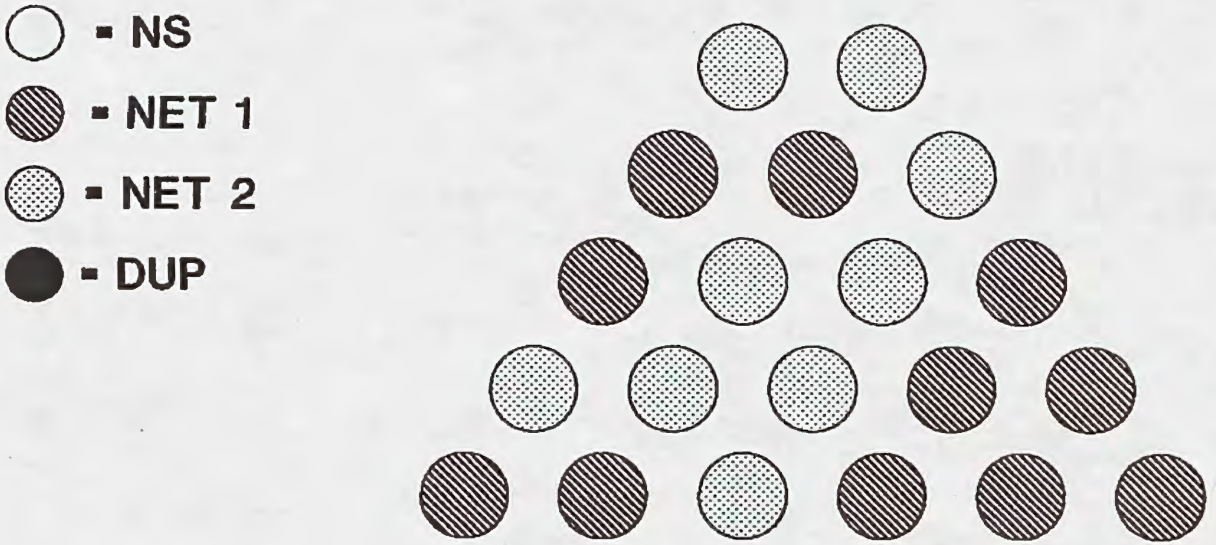
CYCLE # 30

FIGURE 3. 5



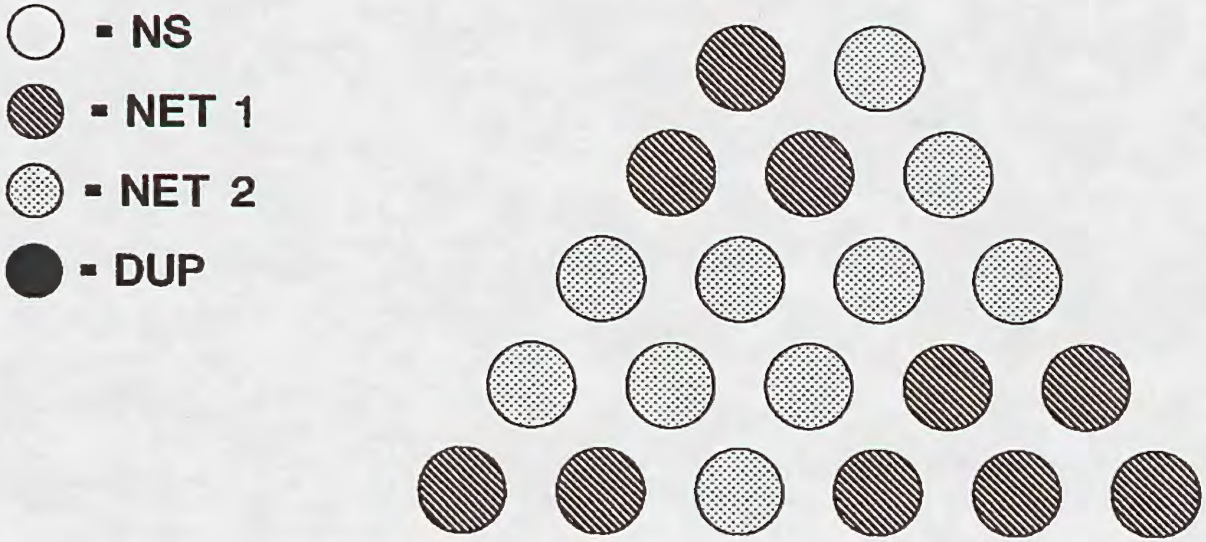
CYCLE #46

FIGURE 3. 5



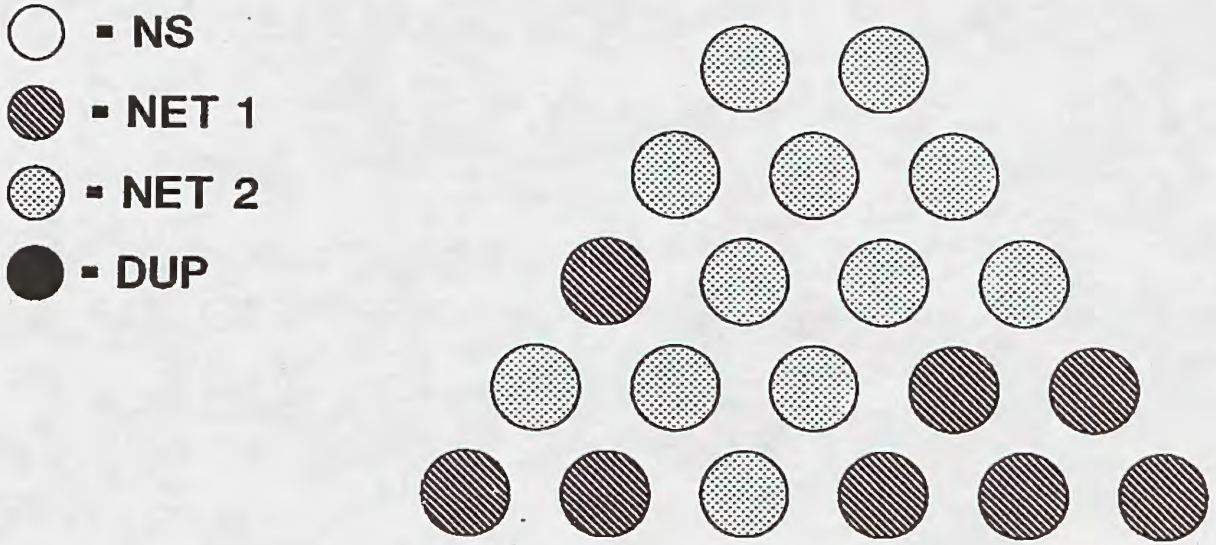
CYCLE # 50

FIGURE 3. 5



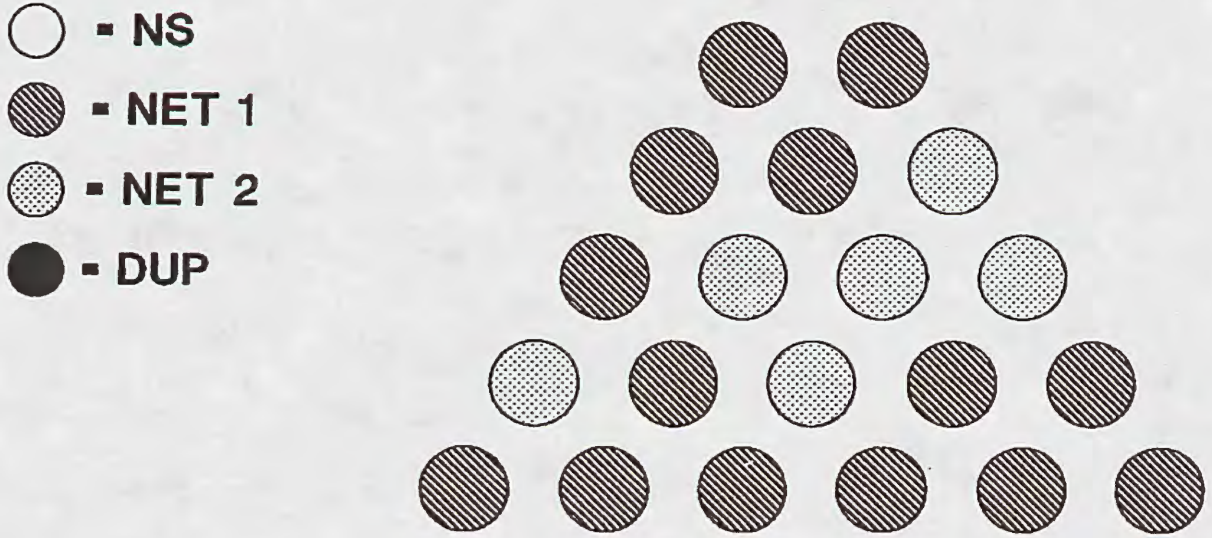
CYCLE # 60

FIGURE 3. 5



CYCLE #_10

FIGURE 3. 5



CYCLE #_80

FIGURE 3. 5

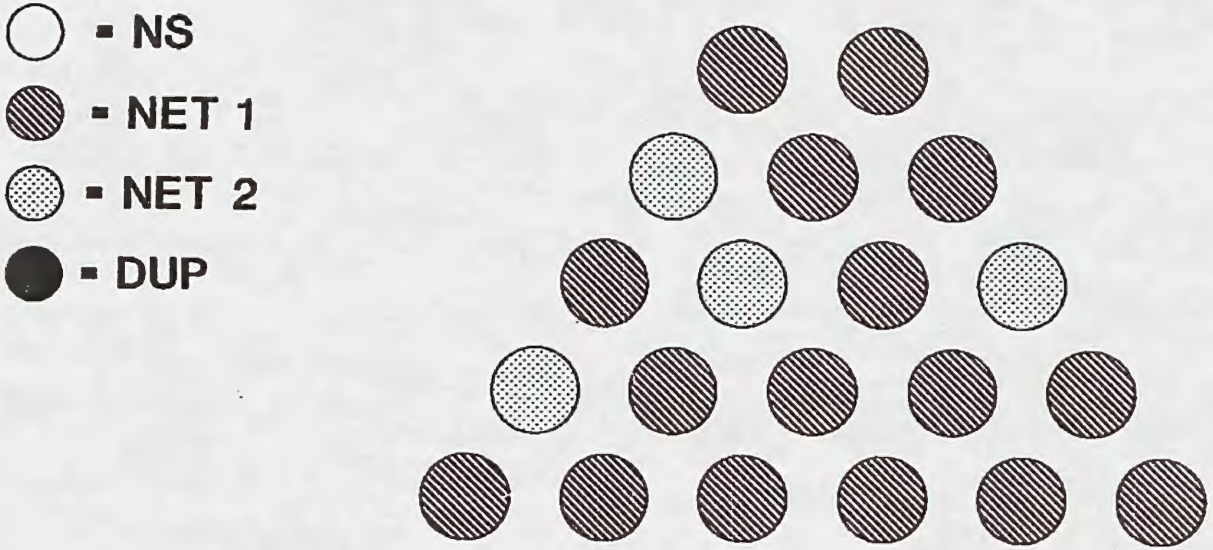


FIGURE 3. 5

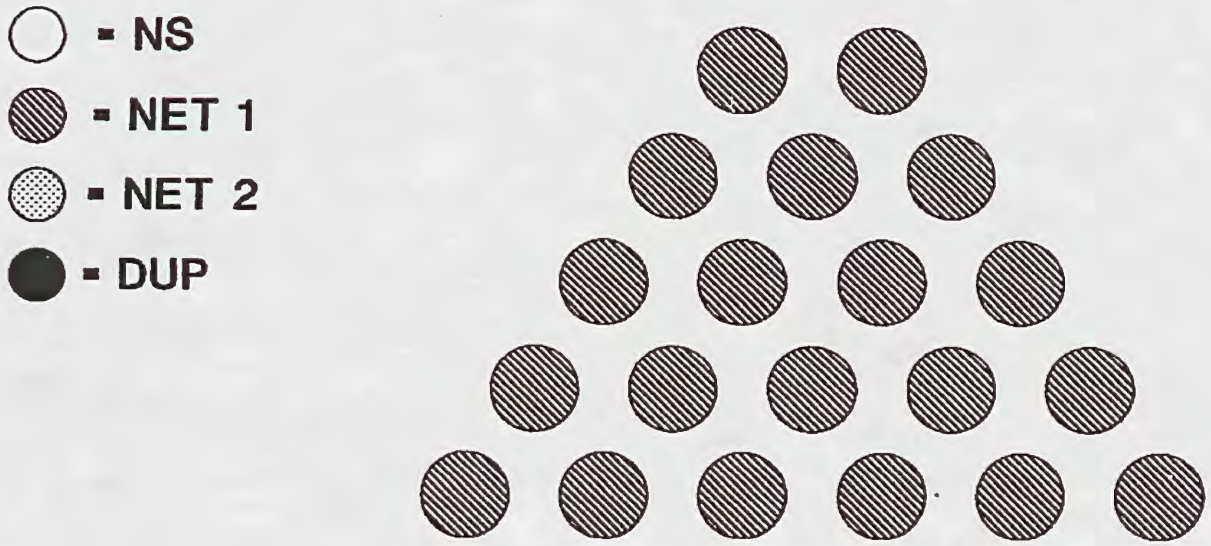
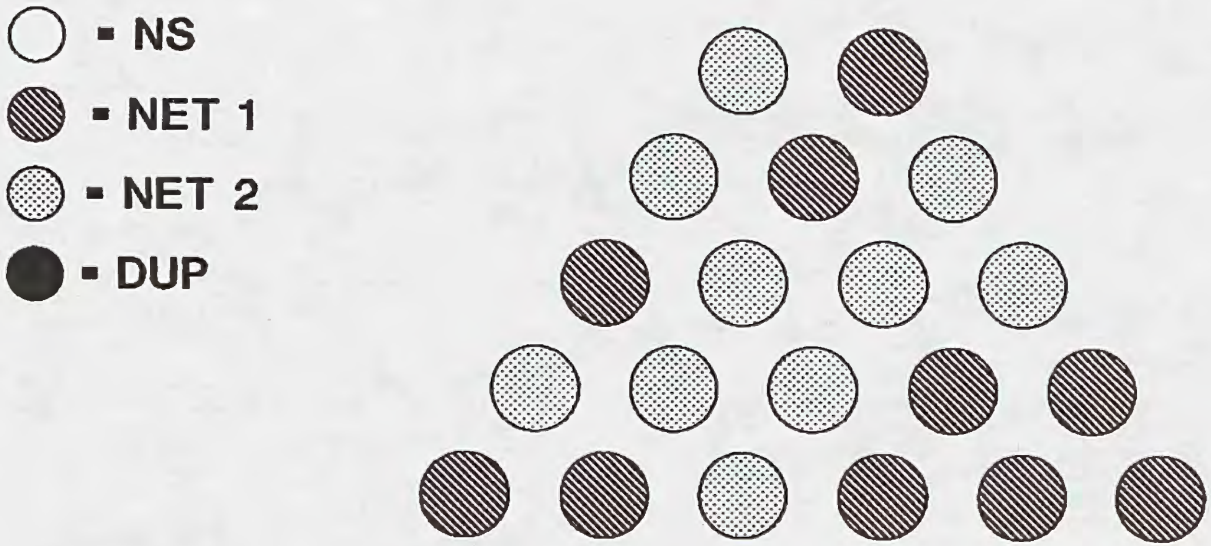
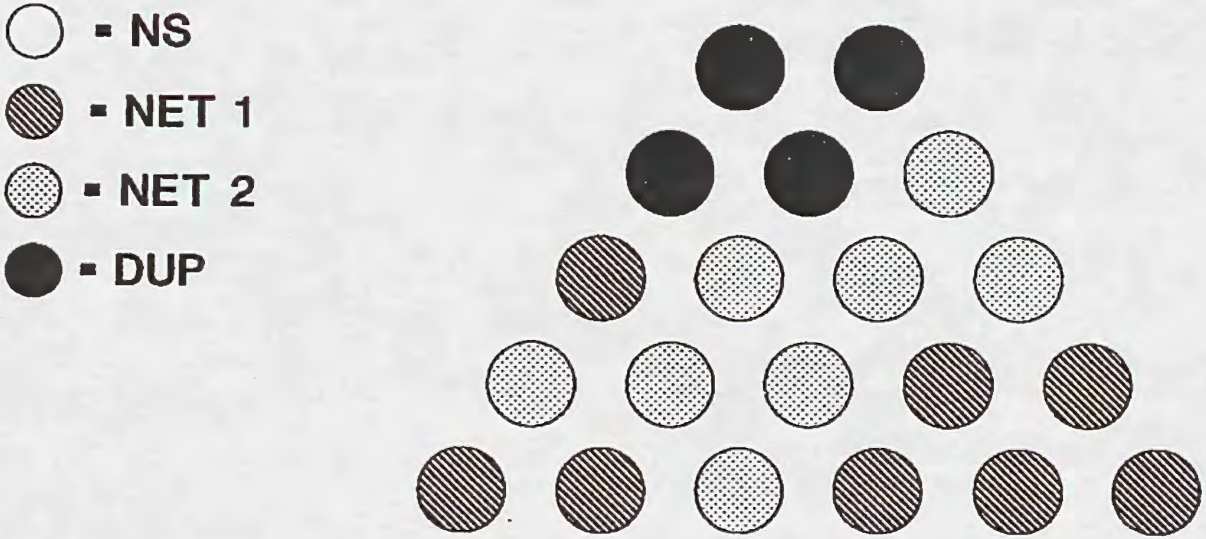


FIGURE 3. 6



CYCLE #0

FIGURE 3. 6



In the preceding case duplications prevented convergence. In other conditions duplication can facilitate convergence. Assume a population made up of two groups who communicate mostly with each other and not with the other group. In Case 4, population members 5, 11, 14 and 20 form a cluster of users 98 percent of whose traffic is with each other. These four subscribers are assigned to NET 1 and the rest of the population is assigned to NET 2. (Figure 3.7) If no duplication is possible and the urn model is run, this pattern will be maintained indefinitely.[4] The two networks serve separate user clusters whose members interact so infrequently that the presence of one is not able to affect the subscriber status of the other. Now assume that all members of the population are allowed to duplicate. The whole population eventually converges on NET 1. (Figure 3.8) Duplication leads to convergence by making the samples of the two groups more sensitive to variation. When no duplication was possible, NET 1 members were always a small minority of the sample taken by NET 2 members and vice-versa. The presence of the opposite network in the sample was never large enough to affect anyone's subscription decision. When duplication is possible, the presence of only one other network member in the sample is enough to change one's status from NET 2 (or NET 1) to DUP. Population members who got the other network in their sample became duplicators. Once they duplicated, they diminished the predominance of NET 2 in other samples, setting in motion a gradual migration to NET 1. Although NET 1 began with a smaller number of members, its core users' demand was so strongly concentrated on each other that it was able to gradually attract the rest of the population.

Figure 3.7:

No convergence on a single network without duplication.

Figure 3.8:

Convergence on a single network when duplication is possible.

FIGURE 3.7

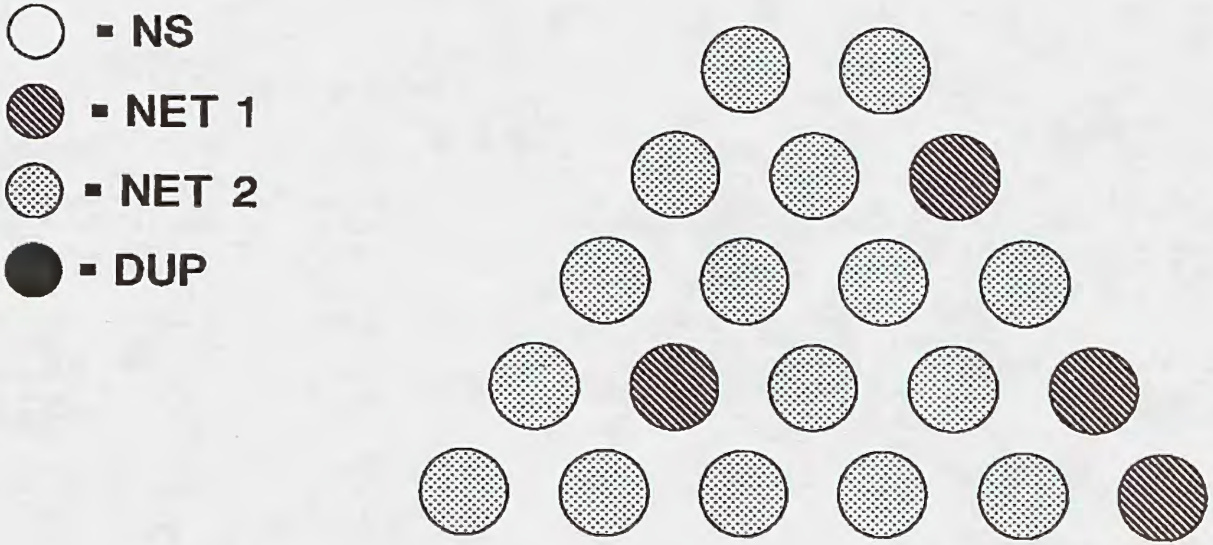


FIGURE 3.8

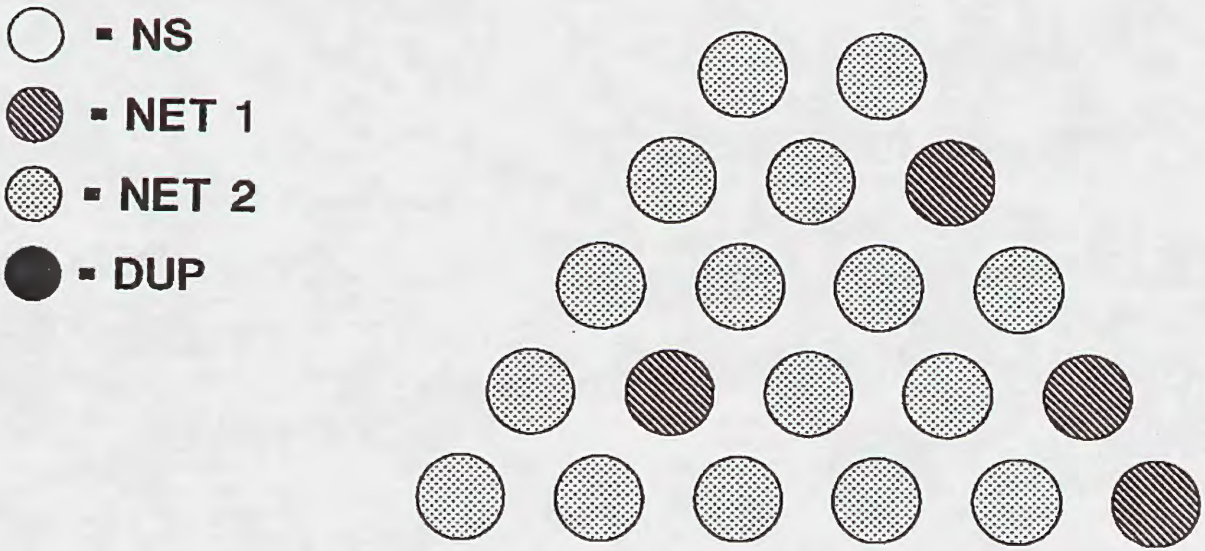
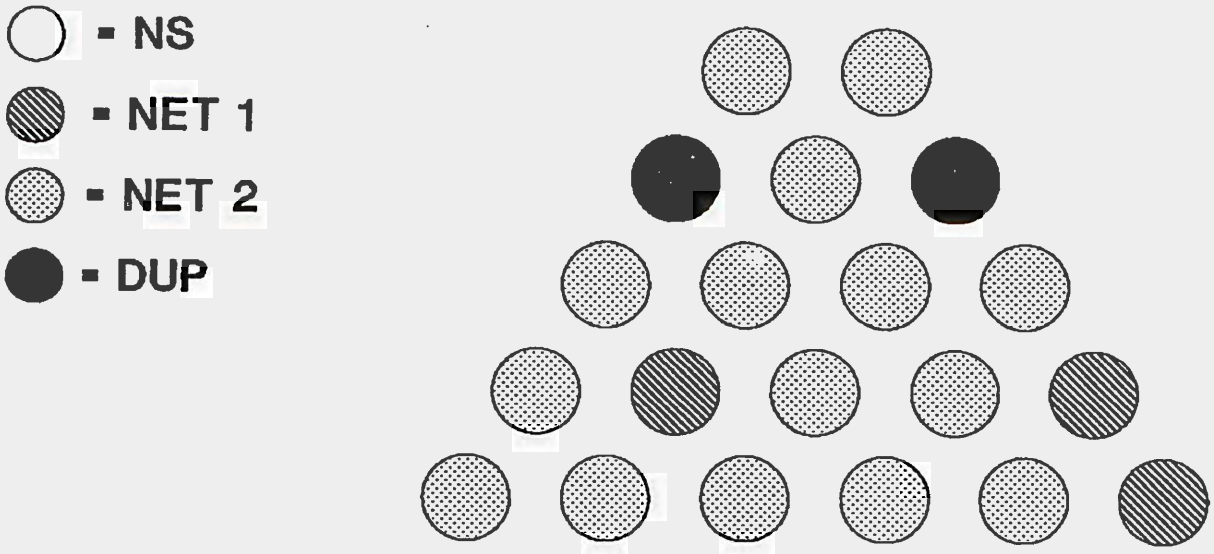


FIGURE 3.8



CYCLE #_5_

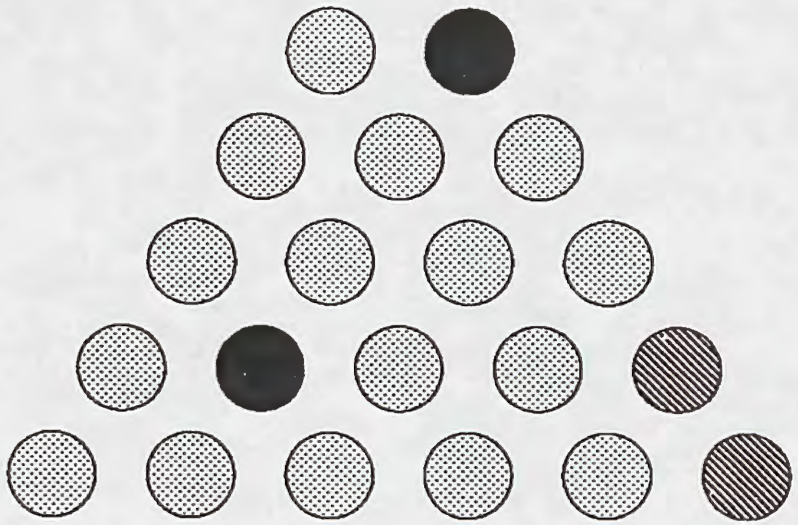
FIGURE 3.8

○ - NS

▨ - NET 1

▒ - NET 2

● - DUP



CYCLE # 10

FIGURE 3.8

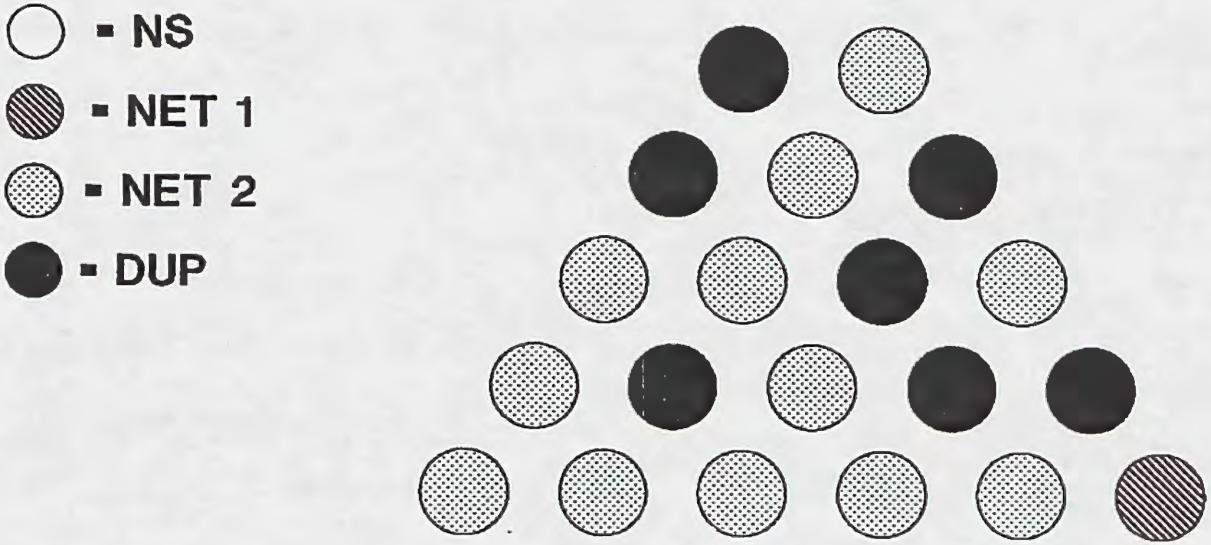
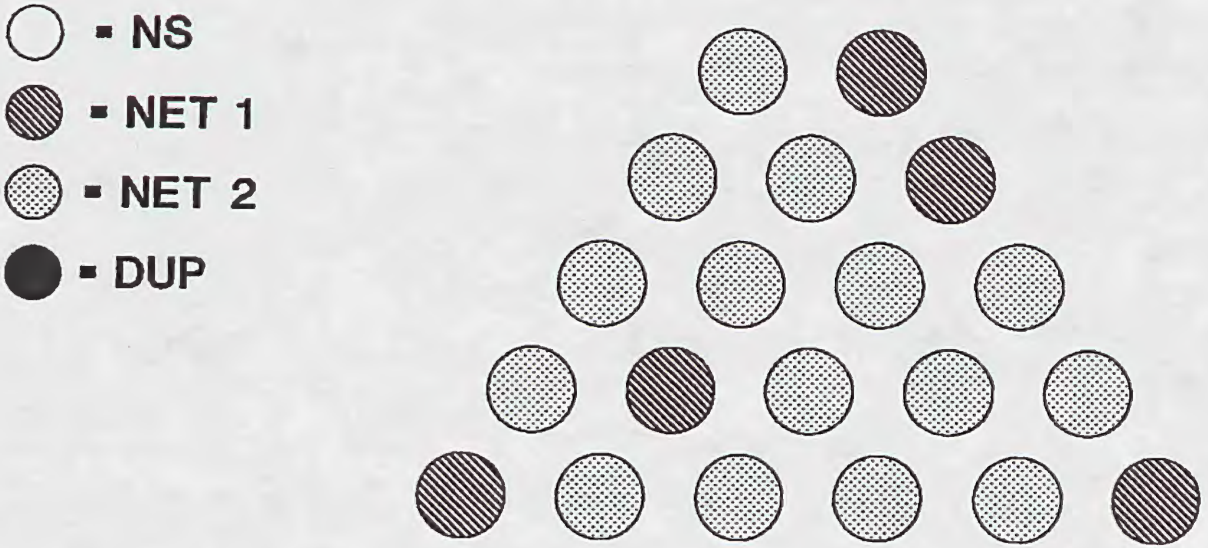
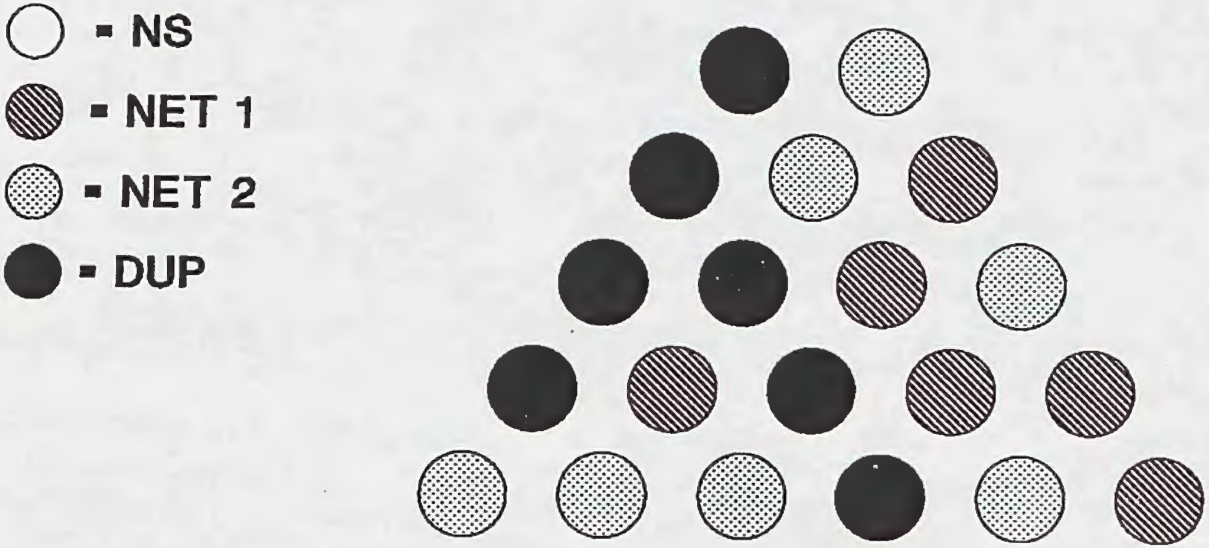


FIGURE 3.8



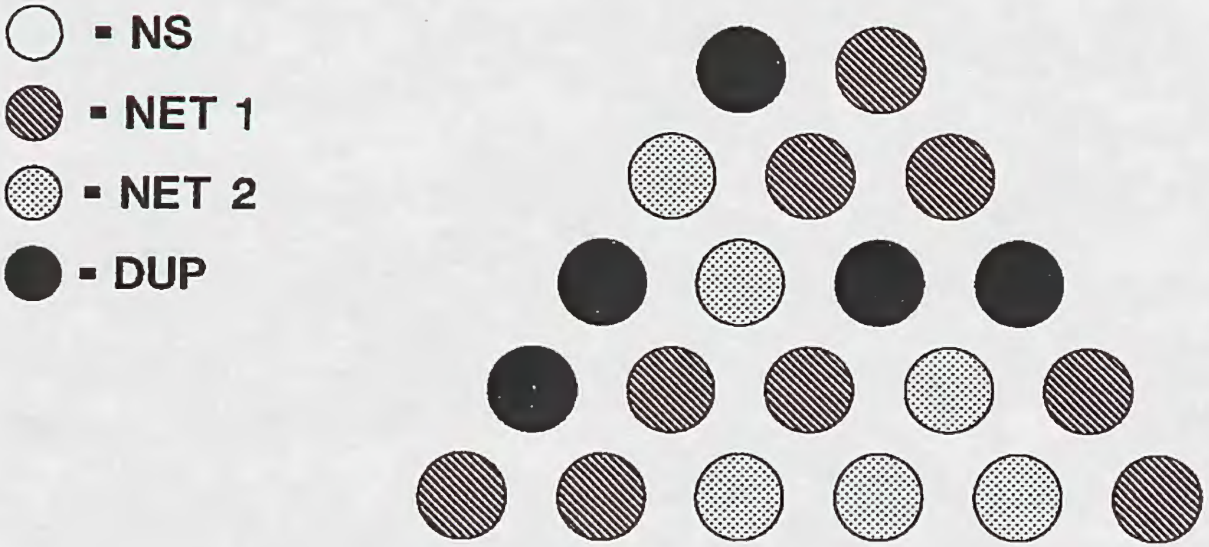
CYCLE # 20

FIGURE 3.8



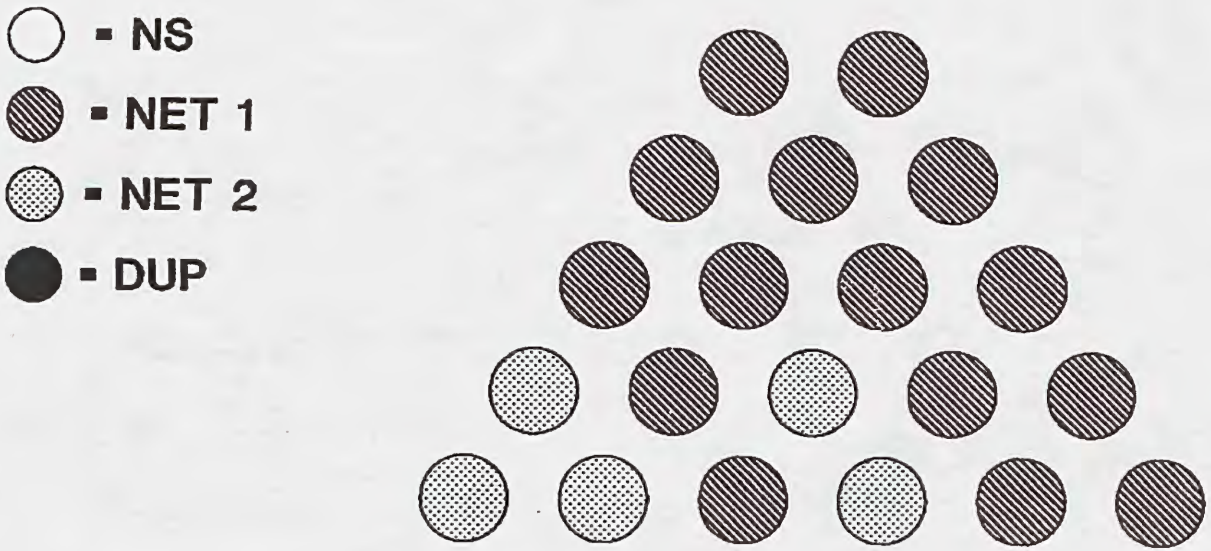
CYCLE #25

FIGURE 3.8



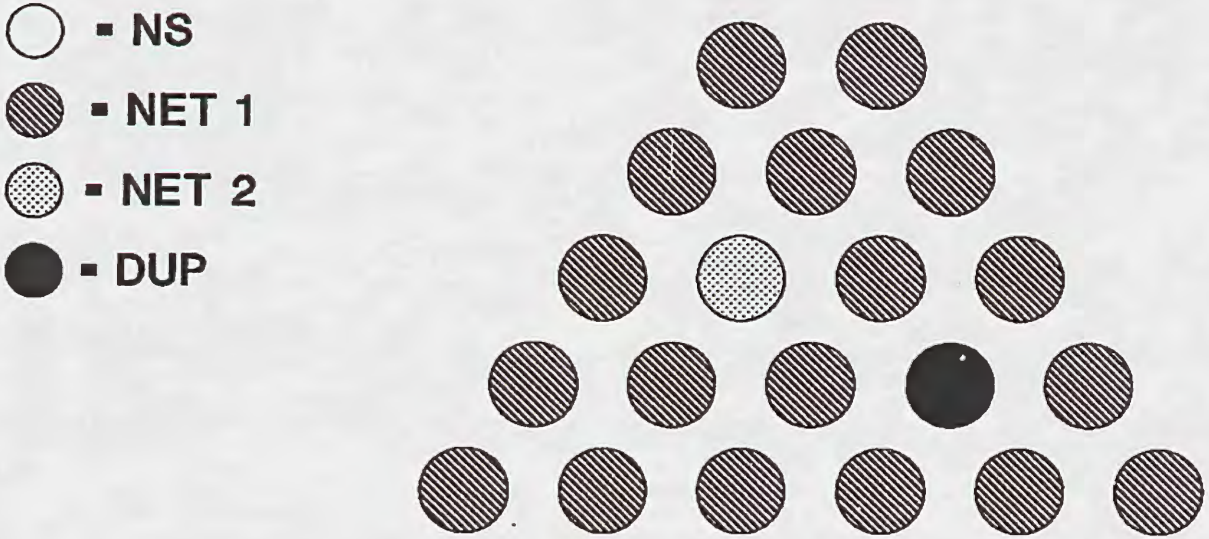
CYCLE #30

FIGURE 3.8



CYCLE #35

FIGURE 3.8



CYCLE #40

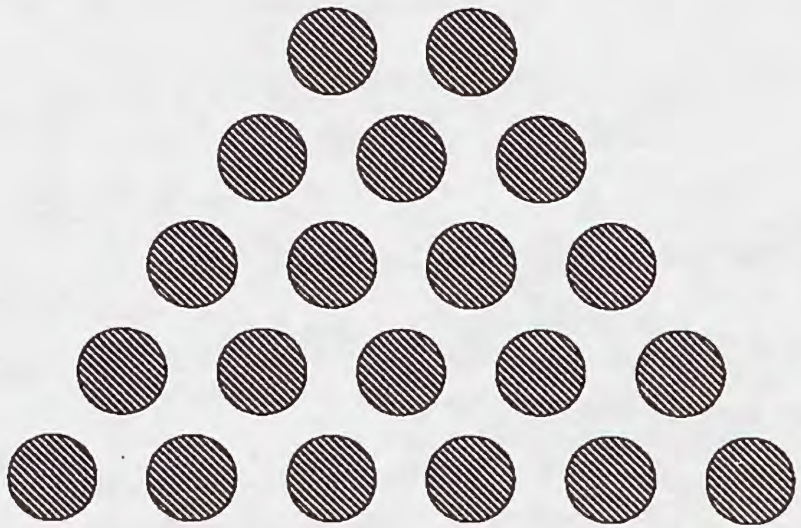
FIGURE 3.8

○ = NS

▨ = NET 1

▩ = NET 2

● = DUP



CYCLE #42

In conclusion, there is no iron law of convergence. The tendency of networks to converge depends on the specific pattern of communication, the extent to which demand is concentrated or dispersed, and whether duplication is possible for all, few or no members of the population. The model proves that the tendency of users to converge on a single telephone system depends on the way the demand for telephone calls is distributed among the members of a population. The (unrealistic) assumption of uniform demand will always result in convergence. Other assumptions, however, show that separate networks can be a stable outcome of user decisions, particularly when duplication is a possibility. If as a matter of historical fact convergence did take place, then we are given some valuable clues about the way the demand for telephone communications among the population was structured.

III

Access Mapping Methodology

The maps on pages 134 - 144 are representations of the telephone calling universe of three cities between 1894 and 1920. The cities selected for mapping were Fort Wayne, Indiana, Los Angeles, California and Utica, New York. The maps show which cities could be called by a Bell or independent subscriber in the selected city. Cities are represented by circles, the sizes of which are proportional to their population in 1910. The circles are color-coded to show whether the city was served by a Bell, independent, or a Bell-connecting independent exchange. Cities with competing exchanges are represented by pie graphs showing the proportion of Bell and independent subscribers. The map does not

represent the mere presence of telephone exchanges or the physical configuration of telephone lines. It is an attempt to show which cities could be called by a Bell or independent subscriber in the selected city at various points in time. To be shown as orange on the map, a Bell subscriber in the city chosen as the point of reference had to be able to call the exchange in question. Cities shown as yellow had to have an independent exchange that could be called by independent subscribers in the city of reference.

The relativity of the representation to a specific city is the key to the concept of access mapping. The access universe offered by today's telephone system is perfectly homogenous. That is, a user in any one city can call the same people and locations as a user in any other city. This was not the case between 1894 and 1920. When a telephone system is imperfectly interconnected the points accessible to a user are different for every city. The system had an individual "perspective," as it were: which cities could be called depended on where one was calling from and the network to which one subscribed. That is why individual cities were selected for access mapping and why the maps are only valid for those individual cities.

The scope of the maps is limited to a relatively small geographic area. The Fort Wayne map shows the states of Illinois, Indiana and Ohio. The Los Angeles map is confined to Southern California. The Utica map is limited to New York state. With the exception of the independent exchange in Los Angeles, which did not make any interstate connections, the range of communication of both Bell and independent subscribers extended beyond the geographic area shown. A more extensive map, however, would have imposed

unmanageable data requirements. The limitation is justifiable, moreover, because the maps do show the area that would have been most important to subscribers in the selected cities. All the available evidence suggests that the ability to place calls to points more than 400 miles away was a negligible factor to an overwhelming majority of telephone users at that time.

The concept of "telephone access" is not unambiguous. Documents in the Bell Labs archives show that around 1900 it was fairly common for Bell operators to manually repeat messages over long distance circuits if the speakers' voices were too faint to be heard unaided.[5] In a purely technical sense, the speakers were inaccessible to each other, but the intervention of a human "repeater" allowed a conversation to take place. Both Bell and the independents often placed public toll stations in cities where they lacked exchanges; thus, although all the exchange subscribers in that city could not be reached by one of the two systems, they were able to place outgoing calls on either system. It was also possible for independent exchanges to be connected physically by long distance lines but still be inaccessible if the call had to pass through an excessive number of switching offices to get to its destination. Each transfer increased attenuation and waiting time, and beyond a certain number placing a call was either physically impossible or so inconvenient as to be worthless. This was more of a problem with the independents than with Bell, for after 1900 the Bell system began to consciously organize the relationship between local feeder lines and through circuits in ways that avoided these problems. For the purpose of constructing the access maps, the following operational definition of "access" was used: a city was

included as accessible by telephone only if there was a telephone exchange there (toll stations only don't count), and only if a direct, real-time connection was possible. No attempt was made to account for waiting time. For independent exchanges, only connections that required 5 or less switches were counted as accessible.

The maps graphically display developmental patterns that are described in greater detail in the narrative. It is apparent from the 1894 maps that prior to the expiration of the patent the Bell system concentrated its development on major cities and neglected small towns. This pattern is particularly evident in the Ohio, Indiana and Illinois territory. A white circle means that no Bell exchange was established in the town, or, if there was a Bell exchange, that it was not accessible from Fort Wayne because of inadequate toll facilities. The large number of unoccupied or unconnected small towns in the area around Fort Wayne in 1894 is apparent at a glance. That Ohio and Indiana became the financial and organizational heart of the independent movement should not be surprising. The reader should also bear in mind that the maps do not show any towns with populations less than 2,500. If these were shown, the lack of coverage would be even more apparent.

From 1894 to 1913 the Bell system dramatically extended its system. The maps show that many new exchanges were established in smaller towns and that Bell entered into interconnection arrangements with independents in other areas. These interconnected or "sublicensed" (see Chapter 6) independent exchanges are color-coded black. The maps show that successful independent exchanges which had attained a dominant share of a

city's subscribers were after 1906 induced to join the Bell system, thus decreasing the scope of independent access. The Utica independent exchange, for example, was cut off from connections to independents in and around Albany when the independent in Auburn was bought out by Bell and other exchanges that once formed part of the independents' link between Utica and the cities to the east were sublicensed. In the Los Angeles area, independent exchanges that had beaten their Bell rivals in exchange competition were sublicensed and brought into the Bell system.

The urn model can be used to analyze and interpret the maps, but the model itself cannot be directly confirmed or refuted by them. The model isolates the effects of interdependent demand on network competition. By eliminating all factors except for interdependence, the model attempts to illustrate network externality behavior in its purest form. In the model, the only issue affecting someone's subscription decision is who else subscribes. It does not take into account whether one network has lower or higher prices or better or worse service, whether a network is profitable or not, or whether a network has liberal or restricted access to capital. These factors, of course, all played an important role in the actual historical process. Being based on empirical data, the maps reflect these influences in addition to the effects of demand interdependence. Thus, there can be no simple, isomorphic correspondence between the processes of the model and the developmental pattern shown in the maps.

There are two other reasons why the urn model cannot form the basis of a rigorous social science test. The model requires that the actual communication probabilities of all users be known. That

kind of detailed and complete historical data is simply not available. Also, the model assumes that the said communication probabilities are fixed. In fact, the communication patterns of early Twentieth Century Americans changed dramatically over the 25 year period covered here, as populations shifted, urbanization and industrialization took hold of the economy, and new communication and transportation technologies were adopted.

If the model is not a "hypothesis" which can be "confirmed" or "refuted" by the maps and the historical data, what is it? The answer is that it defines a kind of process which can be compared to the empirical data and used to interpret and analyze it. Demand interdependence may not account for the whole story of telephone competition, but it was certainly an important part of the story. By identifying the dynamics of access competition in the abstract, the model makes it possible to recognize certain patterns and to ask more precise questions of the historical record.

The model suggests, for example, that highly interdependent (i.e., evenly distributed) communication patterns among a large population lead to convergence on a single system, whereas dual service competition can be sustained for a long time among users whose communication activity is strongly concentrated on a small but diverse group of other users. While this does not tell us that convergence will or will not take place in any specific historical instance, it does clarify what kind of empirical data would be needed to properly investigate the matter.

Looking at the maps in the light of the urn model does provide some interesting clues as to how demand interdependence entered into the Bell-independent competition. The maps show clearly that

when convergence did take place it was quite localized. Either it was confined to a single city and its immediate suburbs, or, when a major urban center was involved, it occurred over a radius of about 50-80 miles. It did not occur over the nation as a whole. Telephone communication patterns, then, may have been increasingly interdependent at the regional and local level, but long distance communications at this point in history still conformed to the kind of matrix values that would sustain dual service.

The Southern California map, for example, shows that despite the Bell system's connections to northern California and neighboring states, the independent exchange in Los Angeles was able to hold onto half of the city's subscribers for an extended period of time. The Los Angeles independent did not make any interstate connections and for most of its existence had no access to San Francisco, Oakland, or points north.

Prior to 1898, the Bell system had established very little presence in Indiana's small towns. The independents (shown in yellow) rushed in to fill the gap. By 1898 the Fort Wayne independent exchange controlled the majority of that city's subscribers. By 1913 this lead had become an overwhelming one. From 1906 to 1913, Bell sublicensed many of the independent exchanges in Fort Wayne's vicinity, giving it access to these cities and denying it to the independents. While Bell's lack of access to the surrounding territory made it possible for the Fort Wayne independent exchange to grow rapidly at Bell's expense, once Bell improved its position in the surrounding areas it failed to erode the independent's dominance in Fort Wayne. With the bulk of telephone communication being local, the expanded short and long

distance connections offered by the Bell system were not enough to overcome the inertia associated with the Fort Wayne independent's near-monopoly control of local exchange service.

The situation is quite different in the regions surrounding the major urban centers of New York and Chicago. There convergence effects seem to have been felt over a 50 to 80 mile radius. Independent exchanges in medium-sized towns within 50 miles of Chicago, such as Peoria, Elgin, and Aurora, have by 1913 begun to shrivel, because of their lack of access to the great metropolitan hub. Independent exchanges further downstate, on the other hand, continue to hold on to respectable portions of the subscriber market. Likewise, Bell's monopoly control of exchange service in New York city seems to have had a stultifying effect on independent exchanges over an 80 mile radius, affecting independents in Northern New Jersey (not shown on the map) and well into New York state. This can be interpreted as evidence that the formation of large urban centers created a regionally interdependent communication pattern. Whether dual service would have been viable had there been a competing exchange in New York city we will never know--but it is clear that the absence of competition in New York itself thwarted dual service competition in the surrounding areas.

The maps conflict with the common belief that Bell's superior long distance technology was instrumental in defeating the independents. The patented technologies would only have given Bell an advantage in providing calls over 200 miles in length. Both the historical data and the example of the model suggest that such ultra-long distance connections were a negligible force in leading to convergence at the local level. The demand for long distance

connections would be concentrated on a small number of users rather than evenly distributed over many users. The model showed that this kind of demand structure can sustain dual systems. When the communication patterns of a minority group are strongly concentrated on a small number of users outside the majority network the tendency to converge on a single system can be nullified. The maps provide some empirical support for this viewpoint. In many cities one of the local exchanges controls 75 to 90 percent of the subscribers. This did not, however, lead to total elimination of the competing exchange in all cases. A small sliver of the subscriber pie remained with the minority exchange. These diehard subscribers were business users who wanted long distance connections that the dominant system did not offer. In Fort Wayne, for example, the near-total dominance of the independent did not lead to the loss of all Bell subscribers. The demand of the Bell remnant was almost certainly concentrated on long distance points that could not be reached through the independent system.

ACCESS MAPS:
LEGEND.

Red: accessible to Bell system subscribers through a Bell-owned exchange.

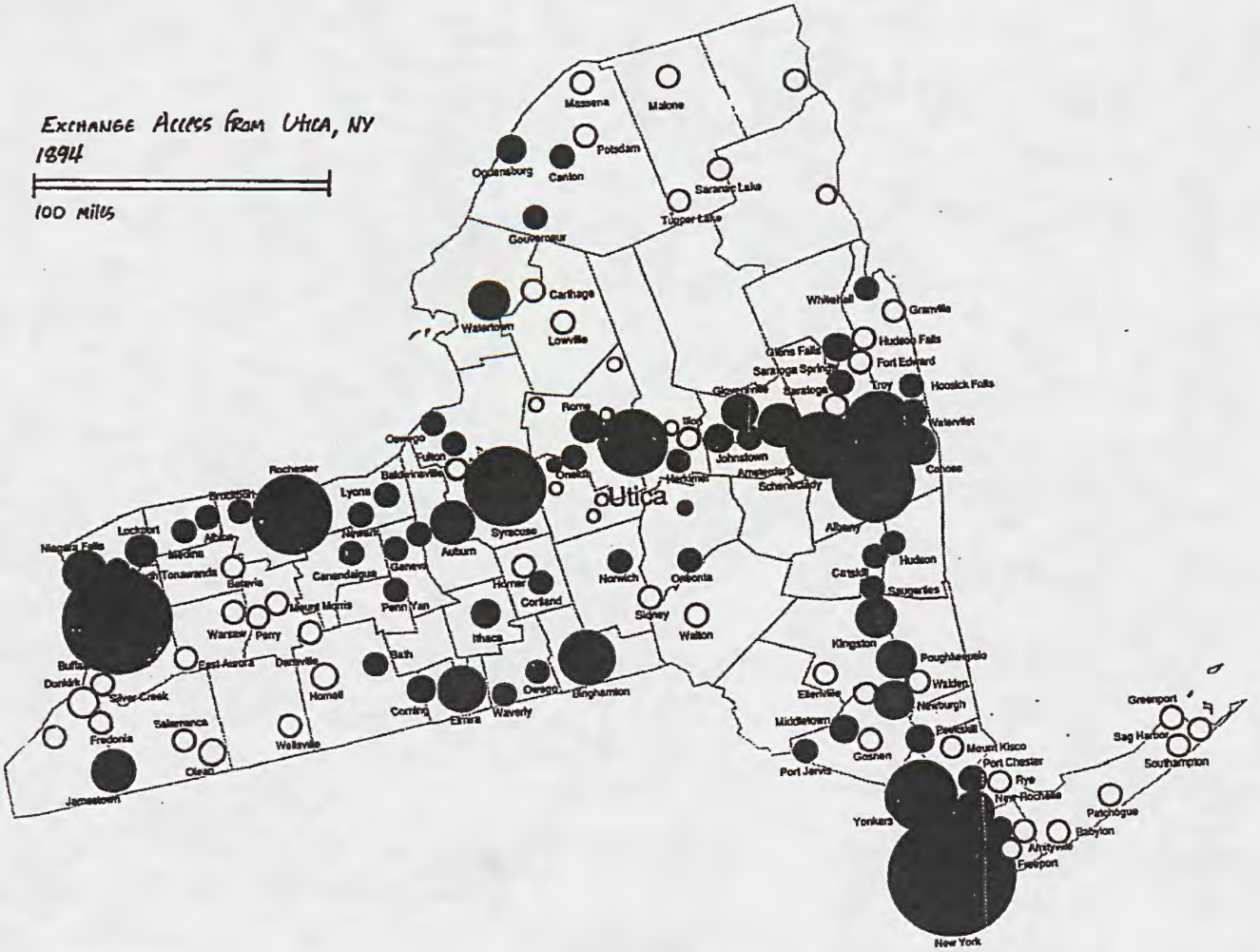
Black: accessible to Bell system subscribers through an independent connecting exchange.

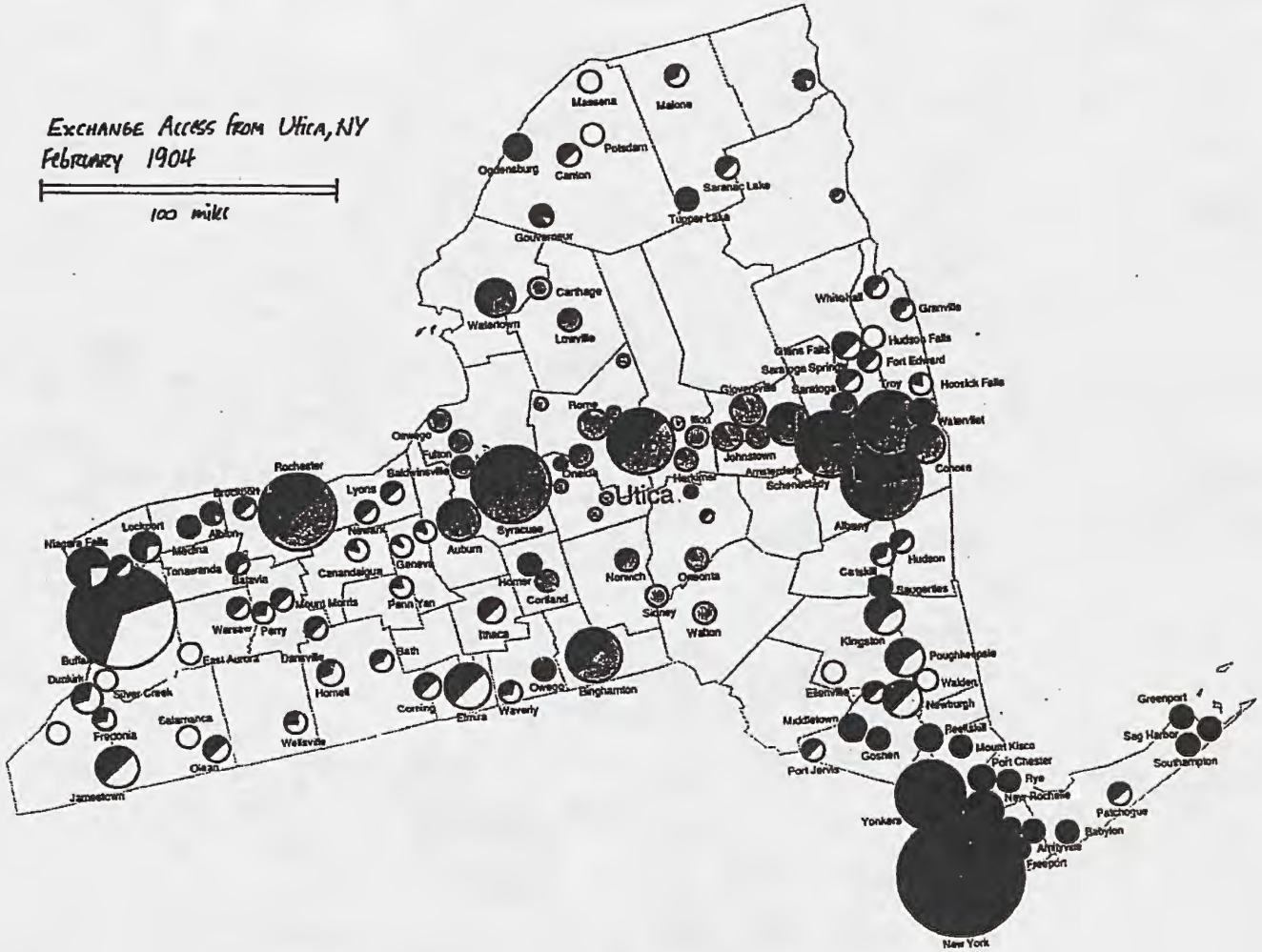
Yellow: accessible to independent subscribers through an independent exchange.

Pie charts: dual service cities. Colored areas indicate proportion of telephone subscribers controlled by Bell (red), Independent (yellow), and Bell-connecting sublicensee (black).

Pie charts with white areas: dual service cities in which an independent exchange controls the white portion of the market but is not accessible to independent subscribers in the city of reference.

Uncolored cities: telephone exchanges not accessible to either the Bell or independent subscribers in the city of reference.


Exchange Access from Utica, NY
1894
100 Miles
Massena
Malone
Potsdam
Ogdensburg
Canton
Saranac Lake
Tupper Lake
Gouverneur
Carthage
Watertown
Lowville
Whitehall
Granville
Hudson Falls
Glens Falls
Fort Edward
Saratoga Springs
Troy
Hoosick Falls
Gloversville
Saratoga
Watervliet
Rome
Ilion
Johnstown
Amsterdam
Schenectady
Cohoes
Oswego
Fulton
Baldwinsville
Oneida
Herkimer
Utica
Albany
Rochester
Brockport
Lyons
Syracuse
Auburn
Lockport
Niagara Falls
Medina
Akron
Tonawanda
Batavia
Canandaigua
Geneva
Norwich
Otsego
Hudson
Catskill
Saugerties
Mount Morris
Penn Yan
Homer
Cortland
Sidney
Walton
Warsaw
Perry
Ithaca
Kingston
Poughkeepsie
Buffalo
East Aurora
Dansville
Bath
Dunkirk
Silver Creek
Hornell
Owego
Binghamton
Ellenville
Walden
Newburgh
Greenport
Sag Harbor
Southampton
Coming
Elmira
Waverly
Middletown
Goshen
Pawling
Mount Kisco
Port Chester
Fredonia
Salamanca
Wellsville
Olean
Port Jervis
Rye
New Rochelle
Patchogue
Babylon
Yonkers
Freeport
Jamestown
New York


Exchange Access from Utica, NY
February 1904
100 miles
Massena
Malone
Ogdensburg
Canton
Potsdam
Saranac Lake
Tupper Lake
Gouverneur
Carthage
Watertown
Lowville
Whitehall
Granville
Hudson Falls
Glens Falls
Fort Edward
Saratoga Springs
Saratoga
Troy
Hoosick Falls
Gloversville
Johnstown
Amsterdam
Schenectady
Watervliet
Cohoes
Albany
Rome
Utica
Oneida
Herkimer
Oswego
Fulton
Baldwinsville
Syracuse
Auburn
Rochester
Brockport
Lyons
Newark
Canandaigua
Geneva
Lockport
Albion
Medina
Niagara Falls
Tonawanda
Batavia
Mount Morris
Penn Yan
Warsaw
Perry
Buffalo
East Aurora
Dunkirk
Silver Creek
Fredonia
Salamanca
Olean
Jamestown
Wellsville
Dansville
Hornell
Bath
Corning
Elmira
Waverly
Owego
Binghamton
Ithaca
Homer
Cortland
Norwich
Oneonta
Sidney
Walton
Catskill
Hudson
Saugerties
Kingston
Poughkeepsie
Walden
Newburgh
Ellenville
Middletown
Goshen
Port Jervis
Beekman
Mount Kisco
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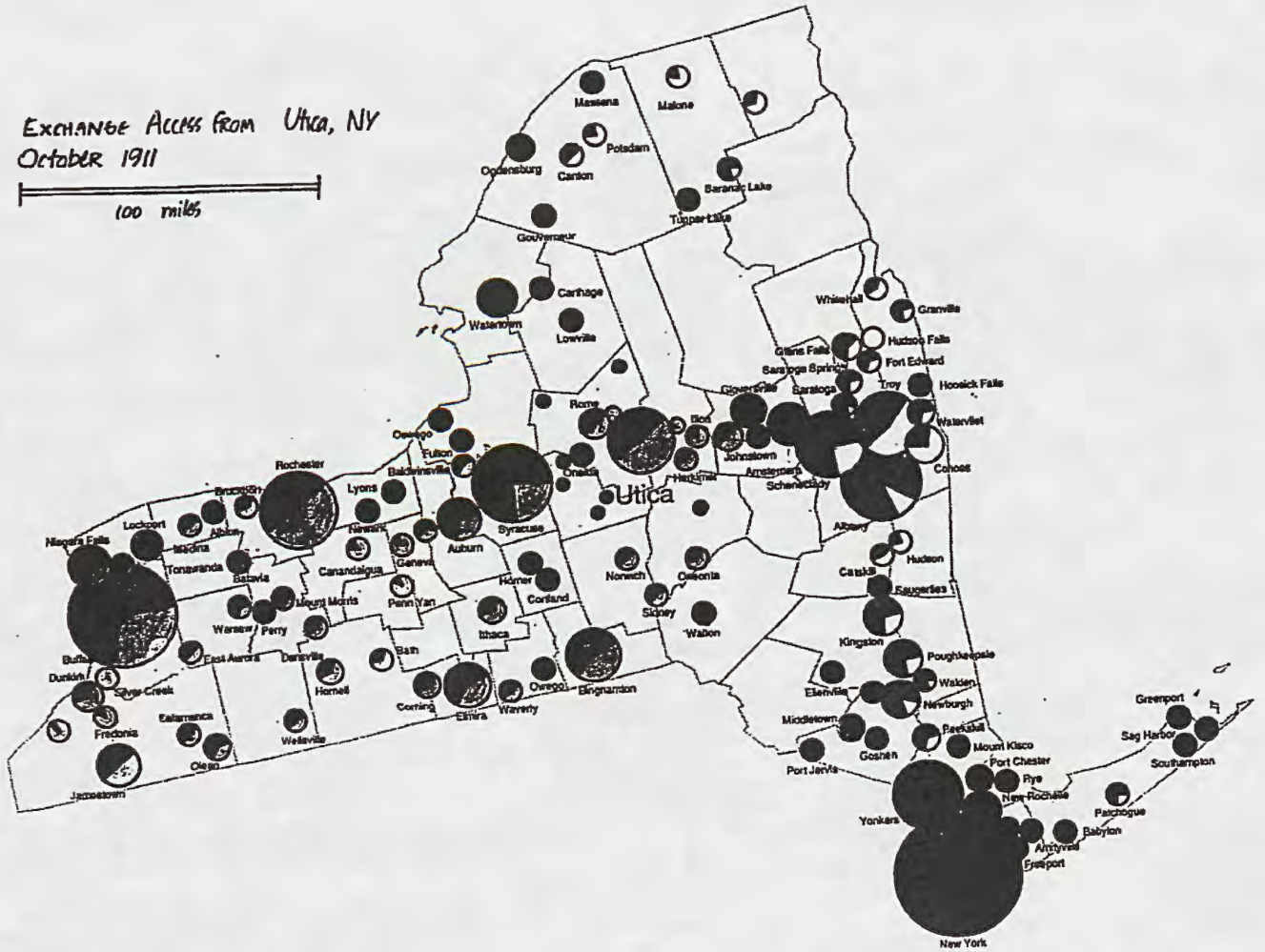
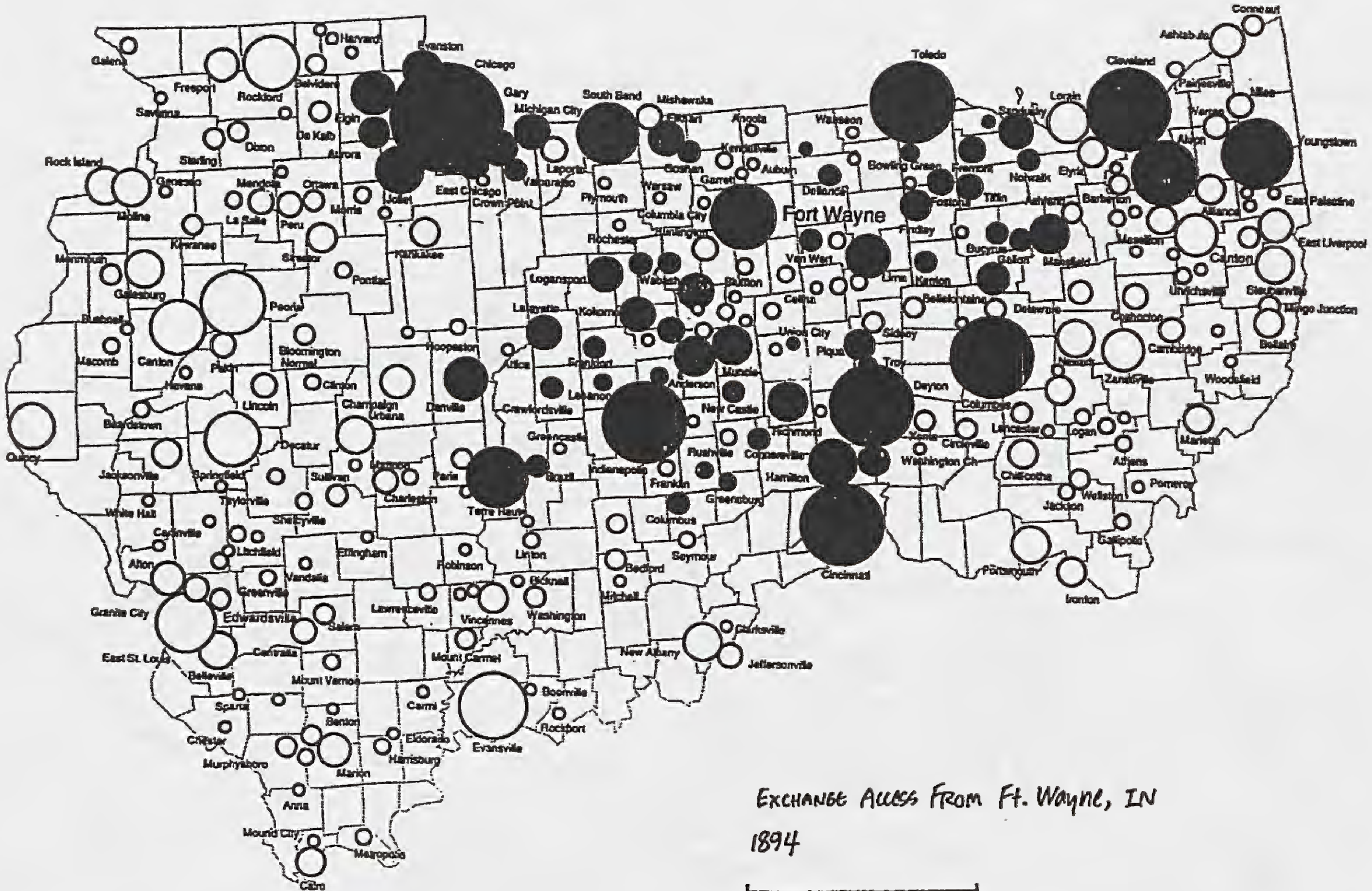
Rye
New Rochelle
Yonkers
Babylon
Amityville
Freeport
New York
Patchogue
Greenport
Sag Harbor
Southampton

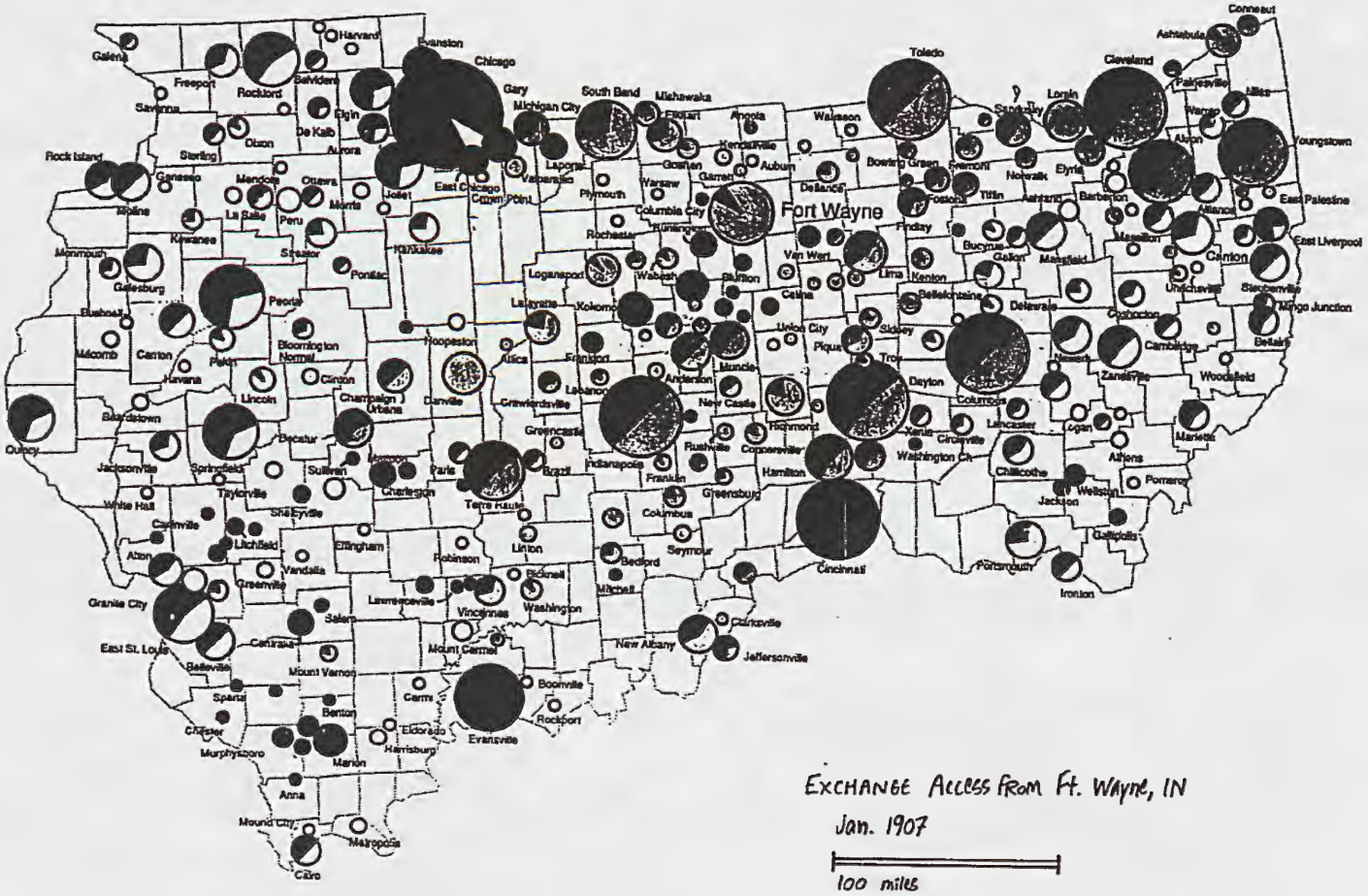

Exchange Access from Utica, NY
October 1911
100 miles
Messena
Malone
Potsdam
Ogdensburg
Canton
Saranac Lake
Tupper Lake
Watertown
Carthage
Lowville
Whitehall
Granville
Hudson Falls
Glens Falls
Fort Edward
Saratoga Springs
Troy
Hoosick Falls
Saratoga
Gloversville
Watervliet
Rome
Boonville
Johnstown
Amsterdam
Schenectady
Cohoes
Albany
Oswego
Fulton
Baldwinsville
Oneida
Utica
Herkimer
Rochester
Brockport
Lyons
Newark
Syracuse
Auburn
Lockport
Albion
Medina
Niagara Falls
Tonawanda
Batavia
Canandaigua
Geneva
Norwich
Oneonta
Hudson
Catskill
Kaaterskill
Homer
Cortland
Penn Yan
Mount Morris
Sidney
Warsaw
Perry
Ithaca
Walton
Kingston
Poughkeepsie
Buffalo
East Aurora
Dansville
Bath
Dunkirk
Silver Creek
Hornell
Corning
Elmira
Owego
Binghamton
Wallkill
Newburgh
Ellenville
Greenport
Sag Harbor
Southampton
Middletown
Fredonia
Salamanca
Wellsville
Olean
Goshen
Port Jervis
Peekskill
Mount Kisco
Port Chester
Rye
New Rochelle
Yonkers
Patchogue
Babylon
Amityville
Freeport
Jamestown
New York



EXCHANGE ACCESS FROM Ft. Wayne, IN

1894

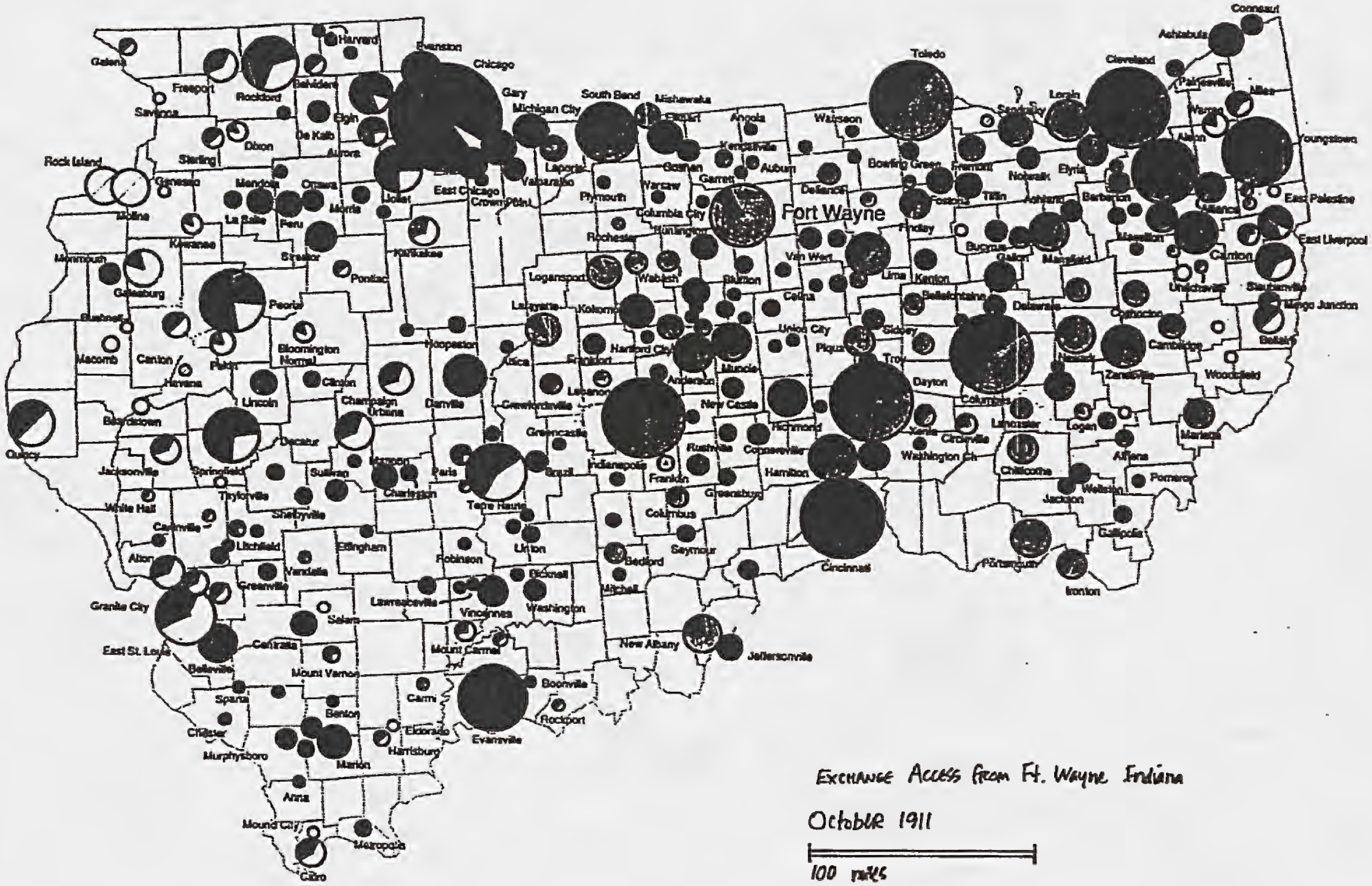
100 miles



EXCHANGE ACCESS FROM Ft. Wayne, IN

Jan. 1907

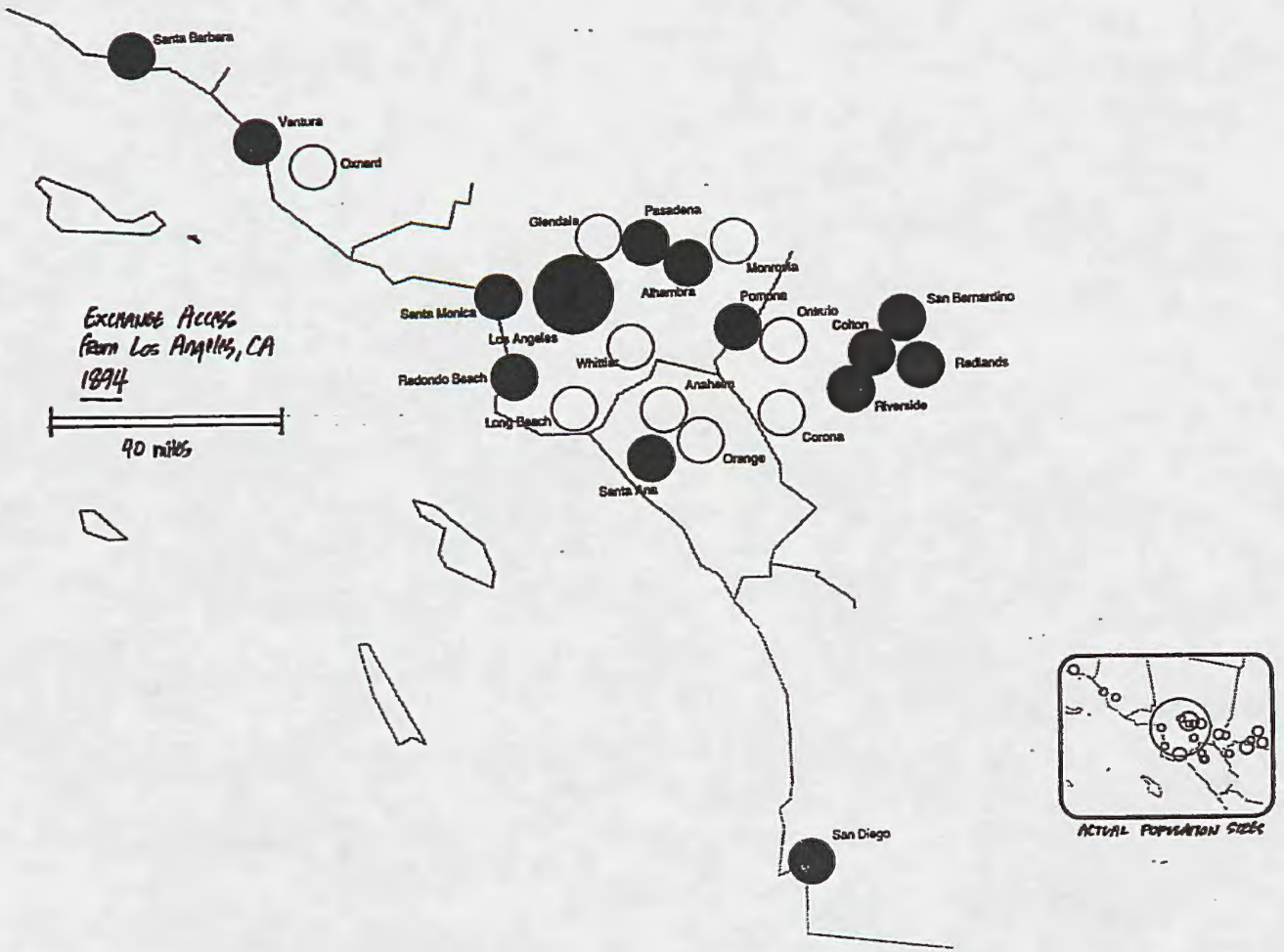
100 miles

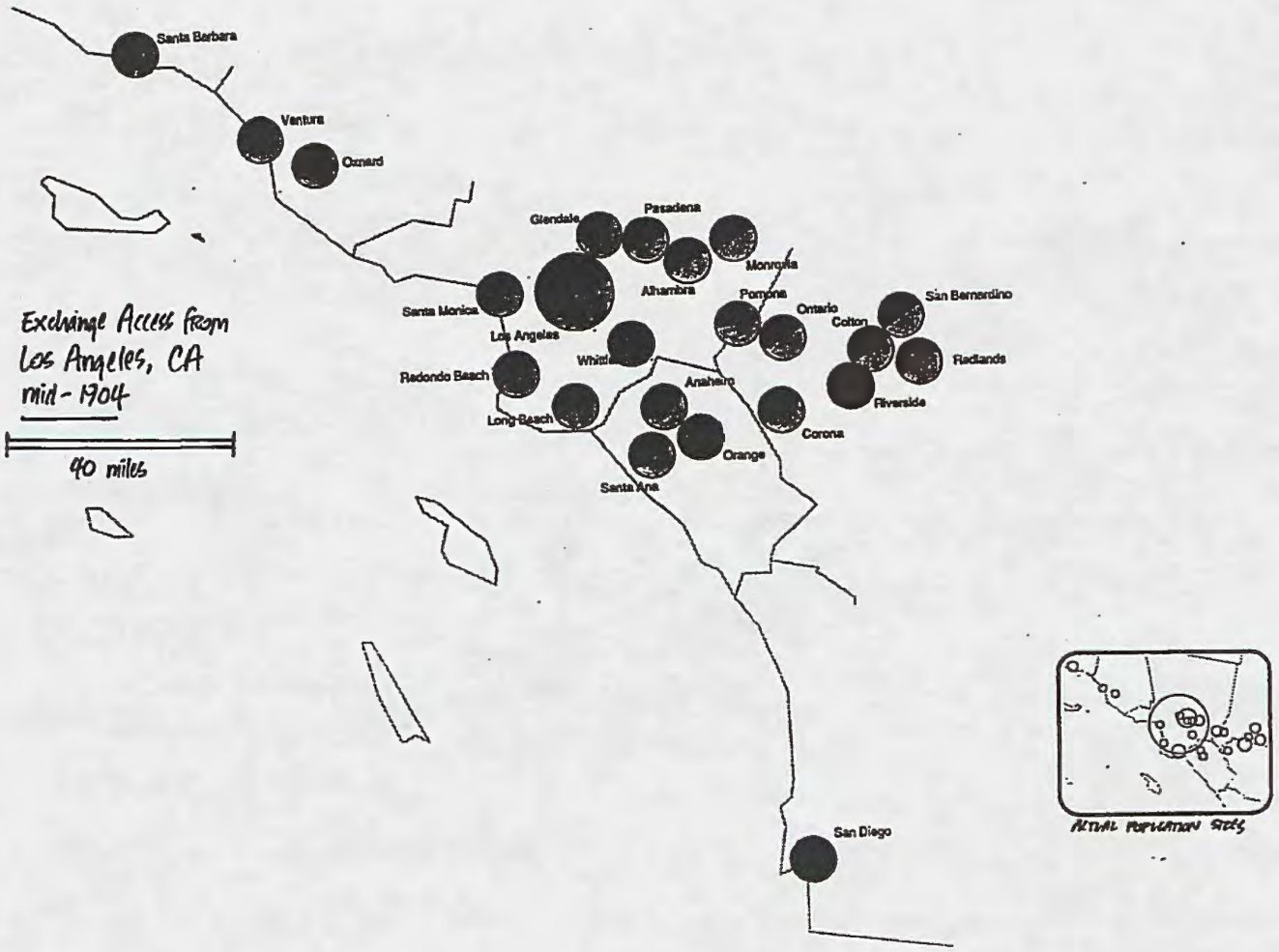


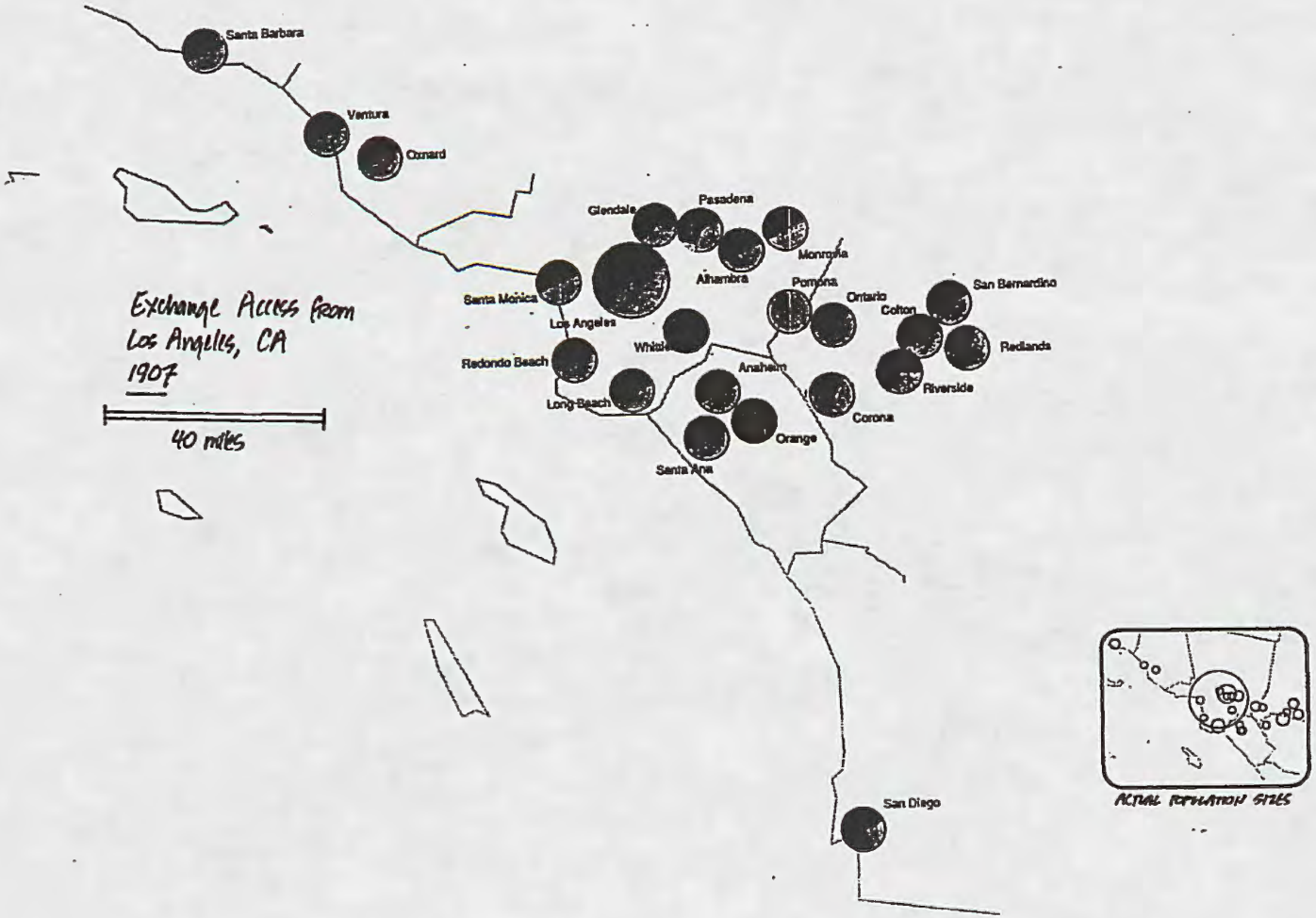
EXCHANGE ACCESS FROM Ft. Wayne Indiana

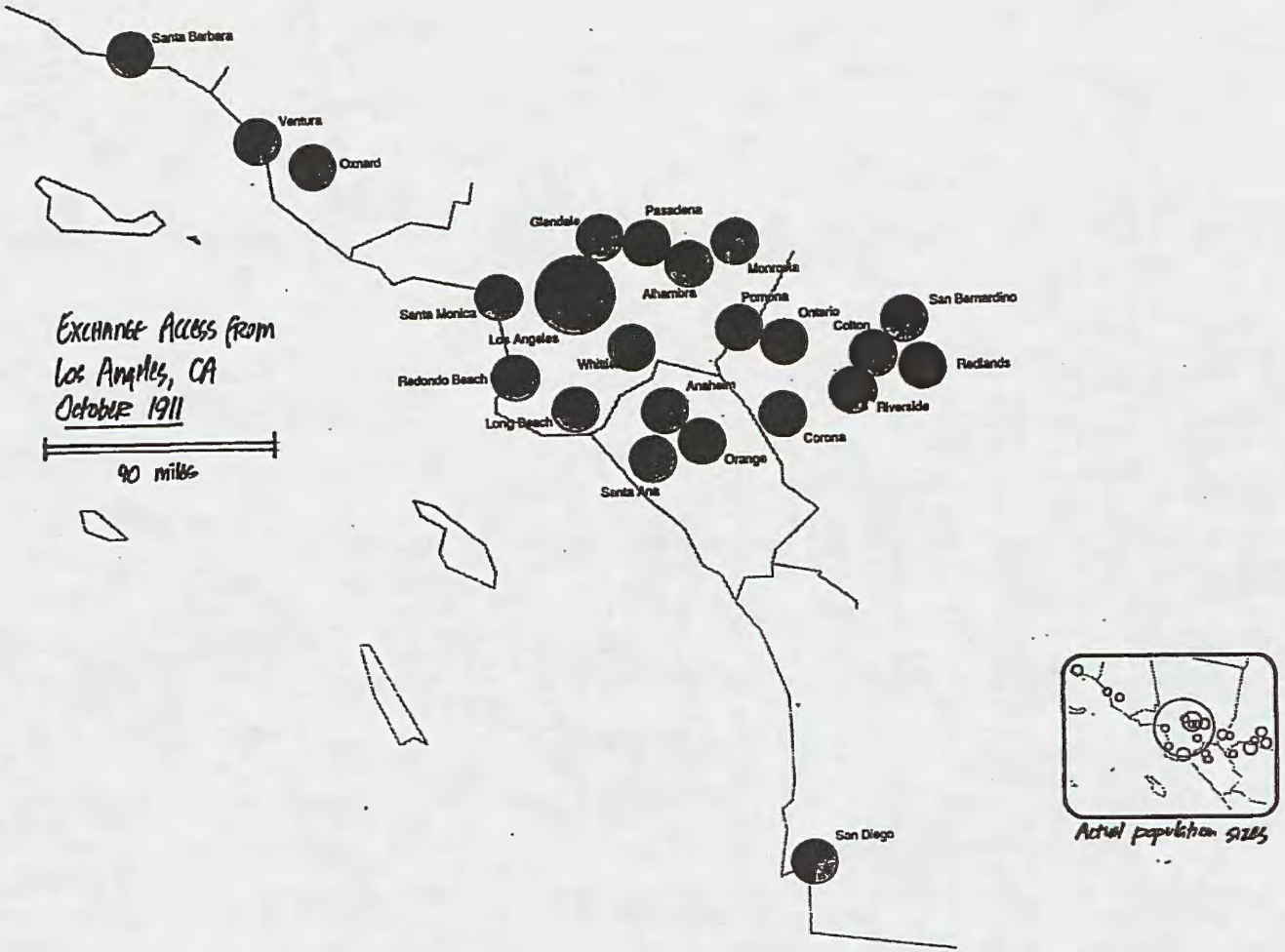
October 1911

100 miles


Santa Barbara
Ventura
Oxnard
Glendale
Pasadena
Monrovia
Alhambra
Santa Monica
Los Angeles
Pomona
Ontario
San Bernardino
Colton
Redlands
Riverside
Whittier
Anaheim
Corona
Redondo Beach
Long Beach
Orange
Santa Ana
San Diego
Exclusive Access
From Los Angeles, CA
1894
40 miles
ACTUAL POPULATION SIZE


Santa Barbara
Ventura
Oxnard
Glendale
Pasadena
Monrovia
Alhambra
Santa Monica
Los Angeles
Pomona
Ontario
San Bernardino
Colton
Redlands
Riverside
Whittier
Anaheim
Redondo Beach
Long Beach
Corona
Orange
Santa Ana
San Diego
Exchange Access from
Los Angeles, CA
mid-1974
40 miles
ACTUAL POPULATION SIZES


Santa Barbara
Ventura
Oxnard
Glendale
Pasadena
Monrovia
Alhambra
Santa Monica
Los Angeles
Pomona
Ontario
Colton
San Bernardino
Redlands
Riverside
Whittier
Anaheim
Redondo Beach
Long Beach
Corona
Orange
Santa Ana
San Diego
Exchange Access from
Los Angeles, CA
1907
40 miles
ACTUAL POPULATION SIZES


Santa Barbara
Ventura
Oxnard
Glendale
Pasadena
Monrovia
Alhambra
Santa Monica
Los Angeles
Pomona
Ontario
Colton
San Bernardino
Redlands
Riverside
Whittier
Redondo Beach
Long Beach
Anaheim
Corona
Orange
Santa Ana
San Diego
Exchange Access from
Los Angeles, CA
October 1911
90 miles
Actual population sizes

NOTES TO CHAPTER 3

[1] A similar argument was made in Gerald Brock, "Telephone Pricing to Promote Universal Service and Economic Freedom," Federal Communications Commission Office of Plans and Policies, Working Paper #18 (1985). A telephone network is described as N*(N-1) different products, where N is the number of persons and N*(N-1) is the number of potential conversations. I thank Professor Marvin Sirbu for bringing this paper to my attention.

[2] See John T. Wenders, 1987, The Economics of Telecommunications (Cambridge, MA: Ballinger) p. 171-190, where a telephone company's use of its control of local exchange subscribers to exert leverage over the long distance market is described as an abuse of monopoly power.

[3] The system failed to converge after 50 sampling cycles.

[4] The system failed to converge after 200 sampling cycles.

[5] On the use of human repeaters, see Doolittle to Cochrane, January 16, 1901, "Hudson River Telephone Co.--Toll Requirements." Box 1330, AT&T-BLA. Doolittle observed that many of cancelled calls were from "women who do not seem to talk loud enough and [who] declined to have the messages repeated. Men, as a rule, agreed to have the call repeated." (p. 8)

Chapter 4

Prologue.

The telephone war that erupted in 1894 had been gathering force for fourteen years. There had been a brief bout of competition from 1878 to 1880, when the Western Union telegraph company attempted to enter the business using instruments invented by Thomas Edison and Elisha Gray. The national Bell Co. defended itself against the telegraph giant by filing a lawsuit claiming that Western Union's telephones infringed its patents. Late in 1879, the two companies reached an out-of-court settlement which ceded the telephone business to the Bell Company while leaving Western Union's telegraph monopoly undisturbed.[1] The agreement cemented Bell's control of the business from 1880 until 1894, when the last patent protecting Bell's original invention expired. This experience with monopoly set the stage for the superheated rivalry that followed in three distinct ways.

1. A Legacy of Suppression.

The Bell patents did not automatically give it a monopoly. Alternative companies sprang up like crabgrass all through the 1880s, and Bell had to actively suppress them. The usurpers could be small, local enterprises or nationally organized stock promotions. Any inventor, backyard mechanic or charlatan who claimed to have invented a telephone could and did serve as the front men for entrepreneurs who needed a patent to enter the

business.[2] The telephone instrument was a fairly simple and inexpensive device to make once the principle of voice transmission by electrical analogue was understood.

Some of the Bell challengers swore that they had beaten Bell in the race to discover the telephone. Daniel Drawbaugh, a self-described "practical machinist" from rural Cumberland County, Pennsylvania, was thrust forth as the telephone's true inventor by the backers of the People's Telephone Company. Others, like Dr. Myron Baxter, Dr. James W. Rogers, Antonio Meucci and the maker of the "Molecular" telephone, introduced slight modifications in the design or asserted that their device was based on a fundamentally different principle that did not infringe the Bell patents.

The real subject of this litigation was not who invented the telephone, but who would get to profit from its commercial development. The high price of Bell telephones aroused the enmity of many subscribers and the avarice of many a potential competitor. A rival patent claim, no matter how spurious, gave promoters the pretext they needed to organize a company, sell stock and begin to install lines and phones.[3] And there was always the chance that their claims might be sustained by the courts. Not until 1887, when the U.S. Supreme Court upheld the controlling nature of Bell's patents in a case combining many challenges to his rights, was the issue clearly settled.[4] In the interim, the electrical journals of the 1880s routinely published notices of non-Bell telephone companies being formed--as well as notices of their being closed down after a few months for infringing the Bell patents.[5] All told, the Bell Company was involved in 600 separate

infringement cases during those years.[6] To the extent that it had a monopoly, its exclusive control was a product of constant, aggressive legal action against alternative companies.

Two specific cases from the mid-1880s illustrate the nature and consequences of this strategy of suppression. In May, 1884, two promoters paid $15,000 for the telephone patents of one Dr. Myron L. Baxter. They formed the Baxter Overland Telephone and Telegraph Company and began construction in the city of Utica, New York. By October of that year the Baxter Company was operating a telephone exchange with 300 subscribers, and had built up the physical capacity to serve 800. Whatever the merits of Dr. Baxter's patent, the operating company was not a fly-by-night stock promotion scheme but a serious effort to provide telephone exchange service. The construction and service quality of the new Company were reputed to be exceptional, and its rates were less than half those charged by Bell.[7] During the winter of 1884 the Bell exchange began to lose subscribers while the Baxter exchange grew. The national Bell organization finally took notice, and on May 17, 1885, the Baxter exchange was shut down by an infringement suit.

At about the same time, an Indiana farmer named John Crump obtained non-Bell telephones from Canada and set up a private line between his house and the home of one of his tenants on an adjoining farm.[8] Crump was not selling telephones or telephone service--the line was for his own personal use. There was no Bell line or exchange anywhere near him. Had he gone to the nearest Bell licensee for his phones he would have had to pay $100 a year to lease them, and he still would have had to set up the line at his own expense.[9] Nevertheless, Crump was soon visited by Bell

agents. They warned him that he was in violation of the law, and then confiscated his telephones.

Examples such as these could be multiplied. Throughout the 1880s, scores of local and national business interests had been willing and able to compete with Bell in the supply of telephone equipment and service. Thousands of farmers had always been eager to take the technology into their own hands. For fourteen years these forces of spontaneous development were held in check by injunctions, fines, and confiscations. For all that, the shoots of illegal competition were never completely exterminated. As late as 1889-1891, well after the decisive Supreme Court decision, it is not hard to find reports of independent local telephone companies either starting up or being closed down by injunction.[10]

The expiration of the Bell patents should not, then, be viewed as the beginning of the competitive movement; it was more like the disintegration of a dike that for many years had protected the Boston corporation from a raging flood. The suppression of independent activity prior to patent expiration also helps to explain the ideologically charged character of the later rivalry. Here was a distant, impersonal corporation growing rich by maintaining a legal strangehold on a popular, useful device. The scenario could not have corresponded better with the archetypes of Evil promoted by populism. The publicity organs of the independent movement ceaselessly reminded their readers of what it was like in the bad old days of monopoly. Even the names of the early legal independents often mirrored those of the suppressed companies of the 1880s: the Peoples Telephone Co., the Citizens Co., etc.

The experience also deeply impressed itself upon the attitudes

of the national Bell company. As one independent propagandist put it, after fifteen years of skirmishes with patent violators, Bell managemement "had come to believe, and believe honestly, that anyone who attempted to enter the telephone field, no matter through what gate, was a lawbreaker--an infringer--an interloper."[11]

2. Rate Wars.

Bell's successful defence of its patent gave it the power to make monopoly profits on its telephones. The national company was not at all bashful about exploiting this power. It required its licensees to lease rather than buy the telephones manufactured by its Western Electric subsidiary at an annual charge of $14 for each set. Since the machinery itself cost about $4 to make, American Bell guaranteed itself large profits on every telephone in service. As protected monopolies, the operating companies were able to recover these costs in their subscription rates. The instrument lease price paid to American Bell accounted for one fourth to one half of the subscription price in small and medium-sized exchanges.

There was, however, some concern that high prices were restricting the number of users. Some operating company managers complained that the royalty payment should be reduced because it was retarding public adoption of the new technology.[12] Theodore Vail, American Bell's general manager, agreed. American Bell's ability to pay stockholders high dividends had come at the expense of development, and in the long run underdevelopment threatened Bell's control of the market.[13]

Bell's attempt to reap monopoly profits on telephones fueled

public suspicions that the company was gouging its captive market. But the price of the telephones themselves was only one source of discontent over rates. Far more important in the long run was that the licensee companies' operating costs steadily increased throughout the 1880s. The resulting rate increases were not abuses of monopoly power, but were legitimately rooted in the economic and technical characteristics of the telephone exchange.

In 1877, Bell managers had assumed that the local companies were basically in the business of leasing telephones. The telephone did not catch on, however, until the invention of the exchange, a place where the users' wires converged to allow any two of them to be interconnected.[14] As switching became more important, the licensees' functions changed. They were no longer there just to lease out machines and collect the rent. They became operating companies with a large labor force and huge investments in switchboards and outside wires and cables. The telephone transmitter and receivers themselves had become the least prominent part of the operation.

As the business underwent this transition, Bell managers made a disturbing discovery: the average costs of telephone exchanges increased as they grew. Until 1881 the rates of the licensee companies were still based on the idea that they were leasing out telephones. Most companies charged flat yearly rates of $20 to $40. Like their subscribers, Bell managers had expected their operations to realize economies of scale as more subscribers joined the exchange. In fact, the reverse was true. Increasing the size of an exchange made it more expensive to run.[15] Large, urban exchanges incurred average costs three or four times those of

exchanges in smaller cities.

The primary source of the problem was the switching process. As the number of subscribers grew, the number of possible connections among them grew much faster--roughly as the square of the number of subscribers. Consequently, switchboards became increasingly expensive to construct, and the operations needed to make connections increasingly complex and slow, as more people joined the exchange.[16] Growth created diseconomies for other reasons, too. It usually meant longer per subscriber wire mileage and more expensive cable and pole construction.

By 1881, Bell managers had come to a rather grim conclusion: expansion had to be accompanied by rate increases. Edward J. Hall, President of the Buffalo exchange and later the Vice President of AT&T, made this explicit in a report before a conference of telephone managers. Only three or four of the more than 300 exchanges in operation in 1881 were able to pay for themselves at then-existing rates.[17] Hall claimed that "the rapid and unexpected growth of the exchange system gave no time for deliberation or study, and forced the adoption of rates which must be changed for our self-preservation, even although it places us in the light of a monopoly taking advantage of its position."[18] In noting that it would probably be necessary to raise rates $5 for every 100 new subscribers, Hall added: "any system which does not provide for that expansion is going to be involved in continual conflict with the public."[19]

What was intended to be a warning turned out to be a prophecy. The need for growth-induced rate increases did involve the Bell companies in "continual conflict with the public" throughout the

1880s. Users responded to higher prices with outrage and frustration. They expected a bigger exchange to offer lower rates, as in any other normal business endeavor. As one report of a rate controversy observed, "As surrounding towns with but 50 or 100 subscribers were getting service for $48 and $36, they could not see why a subscriber to an exchange of 350 should pay more."[20] With no alternative to the Bell company, they felt helpless and exploited as rates went up.

Characteristically, the telephone-using public of the 1880s at first responded to rate increases with "combinations of citizens;" that is, organized boycotts of the service. A rate increase announcement in Rochester, New York late in 1886, for example, provoked a series of protests and mass meeetings among telephone users, who agreed to order out their phones until the increase was revoked.[21] Evansville and Terre Haute, Indiana were also the scenes of widely publicized telephone boycotts.[22] In Terre Haute, nearly half of the city's users removed their telephones on the same day in protest of a rate increase.

The boycotts failed to have any lasting impact on rates, however. Most users found that the telephone had become indispensable to their business. A boycott was most effective when it was only a threat. If the telephone company called their bluff, users found that the attempt to do without telephones was very costly. During the Terre Haute boycott, for example, "loud complaint was heard from the surrounding towns, which were unable to get the usual connection with Terre Haute merchants. Considerable trade in consequence went to Indianapolis."[23] Within a month or two, most users had restored their service at the higher

rates.

With boycotts eliminated as an effective check on rates, some states turned to legislation. The Chicago exchange, for example, had raised its rates from $75/year to $125/year in 1882, leading to a temporary decrease in the number of subscribers.[24] In 1889 a bill to reduce rates in Chicago to $72/year was introduced in the Illinois legislature. Similar attempts to limit or reduce rates by state law were introduced in 1891 and 1895. None of these bills passed, but the recurring attempts at control indicate that there was concern with rising rates. In the state of Indiana, conflict over rates did lead to legislation. A state law passed in 1885 established detailed control over subscription and toll rates.[25] The legislated rates were so low that the Central Union Company informed its customers that it would close down all operations in the state as of June 30, 1886. For the next two and a half years, all exchanges in the state save that in Indianapolis were shut down. The decision stood until the maximum rate law was repealed in February, 1889.

Ultimately, neither legislation nor boycotts gave the telephone-using public the kind of redress it desired. Boycotts were a costly and ultimately ineffective weapon. Legislation was too clumsy, arbitrary and drastic. In this context, the idea of starting an alternative telephone company backed by local capital and managed by local businesspeople looked very attractive. As we have seen, hundreds of localities chose this option during the 1880s in flagrant disregard of its illegality. Most, however, were forced to acknowledge that any conceivable form of competition would infringe the Bell patents. So the local telephone users

swallowed their frustration, paid their bills, and looked ahead to a time when challenges to the monopoly would be legal.

Yet the link between exchange growth and rising costs would return to haunt Bell's competitors. Independent exchanges found it easy to undercut Bell rates when they first entered the field. They soon attracted so many customers, however, that their unit costs increased. Because many localities conceived of competition as a method of rate regulation, they wrote provisions fixing rates into the new company's franchise. As the independent grew, it was forced either to lose money or to ask for a rate increase, thus reneging on its promises and calling into question what many citizens saw as the justification for its existence.

3. <u>One System, One Policy</u>.

Conflicts over rates, service and patent infringement all contributed to the simmering public resentment on which the independent movement capitalized. But two other factors, pertaining to the organization and goals of the Bell system itself, were equally important in setting the stage for the competitive struggle. These were, first, the national Company's contractual relations with its local operating companies, which were consciously designed to protect its control of the business by weaving its members into an integrated system; and second, the Bell Co's vision of the telephone system as a substitute for the telegraph system, a network of voice communication designed to serve business users in the principal towns and cities. The development plan that flowed from this vision left most of small town and rural America without telephones or exchanges.

Looking back on the early years of the Bell System after it had weathered fifteen years of competition, Theodore Vail claimed that the Bell System had been organized to achieve universal service all along. "The Bell System was founded on the broad lines of 'One System,' 'One Policy,' 'Universal Service,'" he wrote in AT&T's 1909 Annual Report.[26] Around 1918 he made the same claim even more emphatically. "From the commencement of the business," he wrote, "one system, one policy, universal service is branded on the business in the most distinctive terms."[27]

If by "One System, One Policy" Vail meant that Bell intended to establish a centrally coordinated monopoly, and by "Universal Service" he meant nothing more than that Bell aimed at a physically integrated system whose subscribers could all communicate with each other, then his claims are undoubtedly true. Vail was recruited from the Railway Mail Service in 1878 to serve as the national Bell Telephone Company's first general manager. As general manager, Vail consciously pursued a vision of a nationwide, fully interconnected system. "Tell our agents," he wrote sometime in 1878, "that we have a proposition on foot to connect the different cities for the purpose of personal communication, and in other ways to organize a grand telephonic system."[28] Vail's intentions were also revealed during his involvement in the negotiation of a settlement with Western Union. Which company would control toll lines was a major source of contention between the two parties. Western Union wanted Bell to confine itself to the local exchange business and allow the telegraph company to control all interexchange connections. Vail's biographer credits him with adamantly rejecting this proposition and insisting on Bell's right

Vail + universal service

Vail's early desire to have LD connections ←

Paine, In one Man's Life p. 179 →

to construct and operate long distance lines.[29]

The contracts defining the relationship between the national Bell organization and its licensed operating companies provide even stronger evidence of the nature of Vail's vision. The Boston headquarters did not have the capital or the ability to construct and operate exchanges directly throughout a country as vast as the U.S. It relied instead on franchise-like agreements to develop the business. Local operating companies were licensed to lease telephones, raise capital and build and operate exchanges in an exclusive territory. These contracts were drawn up under Vail's direction, and constitute his most important accomplishment as general manager.

Vail's license contracts were shrewd attempts to reconcile the need for One System, One Policy with the fact that the system's actual operations were being conducted by many separate, semi-autonomous companies.[30] The controlling nature of the Bell patents were of course the bedrock on which Vail's system of organization rested, for there was no other legal supplier of telephones. In return for the right to lease telephones, the exclusive Bell licensee in a territory agreed to certain conditions, the intent of which was to bind them to the national Bell organization far beyond the life of the patents themselves. In the perpetual licenses granted between 1881 and 1884, the licensees agreed to lease only Western Electric-manufactured telephones, and were prohibited from participating in any telephone business not licensed by American Bell. Licensee companies agreed to give 35-50 percent of all their stock to the parent company. In addition, they had to connect with exchanges outside their

licensing structure

territory through the parent company and were prohibited from building long distance lines outside their territory. They also had to turn over a set portion of all their toll revenues to the parent company.[31]

In his attempt to preserve the control of the national Bell organization over a unified system, Vail had a very clear historical precedent to work from. He had been employed as a telegraph operator for many years, and was the cousin of Alfred Vail, an important figure in the early development of the telegraph industry. He probably would have known, therefore, that competitive warfare and fragmentation developed in that industry when one of the three licensees of the original Morse interests split with the others and began to operate as an independent, competing system.[32] The license contract set up the relations between the parent company and its subordinates in such a way as to make this a virtual impossibility.

Reserving to the national organization a large share of the licensee's stock ensured that the former company would always have a strong voice in the management of the latter. The Bell Company's direct control of Western Electric, the only manufacturing outlet for Bell telephones, erected another safeguard. The requirement that the licensee buy equipment from a Bell subsidiary not only assured the parent company of a steady flow of manufacturing profits; it prevented the emergence of alternative manufacturers who might be able to circumvent the Bell patents. It also made it possible to standardize apparatus throughout the system to achieve communications compatibility.

The same concerns about maintaining control while clearing a

path for nationwide communication underlay the parent company's reservation of long distance interconnection rights. As Vail said in 1918, "it gave us control of the connection of every exchange under license with the outside... That was the business feature of the development that we attached so much importance to, because we believed that no exchange could exist without being more or less tied up with the others..."[33] Any licensee company that attempted to break away from the Bell system, in other words, could be isolated by its inability to connect with any of the surrounding Bell exchanges. Here again, Vail probably drew on the telegraph industry as a model. During the 1850s, the Western Union had established control over the western part of the U.S. by gradually breaking up its competitor's connecting agreements with companies in adjacent territories.[34] An increasingly isolated local telegraph system, faced with a choice of competing directly with Western Union's larger, more extensive system or merging with Western Union, usually chose the latter.

Vail's organization, in short, was designed to create an unified system, impervious to fragmentation and competition, and capable of connecting all of its customers. Indeed, monopoly control and universal interconnection were strongly linked, mutually reinforcing categories in his mind: the conditions which led to one necessarily led to the other. The supply of systemic interconnection required centralized control. Systemic interconnection, however, was not merely a product to be offered to customers, it was itself a powerful lever by which Bell's control of the telephone business could be maintained against centrifugal or competitive forces.

Nevertheless, Vail's claim that the Bell system was founded on the principle of "universal service" is only a half truth. It was not a conscious distortion on his part, but came from looking at Bell System organization retrospectively, in the light of twenty years of independent competition. Universal service, in the sense of service everywhere, to everyone, is not the same as universal interconnection within a system. A system can be universal in the latter sense while being very restricted in scope. In fact, the phrase "universal service" never appeared in any Bell documents until 1907--the peak of the independents' strength--when it became the rallying cry for advocates of a Bell-controlled monopoly and the elimination of dual service. And by that time the scope and usage of the telephone had been transformed so profoundly that the concept of an universal system had taken on a meaning far different from what Vail had meant when he spoke of his "grand telephonic system" in 1878.

What Vail had in mind during those early years was not the "universal service" of 1907, much less the ubiquitous network of 1980. The closest model was the telegraph system of the 1870s, a nationwide, business-oriented message communications network linking terminals in all the principal commercial centers. The telephone would reach largely the same people and places, but improve the efficiency and speed of communication by relying on direct conversation instead of written messages and the mediation of telegraph operators.

That this was in fact the model on which his vision was based is, to borrow his words, "branded on the business in the most distinctive terms" if one looks at the pattern of development taken

by the system in its first two decades. In 1894, after seventeen years of commercial development, the Bell company had installed only 240,000 telephones, one for every 225 people in the U.S. Eighty-five percent of these phones were in businesses.[35] The remaining telephones were generally in the homes of businesspeople who wanted to be able to communicate with their offices from their residences. A noted Bell agent often assessed the demand for exchanges in smaller towns by examining its commercial register.[36] Many new technologies, of course, "trickle down" from business to the home as their costs decrease, but in the case of the Bell system the overwhelming predominance of business users reflected a deliberate policy, a specific vision of what the telephone was for and who would be interested in using it.

This conception was modelled after the telegraph system. Indeed, the telephone operated in a communications environment dominated by telegraphy for its first twenty years, fulfilling the role of adjunct to, complement of, or substitute for its predecessor. The telephone was first promoted successfully as a substitute for district telegraphy--an urban signalling service which allowed users to communicate with the telegraph company from an outlying call box.[37] The district system served as an interface between those business and public institutions capable of supporting telegraph equipment and operators, and smaller users who could not afford such facilities. It was, in effect, a local distribution network for intraurban (as opposed to long distance) telegraphic communications, aiding in such things as messenger calling, package pickup and delivery, police and fire alarms, and collections.[38] The telephone's immediacy and its elimination of

the need for a messenger allowed it to make quick inroads into the district telegraph market. Further reinforcing the complementarity, long distance telephone communications relied extensively on the local messenger services built up around telegram delivery to bring their parties together.

The Bell System's conception of itself as a substitute for telegraphic communication was most clearly revealed by its approach to the development of long distance communications, and its urban bias. From the beginning, Vail was committed to matching the telegraph network in geographic scope, even though voice transmission over long distances posed enormous, unprecedented technical challenges. (The goal of transcontinental voice transmission was not reached until 1915.) Most of the money in telegraphy was made in intercity communication. If the telephone could supersede district telegraphy in local communications, would it not be even more profitable to replace telegraphy's hold over long distance business communications? In 1885, the American Telephone and Telegraph Company was incorporated in the State of New York to oversee and promote long distance development.

Until 1889, local and long distance telephone service were literally two separate, stand-alone systems. Local exchanges relied on cheaper Blake transmitters and iron, grounded circuits, equipment with a speaking range of about 50 miles. The toll network used copper metallic circuits and a more powerful transmitter, and by the late 1880s was capable of transmitting speech 800 miles. A subscription to the long distance service, which was always purchased separately, cost about 35 percent more than the local service. The separation of the two networks once

again reflected a way of thinking modelled on the telegraph precedent. Telegraphy lacked the strong demand interdependence of telephony, because it did not matter whether the sender and receiver of a message both subscribed to the same telegraph service. The message could be delivered by messenger or picked up at the telegraph company's office. If long distance telephone communications required a different kind of technology, it seemed natural, given this model, for it to be separate from the local system, just as the district telegraph system was separate from the intercity telegraph network.

AT&T soon discovered, however, that the development of the toll business was being retarded by its separation from the local exchange business. Most customers did not subscribe to the more expensive long distance service, and therefore were largely inaccessible to the users of the toll network in other cities. In order to increase the utility of the system as a long distance network, Bell in 1889 made a conscious decision to integrate local and long distance telephony.[39] This was to be accomplished by upgrading the local exchanges to the transmission standards of the long distance system. Henceforth, all circuits would be copper metallic, and only the high-quality instruments would be used.

In this case, the goal of complete system interconnection conflicted with the goal of encouraging local telephone use by larger numbers of people. Upgrading the network increased the cost of local exchange service.[40]

The transition to metallic circuits proved to be a wise choice. The growth of electric street railways and electric power plants impaired communication over the old, grounded circuits. The

utility of a subscription to businesses was greatly improved by the expanded toll access. Nevertheless, the decision reveals where the national organization's priorities lay. The decision encouraged intercity communication at the expense of smaller, local users.[41] Bell was pursuing the goal of a voice communications network that could cut into the established markets and uses of the telegraph.

A telegraph model is also implicit in the Bell System's decisions about <u>where</u> to put exchanges. The United States in 1890 was still a predominantly rural nation. Over 60 percent of its population lived in towns with with less than 2,500 people, or on farms. The Bell network rather unambiguously ignored this majority and cast its lot in with urban America. There were more than 7,000 incorporated towns with populations under 10,000 in 1884, and the Bell system had established exchanges in only 52 of them. By 1895, rural penetration had improved, but the urban bias was still marked. (Table 1) In this, Bell was simply following the developmental trajectory of the telegraph system, which began by linking urban centers and gradually extended itself to smaller and smaller towns.

TABLE 1

Telephone Penetration by Community Size, 1895

Population Level	Number of Places	Pct with Exch's	Pct of Bell Subs	Pct of total U.S. Pop.
50,000 +	52	100	50	18
10-50,000	294	98	33	9
2.5-10,000	1150	49	14	9
Rural	--	--	3	63

Source: 1900 Census, Bell Labs Archives

The 346 largest cities, representing only 27 percent of the U.S. population, possessed 83 percent of the nation's telephones. What makes this bias revealing is that in many ways, the cheapest and least technically demanding course of action would have been to establish many small, local exchanges in the small and medium-sized towns. The equipment needed to provide that kind of service was fully developed and easy to mass produce. By contrast, the growth of exchanges in urban centers constantly posed new technical problems in switching, signalling, operation and maintenance. Also, because of the diseconomies of growth associated with large exchanges, small-scale development would have required less capital investment and fewer workers per subscriber, and less complex management practices.

Bell was clearly bent on another task. It was responding to a specific kind of demand for telephone service: the demand of urban businesses for voice telephony as a substitute for, and improvement upon, the nationwide telegraph infrastructure. It therefore left untapped a huge reservoir of public demand for local exchange service. Thousands of farm communities and small towns had no

telephone exchange, and these communities embodied precisely those conditions which made entry into the telephone business easiest. The small, local exchanges they wanted required only modest levels of capital investment and technical expertise. There were also hundreds of larger cities in which the demand for purely local telephone service had been retarded, partly by Bell's monopoly prices and partly by its preoccupation with a grander vision of what telephone service could be. The Bell managers would soon discover that their attempt to cultivate one grand system had left open enormous, fertile expanses where hundreds of smaller ones could grow.

NOTES TO CHAPTER 4

[1] In the out-of-court settlement of November 1879, Western Union agreed to withdraw from the telephone business for seventeen years, to sell its exchanges to the Bell Co., to transfer all telephone-related patents to Bell, and to pay 20 percent of the cost of any new Bell telephone patents for seventeen years. Bell agreed to stay out of the telegraph business, and to forward to Western Union all requests for telegraph service that came through its exchanges, and to pay Western Union 20 percent of its rental on telephones. Federal Communications Commission, Investigation, 1939, p. 124.

[2] The conflicting patent claims are covered in detail in Robert Bruce, Bell. Alexander Graham Bell and the Conquest of Solitude, (Boston: Little Brown) 1973, Chapter 22.

[3] The importance of making and defending patent claims is clarified by George Smith's observation: "Typical of the organization of all the major firms in the electrical industries, telegraph and telephone company organization 'crystallized around patent rights,' and so whoever desired to enter or sustain business in either field had to come to terms with the holders of significant patents. ... Survival (in this as well as in most emerging high-technology businesses of the era) required almost obsessive attention to patent claims wherever they arose." Smith, The Anatomy of a Business Strategy, (Baltimore: Johns Hopkins AT&T Series in Telephone History) 1985, p.9.

[4] U.S. Supreme Court decision, legal citation.

[5] Harry B. MacMeal, The Story of Independent Telephony (Independent Pioneer Telephone Association), 1934, pp.27-29.

[6] Bruce, 1973 (note [2] above), p.271.

[7] MacMeal, 1934 (note [5] above), p. 43.

[8] Telephony Magazine 13:2 (February, 1907) p.92.

[9] Ibid.

[10] MacMeal, 1934 (note [5] above) p.28.

[11] Paul A. Latzke, A Fight with an Octopus (Chicago: Telephony Press) 1906.

[12] C.H. Haskins, manager of the Wisconsin Telephone Co.,

wrote a letter to Theodore Vail, American Bell's General Manager, in 1884 arguing for lower royalty payments. David Gabel, "The Evolution of a Market: the Emergence of Regulation in the Telephone Industry in Wisconsin, .1893-1917." Ph.D. dissertation, University of Wisconsin, 1987, pp.50-51.

[13] Alfred D. Chandler, The Visible Hand (Cambridge: Harvard University Press) 1977, pp.201-2.

[14] Robert J. Garnet, The Telephone Enterprise (Baltimore: Johns Hopkins AT&T Series in Telephone History) 1985.

[15] National Telephone Exchange Association Convention Minutes, Number 3 (1881), p.46. AT&T-BLA.

[16] Milton Mueller, "The Switchboard Problem: Scale, Signaling and Organization in the Era of Manual Telephone Switching, 1877-1897," Technology and Culture July, 1989.

[17] National Telephone Exchange Association Convention Minutes, Number 2 (1880), p.137, AT&T-BLA.

[18] Ibid, p.119.

[19] Ibid.

[20] Electrical World Vol -- No -- (1885), p.94.

[21] Latzke (1906) note [11] above.

[22] Electrical World (n. [20] above).

[23] Ibid, p.95.

[25] Indiana State Regulatory Research Project, AT&T Legal and Regulatory Department, New York.

[24] National Telephone Exchange Association Convention Minutes, Number 4 (1882), p.42.

[26] Theodore Vail, AT&T Annual Report, 1909, p.18.

[27] Gerald Brock, The Telecommunications Industry (Cambridge: Harvard University Press) 1981, p. 102.

[28] Albert Bigelow Paine, In One Man's Life (New York: Harper & Brothers) 1921, p.179.

[29] Ibid, p.137.

[30] "...the Bell policy was to establish the business on the same lines as if it was done direct by the company with its own lines, only substituting a corporation with its Manager... performing the duties of a District Manager." Theodore Vail, cited

in Brock, 1981, p.102. See also Garnet, 1985 (note [14] above), p.70.

[31] Federal Communications Commission: Report on AT&T License Contract Relations: Origins and Development of the License Contract (Washington: GPO) 1936.

[32] Brock, 1981 (note [27] above) p.67-73.

[33] Testimony of Theodore N. Vail, Read et al v. Central Union Telephone Co., Superior Court of Cook County, Illinois, Chancery General Number 299,689, p.1086.

[34] Brock, 1981 (note [27] above) p.76-79.

[35] A detailed breakdown of subscriber categories in the Buffalo, New York exchange in 1892 is contained in the transcript of the Third AT&T Switchboard Committee Meeting, New York, March 15-18, 1892, p.276-277. Residential telephones make up 289 of the total 1,850 stations in the city. The rest are in business offices of various types. By 1907, in contrast, residential telephones comprised 50 to 60 percent of the total in the cities, and a larger portion in the rural areas.

[36] In describing his methods for assessing the most promising places for small exchanges, Thomas Doolittle of AT&T wrote, "Reference was had to Bradstreet or Dun's Commercial Registers, which disclosed the invested capital or what might be called the commercial standing of each place." Doolittle, 1906 Annual Report, p.17, Box 2020, AT&T-BLA.

[37] M.D. Fagen, editor, History of Engineering and Science in the Bell System, Vol. 1 (Warren, NJ) 1975, p.489.

[38] Joel Tarr, with Thomas Finholt and David Goodman. "The City and the Telegraph: Urban Telecommunications in the Pre-telephone Era," Journal of Urban History 14:1 (November 1987) pp.38-80.

[39] Hibbard, Pickernell and Carty, AT&T. "The New Era in Telephony," Address before the National Telephone Exchange Association Convention Number 9, 1889, p. 35. AT&T-BLA.

[40] David Gabel, "Technological Change, Contracting and the First Divestiture of AT&T." Unpublished ms, January 12, 1989.

Chapter 5

Access Competition Begins: 1894 - 1897

Alexander Bell's patent on the telephone receiver lapsed on January 30, 1894. The event riveted the attention of business and electrical circles onto the telephone. The country was in the midst of a severe depression following the financial panic of 1893. The electrical trade journals received hundreds of requests for information about what kinds of telephone instruments could be manufactured or used without infringing the remaining Bell patents. "It would almost seem," mused the Electrical Review, "that the hard-pressed public expect the expiration of Bell's receiver patent to cure the hard times."[1]

Various interested parties jostled for position, stirring up a sense of anticipation. Bell's own licensee companies made it known that they wanted the royalty payment to ABT reduced or even eliminated. State legislators began to draft bills to lower rates. Full page advertisements from new telephone manufacturing companies appeared in the electrical journals, offering to "sell telephones outright" (in contrast to Bell's leasing policy), and assuring prospective buyers that they had nothing to fear from patent litigation. (Figure 5.1) New telephone exchange companies began to file articles of incorporation--a few of them infringers dating back to the preceding decade.[2] In what was widely interpreted as preparation for the coming battle, American Bell Telephone itself

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FIGURE 5.1

asked the Massachusetts legislature to increase its authorized capital stock from $20 million to $50 million, citing the need to extend its long distance system.

Despite the public's palpable feeling that the era of monopoly had ended, there was still a great deal of uncertainty about the patent situation. The expired patents covered only telephones that used a metallic diaphragm to transmit speech. This relatively primitive system had been long superseded by transmitters and receivers that operated on the microphonic principle, using a variable resistance contact. The microphonic transmitter used by ABT had been invented by Emile Berliner in 1877. While Berliner had filed for protection in that year, for reasons no one quite understood the application had gathered dust in the U.S. Patent Office for 14 years, and was not issued until 1891. Bell hoped that the delay in issuing the Berliner patent could be used to limit independent manufacturers to an obsolete telephone technology until 1908. For the next four years it published warnings and filed infringement suits to harass independent manufacturers and to intimidate their financiers and customers. (Figure 5.2) Other inventions were also used as the basis for infringement suits.[3]

The independents fought bitterly against recognition of the Berliner patent. They charged that the delay in issuing it was the result of illicit Bell influence and that the substance of the disputed patent was no different than another patent issued to Berliner in 1880. If the life of an absolute monopoly was prolonged by this device, one trade journal thundered, "a monstrous state of affairs is admitted which, if it cannot be otherwise remedied, would almost justify the entire abolition of the patent

FIGURE 5.2

system."[4] The issue percolated to the highest levels of the government. The U.S. Attorney General took up the independents' cause, filing a suit to nullify the disputed patent. The case reached the U.S. Supreme Court in May 1897. The High Court ruled that there had been no fraud or corruption involved in the delay. In dismissing the charges of corruption, however, it also refused to rule on the questions about the substance of the patent itself. The argument that the invention covered in the 1891 patent was already contained in the now-expired 1880 patent was, the court said, "a defense which is open to every individual charged by the patentee with infringements."[5] To pursue the matter further, Bell had to litigate against individual infringers. This it proceeded to do, but by the end of 1898 the threat of the Berliner patent had been dissipated by adverse decisions.

Manufacturing telephones was fairly easy. The real test of the new companies was their ability to construct operating systems capable of attracting and holding subscribers. The anti-Bell forces embraced this challenge eagerly and, given the complexity of financing and managing an exchange, rather naively. By 1897 at least a thousand new telephone companies were in operation.[6] The first wave of new entry was not confined to rural areas; it occurred across the board. Hundreds of small towns overlooked by Bell seized on the opportunity to construct their own telephone lines. But there were also attempts to establish competing exchanges in Brooklyn, New York city, Boston, Chicago and Philadelphia. Activity in mid-sized cities already occupied by Bell was especially vigorous; 194 cities with populations between 5,000 and 50,000 had dual exchanges by the end of 1897. The fate

of these three distinct approaches to competition differed markedly.

1. The Cities.

Notices of efforts to organize competing telephone companies in the major cities of the East were not uncommon. The Mercantile Electric Co. announced plans to establish a telephone exchange for bankers and brokers in downtown New York city. The New York and Eastern Telephone Co. applied for franchises in Brooklyn and New York.[7] The Drawbaugh Telephone and Telegraph Company, the Mutual Automatic Telephone Company and the Clamond Telephone Co. all took steps to establish themselves in Philadelphia. Between 1893 and 1898 four companies were organized to gain a competing franchise in Chicago.

Most of these attempts to occupy the major metropolitan areas immediately never got off the ground. A variety of snares and pitfalls awaited those who ventured into Bell's urban strongholds. The political manuevering required to obtain a franchise in a major city was complicated and expensive.[8] Heavy capital investment was required to match the facilities of the Bell system. In New York and Boston, where Bell had lavished most of its corporate attention, service was reasonably good. If there were complaints about the telephone company, they were limited to the high price of service. Under these circumstances the incumbent could easily stifle the demand for a new company by making rate concessions. The introduction of measured service in New York city in 1894 decreased the charges for most users, making telephone service available to small users for as little as $8 a month. The result was a huge increase in the number of subscribers.[9]

When the first wave of independents did manage to establish a presence in a major city they were usually ill-prepared to handle the complex financial and management practices and rate structures required of a large exchange. Both of the independent exchanges started in 1894 in cities with populations greater than 50,000 failed within five years. The Home Telephone Company of Baltimore, organized in 1896, offered rates less than half those of Bell but became insolvent after three years.[10] It was sold to a new company which had to rebuild the plant and raise rates by 57 percent.

2. The Rural areas.

Independent telephony is often associated with the small mutual companies and farmer lines that brought the telephone to rural America during the early 1900s. Although both movements were predicated on the expiration of the Bell patents and their interests often converged, their identities should not be confused. Commercial and rural independents were two distinct social phenomena. Each had its own pattern of development and its own agenda. The commercial independents were engaged in business competition; although there was an ideological component to the rivalry that transcended economic considerations, they strove to make their systems profitable and to beat the Bell system at its own game. The cooperative rural systems, on the other hand, were organized to bring the telephone into areas that had been deprived of it and did not consider themselves rivals of Bell. The commercial independents preceded the rural movement by about five years. According to the 1902 Census of telephones and telegraphs, 774 of the new telephone systems that began operation from 1893 to

1897 were commercial independents, while only 84 were mutual companies.[11] After 1900, in contrast, new mutual systems sprang up at the rate of 200-300 per year. Most of the 100,000 or so independent telephones in operation by the end of 1897 were in small towns and cities, not in the rural areas per se.[12]

3. The Excluded Middle.

The real base of the organized independent movement fell somewhere between the extremes of rural and urban. The most successful independents concentrated on building exchanges in small towns where there were no Bell exchanges, then tied them together with short-haul toll lines. Or, they built exchanges in mid-sized cities and connected them with independent systems in the surrounding farms and small towns. The cities on which the latter kind of independent activity centered usually already had a Bell exchange. The independent, however, bolstered its ability to compete with Bell's local exchange service by supplying superior telephone access to the surrounding areas.

There was also a distinct geographic pattern to the first wave of independents. They were concentrated in what the Census Bureau labelled the North Central part of the U.S., which included the states of Ohio, Indiana, Michigan, Illinois, Wisconsin, Iowa, Nebraska, Kansas, Minnesota, North Dakota and South Dakota. Of the 740 commercial independent systems that were started between 1894 and 1897 and survived until 1902, 424 were concentrated in these states.[13] This was 57 percent of all independent systems, and probably accounted for 65 to 70 percent of all independent telephones.[14] By way of contrast, only six independent systems were started in the states of Massachusetts, Connecticut and Rhode

Island. In the three New England states dominated by Bell, 90 percent of the population lived in cities; in the North Central states dominated by the independents, only 30 to 50 percent of the population lived in cities.

The territories and niches occupied by the newcomers faithfully reflected the gaps in Bell system coverage. Bell was rooted in the urbanized, eastern states and had concentrated on supplying intercity long distance communications of a scope comparable to the telegraph system. Its network had started in New England and gradually spread south and west. When the patents expired, AT&T lines were just beginning to extend into Missouri, Michigan, Kentucky and the South. The independents, in contrast, took hold in the cities and towns of the rural, midwestern states on the periphery of the Bell lines and concentrated on developing short distance communication between the cities and the country. While Bell was making it possible for New York to talk to Chicago and for Boston to talk to Philadelphia and Pittsburgh, the independents were making it possible for Massillon, Ohio to talk to the surrounding towns of Dalton, Beach Grove, Canal Fulton and Navarre. Bell had even neglected connections between large cities and their own suburbs and tributaries.[15]

Believing that exchanges in less populous communities could not support themselves, Bell usually just ran circuits out from a larger city and cut in one public station in each small town along the way. Such perfunctory service made telephone communication less than convenient. Users in these locations had to leave their office and go to the public station; and while they could place calls to other cities on the Bell network, it was not possible for

people in other cities to call them. Worse, a single circuit serving public stations in five to ten towns was technically the equivalent of a gigantic party line. A call in any one of the towns tied up the line for all of the towns along the circuit. Anyone talking on the line had to contend with constant interruptions from people in other towns who picked up the phone and tried to signal the central office.[16]

When the independents established exchanges in towns where Bell had only a public station, Bell learned quickly that it had vastly underestimated the demand for and profitability of short-distance toll service. It discovered, too, the demand interdependence of exchange and toll service. The primary value of a telephone in small towns was the link it provided to nearby towns and cities. Once they were connected to neighboring centers with toll lines of adequate capacity, exchanges that were not profitable in and of themselves often generated enough toll business to support themselves. The presence of exchanges stimulated intercity traffic by making the termination and origination of toll calls more convenient.[17]

There were plenty of examples around for Bell to draw lessons from. In West Virginia, new companies started exchanges in the rapidly growing towns of Grafton, Fairmont, Morgantown and Clarksburg in 1895.[18] Although Bell exchanges had just been started in all of those locales, the independents were able to attract subscribers, according to the Bell manager, "by reason of the great extension of toll lines." The towns were situated in a 30 square mile area, each one being about 10 to 15 miles apart. "We cannot afford to cover that territory with toll lines of the

character of construction which we have adopted as a standard," the manager wrote. He concluded: "I must confess to a feeling of discouragement, and am at a loss to determine what we can do...to break down the opposition in our territory."[19] The much-vaunted superiority of the Bell long distance system was of little help here. What was needed most, from the point of view of the average telephone subscriber, were local and regional connections to the places with which he had regular commerce.

That this kind of development had the capacity to make serious inroads into Bell's business had become obvious by the end of 1896. Companies such as The Western Electric Telephone Company of Britt, Iowa, the Western Illinois Telephone Co., and The Farmer's Telephone Co. of Massillon, Ohio constructed extensive networks of grounded iron toll lines connecting rural subscribers to city and town exchanges. The Farmer's Company used its control of access to rural telephone users in Stark County to establish a successful exchange in Massillon (pop. 12,000), the county's second largest city.[20] The Home Telephone Company of Ft. Wayne, Indiana was connected with over 50 towns by the middle of 1896.[21]

Independent concentration on intensive regional exchange and toll development was particularly powerful when it took place within 150 miles of a major metropolitan area occupied by Bell. The increasingly prominent independent presence in the areas leading into the city would later (1898-1902) provide the independent promoters with the leverage needed to open up the city to a competing exchange. The ability to supply termination in the hub cities in turn increased the value of the exchange properties in other parts of the state. It was the Bell strategy in

reverse--a case of the periphery advancing on the center. As an independent spokesman put it, where Bell had worked from the top down, the independents developed from the bottom up.[22] In contrast to the early independent attempts to wire the cities, large urban exchanges that were the culmination of four or five years of prior development in the country and small cities generally turned out to be the financially strongest and longest lasting. Buffalo, St. Louis, Indianapolis, Kansas City, Louisville and Minneapolis-St.Paul all followed this pattern. A competing exchange was not established in Buffalo until 1901, but by mid-1896 the Electrical Review reported that all of the principal towns surrounding that city were connected by independent systems.[23] Kansas City did not admit an independent exchange until 1902, but by 1897 independents were thriving in Leavenworth, Topeka, and Ft. Scott, Kansas, and St. Joseph, Carthage, Webb City, Joplin, and Nevada, Missouri, and many other smaller towns within 150 miles for whom Kansas City served as the regional center.

The State of Michigan affords an example of independent development compressed into an unusually short period of time. By 1895, competing exchanges had been established in 13 of the state's 39 mid-sized cities (pop. 5-20,000). Fueled by lower rates, better rural connections and public hostility to Bell, these exchanges met with quick success in attracting subscribers. In Cadillac (pop. 5,000), Bell held on to only 15 subscribers, compared to the independent's 120. In Ispheming, Bell had 100 subscribers at the end of 1897, the independent 400.

Encouraged by the success of smaller cities, independent

entrepreneurs organized new companies to serve the state's two largest cities, Grand Rapids and Detroit. The Citizens Co. of Grand Rapids grew from 400 subscribers at its opening in mid 1896 to 2,300 by the end of 1897, surpassing the number of Bell subscribers by 1,000. The path to a Detroit franchise had been paved by a reform mayor, who declared that since telephone service cost $25/year in Canada and $65/year in Detroit, he would drive rates down or drive the telephone company out of the city.[24] The Detroit Telephone Co., which began operating in December 1896, had little trouble attracting 5,000 customers, offering as it did rates half the size of the Bell company's. Eighty percent of the independent's initial subscribers were said to be refugees from the Bell exchange.[25]

Then, early in 1897, the New State Telephone Co. was organized to "spread low-rate telephone service to all parts of the state," beginning with the towns surrounding Detroit.[26] Both the New State Co. and the Citizens Co. eventually assumed the role of a long distance company, connecting their dispersed exchange holdings in the state with high-grade, metallic circuits. By 1898, New State Co. lines connected Port Huron, Grand Rapids, Lansing, Grand Ledge, and Lake Odessa.[27]

Bell responded to this flood of competition by suing the Citizens Co. and the Detroit Co. for infringing patented telephone and switchboard apparatus.[28] When the lawsuits failed to intimidate the newcomers, it initiated price wars in Muskegon, Grand Rapids and Detroit. Business and residential subscription rates and toll usage charges were cut in half, to match or even undercut the rates of the competition. These costly moves,

however, failed to put much of a dent in independent subscriber growth. Independent subscribers remained loyal to the local company even when they could secure service from Bell for less. In many cases Bell was reduced to giving away service for free in order to prevent subscribers from deserting its system. The Detroit exchange failed by 1900, but the Grand Rapids-based Citizens Company dominated its section of the state until its merger with the Bell system in 1916.

4. The refusal to connect.

From the perspective of the 1980s the most striking feature of the telephone war was the absence of interconnection between the Bell system and the independents. The Bell organization had always intended to maintain absolute control over its own system, and thus resisted any attempts to make it cooperate with outsiders. The independents, too, soon came to see themselves as a mutually exclusive enterprise, a nationwide movement bent on displacing the Bell monopoly rather than coexisting with it. The two interests thus conducted their rivalry as separate, closed systems, with the subscribers of one unable to place calls to the subscribers of the other. In Chapter 3, this form of competition was labelled "access competition" in order to distinguish it from price competition. Access competition consists of rivalry over the scope of a network. This kind of rivalry gave the Bell-independent contest a special dynamic. Every subscriber who joined the independent exchange was lost to Bell subscribers, and vice versa; every location that was reached by Bell but not by the independents (or vice-versa) gave the former a special kind of leverage over telephone users who

needed to call that location. The overall effect was to encourage both systems to duplicate or surpass the other's access universe.

The decisions that fomented access competition were made in the first three years after the expiration of the patents. The newly arrived independents were just beginning to organize themselves and settle on the best approach to relations with Bell. The eruption of access competition was the cumulative product of three factors: the business policy of the Bell system, the prevailing interpretation of common carrier law, and eventually, a consensus among the independents that interconnection was not a desireable goal. Matters came to a head in March of 1896, when three separate lawsuits pertaining to interconnection consumed the attention of the national Bell management. By 1897, the course of telephone rivalry was set for the next fifteen years. Although legislative efforts to interconnect the opposing interests persisted, without support from either Bell or the independents they could make little headway.

From 1893 to 1897, many independent exchange operators requested physical connections with Bell toll lines so that their subscribers could speak to telephone users in other cities.[29] The early demands for interconnection took two distinct forms. First, there were formal requests for the installation of a trunk line connection between Bell and independent exchanges. The independent might propose to extend a line into a Bell exchange at its own expense, and offer to pay a toll or some division of toll revenue for each incoming or outgoing call.[30] In other cases, a competing independent exchange would simply subscribe to the Bell exchange and install the telephone in its own central office.[31] Then it

would either orally relay messages between independent and Bell subscribers or, what was more significant and dangerous from Bell's point of view, physically connect the subscriber line into its own switchboard.

In the first case, the demand was for a joint operating agreement that would enable Bell and the independent to exchange traffic at prescribed rates. The second tactic effectively erased the boundaries between the Bell and independent exchanges, allowing the independent to offer access to Bell subscribers without paying anything more than the regular subscription price.

A typical request for trunk line interconnection was made in Mt. Sterling, Kentucky, a small town about thirty miles from Lexington, late in 1894. The manager of the independent exchange there wrote a cordial letter to the manager of the Bell licensee in that area proposing to build a line to the nearest Bell exchange so that his subscribers would be able to call Lexington over Bell toll lines. If necessary, he would build his own toll line to Lexington, but he preferred that the Bell Company "run a line right into our central office, and let us transmit your business for you and increase your business here."[32]

When the operating companies referred these requests to the national organization, they were invariably informed that licensee companies were not permitted to connect with "opposition" companies, nor could they permit opposition companies to forward messages over their lines.[33] This blunt dismissal was both predictable and logical. While joint operating agreements with the independents might have been mutually beneficial in isolated instances, their overall effect would have been to completely

unravel Vail's plan of organization. In effect, interconnection would have made independent companies part of the Bell system without their having to sign a license contract. Thus, Bell would have been helping to build up telephone companies over which it had no financial, managerial or technical control. Independent connecting companies could not be required to buy Western Electric equipment; nothing could guarantee that they would route their toll traffic over Bell lines; nothing could prevent them from later building their own, competing toll lines or competing exchanges. Later on, the task of technically integrating and organizing long distance connections would have been greatly complicated. American Bell saw the license contract as the only way to maintain an integrated system under its control--and integration was also the bulwark of its strategy to control the telephone business itself. Now that the patents had expired, interconnection was the only way to induce operating companies to become Bell licensees. Bell management really had no choice but to resist these early, casual attempts to integrate its operations with independent companies. To do otherwise would have corroded the foundations on which its whole organization was based.

The Kentucky case, moreover, demonstrates clearly the economic consequences of the two approaches to interconnection. Had the independent been allowed to interconnect, it would have had no need to build an additional line to Lexington. With interconnection denied, the opposition companies had to build their own facilities in order to match the scope of telephone access available through Bell. Refusal to interconnect was "anti-competitive" only in the sense that it prevented new companies from starting out on a level

playing field. In a far more meaningful sense, however, it was the refusal to connect that encouraged robust competition, because it impelled Bell's rivals to set up lines and exchanges that duplicated and competed for subscribers and traffic with Bell's own.

When it became clear that overtures for voluntary interconnection would be spurned, some independents turned to the courts and the legislatures. The telephone was already regarded as a common carrier cast in the same general mold as the telegraph and railroad companies. The law regarding the relations between competing telephone companies was still unclear, however. The technical characteristics of the business differed enough to make the application of statutes and case law based on railroad and telegraph precedents less than obvious. It was true, for example, that state laws required telegraph companies to accept and deliver messages brought to them by other telegraph companies.[34] Early telephone interconnection bills in Michigan (1893), Ohio (1895), Indiana (1895), Illinois (1897) and Wisconsin (1897) seemed to have been drafted with these precedents in mind.[35] But the transfer of telegraph messages did not necessitate physically linking and jointly operating the competing companies' wires. All it required was a willingness to accept a hard copy message from one company for transmission at the second company's convenience. Telephonic communication, on the other hand, involved a real-time link between two parties, and thus would have necessitated integrating the facilities and operations of rival companies.

Some proponents of interconnection sought to base their claims on the common carrier status of railroad, telegraph and telephone

companies. Common carriers were required to serve all members of the public without discrimination. If the concept of the nondiscrimination could be stretched to include service to competing companies, it could form the legal rationale for interconnection. Rivalry between separate systems had existed for some time in both the telegraph and railroad industries, however, and the courts had drawn a fairly sharp distinction between nondiscriminatory service to the general public, an obligation which was clearly imposed by the law, and contracts with connecting companies, where special arrangements favoring one company over another were considered normal prerogatives of business management.[36] Compulsory connections that allowed one company's facilities to be occupied or used for the commercial benefit of a rival company were considered an unconstitutional "taking" of private property prohibited by the Fifth Amendment.[37] Still, the Bell Company had no guarantees as to how the law would be interpreted in this case.

The first legal challenge came from a financially shaky independent exchange in Waukesha, Wisconsin. The National Telephone Construction Co. had attracted about 75 subscribers in Waukesha.[38] In the Fall of 1895, the Wisconsin Telephone Company discovered that the independent, which subscribed to Bell's long distance service, had linked the Bell line to its switchboard so as to allow its exchange subscribers to be patched into the Bell toll network.[39] When Wisconsin Telephone threatened to remove its phone and discontinue service, the National Co. filed suit and succeeded in obtaining an injunction. "This will evidently be a test case," a Wisconsin Telephone official wrote to American Bell,

"and will have great weight in similar proceedings which must arise elsewhere."[40]

While the Waukesha case was pending, the Norwalk Telephone Company, an independent exchange competing with the Bell company in Norwalk, an Ohio town of 7,000, submitted a notice to the Central Union Company requesting permission to build a trunk line connecting its telephone exchange with the Central Union's. The letter was "carefully and formally drafted, with legal skill for its purpose," Central Union's lawyer observed. "It is of value in showing on what lines the attack on us in Ohio may be expected to come."[41] News that this gauntlet had been thrown down soon reached President Hudson in Boston, who went about securing the best legal assistance available.[42]

Simultaneous to the Norwalk case, an independent exchange in Madison, Wisconsin sued the Western Union telegraph company in an attempt to compel it to place one of its telephones in the Madison telegraph office.[43] Wisconsin Telephone already had a telephone in the Western Union office, allowing it to call in messages to be sent over telegraph lines. The cooperative arrangement between Bell and Western Union was a product of the 1879 patent settlement. Because telegraphy was still a far more prominent mode of communication than the telephone at this time, the Madison independent's inability to place calls to the Western Union office limited its value to potential subscribers. Twice the independent company asked Western Union to allow it to put one of its phones in the office at no charge to Western Union. Both times it was ignored. Charging discrimination and injury, it filed suit in the State Circuit court February 20, 1896.

It was already well established in law that telephone companies were required to supply service to all telegraph companies who requested it. The Madison case, however, inverted this doctrine, demanding in effect that telegraph companies be required to accept telephone service without discrimination. The AT&T counsel working on the Norwalk, Ohio case recognized that the principle at stake was closely related to the right to compel physical connection of telephone companies:

> The telegraph company is threatened with the establishment of a rule of law which might enable not only telephone companies, but also district messenger companies, and other similar companies, to compel the furnishing of facilities for delivering messages to a telegraph company on the premises of the latter, different from those allowed to the general public; and, going further, might enable other telegraph companies to compel a rival telegraph company to at least allow [their] wires...to be carried into the office of the defendant company, so that messages could be there repeated and forwarded; and the next step, of course, is to compel actual physical connection of the lines of the two companies.[44]

American Bell was not optimistic about the outcome of the Wisconsin cases. In 1882 the Wisconsin legislature had passed a law requiring telephone companies to "receive and transmit without discrimination messages from and for any other company...upon tender or payment of the usual or customary charges therefor."[45] This was a straightforward application of telegraph precedents to the telephone system. An unfavorable decision might lead other states to pass similar laws. Bell looked for a way to avoid taking the case to its conclusion. It uncovered rumours that the Waukesha independent was eager to sell out, and began to make overtures to its management.[46] When the interconnection issue threatened to

erupt into litigation in Wausau, another Wisconsin town, Bell offered to put its own long distance instruments into the offices of independent long distance users for free in order to preempt the demand for linking the two systems.[47]

Attempts to avoid the issue notwithstanding, Bell's lawyers prepared a strong legal defense against compulsory interconnection. They asserted, first, that its status as a common carrier required it to serve the general public without discrimination, but not other telephone companies.[48] This reasoning had been upheld by the courts before. In Postal Telegraph Cable Co. v. Hudson River Telephone Co., 467 Supreme Court (1887), the Judge's opinion held:

> Now while the rule is well settled that a common carrier must serve its public impartially, still it must be borne in mind that its duty is to the public, and not to other and competing common carriers. One common carrier cannot demand as a right that it be permitted to use a rival common carrier's property for the benefit of its own business.

This defense, however, relied on the interpretation of statute law and thus could be superseded by new legislation. A more fundamental argument was that the requirement to connect with a rival company was an unconstitutional "taking" of private property. This argument had two separate nuances. Connection involved physically entering the premises of the company, attaching wires to its switchboard, and engaging its workforce in the operations required to connect subscribers. Such intrusions seemed an invasion of one company's property rights by another. But there was another element to the argument more directly related to the unique circumstances of the telephone business. The telephone

company, its lawyers asserted, had expended large sums of money and energy on the construction of a telephone system linking subscribers all over the state. Its competitors had built only small, local exchanges. If the two exchanges were interconnected, the small exchange would be able to profit from the sale of widespread access without running the risks or assuming the burdens of building a large-scale system. To allow a competitor to benefit from the involuntary use of these facilities was nothing more than the expropriation of its property. In this argument, the "property" at issue was not so much the physical facilities of the telephone company, but the access to subscribers it had created by constructing those facilities.

In the middle of 1896, this view of the interconnection issue scored some important victories. In Waukesha, Bell mooted the issue by buying out its competitor. In the Madison lawsuit, the case for compelling the telegraph company to accept service from an independent telephone company was rejected. Relying on the precedent of the Express cases, the Judge ruled that a common carrier who makes special cooperative business arrangements with another company need not extend the same arrangement indiscriminately to all other companies. The principle of nondiscrimination applied to consumers only, not to business rivals.[49] The same reasoning was used two years later in a case involving telephone interconnection in New York State.[50]

In Norwalk, the independents themselves suspended the litigation--not because they feared losing, but because they feared they might win. According to an intelligence report gathered by F.R. Colvin, a Bell agent working under cover in the independent

ranks,[51] most independent exchange operators in Ohio opposed compulsory interconnection. The Norwalk case was the first item of business when the Ohio Independent Association met in March of 1896. The Ohio meeting was also attended by a delegation from Indiana. According to Colvin's sources, "every delegate at the meeting rose one after the other and roasted Mr. Graham [the Norwalk Co. representative] alive for commencing the litigation."[52] Already, the Ohio independents had exchanges in seventy five small towns. (Bell, in contrast, had only 31 exchanges in Ohio towns with populations under 10,000.) Most of the towns with non-Bell exchanges were connected, or were in the process of being connected, with independent toll lines. If the Norwalk Co. won its case, they feared, the Bell Company would be able to demand and get access to these lines. This would increase the scope of Bell's access in the state and undermine the incentive for telephone users to subscribe to an independent exchange. According to Colvin, "the whole convention to a man then entreated Graham to have Judge Wickham withdraw the suit."[53] After some soul-searching, Graham returned to Norwalk and became a dues-paying member of the state independent association. The Ohio independents pursued a strategy of building exchanges and toll lines in areas not served by the Central Union Company.[54] Nothing more was heard of the Norwalk Company's lawsuit.

Proposals to interconnect Bell and independent telephone exchanges continued to surface sporadically in various states throughout the 1890s and early 1900s. They failed because the weight of legal precedent was against them and because of the political opposition of the Bell and independent interests. From

the skirmishes of 1894-96 a common doctrine regarding the effects of connecting competing telephone companies had emerged. Its essential tenets were accepted by both the Bell companies and by most of the organized independent movement, and were bolstered by the U.S. Supreme Court's interpretation of the Fifth Amendment.

The basis of this doctrine was a distinct way of applying the concept of property rights to the telephone business. The telephone companies were asserting ownership over the relations of access created by their toll lines and exchanges. For both Bell and independent, "competition" meant separate systems supplying different subscriber universes, each vying with the other to attract customers. The subscriber universe itself was their most important product, the valuable resource they offered to sell to the public. Competition was a matter of making that resource better than one's rival's, which in this case meant more universal. Interconnection destroyed that form of rivalry by eliminating the differences in their access universes. It thoroughly undermined the competitive advantage to be gained by attracting new subscribers, building competing exchanges and constructing toll lines. J.W. Gleed of Bell's Missouri and Kansas Co., speaking against a physical connection law proposed to the Missouri legislature in 1907, put it this way:

> My opponent has built up a telephone system of 1,001 subscribers. I have an exchange in which each subscriber has access to 6,000 other persons. Now assume this [physical connection law] to have taken effect. Where before my competitor owned an exchange which gave each of his subscribers access to 1,000 persons only, now my competitor owns an exchange in which each subscriber has access to 7,000 persons. What I may call the 'access

> value' of my competitor's exchange has simply been multiplied by seven...without a penny of expense or a particle of increase in his rate.[55]

The Ohio independents' reaction to the Norwalk case makes it clear that they too conceived of telephone competition in these terms. Their plan was to control telephone connections to towns neglected by Bell, and eventually to attract subscribers away from Bell in other areas through its control of these connections. Even the independents who supported compulsory interconnection comprehended the issue in the same terms. Bell, they reasoned, was politically unpopular. It won subscribers because its lines reached places and subscribers that the independents' didn't. If telephone subscribers did not have to choose between two mutually exclusive subscriber universes, one controlled by Bell and the other controlled by the independents, but could instead obtain access to Bell toll lines and subscribers while subscribing to an independent exchange, Bell would lose most of its customers. One independent spokesman predicted that with interconnection, "we can obtain at once every one of their exchange subscribers."[56] American Bell felt the same way about its toll network linking exchanges in the larger cities. Giving independents access to its extensive toll network would eliminate its leverage over the subscription decisions of telephone users in the local exchange.

As a commodity around which property boundaries could be drawn, however, access had an unusual feature. When independent companies subscribed to a Bell exchange and then connected the Bell line into their own switchboard, they acquired the ability to sell access to Bell subscribers. Technically, there was no distinction

between Bell's sale of access to a normal customer of the exchange and the sale of exchange access to a competing telephone company, which could then profit from the resale of the subscriber set Bell had created. In order to maintain system boundaries, a legally enforceable distinction between these two classes of users had to be drawn. From a property rights standpoint, the situation was analogous to copyright and patent protection. Patent and copyright laws allow the creators of new information to sell access to it without losing their proprietary control of it. In prohibiting unauthorized reproduction of copyrighted material or unlicensed use of patented inventions, intellectual property law distinguishes between buyers who benefit from the use of the information itself, and those who use the access to information created by the initial sale to profit from its resale.

Both sides' unwillingness to interconnect stemmed in part from their recognition of this unique economic characteristic of telephone access. Merging the subscriber universes of competing telephone companies via interconnection, in their view, undermined their control of the basic resource on which their business was founded: communications access.

To the Bell interests, interconnection would encourage "all sorts of small, parasitic companies [to] spring up to sap the revenues of large companies already established."[57] The independent opponents of interconnection emphasized not parasitism by small companies, but interconnection's deleterious effects on their own attempts to construct an alternative system. If Bell subscribers could obtain access to independent exchanges through Bell toll lines, who would invest in and who would subscribe to an

independent long distance system? If a large city occupied by a Bell exchange was enabled to gain access to the surrounding towns dominated by the independents, why would the city franchise a competing exchange? By the end of 1897, most of the organized independent operators were willing to take up the gauntlet thrown down by Bell's refusal to connect with them. They confidently looked upon the thousands of small communities lacking Bell exchanges and the hundreds of new independent exchanges springing up in them. In the two hundred cities with dual service, they saw independent exchanges undercharging Bell companies and attracting as many subscribers in six months as the Bell exchange had gathered in the previous seventeen years. They knew they were up against a powerful foe; their public pronouncements and trade publications exhibit that blend of strident defiance and paranoia typical of an underdog unsure of its success. By embracing access competition as their modus operandi, however, the independents signalled their willingness to make it an all-or-nothing battle.

NOTES TO CHAPTER 5

[1] Electrical Review 24:6 February 7, 1894.

[2] Electrical Review 25:10 September 5, 1894. The patent expiration revived the Pan Electric Company and the Drawbaugh Company.

[3] Bell sued independent companies that attempted to use the so-called "Multiple" switchboard, a circuit arrangement that allowed a single operator to make connections with all the subscribers in the exchange, and the telephone switchhook, which automatically signalled the central office when the subscriber picked up the phone. For an example of patent litigation on issues other than Berliner, see Electrical Review 33:5 (August 3, 1898), p. 71.

[4] Electrical World 23:1 p. 1, January 6, 1894.

[5] Electrical Review 30:19 May 12, 1897.

[6] U.S. Bureau of the Census. Electrical Industries Census, 1902. Table 10, p. 9. This estimate is conservative because the BOC data only counted companies that were started between 1893 and 1897 and were still in existence in 1902.

[7] Electrical Review 24:15 (april 11 1894) p. 175.

[8] In Philadelphia, the franchising of the Mutual Automatic Telephone Company was quashed when politicians were accused of exchanging their influence for stock in the company. Electrical World 29:8 (August 19, 1894). In Brooklyn, the city council franchised an independent company three times only to have it vetoed by the mayor each time.

[9] The number of subscribers in New York city more than doubled, going from 9,000 to 21,000, in the four years following the introduction of measured service. A residential user paid $8 to $10/month and 15 cents for the first 600 calls. Exchange Statistics.

[10] Electrical Review 34:2 (January 11, 1899) p. 26.

[11] BOC. Electrical Industries Census, 1902. Tables 10 & 11, p. 9-10.

[12] Claude Fischer estimates that only 3 percent of the total telephones in the U.S. were rural in 1900. "The Revolution in Rural Telephony," Journal of Social History Fall 1987.

[13] BOC Electrical Industries Census, 1902.

[14] The 65-70 percent estimate is derived from the 1907 Telephone Census of 1907, which showed that independent companies in the North Central states accounted for 65 percent of all independent telephones.

[15] In one of many such reports circa 1898-1900, Thomas Doolittle described how the independents had capitalized on congestion and underdevelopment of Bell toll facilities around Philadelphia. "Report on Toll Matters." September 11, 1899. Box 1330, AT&T-BLA.

[16] Doolittle criticized the "disposition to introduce public stations on circuits which should be clear for through business," as well as the practice of allowing small exchanges situated between two major toll centers to cut in on through circuits. Doolittle to Hudson, June 27, 1899. Box 1330, AT&T-BLA.

[17] See Chapter 6.

[18] The population of Grafton, Fairmont, Clarksburg and Morgantown in 1900 was 5,650, 5,655, 4,050 and 1,895, respectively. By 1910 they had all grown substantially: to 7,563, 9,711, 9,201 and 9,150.

[19] J.King Goodrich to C.J. French, August 26, 1896.

[20] Electrical Review 24:24 (June 13, 1894) p. 293.

[21] Electrical Review 26:3 (July 15, 1896) p. 35.

[22] MacMeal The Story of Independent Telephony (1934) p. 26.

[23] Electrical Review 29:3 (July 15, 1896) p. 36.

[24] Electrical Review 25:10 (September 5, 1894) p. 118.

[25] Electrical Review 29:11 (September 9, 1896) p. 123.

[26] Electrical Review 30:8 (February 24, 1897) p.87.

[27] Electrical Review 31:6 (August 8, 1897) p. 64; 31:12 (September 22, 1897) p. 146.

[28] Electrical Review 29:1 (July 1, 1896); 32:26 (June 29, 1898) p. 429.

[29] "We are frequently asked by parties who have organized opposition companies...what arrangements they could make to connect with our toll lines." O.E. Noel, President and General Manager, East Tennessee Telephone Co., to C. Jay French, General Manager, ABT Co., December 10, 1894. Box 1066, AT&T-BLA.

[30] The Mt. Sterling independent operator offered to let Bell build a line into his exchange and pay a small toll for the use of the line by his subscribers. Letter reproduced in Noel to French, note [29] above.

[31] See, for example, C.A. Nicholson, General Manager, Central New York Telephone Co., to C. Jay French, ABT Co., April 6, 1898: "Application is made to us by the opposition at Baldwinsville and Oneida for exchange connection, telephones to be placed in the Central Offices of the opposition companies at these points....Under [the Bell] Exchange Contract can we discriminate against their customers forwarding messages to points on our trunk lines?" Box 1166, AT&T-BLA.

[32] Noel to French, op cit note [29].

[33] C. Jay French to O.E. Noel, "Business in connection with opposition enterprises," undated draft, Box 1066, AT&T-BLA.

[34] A typical nondiscrimination statute, Section 103 of the New York state Transportation Corporations Law read: "Every such [telephone] corporation shall receive dispatches from and for other...telephone lines or corporations...and on payment of the usual charges by individuals for transmitting dispatches as established by the rules and regulations of such corporation transmit the same." The use of the terms "dispatches" or "messages" in these laws shows the extent to which the telephone business was viewed as an extension of the telegraph business. In reality, telephone companies were in the business of providing circuits for real-time voice communication rather than discrete "messages."

[35] All of the physical connection bills listed in the text did not pass.

[36] The Express cases, 117 U.S. 601 (1886), involved railway express services which contracted with railroad companies for through service. In an attempt to obtain what might today be called "equal access" to railroad facilities, various express companies sued the railroads and the cases were tried together. In denying the express companies' attempt to compel the railroads to give them through-line facilities, Chief Justice Waite distinguished between being a common carrier and being a "common carrier of common carriers." "The constitution and the laws of the states in which the [rail]roads are situated place the companies that own and operate them on the footing of common carriers, but there is nothing which in positive terms requires a railroad company to carry all express companies in the way that under some circumstances they may be able, without inconvenience, to carry one company."

[37] In Postal Telegraph Cable Co. v. Hudson River Telephone Co., 467 Supreme Court [1887), the opinion holds that nondiscrimination "does not authorize [the plaintiff] to transmit

its own messages over defendant's wires, on payment of the merely nominal sum required of its ordinary subscribers. Such a rule would result unjustly to the defendant, as it would enable the [plaintiff] to enter into competition with the defendant in the transmission of messages over its own wires."

[38] The telephones of the Waukesha independent were reputed to be of poor quality and its service unreliable. W.A. Jackson, Wisconsin Telephone Co., to John Hudson, President, ABT Co., November 13, 1895. Box 1298, AT&T-BLA.

[39] Miller, Noyes, Miller & Wahl to ABT Co., November 12, 1895, Box 1298, AT&T-BLA.

[40] W.A. Jackson to C.J. French, October 7, 1895, Box 1298, AT&T-BLA.

[41] A.A. Thomas, Solicitor, to H.B. Stone, President, Central Union Telephone Co., January 2, 1896. Box 1298, AT&T-BLA.

[42] Melville Egleston, AT&T Legal Department, to John E. Hudson, President, ABT Co., March 16, 1896. Egleston took charge of the litigation and on his recommendation Bell retained the Cleveland law firm of Squire, Sanders & Dempsey. AT&T-BLA, Box 1298.

[43] Dane County Telephone Co. v. Western Union Telegraph Co., State of Wisconsin, Circuit Court of Dane County. Petition of the plaintiff, Box 1298, AT&T-BLA.

[44] Egleston to Hudson, March 9, 1896. Box 1298, AT&T-BLA.

[45] 1882 Law of Wisconsin, Chapter 196. Cited in Gabel, 1987, p. 341.

[46] Fuller to Hudson, November 16, 1895. AT&T-BLA, Box 1298.

[47] Fuller to Hudson, November 30, 1895. AT&T-BLA, Box 1298.

[48] "[The Bell Company] only undertakes to do business on its own lines and through its own instruments. It does not offer to connect generally with other companies. It does not undertake business of that character, and a common carrier is only bound to do the kind of business it holds itself out to the public as doing." Legal memorandum, Miller, Noyes, Miller & Wahl, November 12, 1895, p.5. AT&T-BLA, Box 1298.

[49] Opinion of Judge Siebecker, Dane County Telephone Co. v. Western Union Telegraph Co. (undated--decision made March 18, 1896), AT&T-BLA, Box 1298.

[50] The Judge held that a reasonable construction of the common carrier statute in New York did not require one telephone system to supply connections with its system to another company

enabling the latter to utilize the connected system as part of its own on payment of the nominal sum required of ordinary subscribers. Syracuse Standard, July 2, 1898. Box 1166, AT&T-BLA. [51] F.R. Colvin to President Hudson, April 8, 1896. Box 1298, AT&T-BLA.

[52] Ibid.

[53] Ibid.

[54] The Secretary of the Ohio Association wrote a letter to every independent exchange "particularly touching the necessity of hurrying the construction of toll lines connecting towns so small as not to be reached by the Central Union Co." Colvin, Ibid, p.8.

[55] J.W. Gleed, Missouri and Kansas Telephone Company, "Argument Against the Proposed Law Compelling the Physical Connection of Telephone Systems," 22 pp., printed, submitted to the Missouri Legislature 1907. AT&T-BLA.

[56] Gabel, 1987, p.346.

[57] J.W. Gleed, "Argument Against..." 1907, note [55].

Chapter 6

The Independent Tide: 1898 - 1906

> "There is no longer such a thing in this country as a telephone monopoly. There are now two large telephone interests. One, a mere bantling scarcely more than four years old, which has not yet fully come to a realization of its own strength and importance. The other an elderly, sedate and somewhat reflective sort of monopoly, making what may or may not be an honest effort to atone for the numerous indiscretions of its past."[1]

Competition between Bell and the independents took a variety of forms. They competed for investment capital and for the political support needed to get franchises. They fought a public relations battle. They tried to offer more attractive rates and more efficient service to subscribers. The primary concern of this study, however, is the peculiar kind of competition set in motion by their refusal to connect with each other. Although price competition was often foremost in the minds of contemporaries, it was access competition that established the distinctive economic, political and social parameters of the process and had the most far-reaching effects. One cannot understand the business strategies adopted by the two interests, the rate policies and practices that were adopted, the reasons for the growth and eventual decline of competition, or the problems that ultimately

had to be addressed by regulators without reference to the fact that two mutually exclusive networks were at war with each other.

During the first four years of the rivalry dual service had gained an unbreakable grip on the towns of the less urbanized states. Independent exchanges had the financial backing, patronage and sympathy of many local citizens, and often controlled access to a larger number of telephone users in a county. Bell exchanges attracted business users with more geographically dispersed calling patterns. Thus Bell and independent exchanges, even when they overlapped and competed, were offering quite different products. Their ability to win subscribers away from each other was limited by this factor. Sometimes the independent was acknowledged to offer superior service, facilities and rates, yet Bell held on to a core of subscribers because it and it alone offered connections to certain desireable locations. At other times the independent service was poorly maintained and operated, yet was still patronized for its links to local farmers and businessmen, many of whom were stockholders in the independent system. This disparity encouraged the two networks to duplicate each other. Substitution of one network for the other was possible only when both had access to the same places. Starting from its foothold in the middle, then, access competition pushed dual service upward into some of the nation's largest cities, and outward to the rural extremities. Table 6.1 shows the growth of dual service between 1898 and 1906.

The independents did not suffer much from their lack of connections to the Bell system--not yet. On the contrary, their exclusion from Bell exchanges and toll lines encouraged them to invade Bell territory with new exchanges and to organize themselves

in ways that would facilitate the interconnection of all anti-Bell users. The supply of telephone facilities was so far below the demand for them that there was plenty of room for carving out new subscriber universes. While the aggregate number of Bell telephones grew at a rate of 26 percent a year, the number of independent subscribers doubled every 18 months. Much of this torrid rate of increase stemmed from the establishment of new exchanges. Independent exchanges that already existed, however, usually doubled in size in the first few years of their existence. When independent exchanges failed, and many did, it was rarely for want of subscribers. By 1902 there were 1.3 million Bell telephone subscribers, about three times the number that had existed in 1897. But there were nearly a million users of independent telephones. As a result of this unchecked growth, Bell was forced to make major adjustments in its non-interconnection policy.

1. Dual service in the cities.

Until 1898, direct telephone competition had been confined mainly to small towns, and to medium-sized cities in parts of the country underdeveloped by the Bell system. From 1898 to 1903 the wave of new competition swept into the urban centers. Table 6.2 shows the starting dates of independent exchanges in cities over 50,000 in population.

TABLE 6.1

The Growth of Dual Service, 1894-1909

By Exchange

	1894	1898	1902	1906	1909
A	22	249	449	466	451
B	2%	30%	55%	57%	55%

A = No. of U.S. cities over 5,000 in population with competing telephone exchanges

B = Percentage of cities over 5,000 in population with competing exchanges

Growth of Dual Service, 1894-1909

By Population

	1894	1898	1902	1906	1909
C	.399	6.189	14.617	15.263	15.085
D	1%	23%	54%	57%	56%

C = Cumulative population of communities with competing exchanges (in millions).

D = Population of communities with competing exchanges as a percentage of total population of all cities over 5,000 in population.

(Sources: Bell Labs Archives, 1900 Census)

TABLE 6.2

Starting Dates of
Dual Service in Cities over 50,000 in Population,
1898-1904.

Numbers in Parentheses Indicate City's Population Rank in 1900 Census.

1898	
(7) Cleveland, OH	(52) Wilmington, DE
1899	
(43) Atlanta, GA	(2) Chicago, IL
(21) Indianapolis, IN	(19) Minneapolis, MN
(12) New Orleans, LA	(11) Pittsburgh, PA
(4) St. Louis, MO	(68) Wilkes-Barre, PA
1900	
(27) Allegheny, PA	(28) Columbus, OH
(65) Duluth, MN	(55) New Bedford, MA
(24) Rochester, NY	(64) San Antonio, TX
(62) Savanna, GA	(23) St. Paul, MN
(30) Syracuse, NY	
1901	
(8) Buffalo, NY	(51) Camden, NJ
(45) Dayton, OH	(33) Fall River, MA
(38) Scranton, PA	
1902	
(40) Albany, NY	(13) Detroit, MI
(69) Harrisburg, PA	(22) Kansas City, MO
(18) Louisville, KY	(3) Philadelphia, PA
(50) Reading, PA	(48) Seattle, WA
(26) Toledo, OH	(56) Troy, NY
1903	
(36) Los Angeles, CA	(37) Memphis, TN
(54) Oakland, CA	(61) Peoria, IL
(60) Utica, NY	
1904	
(55) New Bedford, MA	(70) Portland, ME
(63) Salt Lake City, UT	

A handful of major cities repelled the pressure to establish a competing company. Of the cities over 100,000 in population, only Boston, New York, Washington D.C., Cincinnati, Milwaukee and Denver managed to retain a single telephone system throughout the competitive period. Of these, only Washington and Cincinnati refused to franchise a competitor; the other cities authorized a new entrant but the independent failed to raise the capital needed to build a competing exchange.

Quincy, Illinois typified some of the causes behind the independents' advance into the cities. A city of 36,000 in 1900, Quincy sits on the western edge of Illinois on the bank of the Mississippi river. At the time of patent expiration, the 500 subscribers of the Bell exchange there could call Springfield (102 miles away), Peoria (132 miles away), and many other distant cities in Illinois. In the city's own county of Adams, and in neighboring Brown, Hancock and Pike counties, however, there was practically no Bell presence. New, independent exchanges grew up in these areas very rapidly after 1894. They remained isolated until 1895, when the Western Illinois Telephone Company of Augusta began to construct toll lines connecting the independents in the region. In January of 1896 the Western Illinois Co. obtained the city's permission to bring its lines into the building of a grocery supply company in Quincy, where a toll telephone was set up. From contemporary newspaper accounts it is clear that the line served small town merchants in the farm counties who ordered supplies from wholesalers in Quincy.[2] This short-distance service was very popular with the local merchants and farmers; it represented a type of usage that had been utterly neglected by Bell. The

convenience of the Quincy telephone line was noticed immediately by the wholesale merchants of Newark, Missouri, a town of 400 inhabitants forty miles to the west. They began to raise money to construct a line crossing the Mississippi river linking Quincy, Newark, and thirty other points in Lewis, Knox and Marion counties, Missouri. Word of the proposed new telephone line spread through the county newspapers and was received with great enthusiasm.[3] The money was raised by local stock subscriptions and by advance purchases of toll tickets. A submarine cable was laid before the end of the year.

The Western Illinois Co. was just one of many independent companies in the area, albeit one of the largest. By March, 1899, it owned exchanges at Macomb, Rushville, and Carthage, Illinois. It operated 700 miles of toll line in six counties, and maintained toll stations at 59 towns. Through its submarine cable across the Mississippi river it connected with points in Missouri and Iowa; another cable across the Illinois river at Beardstown linked users to the farming areas around Springfield.[4] Still, there was no independent exchange in Quincy itself, the largest city within 100 miles. The Bell exchange there was closed to independent connections. The only way to obtain access to the independent systems surrounding the city was to pay an independent line to install a private line and toll station. The number of these private, independent toll stations in Quincy grew from one in 1896 to at least 8 in 1903, illustrating the growing demand for independent connections.[5] These private lines were more expensive than a subscription to an exchange, and were becoming increasingly difficult to set up because the lines had to pass over private

property in order to avoid the need for a franchise. The burgeoning independent presence outside the city lent support to the idea of establishing a competing exchange. Several promotors began to approach the city for a franchise. Soon Quincy was forced to debate the merits of dual service.

Independent control of a majority of telephone users outside a city did not guarantee that it would franchise a competing company. In cities where public sentiment was overwhelmingly against Bell (as in Indianapolis or Detroit), or where state laws made it possible to enter the city without a municipal franchise (as in St. Louis), there was little debate and only a year or two of preparation was needed. In other cities, (e.g. Chicago and Milwaukee) public debates about franchising a new company dragged on for years. Quincy was one of the latter cases. Public discussion of dual service seems to have begun in 1899. Some objected to the inconvenience of fragmentation and duplication while others stressed the need for access to the country. The editors of the Quincy Herald apparently had been following the debate in Chicago, where several proposals to franchise competing companies had come and gone since 1893. In March 20, 1899, it reprinted an editorial from the Chicago Evening Post:

> Of what advantage will a telephone rate half as large as the present be, if one has to have two telephones in order to keep in touch with the busines world? That is a problem which is troubling a good many people just now. Of course the answer is that in time one company or the other would be forced out. ... The new company with the low rate would begin to absorb the old company's business, and in the end the old company would be forced to meet the new rate. With equal rates, there would be a brief struggle for supremacy, and the one that succeeded in getting the

> larger share of the business in that contest would have little difficulty in acquiring all of it afterwards. But how long would this take? And what kind of a time would the subscriber be having while both were doing business? A commercial house must have a telephone that belongs to the company its customers patronize, and if its customers patronize two companies, it must do likewise.

The argument is framed from the perspective of a business user. The emphasis on the extra expense of a duplicate subscription for business users is typical of both the early and the later debates about dual service. At this early stage, most telephone users probably were businesses. But the public debate followed the same lines much later, when the majority of the telephone users in the country were non-duplicating residences. The editorial went on to express some qualifications about its criticism of dual service: "The future benefits may be sufficient to justify the costly and disagreeable interval, but the immediate outlook is unpleasant enough to cause some hesitation. ...the arguments on this case are not all on one side."[6] The position taken by the newspapers always played an important role in encouraging or discouraging competition. In some cities, the newspaper owners were financially involved in the independent company. In Quincy, the weekly Herald defended what it referred to as Bell's "excellent system." When reporting on the growing number of proposals for competing companies in 1902, it commented sardonically on the duplication problem by noting that with all the new systems "we will be able to have a telephone in every room in the house."[7]

The arguments in favor of a new exchange also reflected the interests of business users. In a letter to the Herald, a citizen of a nearby town argued:

> There are only eight or ten business houses in Quincy that have direct connection with these country lines and it has been an effort of great labor on the part of the telephone managers to even get access to these few places, all the wires to reach the different outlets had to run over private property. If the City Council wants to do the fair thing, instead of running around with foreign promoters and schemes, let them give a liberal franchise to their own county system. An exchange at Quincy with 200 or more of the principal business houses...would be of immense benefit to Quincy merchants, besides a matter of greatest convenience to the country merchants and farmers who do their trading almost exclusively in Quincy.[8]

"Foreign promoters and schemes" referred to the proposals Quincy had received from companies headquartered in Chicago and Macomb. Localism was always an important factor in the franchising of competing companies. Applicants had to obtain the backing of important local citizens if they expected to succeed.

After five and a half years and at least three separate applications to establish competing exchanges, Quincy's City Council franchised the Quincy Home Telephone Co. September 19, 1904. Quincy Home was the brainchild of Charles Wheat, a local promoter who managed to win the support of several prominent citizens. The company's automatic exchange system opened in the summer of 1906. It replaced many of the older independent toll lines with copper metallic circuits, and arranged interconnection with the association of small independents. In the Fall of 1906 it organized a separate company, the County Home Telephone Co. to acquire and connect independent lines in the farm areas. In the first year after the entry of the Quincy Home Co., the presence of a competing exchange did more to stimulate new subscribership than to take subscribers away from Bell. The Bell exchange, which had

been growing by about 300 a year since 1902, canvassed for new subscribers and grew at the same rate.

In larger cities, the dual service debate centered on rates. City councils approached competition as a way of controlling or reducing charges, often contrasting it with municipal rate regulation or measured service as a means to this end. Cities also used the threat of a new franchise to attempt to extract rate concessions from the Bell company. To the independent movement, of course, building an access universe comparable to Bell's was the paramount consideration. The state associations lobbied city governments to open their municipalities to an independent exchange by arguing that businesses in the city would benefit from the availability of connections to their subscribers. The Chicago City Council was told by independent spokesmen that there were "more telephones within 500 miles of this city which have no telephone access to Chicago than the total number of Bell connections within the same territory." The businessman in the midwest, claimed the independents, will talk to the jobber or manufacturer in independent cities from his own office in preference to going out of his office to a toll station and waiting fiftenn minutes to two hours to talk to Chicago. "The inevitable result is that Chicago businessmen lose a large volume of business." The Indiana Mutual Telephone Association, the state independent organization, submitted a resolution to the city of Indianapolis in 1898 stating:

> The independent telephone exchanges throughout the state of Indiana have no telephone connection with the city of Indianapolis, which fact retards the free business intercourse between the citizens of the towns of the state

> and the capital city. ...A large percentage of the business which ought to be carried on within the state is being sent to outside cities.

These arguments were usually effective ways to prod city councils into franchising new exchanges.[9] When the city governments were unwilling to open up their cities, independents were often successful in winning the support of the public. In Oregon and Washington, for example, independent promoters who had been blocked by city governments obtained franchises by means of the public initiative and referendum.[10] Voters in Denver and Omaha also approved competing franchises in 1906.

Still, the independents were often forced to make rates rather than access the basis of their franchise pitch in major cities. In order to gain access, they promised rates half the size of Bell's and a variety of free services to the city government. The outcome depended on how satisfied the local business community was with the Bell service.

Between 1893 and 1906, nine different companies were organized to provide competing telephone service in the city of Chicago.[11] The early applicants (1893-1898) vanished with little to show for their efforts. After 1898, however, the prospect of competition could hardly be ignored. There were more than 300 exchanges unconnected to the Bell system in Illinois and Indiana clamoring for connections to the city.[12] There is also evidence that the business community thought Bell's telephone service was too expensive. A bill that slashed telephone rates in Chicago by more than half passed the Illinois House unanimously in 1899.[13] As the newspapers pointed out, the bill was a little more than a public

relations gesture by the legislators; its rate reductions were so extreme that it was certain to be invalidated by the courts. But it did allow the politicians to appear as if they were doing something about telephone rates, which evidently were the source of widespread discontent in Chicago.

Three well-organized independent attempts to enter Chicago were mounted between 1899 and 1906. They resulted in one partial victory and two defeats. The Illinois Telephone and Telegraph Co. was franchised Feb. 20, 1899. ITT was the owner of the Automatic Electric manufacturing company. Using the slogan "Prompt, Private, Perfect," it offered automatic switching of the Strowger type and all single-line metallic circuit service. The company's rates were usage-sensitive, charging for each switch up to a maximum of $85 for businesses and $50 for residences, well below the Bell rates. These rates were fixed as the maximum in its franchise. It is not clear when its service actually began, but by August 1906 it had about 6,000 subscribers.

ITT never lived up to its potential as a competitor of Bell, however. The financial interests backing the project were really interested in developing an underground subway system to transport mail and parcels. The telephone business was seen as an easier way to get the underground tunnel privileges needed for this purpose.[14] In 1905 it changed its name to the Illinois Tunnel Company. The Tunnel Co. had to keep up its telephone business to prevent its franchise from being invalidated, but never aggressively developed it. It also failed to connect with the independent toll lines and exchanges outside Chicago until 1911.

The other two did not get that far. The United Telegraph,

Telephone and Electric Co. was franchised to serve Hyde Park before that neighborhood was absorbed by the city of Chicago. Its exchange at 47th and Cottage Grove operated 600 telephones. In December 1900 an ordinance allowing the United Co. to extend facilities throughout Chicago was introduced in the City Council.[15] In 1906 another new company with solid backing from the independent movement, the Manufacturers Telephone Company, sought a franchise.

In both cases the proposals led to lengthy hearings before the city council committee on gas, oil and electric light. The reports that emerged from these hearings tended to support the view that it was better to reduce rates through municipal regulation or by introducing measured service than by competition.[16] Both competing franchises were denied. Instead, an ordinance imposing detailed regulation of rates and service upon Bell's Chicago Telephone Co. was passed November 6, 1907.[17] The prevailing attitude was summed up by a Chicago Daily News editorial of 1903, which opposed dual service as a "scheme to fool the weak-minded" but supported action to reduce rates. "There is no reason why [the Chicago Telephone Co.] cannot be compelled to give fair rates to the people when it comes asking for a renewal of its franchise [in 1909]. If that company will not consent to be reasonable let the city go into the telephone business itself."[18]

Indianapolis, on the other hand, authorized a competing telephone company very quickly. There were only 2,286 subscribers in the city of 169,000, and the service of the Bell company in that city was generally considered to be poor. A long history of disputes over rates had marred relations between the telephone

company and the state's citizens; yet the company's franchise made no provisions for rate control and contained no expiration date. In March, 1898, the New Telephone Company obtained a franchise, but the city Board of Public Works compensated for its lack of control over the Bell exchange by attaching important restrictions to it. The New Company franchise fixed maximum rates at $40 for business and $24 for residences, 55 percent and 50 percent of the respective Bell rates. The franchise expired after 25 years and became void if the new company was consolidated with or purchased by a competitor.[19] That competition was conceived as a method of rate control is clear from the franchise itself, which stated in its preamble that "the principal consideration for the granting of the franchise ...is and will be the securing of a reduction of telephone rates to the citizens."[20] By January 1906, the New Company was serving 9,354 subscribers while the Bell exchange had grown to 7,670 subscribers.

Independent expansion into the cities was moderated by the loss of several important exchanges. The Detroit exchange, teetering on the edge of bankruptcy, was sold to Bell's Erie system in 1900. Contrary to the trend in the rest of the country, dual service declined in the South. Due to cheap construction, unrealistically low rates and a lack of regional cooperation and interconnection, independents in Mississippi, Louisiana and parts of Virginia, Alabama and Kentucky were decimated by bankruptcy and Bell acquisition after 1900. The Cumberland Co. was particularly active in gobbling up financially exhausted independents. It acquired twenty noncompeting exchanges and six competing systems in Mississippi, Louisiana, and Kentucky between January 1900 and April

1901. The competing New Orleans exchange was one of the properties acquired.[21]

These failures portended financial problems that were to haunt the urban independent systems. In large exchanges, the independent promoter's calculation of the profits that could be made at lower rates had overlooked two critical considerations: depreciation and the diseconomies of growth. In the first year or two of operation, the new exchange performed well and appeared to make profits and even pay dividends. After four or five years, the company learned that the "profits" and "dividends" of the preceding years had not been profits at all, but should have been retained to renew the exchange's physical facilities. They also learned that their costs increased as they added subscribers, making their initial rates inadequate. Compounding the problem, low rates were often locked into the franchise. By 1906 the independents in St. Louis, Cleveland, Indianapolis, Pittsburgh, Toledo, Madison, and many other cities had been forced to swallow their rhetoric and ask for rate increases of 20 to 50 percent.[22] Others began to engage in acts of financial legerdemain, such as issuing new bonds to pay for the old ones before they matured, in a desperate attempt to raise the capital needed to renew and expand. Access competition demanded that they expand, become more universal, to remain competitive, and as the Bell system had learned a decade before, expansion demanded huge amounts of investment capital.

2. Dual service in the country.

Around 1900 a new force entered the telephone competition, a development as important in its own way as the initial wave of independent competition. Huge numbers of farmers began to buy

their own telephones and wire and set up country telephone systems. Farmer lines were basically party lines which passed through 5 to 20 houses. Many were built by cooperative organizations which drew on their own member-subscribers for capital and operating labor. Subscribers were expected to maintain their own part of the line, the poles on their property and their own phone. Advice on how to construct them was disseminated to millions of farmers through periodical publications such as the Farm Journal. To the large number of Americans who lived on farms, these neighborhood party lines provided welcome relief from isolation. According to one source, "from the day the second telephone is put on [the line] for about two months there is never a time when the line is not busy."[23] Once one line was established in a farming area, "telephone contagion" struck the whole community. Nearby farms, hearing tales of its success, decided to build one of their own.

Initially, each small farm line had its own organization, and its business had to be submitted to a vote of all of the members. As the lines proliferated throughout a region, these organizations made arrangements to interconnect their lines at someone's house. Farmhouse "nodes" usually were not exchanges with switchboards, but simple serial connections. They were run by farm wives or daughters who could be relied on to stay nearby to listen for the signal bell. If a person on one farm line wanted to talk to someone four farm lines away, he or she had to signal and make a connection through four different homes. Making a connection could become a long and socially interesting process. "I know men...who cannot communicate with people in their neighborhood because the people that keep up the home exchange don't like some of the people

in the other neighborhood," complained one telephone company employee.[24] As the use of the telephone in the area spread, these small cooperatives often combined and adopted a corporate, commercial form of organization.[25] Commercial rural systems averaged about 8 telephones to a line; the mutual and farmer systems averaged about 24 telephones to a line.

The telephone Census of 1902 documents the initial phases of a massive increase in the number of rural telephones. According the census, there were 5,979 tiny farmer lines and rural mutual systems in 1902, and another 15,598 rural lines run on a commercial basis.[26] Rural lines accounted for more than a quarter of a million telephones in the U.S., about 11 percent of the total. As Fischer has shown, during the next ten years telephone penetration in the farm areas caught up with and surpassed that of the urban areas.[27] The growth of farm lines had begun to alter the longstanding rural/urban imbalance in the distribution of telephones.

As the farm lines blossomed they were drawn into the competition. Farmers wanted connections to markets and merchants in the cities; the telephone companies wanted to obtain a competitive edge by controlling access to rural subscribers. Thus, what could have remained isolated, technically unsophisticated and financially weak systems became connected to and partly supported by the outside world. Independent and Bell alike took note of what came to be known as "the farm line proposition." This referred to the negotiations over the terms on which the rural lines would interconnect with one of the systems. The once-neglected farmer became a highly sought-after prize. One Bell manager who was

particularly active in urging his local managers to go after the farmers said, "I say to you managers that whenever you have the farmers tied on to your exchange you have got the merchants where you want them."[28] Another Bell manager, decrying the lack of rural development of the Bell system in the Rocky mountain area, warned that if the independent got the farmers "he has anchored his exchange."[29]

These rural lines are generally counted by economic historians as part of the independents' "market share," but a large percentage of them--perhaps half--had no vested interest in competing with Bell. Their goal was to bring the benefits of the telephone to their areas at the lowest possible rate. They would agree to connect with whoever offered the best terms, which might be Bell, the independent, or neither. Rural telephone systems proved to be as independent of the Independents as they were of Bell. When they became dissatisfied with the toll charges imposed on them by a connecting exchange, they would frequently disconnect their line and set up their own terminus in the same town. Whereas the organized independents almost never entered into direct competition with each other, the farmer lines didn't care who they competed with. In some cases four different switchboards operated in the same community due to disagreements over connecting charges. This type of competition so exasperated the organized independent movement that their associations tried to get manufacturers to refuse to sell equipment to independent companies that initiated competition when another independent was already adequately serving the community. From a competitive standpoint, the farmers were not independents but "swing voters" who had to be courted by both

sides.

It was the presence of access competition that gave the farmers their leverage over the telephone companies. Dealing with the farmers was extraordinarily difficult for both telephone interests because there were no standard terms of trade; each farm line had to be negotiated with on an individual basis, and the farmers were very demanding. Bell and many urban-based independents probably would have preferred to ignore them. The competition for subscribers, however, forced both Bell and the independents to seek out the farmers and offer favorable terms for interconnection. In 1900, for example, the New York and Pennsylvania Telephone Co., a Bell licensee, issued a general order announcing that "during the current year it is the intention of the company to push the development of telephone service in the rural districts."[30] The NY & PA Co. developed two special rural line contracts, one to establish a small switching station in farm houses, the other to connect farm lines to a toll station along the Bell lines. It was the first time the Bell licensee in that area had made such an effort. Not coincidentally, the Company's territory in western New York and northern Pennsylvania was overrun with competing independents. Bell's Cumberland Telephone and Telegraph licensee of Kentucky, Louisiana, Tennessee and Mississippi began to offer connections to its system for only $2/year to farmers who built and maintained their own lines.[31] This low rate prompted the Mississippi Independent Telephone Association to charge Bell with predatory pricing before the state Railroad Commission.[32]

Interconnection agreements could also serve as the basis for

providing capital or maintenence for farmer lines that had grown beyond the capacity of the local organization to manage. Farm lines were easy and inexpensive to establish, but once they grew and achieved a wider scope of interconnection the farmers rarely had the time to maintain them or the capital to upgrade them to higher technical standards. When it became necessary to consolidate the management of many small, separate lines into an integrated system, a shift from a mutual to a corporate form of organization usually had to be effected. This could involve some form of capital assistance from one of the two telephone interests. In other cases, the farmers would simply sell their lines to Bell.

3. Organization of the independent movement.

The anti-Bell forces lacked the centralized management and common ownership of the Bell companies. The temptation to refer to them as "the" independents is irresistable, but the common label should not obscure the critical fact that no single equipment manufacturer, business policy, management or financial group held them together. Each company had come into existence independently, and thus any form of cooperation had to be achieved piecemeal through meetings, negotiations and mergers. To bring this cooperation about the independents relied on a variety of methods.

Ideology was one of the movement's strongest bonds. Independent telephony was a crusade as well as a business proposition.[33] Its spokesmen capitalized on seventeen years of smoldering frustration with Bell's rates and service. In the early years, patronizing an independent exchange became a cathartic act of retribution against the trusts, a way of reasserting citizens' control over the economy. Independent telephony represented a

variant of populism which was not anti-business or anti-capitalistic per se but favored local enterprises over large, "foreign" corporations. The independents appealed to those who wanted the benefits of the market, industrialism and technology but were in revolt against the impersonality and abuses of the large-scale business organizations to which it had given rise. The solution to the problems of monopoly and domination was business competition grounded in the resources and knowledge of the local community. Hundreds of independent telephone companies adopted the name the "Home" telephone company. Many others called themselves the "Citizens" or the "Peoples." The idea of a "Home" company and of patronizing "home" businesses had a powerful grip on the popular mind. Its substance and its appeal were gradually eroded, however, by the logic of access competition, for in order to compete effectively with Bell the independents had to tap capital resources outside the local community and extend their operations to a countywide, statewide or regional scope.

Independents bent on competing with Bell quickly came to understand that trans-local coordination was necessary to achieve physical connections and a common strategy. As early as 1896 they began to build voluntary associations, statewide or regional in scope. State independent telephone associations emerged first in the midwestern states of Indiana, Ohio and Pennsylvania, where independent telephony was strongest. These state associations then assumed a leadership role in organizing a national association. Representatives from the three state organizations named met in New York city in March 1897 to discuss the formation of a long distance organization capable of connecting independent exchanges throughout

the U.S.[34] Mutual protection from patent infringment litigation was also part of their agenda. These consultations resulted in a nationwide call to attend a preliminary organizational meeting in Chicago. The first national convention of the independent telephone interests was held in Detroit June 22, 1898. The convention attracted 500 delegates from 19 states, representing 100 telephone exchanges and 30 manufacturers, and adopted a constitution and the name "The Independent Telephone Association of the U.S.A."[35] The convention proceedings were careful to exclude Bell representatives from being delegates, even going so far as to telegraph the home town of a delegate accused of being a Bell employee for verification of his identity.

The problems inherent in organizing such a diverse group became apparent at its first meeting. There were credentials battles and conflicting agendas. To some, defense against patent litigation was the most important goal; others did not fear such lawsuits but wanted the association to lobby for favorable legislation or to help develop toll lines. The Detroit Telephone Co., whose city hosted the convention, was so disgruntled that it announced it was dropping out. Manufacturing companies, outnumbered by operating companies, objected when the constitution assessed dues on them but refused to allow them a vote. The constitution was adopted with a "large dissenting element."[36] Only fourteen states attended the group's second convention, held six months later.[37]

While long distance interconnection had always been a consideration in the creation of the ITA, national independent associations never played a significant role in operations. At

best, they served as a forum for the discussion of policy and lobbying. The real work of coordinating independent toll connections took place at the state level. The state associations tried to establish uniform schedules of long distance rates and establish methods for dividing toll revenues between the originating and terminating companies. By 1904, most state associations had formed clearinghouses to handle these problems for member companies. The state associations tried to encourage uniform technical and operations standards and to enforce a common business policy regarding its competitor. For example, it would expel members who agreed to interconnect with Bell, and urge other independents to refuse to sell it equipment or exchange traffic with it. The independent movement thus relied on its associations to handle many of the management functions provided for Bell licensees by AT&T and ABT.

For the independent companies who relied exclusively on state associations, the lack of a central authority continually handicapped their attempts to coordinate toll interconnection. In November 1904, Telephony Magazine observed that it was "the exception rather than the rule" that "we are able to offer competition on messages of over 100 miles." In some cases the problem was poor construction, in other cases it was roundabout routing, in still others it was inconsistent or uncoordinated operating procedures. In a speech before the International Telephone Association, a prominent independent telephone operator summarized the independent movement's managerial problems:

> This is our strength. ...we are better able to give

> satisfactory local exchange and "short haul" long distance service than companies managed and owned by directors and stockholders hundreds of miles away. Long distance service, however, under chis kind of management is not satisfactory. Here is where we are weak: one company believes in a three minute time limit, another in five. One says one half cent per mile is enough; another three-fifths cent. This companies lines are of copper, that one's mostly iron. This company uses a code designed by its own traffic manager, that one the code of its state association, and the next one no code at all, and so on. What is the result? Confusion, bad service and dissatisfied customers.[38]

One response to the disorganization problem was to attempt to impose a corporate order on the heterogenous mass of independent activity from the top down. In 1899, two ambitious attempts to recast the independents in the mold of the Bell system surfaced. One was an attempt to merge all of the leading independent telephone equipment manufacturers into one organization. The consolidated manufacturers company, its proponents claimed, would "standardize telephone apparatus; ...own all patents and employ the best experts now operating individually and competitively, under one management, and focus the advantages of all this in one type of telephone apparatus."[39]

The organizers claimed to have commitments from twenty telephone makers, representing 90 percent of all independent manufacturing. But when the Electrical Review solicited the opinions of a sample of leading independent manufacturers the appearance of solidarity dissolved. Stromberg Carlson of Chicago and Williams Electric of Cleveland, among others, stated that they were perfectly satisfied with the prices and the volume of business they were receiving. For the companies for whom telephone production was only one branch of a larger electrical supply

business, the unification of their competitors offered a chance to expand their market share. Companies that produced automatic equipment saw themselves as a separate market and were therefore disinclined to join the combination.[40] The independent manufacturing field at this time included close to fifty firms. No technological or economic barriers to entry existed. Molding this diverse bunch into a single concern did not prove to be feasible.

An even more ambitious attempt to weld the independents into a unified force was the Continental Telephone, Telegraph and Cable Company, organized late in 1899. The Cable Co. approached consolidation from the exchange and long distance operations side instead of through manufacturing. Its plan, according to its prime mover, the Philadelphia capitalist Martin Maloney, was to purchase stock control of as many independent properties as possible and combine them into "one great system that would give a long distance service outside of the Bell lines, in any part of the country."[41] Maloney appeared to have lined up the financial and managerial support to carry out this plan. William J. Latta, a general agent of the Pennsylvania Railroad, was chosen as its president; its financial backers included a Philadelphia group of investors in street railway properties headed by P.A.B. Widener, William Elkins and Thomas Dolan.

The Cable Co. acquired financial control of companies that had been organized (but not yet franchised) to run competing exchanges in Boston and New York. But it rose to its greatest prominence when in 1900 it acquired a controlling interest in a large chunk of the Bell system itself: the Erie system. The Erie system was a holding company made up of five Bell licensee

companies in nine western states (Michigan, Wisconsin, Minnesota, North and South Dakota, Texas, Arkansas, Kansas and Oklahoma) and one major city (Cleveland). It represented about 15 percent of all Bell subscribers. The acquisition rocked the Bell system, but ultimately proved to be the undoing of the Cable Co. According to the FCC Investigation, the key Philadelphia capitalists had withdrawn from the Cable Co. in the course of making a deal with the Morgan interests, who did not want to see a nationwide competitor of the Bell system emerge.[42] This left the company financially overextended, and within two years it had been taken over by Bell again.

As previous historians have suggested, the Telephone, Telegraph and Cable Co. could have become a nationwide rival of the Bell system. The independents needed both capital and systemic planning. Whether the Cable Co. would have successfully provided those missing links is another question. Its ability to acquire financial control of independent companies did not necessarily translate into an ability to combine and manage hundreds of companies with different conditions and personnel. The Bell system itself, with its centralized organization, control of patents and vertical integration, did not really begin to function as an integrated system until about 1900. There is no evidence that the Cable Co. ever integrated or even improved the operations of the independent companies it controlled. The New York and Boston corporations it owned never acquired franchises or established exchanges; overcoming the enormous Bell lead in those cities would not have been easy. The success of the Cable Co., moreover, should not be equated with a victory for either the independent movement

or for permanent market competition. Had its acquisition of the Erie system succeeded, a large number of its telephone properties would have been former Bell exchanges locked in direct competition with independents. Faced with this predicament it could have continued the competition, in effect assuming the role of the Bell system and thereby changing little, or consolidated with the independents, eliminating competition more quickly than otherwise would have happened. David Gabel's study of the Wisconsin independents has shown that they first greeted the takeover of the Erie system with enthusiasm because they thought the Cable Co. was part of the independent movement. Letters were sent to President Latta indicating their willingness to suspend competition in exchange for interconnection with Milwaukee.[43] The Cable Co. did not respond to these overtures, either because it had no clear policy or because it contemplated competition rather than alliance with the independents.

Despite the failure of the Cable Co., many independents managed to integrate their operations and achieve fairly competitive levels of long distance interconnection. Once again, the most successful development strategy proved to be neither a grandiose attempt to organize the entire country nor voluntary associations of small, local units, but something in between. The strongest independents achieved a scope of operations comparable to that of a Bell licensee company. They acquired control of several exchanges in a region covering several counties or spread across one to three states. In a particularly healthy system, the exchange properties included at least one large city in which the independent controlled access to 40 - 50 percent of the subscribers

and the exchanges were supplemented by a long distance company with circuits connecting all of its owned exchanges and lines to neighboring independent systems. Unlike a Bell licensee, the independent regionals never managed to own all of the independent exchanges in their territory. They relied instead on interconnection agreements with autonomous, smaller exchanges which remained independent of Bell. The long distance company would place toll stations in towns where there was no independent exchange.

4. Bell accelerates development.

The Bell system had tried to respond to competition by waging price wars, blocking independent franchises in major cities, and buying out its competitors. It soon became clear that price wars were costly and not terribly effectual, and that a successful, growing independent system would not sell out. Around 1900, Bell management began to face the fact that its own underdevelopment, especially in small city exchanges and in the short and medium range interexchange market, was the primary cause of independent success. Its advice to the licensee companies began to stress good service, rather than meeting independent rates, as the proper response, and the national organization embarked on a major development program, raising millions of new capital. The ensuing rationalization of operations and growth of connectivity in the Bell system was a direct consequence of access competition.

The most consistent, committed advocate of responding to competition with development was Thomas B. Doolittle of AT&T. Doolittle was the inventor of hard-drawn copper wire and was credited with installing the first commercial telephone exchange in

1878. He took a special interest in the toll business, and in 1891 received permission to devote all of his time to it. He began to travel through the country studying the operating conditions of the licensee companies. As Doolittle and his staff passed through the territories, they studied traffic patterns and volume, rates, and the operating procedures used in making up toll connections. They would then draw up detailed recommendations for exchange and toll line facilities construction and improved operations. Working patiently for fifteen years, Doolittle spearheaded the administrative rationalization of interconnection within the Bell system.

When Doolittle began his work, the toll facilities of the licensee companies generally were poorly developed and inefficiently run. The management of the national company and that of the licensee companies were not well coordinated; as one of his reports observed, operating company managers were suspicious of "the Boston influence."[44] As noted before, the independents had exploited the dearth of short-haul toll facilities. In the New Jersey and Pennsylvania suburbs of Philadephia, for example, lines of 15 or 20 people waited an hour for a connection to Philadelphia and two and a half hours for an open circuit to New York. The absence of through circuits clogged the system, making it impossible for operators to serve their own subscribers without delaying calls that had to pass through their exchange from other points:

> The business between towns outside of Philadelphia is practically at a standstill, for the reason that the wires

> for this purpose form a part of some trunk to Philadelphia, and are therefore overloaded with Philadelphia business. Nearly all points that do not have direct trunks to Philadelphia are practically deprived of Philadelphia service during the busy hours.[45]

Large parts of New Jersey and eastern Pennsylvania were in the hands of the opposition as a result.

Doolittle's toll line development strategy was based on a clear, explicit grasp of the demand interdependence of telephone service. The national management of the Bell company was not interested in extending exchange or toll line service to places that would not be profitable. It therefore needed a rule to determine what places did and did not warrant telephone facilities. Doolittle came up with an estimate of the probable average earnings per person that could be expected from linking a place into the toll system. If the population multiplied by the estimated revenue exceeded a certain number, the city would get a line; if not, it wouldn't.

After a few years Doolittle's records of toll calling receipts convinced him that the average revenue that could be expected from a place <u>increased</u> as it was connected to more places. This in turn enabled him to recommend extending toll lines to smaller and smaller towns.[46] In an effort to convince the Boston management to invest in exchange and toll line development, he prepared a diagram illustrating the increased traffic over a toll trunk line that would result from connecting groups of tributary towns (Figure 6.1).

> Our records show that the larger the number of places

> connected, the larger will be the percentage of people interested in the toll lines, both from a social and a business standpoint, and I expect that as the number of places increases, we shall so increase the amount [of business per person] that we shall be able to profitably extend the toll lines to points which, at present, it will not pay to connect.[47]

Doolittle's grasp of demand interdependence made him an advocate of exchange as well as toll line development. When people were attached to an exchange they could receive incoming calls in addition to placing outgoing calls. His reports on the licensee companies from 1896 to 1902 always contained long lists of towns where small exchanges should be placed.[48] In promoting the development of small exchanges, Doolittle pioneered the theory and practice of "subsidizing" local exchange access with long distance revenues. The company would gain by establishing inexpensive exchange service in small towns even if the exchange itself lost money, he argued, because

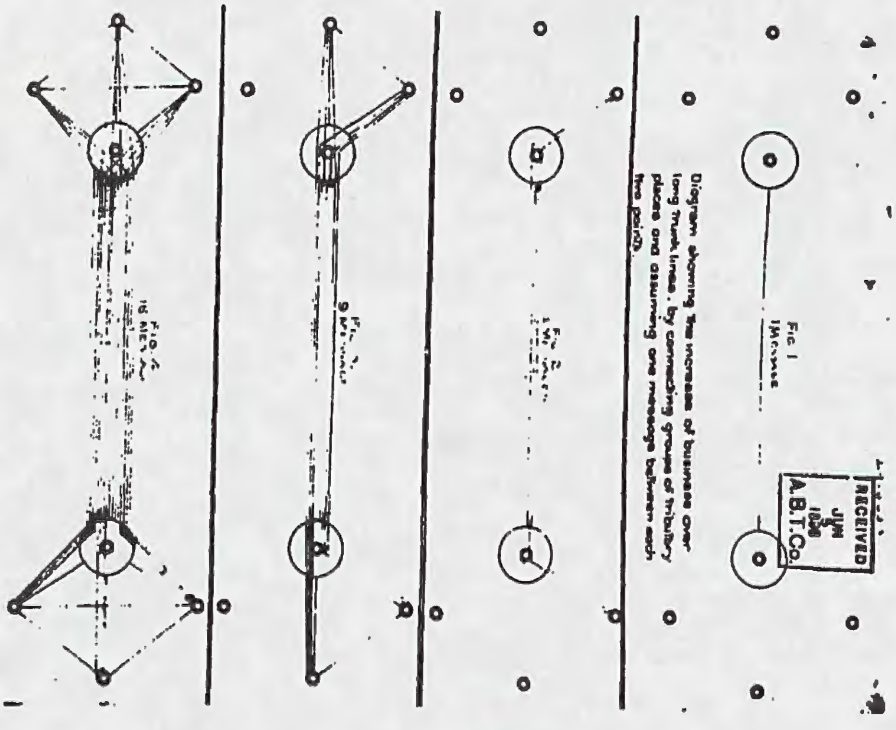


FIGURE 6.1

giving users in other locations access to subscribers in the smaller towns would stimulate increased use of the toll lines.[49] His reasoning must have influenced President Fish, who wrote in 1902:

> it is at least worth considering whether or not cheap exchanges in the small towns do not add enough to the toll business to make them a proper investment, even if there is no profit in the small exchanges.[50]

Using scientific traffic studies, Doolittle mapped out the additional lines needed to avoid congestion. He also pioneered a method of routing, handling, and accounting for calls known as "center checking." Center checking centralized the responsibility for routing and accounting at designated exchanges.[51] When implemented, every operator in the region knew where to transfer toll calls headed to a specific destination, and the operators at the toll center knew how to get the call to its destination as directly and quickly as possible. Rationalizing the process of toll interconnection reduced the amount of time consumed by making a connection and resulted in great savings in plant facilities.[52] The rationalization process also made it possible for the licensee companies to exploit "phantom circuits," a method of creating a third voice circuit out of two metallic circuits.[53]

Rate rationalization was another important achievement of Doolittle's. He went about systematically simplifying and reorganizing the licensee companies' toll tariffs by replacing charges based on route mileage with a more uniform airline mileage basis. His reports contain an interesting exploration of, and

attempt to rectify, the cracks and inefficiencies in interexchange service caused by Bell's division of the country into separate territories under different managements. He noted that if two towns were only fifty miles apart but were located on opposite sides of a border separating two licensee companies, a caller could end up paying the rate for a 150 mile call due to the way the call was transferred between the two Bell companies. Independent competitors were taking advantage of such rate discrepencies, offering more direct, cheaper service.[54]

Doolittle consciously thought of his work as scientific management. This meant rational organization of toll facilities and operations based on scientific studies of traffic, rather than the regimentation of labor. (There is no reference to Taylor or Taylorism in his work.) He believed that there were distinct principles underlying the telephone business which, when discovered, could be applied to operations to maximize efficiency. "I have endeavored," he wrote to Vail, "to attract and retain in my department men who have been well grounded on the correct lines, and who are not only able to absorb advanced ideas of the business but to impart those ideas to others in a manner acceptable and convincing."[55] A. Curtis Blood, who was the first to apply probability theory to telephone traffic, worked on Doolittle's staff, as did Ernest Gray, another pioneer in the development of mathematical traffic theory and automatic switching. In line with his drive to rationalize toll organization, facilities planning, and rates, Doolittle brought the managers of AT&T, the licensee companies, and independent connecting companies together at conferences which established how traffic should be routed and

which company's lines should be used.

Doolittle felt that his work was not appreciated or used appropriately by the licensee companies until about 1905. As he admitted in retrospect, "a vast amount of laborious work was performed, which resulted in a report that was not understood, and in many cases, not even read..." By 1906, however, he felt that he had gained the confidence and cooperation of the licensee company managers. A bracing dose of competition had forced them to pay attention. Toll lines, he stressed again and again, were the Bell system's "most effective weapon" against competition. Doolittle's efforts helped to reverse the independents' incursions into the short-haul toll market. In 1902, independents handled 37 percent of the toll calls. By 1907 this had declined to 24 percent.

5. Bell is forced to alter its interconnection policy.

Conventional wisdom has it that Bell's refusal to connect with the independents was a harsh and powerful competitive tactic. More generally, theories developed by antitrust economists tend to classify such "refusals to deal" as inherently monopolistic. An established system which denies access to or makes itself incompatible with its competitors is, according to this doctrine, suppressing competition. Treatments of telephone history also tend to see the eventual interconnection of Bell and the independents as a product of regulatory intervention alone. In fact, the Bell system's most powerful strategic ploy proved to be interconnecting with certain independents, and this policy change was made in response to market rather than political pressures.

Between 1894 and 1901, the national Bell organization adhered to a policy of strict exclusion. Independent companies could not

be connected to Bell exchanges or toll lines even when they occupied territory remote from any Bell exchange and were not competing with Bell. Bell refused to purchase equipment from independent manufacturers and refused to sell Western Electric equipment to the independents. The independents made their most rapid gains in this period. Their growth occurred because of, rather than in spite of, the no-connection policy. Bell was simply unable to keep up with the demand for telephone service in thousands of small towns. In 1901 there were still 112 cities greater than 5,000 in population with no Bell exchange (12 percent of the total), and there were Bell exchanges in only 1,775 of the 5,447 incorporated places with a population between 500 and 5,000 (32 percent).[56] In these conditions, the only accomplishment of the noninterconnection policy was to cut off Bell from the majority of telephone users in the areas it had left undeveloped, and to guarantee its competitors exclusive access to every exchange built independently of the Bell system. In the states of Indiana, Ohio and Illinois, the independents greatly outnumbered Bell and were on the verge of achieving the kind of critical mass that could result in mass desertions of Bell exchanges.

By this time it was clear even to the distant Boston managers that absolute exclusion of independent companies had been a costly mistake. Some managers of the licensee companies began to consider exchanging traffic with independent exchanges that did not directly compete with those of Bell. This policy was known as "sublicensing" because it involved a licensee company extending the connecting privileges of the license contract to independent companies within its territory. Two licensee companies that had

been particularly hard hit by competition actually had begun to implement this policy on their own.[57]

The national organization moved more slowly. Unlike other adjustments in Bell practices made in response to competition, sublicensing involved revising some of the fundamental assumptions underlying the license contract. The primary object of the license contract was to secure profits and control for the national organization while harnessing local initiative and capital. But how could the same level of control be maintained when interconnecting with independent companies? If Bell was to interconnect with noncompeting local exchanges, should it require them to lease Bell instruments, as it did of its traditional licensees? If so, what would induce these independents to lease Bell instruments when it could obtain independently manufactured telephones at a lower price? If not, how could it maintain the uniform technical standards it desired? Since Bell would have no ownership control over the connecting company, there was also the risk that sublicensed companies might break the connection contract later. On September 25, President Fish sent out a letter to the top executives of AT&T and ABT soliciting their opinions on these questions.[58]

All of them agreed that the time for some form of sublicensing had come. AT&T Chief Engineer Joseph Davis admitted that the Bell Co. had had no idea how widespread the demand for telephone service would prove to be at the time the perpetual license contracts were drawn up in the early 1880s:

> [If] it could have been forseen what an extensive

> development of the telephone business would be required to meet the needs of the people, and the amount of capital involved, it would have been good policy on the part of the ABT Co. to have encouraged its licensees to sublicense to local people the right to furnish service in country districts and villages and towns..., and to have supplied telephones for this purpose at very moderate rental. If this had been done the field for opposition companies would have been very much curtailed and we would now have friendly instead of hostile people in such places.[59]

Davis's comment underscores the fact that universal service was not part of the original conception of the business, as Vail later claimed. Never in their wildest dreams did the early Bell managers think that telephone service could be demanded by, and profitably extended to, as many people and places as turned out to be possible.

E.J. Hall, Vice President and General Manager of AT&T, George Leverett, AT&T General Counsel, and Thomas Sherwin, the ABT Co. General Auditor, all agreed that Bell should insist on leasing its own telephones to sublicensees rather than selling them or permitting them to use independently manufactured telephones. Interconnection with users of other telephones was objectionable on three grounds. First, it reduced the Bell system's control over its technical standards. Using only Bell phones promoted uniformity and compatibility, while leasing encouraged operating companies to turn in equipment as it became worn or obsolete, allowing the system to maintain better standards of communication. Second, the Bell system had publicly opposed physical interconnection laws on the grounds that independent phones were of lower quality than theirs, hence their use over the Bell system would impair the quality of the service. It seems fairly clear

that President Fish and the others who made this argument knew that it was untrue; the quality of the major independent brands was equal to Bell's.[60] The real reason for opposing physical interconnection was the property rights argument outlined in the previous chapter. But having used the other argument publicly, they knew that connecting with independent equipment now would obviously contradict it and make them look dishonest, and might thereby lend support to compulsory interconnection. Last, but not least, Bell knew that leasing telephones was far more profitable than selling them outright.[61]

Within this solid consensus in favor of sublicensing, a significant number of the commenters favored an even more liberal policy. Leverett suggested that the requirement to use Bell phones could be made more acceptable to the independent companies if Bell offered to furnish them below cost, or even at a rate that was purely nominal.[62] Davis, on the other hand, believed that while every effort should be made to induce independents to use Bell telephones, the benefits of "extending the field of the Bell interests" via interconnection more than compensated for any disadvantages that might accrue from the use of non-Bell telephones.[63]

What impressed the commenters most were the competitive advantages to be gained by sublicensing. Interconnection would allow Bell to gain access to small town and rural locations without building and operating what were likely to be unprofitable exchanges. The small exchanges so connected could serve as feeders to the Bell toll system. As it extended Bell connections to unserved areas, it would also take connections away from the

exclusive control of competing independents. Potential competitors, Leverett observed, would be coopted by the new policy:

> telephone companies established in regions which we do not occupy...become starting points for attacks upon our system in other places where such opposition is extremely undesirable. [I]f people are willing to venture their own money and do business in a territory we have not occupied, we should regard them and endeavor to have them in fact as allies, and not as competitors.

The new policy was ratified; henceforth, licensee companies could sublicense independent exchanges under a standard form of contract with the blessings of the national corporation.[64] The new sublicense contract demanded three conditions for interconnection: the independent exchange could not be in direct competition with a Bell exchange; it could use only Western Electric telephones; and it had to agree to connect with only Bell toll lines. Officially, Bell charged its sublicensees $2/year per instrument. In actuality, the licensees deviated from these conditions according to the exigencies of the competitive situation.[65] The beleaguered Central Union Co. connected with noncompeting independents from 1904 on regardless of what instruments they used.[66] Wisconsin Telephone gave its sublicensees ten years free use of Western Electric telephones until pressure from the national organization forced it to conform to the standard contract.[67]

Under these terms, sublicensing progressed, but slowly. In Central Union territory, the number of connecting independent exchanges grew from 194 in 1902 to 253 in 1904. After the Central Union Co. liberalized its terms in 1904, however, allowing

sublicensed exchanges to retain non-Bell telephones, the number of sublicensed exchanges jumped to 513 in one year. By 1907, the Central Union owned and operated 310 exchanges and 188,000 telephones, while its sublicensees operated 777 exchanges representing 192,000 telephones. In other words, the majority of telephone users in that territory were connected into the Bell system through independent exchanges.[68]

Given the dynamics of access competition, sublicensing was a powerful weapon. It not only provided Bell with connections to the small locations Bell was uninterested in serving, it also removed these exchanges from the independent orbit. Sublicensing could also be used to withdraw from dual service competition without losing access to the city's telephone users. In mid-sized cities where the independent exchange had established a commanding lead in subscribers, Bell would offer to pull out if the independent would agree to become a sublicensee. If the independent agreed, Bell gained access to the preponderance of subscribers in the city while relieving itself of the need to maintain a facility under the rigors of competition. The independent gained access to Bell's toll lines and respite from competition, a chance to raise its rates. Thus, what appeared to be an independent success suddenly became a setback; a whole group of subscribers was snatched out from under them. Such was the case in Middletown, New York, whose independent exchange had 1,000 users to Bell's 90, and Emporia, Kansas, whose independent had 1200 subscribers to the Bell company's 131. The Middletown independent entered into a sublicense contract with Bell's Hudson River Co. in January 1904.[69] The Emporia independent was sublicensed and the Bell

exchange closed down in 1905.

The organized independents immediately recognized that sublicensing threatened to disintegrate their movement. Their publications and associations assailed the practice in the strongest terms. "You cannot be an Independent company and connect in any way with the Bell," James Hoge, President of the national independent association wrote in the pages of Telephony. "You cannot serve two masters. You must choose between the people and a greedy corporation."[70]

In December 1902 the convention of the Interstate Independent Telephone Association in Chicago was forced to deal with the problem at length.[71] A delegate from Illinois moved that companies using Bell telephones be disqualified from membership. An Iowa delegate opposed the participation of "anybody in any way connecting with the Bell companies under contract." Connection with Bell lines destroyed the push for independent growth, added an Ohio delegate. In response, the owner of an exchange in Ashland, Kentucky pointed out that his was the only telephone exchange in town. The steel mills and iron works there demanded long distance connections to New York and Chicago, which could only be obtained over Bell lines. He claimed that Bell did not enforce the exclusive connection feature of the contract in his territory; they allowed him to send traffic over their lines even though he was connected to other independent companies. His company, he claimed, was "independent from the ground up," but if it could make an arrangement with the Bell companies for long distance connections and thereby keep a competing Bell exchange out of the city, he believed it was good business policy.

A committee was appointed and charged to make a report on the issue. Its recommendations made a slight concession to those independents facing circumstances like the Kentucky exchange, but basically came out strongly against any form of cooperation with Bell. Operating companies or individuals using Bell apparatus tend to "demoralize and destroy the independent movement" and should be barred from membership in the national, interstate or state asssociations. Only companies that connect their toll lines and exchanges with independent companies should be eligible for membership. The committee report added:

> We deplore individuals or companies connecting lines and exchanges with Bell licensee companies, ...as we believe that no such relation should be permitted, except, possibly, in isolated cases, which arrangement should be passed upon and authorized by the state association, ... the executive committee of the interstate association, or the advisory board of the national association, the authority in each case to be granted only by a 2/3 vote.

The resolution passed unanimously. The independents also countered sublicensing by starting new, competitive exchanges in cities signed by Bell, or by buying out a sublicensed exchange. In some cases, independents changed their minds after signing a Bell contract and rejoined the ranks.

NOTES TO CHAPTER 6

[1] S.P. Sheerin, "The Value of Long Distance Toll Lines," presented at the 3rd Annual Convention of the Independent Telephone Association, June 26, 1899. Box 1113, AT&T-BLA.

[2] Quincy Herald, January 10, 1896. Cited in Theodore N. Vail Chapter, Telephone Pioneers of America, The Story of the Telephone in Quincy, Illinois (Illinois Bell Telephone Co., 1948), p.114.

[3] Quincy Herald, February 10, 1896. Cited Ibid.

[4] Western Electrician, March 11, 1899.

[5] The Story of the Telephone in Quincy, n.2 above, p. 135.

[6] Ibid.

[7] Quincy Weekly Herald, December 12, 1902.

[8] The Story of the Telephone in Quincy, n.2 above, p.134.

[9] Chicago reference: "Statement of the...Independent Telephone Interests..." In the matter of the Application of the Illinois Tunnel Company for Permission to Sell its Telephone Rights to the Chicago Telephone Company. Committee on Gas, Oil and Electric Light of the City Council of the City of Chicago, May 27, 1909. Box 1357, AT&T-BLA. Indiana reference: Electrical Review 32:4 January 26, 1898, p.61.

[10] Telephony XII (July 1906) p. 15-17. Voters in Denver and Omaha also approved the franchising of a competing exchange in 1906.

[11] The following companies were organized to apply for competing telephone franchises in the city of Chicago: The Chicago Twin Wire Long Distance Telephone Company (1893), Cosmopolitan Telephone Company (1895), Commonwealth Electric Company (1897), Independent Telephone Company (1898), S.J. Heafield (1898), Illinois Telephone & Telegraph (later the Illinois Tunnel Company) (1899), Hyde Park District Telegraph & Electric Company (1901), United Telegraph, Telephone & Electric Company (1901), Manufacturers Telephone Company (1906).

[12] "Hot Telephone Talk," Chicago Record-Herald, June 27, 1901. An independent spokesman quoted in the article claimed that 20,000 Indiana farmers with independent phones were unable to call Chicago.

[13] Western Electrician March 25, 1899 p.174 and April 8, 1899 p.201.

[14] See the Report re: the Illinois Tunnel Company, December 30, 1903. Box 65, AT&T-BLA.

[15] "Hot Telephone Talk," n.12 above.

[16] Report of the Special Committee on Telephone Rates and Service," Chicago City Council, March 2, 1903. Hugo S. Grosser, City Statistician, Report. Telephone Service and Rates. Report of the Committee on Gas, Oil and Electric Light to the City Council of Chicago, September 3, 1907. See also Schedule of Rates and General Information Regarding Telephone Service, Chicago City Council Committee on Gas, Oil & Electric Light, November 27, 1906.

[17] The full text of the telephone rate regulation ordinance of November 6, 1907 is in Box 65, AT&T-BLA.

[18] Chicago Daily News, June 8, 1903.

[19] Patrick O'Neill, "Refranchising the New Telephone Company: Municipal Policy in the Competitive Era." Midwest Journalism History Conference, April 23, 1988, p. 7.

[20] Ibid.

[21] Cumberland Telephone & Telegraph Co., "Statement of Purchases of independent and opposition exchanpes and long lines, January 1, 1900 to April 1, 1901." Box 1336, AT&T-BLA.

[22] Cumberland Telephone Journal, 1906. Box 1336, AT&T-BLA. See also "O'Neill, "Refranchising the New Telephone Co.," n.19 above.

[23] Cumberland Telephone Journal 10:1 January 15, 1904, p.12. Box 1336, AT&T-BLA.

[24] Ibid, p.13.

[25] Telephone Census of 1907, p.76-77.

[26] Telephone Census of 1902, Table 13.

[27] Claude Fischer, "The Revolution in Rural Telephony," Journal of Social History Fall 1987, p.5-6.

[28] Cumberland Telephone Journal 10:1, p.12.

[29] Pickernell, AT&T, to G.Y. Wallace, President, Rocky Mountain Bell, March 27, 1905. AT&T-BLA.

[30] New York & Pennsylvania Telephone Co., General Order #34, February 14, 1900. Box 1330, AT&T-BLA.

[31] Cumberland Telephone Journal, October 15, 1904. Box 1336, AT&T-BLA.

[32] Electrical Review 30:11 (March 17, 1897) p.130.

[33] Electrical Review 30:26 (June 30, 1897) p.307ff.

[34] Ibid.

[35] MacMeal (1934) p.92.

[36] Telephony (November 1907).

[37] Electrical Review 34:13 (March 29, 1899) p.290.

[38] Electrical Review 34:14 (April 5, 1899) p.218-9.

[39] Electrical Review 35:19 (November 8, 1899) p.292.

[40] FCC Investigation (1939) p.131-132.

[41] David Gabel (1987) p.187.

[42] Doolittle to Vail, January 29, 1908. Box 2020, AT&T-BLA.

[43] "Report on Toll Matters," Doolittle to Hudson, September 11, 1899. Box 1330, AT&T-BLA.

[44] Doolittle to Fish, March 22, 1904. Box 1330, AT&T-BLA.

[45] Doolittle to Davis, June 4, 1896. Box 1285, AT&T-BLA.

[46] Engineers' Department June 7, 1898. Box 1285, AT&T-BLA.

[47] Doolittle Letter Book #12, p.331 (1896). AT&T-BLA.

[48] Fish to Yost, August 30, 1902.

[49] See description of center checking procedure and routing sheet for Harrisburg, Pennsylvania toll center, Box 1330, AT&T-BLA.

[50] Doolittle, 1907 Annual Report. Box 2020, AT&T-BLA.

[51] The problem of inconsistent rates was particularly acute in New York and Pennsylvania, where the territory was divided up into an unusually large number of licensee companies. New York state alone was served by seven different Bell companies. For a description of the rate and coverage problems this created, see New York and Pennsylvania Telephone Co., Doolittle to Hudson, June 20, 1900. Box 1330, AT&T-BLA.

[52] Doolittle to Vail, cover letter accompanying 1907 Annual Report, January 29, 1908. Box 2020, AT&T-BLA.

[53] Davis to Fish, October 23, 1901.

[54] The Central Union Co. (Ohio, Indiana and Illinois) and the Northwest Telephone Exchange Co. (Minnesota, North Dakota and South Dakota) were the two licensee companies to implement sublicensing before being authorized to do so by the national company.

[55] Fish Circular Letter re: sublicensing, September 25, 1901. Box 1276, AT&T-BLA.

[56] Davis to Fish, October 23, 1901. Box 1276, AT&T-BLA.

[57] Fish to Kilgore, February 24, 1902. Box 1276, AT&T-BLA.

[58] Sherwin to Fish, October 22, 1901. Box 1276, AT&T-BLA.

[59] Leverett to Fish, October 17, 1901. Box 1276, AT&T-BLA.

[60] Davis to Fish, n.53 above.

[61] General Manager's Letter Book, #632. October 31, 1901. AT&T-BLA.

[62] Fish to Wallace, June 20, 1903.

[63] Atwater, History of the Central Union Company, p.136-7.

[64] David Gabel (1987) p.163-165.

[65] Central Union Co., Minutes of a Special Meeting of the Directors, March 20, 1907. AT&T-BLA.

[66] American Telephone Journal 11:4 (January 28, 1905).

[67] Telephony 11:5 (May 1906) p. 314.

[68] Western Electrician, December 13, 1902, p.426.

Chapter 7

Dual Service

For the ten years between 1902 and 1912, competing telephone exchanges operated in more than half of all American cities over 5,000 in population. When dual service peaked in 1904, it existed in 483, or 60 percent, of the cities with a population greater than 5,000. In terms of the total number of competing exchanges in cities of all sizes, dual service reached its apogee in 1911, when it existed in 2,290 places.

Because we are all familiar with universal interconnection and rely on it heavily in our everday life, we tend to assume that its absence was simply a mistake, a problem crying out for a regulatory solution. Exchange competition should not be judged by the standards of a different era, however. Dual service was the deliberate choice of hundreds of American cities, and remained in place for a significant period of time. As late as 1907, major cities such as Boston and Milwaukee decided to franchise new systems after long public deliberations. New York city came very close to doing so after extensive studies of dual systems in other cities. It seems unlikely that these cities did not know what they doing. Besides, we are in no position to assess the significance of homogenized telephone access unless we know something about what

things were like when it didn't exist. Dual service must be taken seriously in its own right, and its characteristics analyzed as objectively as possible. This chapter examines exchange competition from two angles. It looks at the way subscribers divided themselves between the two systems, and then turns to the public debate about the merits of dual service that occurred between 1905 and 1910.

1. The Anatomy of Subscriber Fragmentation.

The analysis of subscriber fragmentation patterns in a dual system is especially rewarding from the standpoint of social theory. The parallels between dual service and bilinguilism were already suggested in the first chapter. Like language barriers, dual service divided communities by communication; unlike language, however, the division of the public into two telephone systems reflected consumer choice rather than cultural inheritance. By heightening our awareness of who was connected to whom, by illuminating peoples' choices about who it was and was not important to have telephone access to, subscriber fragmentation patterns provide a fascinating road map to the organization of urban society.

How did dual service work? The first thing to keep in mind is that in 1907 the telephone was not yet the dominant mode of communication for the majority of the people living in cities, although it was rapidly becoming so. Only 20 percent of the people in a large city had telephones in their homes. The rest of the public, if they used telephones at all, relied on public stations, which may or may not have been pay telephones. Drug stores and

saloons, for example, had a very high subscription rate because they were customarily telephones that could be used by the people in a neighborhood. Virtually all large businesses had telephones, especially if they were national or interstate in scope. About 50 to 75 percent of the smaller businesses used the telephone, the rate varying widely depending on the type of business. All of these adoption patterns had changed radically since 1894 and were still in flux in 1907. In this context, the presence of two incompatible systems created inconveniences, but they were accepted as part of the process of growth and experimentation, just as incompatible bank cards and computer models seem unobjectionable today.

To provide some historical perspective, it is useful to compare the telephone system with the city directories of the period as a communications medium. City directories listed the names, occupations and street addresses of all the residents and also contained listings of the city's businesses, services and institutions. Like its successor the telephone directory, these publications were both a source of useful information and an advertising medium. Their publishers made money by selling subscriptions to the public and display ads to businesses. City directories had been an established and profitable genre of publication for at least 70 years. Every major city had one; some of the bigger publishers, like Polk's, supplied several cities.

After 1920, the <u>street</u> directories of the 1800s and early 1900s were totally displaced by <u>telephone</u> directories and yellow pages. Every function that the city directories had served was absorbed by the phone book. There was one important difference,

though: the telephone and the automobile had radically redefined the nature of urban space. A directory that emphasized location was of little use when the bulk of urban commerce was organized around real-time telecommunications. The most important thing to know was not where people or businesses resided but how to get in touch with them by telephone. Communications access was primary; the street address, secondary.

In 1907, city directories still sold more subscriptions than the telephone exchange. Many businesses (not all) listed their telephone numbers in their directory ads, but for most of the public the really important information was where things were located. Dual service was thus a characteristic of an urban communications system in transition. Although rapidly emerging as dominant, the telephone had not yet absorbed and eliminated older media such as the telegraph and the city directory.

For many businesses, subscribing to both the Bell and independent exchanges was a simple way to get around the fragmentation caused by competition. As these advertisements from the Louisville, Kentucky city directory of 1909 [1] show, duplicate subscriptions were treated as a routine part of doing business. (Figure 7.1) Both numbers were listed in the advertisements, and many businesses arranged to have the same telephone number on both the "Home" (the independent) and the "Cumberland" (the Bell licensee company) exchanges. Their duplication, of course, made it unnecessary for many smaller subscribers to do so, for the latter were guaranteed access to these services regardless of whether they were Bell or Home Co. subscribers.

The decision to duplicate or not can be taken as an indication

Nichlies Wm C butcher r ws Shelby s of Rawlings
Nichol David W foreman Consumers' Dist Co b *2330 W Walnut
" Louise C wid David r *2330 W Walnut
" Matilda M sews Kaufman-Straus Co b *2330 W Walnut
Nicholas Adam c r 1816 W Madison al
" Clarence oiler Lou Ry Co b 2109 (2107) W Mkt
" Cora c cook Business Woman's Club
" Emma C b 1417 (1317) S 2d
NICHOLAS GEORGE atty Ky Title Co r Warwick Villa
" Geo W Rev c pastor Presbyterian Mission r 1605 (805) S Hancock
" Julia b *615 W Walnut
" Louis furnaceste Brand & Bohrman r 2608 (2612) Bank
" Mary E opr Lou Clothing Co b *624 Myrtle
" Mary S b 1417 (1317) S 2d
" Peter with Standard Furnace & Range Co r 2728 (2744) W Main
NICHOLAS POPE atty Ky Title Co r Shelbyville
" Saml S b 311 (309) W Walnut
" Sarah r 1114 (942) S 4th
" Victor L molder Fischer-Leaf Co r 1550 (1604) Lytle
" Wm S c helper r 1533 (1531) Lytle
Nicholason John c porter r es Rehm n of Frankfort av
Nicholes Floyd b 1509 (949) Waterbury
Nicholls Jas A (Moses & Nicholls) b 1032 (942) S 4th
" Ora B wid Wilson b 1408 ( ) Herp
" Wm c barber b 731 (727) W Walnut
Nichols, Albert c janitor b 766 (666) S 5th
" Alex driver Geo Weideman Brew Co r 649 (639) E Breck'dge
" Alex r 1630 (830) S Hancock
" Alice H wid W B r 2208 ( ) W Oak
" Allen c lab b *1023 W Green
" Almira stenog BELKNAP HDW & MFG CO r N A

NICHOLS—Continued.
" Andrew L clk b (151) Jane av
" Anna stenog BELKNAP HDW & MFG CO r N A
" Arthur c lab r 735 (629) Center
" A B salesman b 316 (310) W Walnut
" Benj c helper Hartman Furniture & Carpet Co r 2318 (2320) Magazine
" Benj c porter r 224 (220) E Green
" Benj H c hostler r 340 (336) E Green
" Birdie c stemmer Strater Bros Tob Co r rear *228 E College
" Cecilia c laundress b 2611 (1413) Burghard av
" Chas H foreman r *907 E Gray
" Chas J lab Tyler Box Co r 1434 (1636) Van Buren
" Clarence E b (151) Jane av
" Clarence J mngr Bijou Theater r 948 (406) S 24th
" Clay L physician 2620 (1384) S 18th
" Collins c driver r 2611 (1413) Burghard av
" Curtis c lab r rear 1576 (191) Pope
" David C c fleaher Western Tanning Co r 2604 (1454) S 12th
" Dena wid J W r 948 (406) S 24th
" Edna finisher Lou Clothing Co b 1317½ (213) S 23th
" Effie stripper Linker Stogie Co b (615) E Chestnut
" Eli A fireman I C R R b 1900 (1130) S 15th
" Elizabeth c b *1121 Magazine
" Ella mach opr Home Laundry Co b 545 (537) E Jeff
" Emma music tchr 2627 (2631) Bank
" Florence H c retlor b 2036 (2028) Congress
" Floyd c cook 45, *306 W Bway
" Miss millinery 423 (823) S 4th
" Hardy lab b 733 (731) E Jeff
" Haywood baker N Proctor & Son b *1700 W Madison
" Helen laundress b 545 (537) E Jeff
" Hubert T lab Ky Wagon Mfg Co b 3323 (2825) Jones
" Hughes T dentist 2620 (1384) S 18th
" Jas c porter H Straus & Sons Co b 920 (916) Ballard
" Jas A watchman r *2121 Force av
" Jas C custodian Clay Lodge K of P Home r 726 (528) S 6th
" Jas W carp r es 2d al n of Avery av
" John com mer 108 (102) E Jeff r 625 (533) S 1st
" John lab b 1707 (1007) S Shelby
" John I foreman T D & W Handle Co Co r 2459 (1836) Amber
" Jos K plasterer b *1209 W Jeff
" Josie c retlor Buckner, Dunkerson & Co b 2036 (2020) Congress
" Katie M packer Whiteides Biscuit Co b *1608 Cedar
" Lauda R motorman Lou Ry Co b 1909 (665) S 26th
" Laura wid C B r 733 (731) E Jeff
" Laura D wid J W b 525 (529) W Oak
" Lillian mach hand Capitol Steam Laundry b 545 (537) E Jeff
" Lizzie Mrs dressmkr 530 E Jeff al
" Lornax c student r *600 W Ky
" Louellen Mrs folder Long's Towel Supply r 545 (537) E Jeff
" Lucien I dentist 2620 (1384) S 18th

FIGURE 7.1

of who did and did not value, and of who could and could not afford, universal telephone access. As one might expect, different categories of users show very different rates of duplication. Fortunately, the Bell Labs Archives possesses a document with detailed data about duplication and subscription patterns in one city. In 1910, a lawyer for the Louisville Home Telephone Co., the independent competitor of Bell in Louisville and the surrounding region, broke down all of the city's telephone subscribers into 214 categories and compiled a list showing how many members of each category were Bell subscribers, Home Co. subscribers, or duplicators.[2] The Tables which follow are based on the data in this list, which gives us some insight into the way telephone communication patterns and social structure were related to the dual telephone systems.

The city of Louisville had 16,263 telephone subscribers in 1910. Sixty percent of the phones were residential and the rest were businesses. 2,923 of these users subscribed to both the Bell and independent exchange. The aggregate duplication rate is 18 percent, but this number is not very meaningful by itself. A breakdown of the subscribers shows that the duplication rate follows a hierarchy. This hierarchy of information flow appears in some form in all social organization. The demand for communication is concentrated at the top, where there is a small number of large users who make up a disproportionate amount of the volume of calling and also tend to demand communication over a broader geographic scope. Thus, among banks, railroads, hotels, and the suppliers of wholesale farm supplies like plows, seed and fertilizer, both the rate of telephone subscription and the rate of

duplication were very high. (Table 7.1) All of the businesses in this category had telephones, and 75 - 100 percent of them duplicated. Businesses with a duplication rate over 75 percent accounted for only 1.5 percent of the total telephones in the city of Louisville, but made up 7.5 percent of all duplicate subscriptions. As these enterprises were generally large, capital-intensive, and highly dependent upon widespread communications access, a duplicate subscription was just an additional cost associated with doing business, not much different

TABLE 7.1

Duplication Rates: Large-scale business

	Both phones	Home only	Bell only	Duplic Rate	Subsc Rate
Telegraph Cos.	4	0	0	1.00	1.00
Mill Supplies	7	0	0	1.00	1.00
Gas, Electric Light	4	0	0	1.00	1.00
Fast Freight Lines	11	1	0	.92	1.00
Railroads & Railways	21	2	1	.87	1.00
Banks & Trust Cos.	25	2	2	.86	1.00
Express Companies	6	1	0	.85	1.00
Fertilizer Mfrs.	8	1	1	.80	1.00
Hotels	21	6	0	.78	1.00
Laundries	26	7	1	.76	—

TABLE 7.2

Duplication Rates: Medium-scale business

	Both phones	Home only	Bell only	Duplic Rate	Subsc Rate
Hay, Grain & Feed	34	36	3	.54	--
Druggists	83	69	3	.53	1.00
Coal Dealers	46	42	9	.47	1.00
Insurance	65	46	36	.44	--
Dentists	35	44	3	.42	.63
Liquor Dealers	43	56	18	.37	--
Plumbers	25	45	1	.35	.74
Attorneys	85	109	90	.30	.78
Butchers	19	47	7	.26	--
Dry Goods	15	36	6	.26	.21
Groceries	182	466	62	.25	--

TABLE 7.3

Duplication Rates: Neighborhood Level

	Both phones	Home only	Bell only	Duplic Rate	Subsc Rate
Billiard Halls	1	5	0	.16	--
Bowling Alleys	1	5	0	.16	--
Carpenters	11	55	9	.14	.50
Barber Shops	1	6	1	.12	--
Bakers	9	61	9	.11	.39
Saloons	64	487	19	.11	.87
Tailors	8	60	9	.10	--
Churches	3	12	14	.10	--
Residences	900	5449	3971	.09	.20

from ordering an extra telephone extension or another line from a single system.

In the middle of the hierarchy were smaller businesses who used the telephone frequently but whose markets and suppliers were more localized. Physicians, dentists, coal dealers, druggists and attorneys--all these retail businesses and professional services drew their customers from more than one neighborhood but were not really citywide in scope. This class of user duplicated at a fairly high rate, but not as often as the larger businesses. (Table 7.2) Despite widely varying levels of telephone subscription there was a relatively consistent duplication rate in the range of 30 - 50 percent. For these users, duplication was more of an economic burden than it was to the larger enterprises at the top of the communications hierarchy. Telephones in drug stores, it should be noted, functioned as public telephones for the community, accounting for both the 100 percent subscription rate and the relatively high level of duplication.

The relative dominance of the Home Co. in Louisville made it much more likely that middle-level subscribers who used only one phone would be independent subscribers. There are, however, interesting exceptions to this rule, such as lawyers and insurance companies. Whereas single-phone businesses such as coal dealers, butchers and plumbers favored the Home Co. by ratios of five or six to one, in the aforementioned professions the Bell Co. was almost even. The disparity could be explained in a number of ways, the data by itself being insufficient to rule out several options. One possibility is that those involved in law and finance had a greater need for long distance connections to Cincinnati and the

East. Another explanation is that certain lawyers and insurance companies formed a community of interest with other Bell users and saw little need for connection with Home Co. subscribers.

The final class encompasses what might be called the neighborhood level of social organization. (Table 7.3) These users stood at the bottom of the communications hierarchy, in that there were large numbers of users with highly localized uses for the telephone and a relatively low volume of calling. In addition to residential users, it included smaller scale businesses--bakers, barber shops, tailors, carpenters--and local recreational and cultural institutions, such as saloons, churches and bowling alleys. Here the duplication rate is consistently low, averaging about 10 percent. Many of the residential duplications were business-related; e.g., physicians and dentists who needed to maintain access to their clients at all times. On the whole, this class of subscribers used the telephone over a limited local area and had little interest in universal access.

Once again, an uneven division of various subscriber categories suggests that subscription choices reflected other social boundaries. There is a marked bias toward the Home Co., for example, among "working class" institutions like bowling alleys, billiard halls and saloons. The figures for residences and churches, on the other hand, are not so lopsided. This suggests that at the bottom of the hierarchy telephone users were divided by neighborhood and/or economic status. The wealthier sections of town went for the Bell system, which had higher rates and whose advertising tended to project an image of solidity and respectability. Those of more modest means responded to the

independent's appeal to localism and its lower rates.

Unfortunately, no statistical breakdown of residential subscribers by neighborhood or economic status exists with which to support this hypothesis. There is, however, an interesting document dated December 3, 1909 concerning the Bell and independent exchanges in Quincy, Illinois. It is a field report on the state of competition in Quincy written for the Central Union Telephone Co., a Bell licensee. It states:

> I find that the Central Union Co. is well thot [sic] of by the large majority of substantial business houses and of the better class of resident subscribers, while the Quincy Home Telephone Co. receives their greatest support from the interest affiliated with the political and labor associations in Quincy. Our subscribers are of the better class, those more able to meet their bills promptly, while the Quincy Home Telephone Co. have the poor class and are running great chances on collecting their accounts.[3]

A report out of St. Joseph, Missouri also noted that the independent exchange had attracted a large number of subscribers considered undesireable by the Bell system. The Bell manager there went through the independent company's directory and polled all of its subscribers by telephone. It discovered that 80 of the telephone users who claimed to have switched companies because of problems with Bell were listed as "No Good" on Bell's cash ledger. The report also counted 102 Home Co. subscribers as "undesireable" on account of their being "colored."[4] In other communities, the independent, backed by prominent local citizens, may have attracted the "better class." Which telephone company attracted which group is not as important as the fact that the division of the telephone-using public followed other political, social and

economic divisions.

As a tool of citywide commerce and communication, then, dual service required large-scale, high volume users to take out duplicate subscriptions. Business duplication gave both Home and Bell subscribers telephone access to a broad range of the city's institutions and services. As one moved down the scale of social organization from the regional and metropolitan levels to the neighborhood and the home, the rate of duplication progressively declined. In the middle of the hierarchy, there were small businesses who wanted and often needed universal service, but for whom a duplicate subscription represented a significant additional cost. At the lower levels of this hierarchy, where there were large numbers of small users, dual service noticeably restricted the degree of social integration. But it did not do so arbitrarily or randomly. Different classes and neighborhoods divided themselves into communities of interest with a high degree of self-contained communication. There was, of course, always a chance that one would not be able to call an acquaintance or a business. Public telephones on streets and in drug stores and groceries, however, gave people a chance to use the other system. The lack of interconnection between the two systems was less of an impediment to the telephone users of 1910 than it would be now, precisely because telephone usage patterns and urban organization had not adapted to the possiblities of universal service.

If one of the two competing exchanges controlled less than 35 percent of a city's subscribers, as many as half of its subscribers might be duplicators. In St. Joseph, Missouri, for example, Bell subscribers outnumbered Home Co. subscribers by three to one. The

1,048 duplicate subscribers represented only 12 percent of the Bell list, but accounted for 40 percent of the independent subscribers. In Philadelphia in 1907, where Bell had 95,000 subscribers and the independent only 15,000, 65 percent of the independent subscribers were duplicators. A small market share was not necessarily fatal as long as new subscribers were joining the network at a rapid pace. If the smaller system had a significant pool of what were called "exclusives," i.e. nonduplicating subscribers, it could attract new subscribers and make it worthwhile for business subscribers to duplicate. Once rapid growth in the overall number of subscribers stopped, however, large disparities tended to reinforce themselves over time. More and more subscribers gravitated to the dominant system and the minority exchange's base of "exclusives" began to shrink.

The presence of two nonconnected telephone exchanges had a more arbitrary effect on long distance calls. At the local level, the subscribers could gather a fairly accurate idea of to whom they were choosing access when they selected one system over the other. The need for toll connections was often less predictable and the factors determining whether Bell or the independent was dominant were not necessarily the same as those in their own city. After 1907, legislatures, courts and utility commissions began to enforce interexchange connection of Bell and independent systems even when they tolerated dual service at the local level.

For the vast majority of subscribers, however, making calls to places over 100 miles away was a rare event. If the Bell system had the only long distance connections to a city and a subscriber was attached to the independent system, he went to the Bell central

office, where there were special booths set up to handle toll calls, or to a public toll station somewhere in the city. To merchants, farmers, and other businesspeople to whom long distance telephoning was necessary but not routine, going to the Bell office to place a call seemed no more unusual than going to the post office to mail a letter. A Mr. Schleicher, the Bell manager at Mt. Carmel, Illinois in 1904, noted the only toll lines of the competing exchange in his city ran to a nearby farmer system:

> Supervisor: Are the patrons of the Home Company complaining of inability to get outside connections?
>
> Mr. Schleicher: Well, no, sir.
>
> Supervisor: They inconvenience themselves by coming into our office?
>
> Mr. Schleicher: Yes, sir. I had toll business last month amounting to $250. They will inconvenience themselves by walking three or four squares to our office.[5]

A vivid (but probably not typical) account of this process is contained in the correspondence of Thomas Doolittle. On an inspection of the Bell facilities in Middletown, New York, in 1901, Doolittle observed that poor Bell service had left its exchange with only 89 subscribers to the independent's 400:

> It must be remembered that the 400 opposition subscribers have to come to our office to get long line service. At the time of my visit there were six people standing in a dark place less than six feet square, with no place to sit, and all waiting for a long distance connection. I entered the booth to make a call for Albany, and felt compelled to step outside pending the making up of the connection, on account of the offensive odor of the place.[6]

In smaller cities, access competition made it possible for organized groups of telephone users to boycott one service in favor of the other. Group decisions to patronize one system were sometimes motivated by a desire to achieve coordination economies, but more commonly arose to protest and punish a rate increase. The instigators could be boards of trade, merchants associations, or groups of physicians, grocers or druggists.[7] Because their decision affected the calling habits of other users, the organizers placed notices in the newspapers advising readers "We only use the Home Telephone" or "Call us over the Home." Or they issued cards with that message and distributed them to their customers.[8]

A particularly effective mass shift of users to one system took place in Paducah, Kentucky, after a Bell rate increase. On June 1, 1911, virtually all of the city's retail merchants ordered their Bell phones taken out and the independent company's phones installed. The grocers, lumbermen and coal dealers kept the Bell phone until July 1 only because the swamped independent exchange did not have the capacity to serve them until then. The number of Bell subscribers decreased by 700 in two months.[9] In an attempt to minimize the damage, Bell kept the names of many of the boycotters in its directory. Advertisements attacking the Home Company appeared in the paper, and five full-time salesman were sent out to offer $1 a month service to residences. Groups of doctors and dentists responded with newspaper notices informing the public that they were no longer Bell subscribers and denying rumors that they planned to return to the Bell exchange. (Figure 7.2)

Figure 7.2)

2. The Public Debate.

Dual service became controversial as soon as it became widespread. A public discussion of the merits of dual service generally took place whenever a city of appreciable size was considering franchising a competing exchange. By the middle of the decade, however, the issue of telephone competition had seeped into national forums. Telephone competition became the basis of a nationwide public relations battle between Bell and the organized independents. Both interests began to formulate their respective cases for monopoly and competition and find outlets for them in magazine articles, advertisements and books.

Bell's public relations bureau issued pamphlets and releases gloating over independent bankruptcies and rate increases.[10] The object was to depict them as fly-by-night operations whose stock was worthless. This tactic met with some success in eastern centers where there were no independents, but was hardly persuasive in areas that had been served by competing exchanges for ten years. It gradually became evident that Bell's most appealing argument revolved around interconnection. Bell and Bell alone was in a position to supply a comprehensive system that would allow any telephone user in any part of the country to call up any other user. Henceforth, the public relations assault on competition would concentrate on fragmentation, and the allegedly wasteful duplication that went with it. Bell's adoption of "universal service" as its motto came at the peak of the competitive era, and was the rallying cry of its argument to eliminate competition.

One of the earliest entries in the debate was an article in

The Atlantic entitled "Telephone Development in the United States," by F.W. Coburn.[11] The magazine was published in Cambridge, Massachusetts, near ABT headquarters, and took an unambiguously pro-Bell stance. The author began by recounting the extraordinary growth of telephone usage and long distance interconnection. Engineers, to whom he referred in tones approaching reverence, were projecting a telephone penetration rate of one telephone for every five households in the near future. In the not too distant future, the telephone would be within the reach of everyone and a "great national system" would "enable everybody to reach practically everybody else anywhere in the United States." In the author's presentation, these impressive advances in telephone communications were attributable to expert engineers, not to business rivalry. Indeed, the very existence of independent companies was denounced as an obstacle to "that orderly development of the telephone utility upon which the engineering experts are basing their estimates:"

> An enlightened public policy would have prevented their ever coming into existence, while allowing the Bell companies everywhere to maintain their monopoly, and holding them strictly to account for producing satisfactory results.

The only "proper reason" for the independents' existence was to occupy territories which no Bell company had ever preempted, and even then their presence was justifiable only when they agreed to restrict themselves to local service and rely exclusively on Bell to provide the long distance connections.

The author condemned dual service as the cause of "manifold

inconveniences" and "protracted irritation on the part of citizens:"

> If one is a user of the Bell telephone, while one's correspondent is a user only of the service of an independent company, the two people are still as far apart as if Mr. Bell had not invented the telephone. The only remedy in such circumstances is expensive and cumbersome; each man must use the service of both companies.

The Atlantic received so many letters responding to the Coburn piece that it decided to give an independent spokesman equal time. The response was poorly conceived.[12] It devoted most of its argument to an attempt to show that many other inventors besides Bell had come up with a telephone, an irrelevant issue by 1905.

A year later, the Bulletin of the League of American Municipalities began to carry articles by H.J. Gondon condemning telephone competition.[13] The League was an association of reform city officials based in Des Moines, Iowa. Its pages explored and advocated the new managerial techniques pioneered by the progressive movement: city government by commission, municipal ownership or regulation of public utilities, the elimination of bribery and corruption, etc. Its strongest ties were to city governments in Kansas, Nebraska and Iowa.

The independent trade publication Telephony responded vigorously to the charges in the Bulletin, denouncing its author as a "Bell hireling."[14] Bowing to the pressure of the organized independents, the League's Bulletin ceased its criticism of telephone competition and reprinted a speech by Francis Dagger, a Canadian advocate of competition, in the August 1906 issue. Dagger

pointed out how competition had advanced the development of telephony, lowered rates and improved service. The conflict probably made the midwestern urban reformers uncomfortable. All their instincts led them toward expert planning: competition in utility services was wasteful and chaotic; regulated monopoly was the ideal. But they were also critical of big corporations and in favor of locally responsive government, which tended to make them sympathetic to independent, local companies.

The fragmentation argument was the key to the political defeats suffered by the cause of independent competition in large cities. In June 1905, the Merchants Association of New York issued a report to the city franchising authority expressing its opposition to franchising any independent telephone company. "The effect of two rival telephone systems in one city is to divide the population into two parts, without means of telephone communication with each other except at excessive cost." Dual service "compels a choice of two evils: either half service or a double price."[15] The New Orleans Board of Trade came to almost identical conclusions in its report of 1908.[16]

An assortment of user groups in Chicago opposed the franchsing of a competing telephone company because of the inconveniences of dual service. The Telephone Users Protective League, which described itself as a federation of "28 of the largest and most important business and commercial associations in Chicago," sent a resolution to the Chicago City Council in November 1907 claiming that "the greatest possible inconvenience and unnecessary expense to telephone subscribers would result from the existence of two competing telephone systems in Chicago."[17] The Chicago Federation

of Labor, claiming to represent "large numbers of telephone users," declared that "duplicate telephone systems in this city would be a calamity to all users." The Labor Federation also objected to the Bell policy of refusing to interconnect with independent exchanges outside of the city.[18] Throughout the country, socialists advocated municipal ownership as a third alternative to competitive fragmentation and private monopoly.

The biggest salvo in the debate was fired in AT&T's 1907 Annual Report, written by Theodore Vail upon his return to the Presidency. In it, Vail articulated for the first time the slogan "One System, One Policy, Universal Service," and the philosophy underlying it. The 1907 Annual Report was as much political pamphlet as business report; it was sent to thousands of newspapers and opinion leaders as well as the company's stockholders. The themes it struck up were repeated with variations in every succeeding Annual Report until 1914. In the Reports, Vail hammered away at the theme that only a single, integrated system offering connections among all subscribers in all locations could realize the telephone's potential. The rationale for universal service had four components.

First, Vail argued that the value of a telephone network increases with the number of subscribers. Universal interconnection widens one's communications options, bringing access to parties or locations that one could never have predicted one would need. As Vail put it, "there are times when it is most necessary to get communication with someone who, until the particular necessity arose, might have been unknown and unthought of. It is this necessity, impossible to predetermine, which makes

the universal service the only perfect service."[19]

Second, Vail contended that competition between telephone networks is always imperfect competition. His argument was based on a clear grasp of the inherent nonhomogeneity of separate networks. Rival telephone services are never perfect substitutes for each other because both will offer access to different subscribers. Consequently, competition requires either a duplicate subscription, which Vail considered wasteful, or restricted access.[20]

Vail's third argument for monopoly invoked the managerial imperatives of coordinating interconnection. Interconnecting exchanges all over the country required centralized management. "Interdependence, intercommunication, universality," he claimed, "cannot be had with isolated systems under independent control....They require the standardization of operating methods, plant facilities and equipment, and that complete harmony and cooperation of operating forces, that can only come through centralized or common control."[21]

Fourth, having made the case for monopoly, Vail was willing to accept the consequences of removing his industry from competitive pressures: government regulation of rates and service.[22] In the annual reports and in an article in the Atlantic published in 1913, Vail argued for a private monopoly monitored by an expert commission, a view that dovetailed with developments in other utility services.[23]

Vail's powerful vision infused Bell's public image with a new coherence. In a series of full page ads which began to appear in 1912, Bell presented itself as a nationwide system linking every

community in the U.S., even though it was years away from achieving that goal. (Figures 7.3 - 7.5) "To one who has a Bell telephone at his lips," one ad declaimed, "the whole nation is within speaking distance." Comparisons between the Bell System and "the Tree System" advised readers that:

> A noble tree thrives because the leaves, twigs, branches, trunk and roots are all working together, each doing its part so that all may live.
>
> This is true also of that wonderful combination of wires, switchboards, telephones, employes and subscribers which helps make up what is called the Bell Telephone System.

FIGURE 7.2

Doctors Deny Rumor of Change

Paducan, Ky., July 19, 1911.

We, the undersigned, physicians of Paducah, Ky., certify that our names, which appear in the East Tennessee or Old telephone directory, issued July 1st, 1911, was published without our knowledge or consent. Our Old or East Tennessee telephones were ordered removed from our offices and residences on June 1st, 1911, and have not been used since that date. There is a rumor afloat that the doctors contemplate reinstalling the Old or East Tennessee telephone. In order that our position may be thoroughly understood, we desire to say that we are perfectly satisfied with one telephone and do not intend to incur the expense of installing another or second telephone.

(Signed) S. Z. Holland, M. D., R. DuCasse, J. T. Reddick, C. P. Burnett, H. M. Childress, M. M. Cooley, H. T. Rivers, J. C. Freeland, O. P. Kidd, S. B. Pulliam, H. P. Linn, Jeff D. Robertson, W. C. Eubanks, Robt J. Rivers, R. E. Hearne, B. A. Washburn, Frank Boyd, P. H. Stewart and J. W. Bass, C. E. Kidd, J. Q. Taylor, J. B. Acree, W. G. Graves, Della Caldwell, C. H. Johnson, H. F. Williamson, H. T. Hessig, Vernon Blythe H. G. Reynolds, H. H. Duley, Jr., J. G. Brooks, W. H. Parsons, H. L. Bradley, E. B. Willingham, C. E. Purcell, J. W. Pendley.

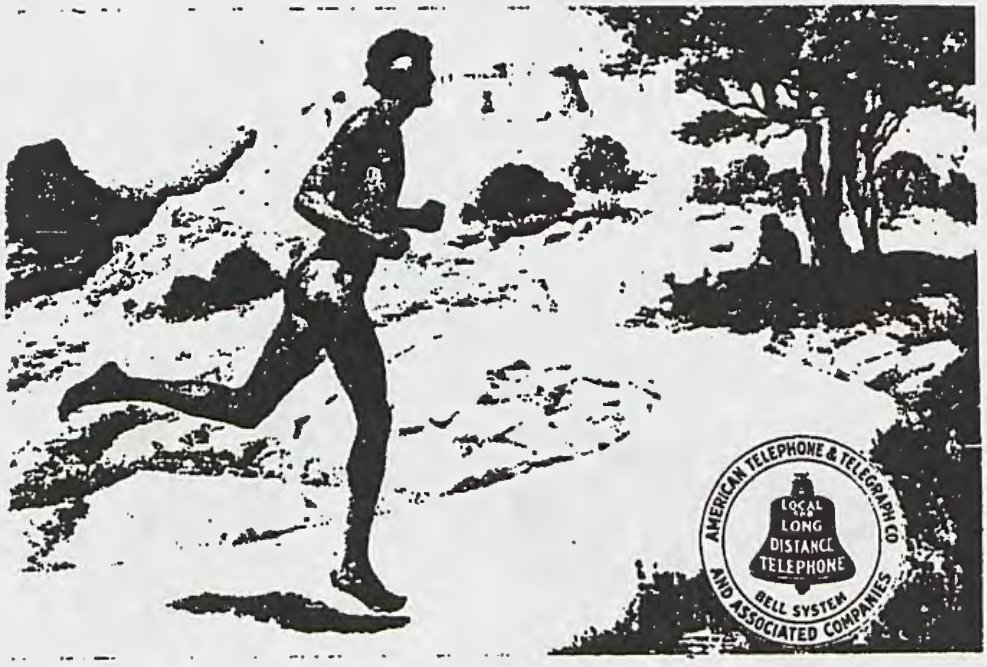
Notice

Paducah, Ky., July 19, 1911.

We, the undersigned, dentists of Paducah, Ky., certify that our names, which appear in the East Tennessee or Old telephone directory, issued July 1st, 1911, were published without our knowledge or consent. Our Old or East Tennessee telephones were ordered removed from our offices and residences on June 1st, 1911, and have not been used since that date. There is a rumor afloat that the dentists contemplate reinstalling the Old or East Tennessee telephone. In order that our position may be thoroughly understood, we desire to say that we are perfectly satisfied with one telephone and do not intend to incur the expense of installing another or second telephone.

(Signed) I. B. Howell, C. K. Milam, W. L. Hansbro, W. V. Owen, Sydney Smith, O. B. Powell, E. W. Stamper, J. V. Voris, McJohnson & Diamuke, King Brooks, W. H. Neville.

FIGURE 7.3



Message Bearers Ancient and Modern

Pheidippides, the most noted runner of ancient Greece, made a record and an everlasting reputation by speeding 140 miles from Athens to Sparta in less than two days.

Runners trained to perfection composed the courier service for the transmission of messages in olden times. But the service was so costly it could be used only in the interest of rulers on occasions of utmost importance.

The Royal messenger of ancient times has given way to the democratic telephone of to-day. Cities, one hundred or even two thousand miles apart, are connected in a few seconds, so that message and answer follow one another as if two persons were talking in the same room.

This instantaneous telephone service not only meets the needs of the State in great emergencies, but it meets the daily needs of millions of the plain people. There can be no quicker service than that which is everywhere at the command of the humblest day laborer.

Inventors have made possible communication by telephone service. The Bell System, by connecting seven million people together, has made telephone service so inexpensive that it is used twenty-five million times a day.

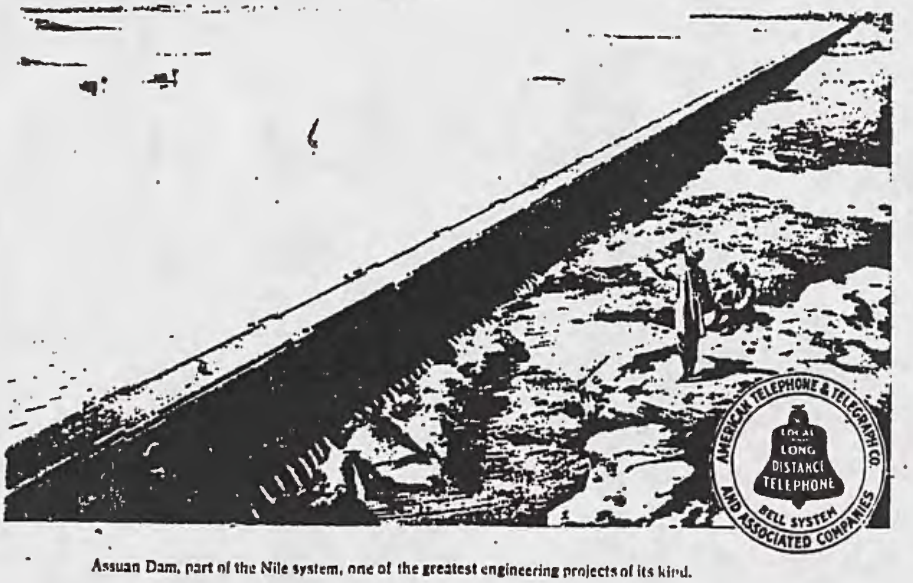
Captains of war and industry might, at great expense, establish their own exclusive telephone lines, but in order that any person having a telephone may talk with any other person having a telephone, there must be One System, One Policy and Universal Service.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

AND ASSOCIATED COMPANIES

Every Bell Telephone is the Center of the System

FIGURE 7.4



Assuan Dam, part of the Nile system, one of the greatest engineering projects of its kind.

The Nile System—The Bell System

For thousands of years Egypt wrestled with the problem of making the Nile a dependable source of material prosperity.

But only in the last decade was the Nile's flood stored up and a reservoir established from which all the people of the Nile region may draw the life-giving water all the time.

Primitive makeshifts have been superseded by intelligent engineering methods. Success has been the result of a comprehensive plan and a definite policy, dealing with the problem as a whole and adapting the Nile to the needs of all the people.

To provide efficient telephone service in this country, the same fundamental principle has to be recognized. The entire country must be considered within the scope of one system, intelligently guided by one policy.

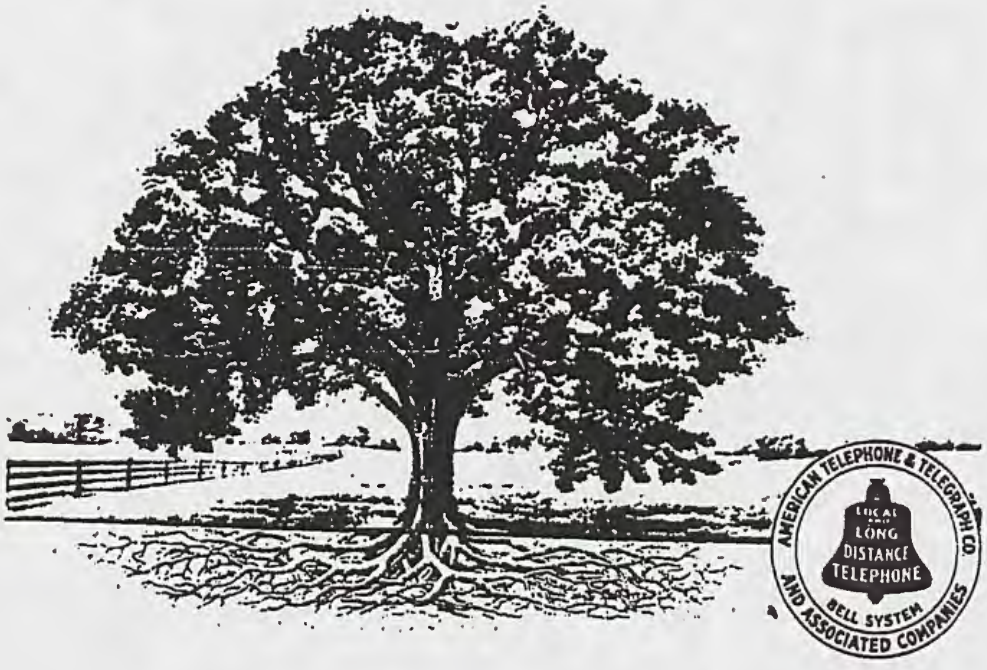
It is the aim of the Bell System to afford universal service in the interest of all the people and amply sufficient for their business and social needs.

Because they are connected and working together, each of the 7,000,000 telephones in the Bell System is an integral part of the service which provides the most efficient means of instantaneous communication.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy *One System* *Universal Service*

FIGURE 7.5



The Tree System—The Bell System

A NOBLE tree thrives because the leaves, twigs, branches, trunk and roots are all working together, each doing its part so that all may live.

Neither the roots nor the branches can live without the other, and if the trunk is girdled so that the sap cannot flow, the whole tree dies.

The existence of the tree depends not only on the activity of all the parts, but upon their being always connected together in the "tree system."

This is true also of that wonderful combination of wires, switchboards, telephones, employes and subscribers which helps make up what is called the Bell Telephone System.

It is more than the vast machinery of communication, covering the country from ocean to ocean. Every part is alive, and each gives additional usefulness to every other part.

The value of telephone service depends not only on the number of telephones, but upon their being always connected together, as in the Bell System.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy ***One System*** ***Universal Service***

The independents did not have a large, sophisticated public relations organization, but they did not do badly. They relied on the trade press to monitor the public dialogue and used spokesmen from state and national associations to air their case in public hearings. Their national organization adopted a common symbol, "the shield," to mark independent telephones and exhorted all its members to use it. (Figure 7.6) In 1906, Telephony magazine published a propaganda book to present the independents' side of the controversy, A Fight With an Octopus by Paul Latzke, a writer of popular magazine articles romanticizing industrial success. The essays making up Octopus first appeared in serial form in Success magazine. The book extolled the independent movement as a story of the triumph of honest, enterprising Americans over a greedy, distant trust. The publishers of Telephony took care to make the book "high-grade, dignified and attractive," but also inexpensive enough to reach a mass audience.[24] It was sold in lots of 1,000 for 13 and a half cents each.

The independent movement was initially put on the defensive by attacks on subscriber fragmentation, but by 1907 had developed a plausible and interesting set of counterarguments. They pointed out that fragmentation notwithstanding, the rivalry for new subscribers had resulted in a net increase in telephone access for most users. Thus, while a business user had to pay more in absolute terms for two subscriptions, he was also getting access to five or ten times as many subscribers for a price that was only a little higher than the rates of the monopoly period.[25] In Indianapolis, for example, a business subscriber paid $72/year for access to 2,286 other users in 1898. Following the entry of the

New Company, a duplicating business user paid $94 for access to 21,000 subscribers. They also cited indisputable evidence that competition had improved the service offered by the Bell companies.[26] These benefits, they argued, were well worth the price of some fragmentation.

Editorials in the independent trade press affirmed that business users in the top and middle of the hierarchy often opposed the introduction of dual service. "It is the merchants and business men of a community, newspapers and other personal and impersonal leaders of public thought that are generally found in the forefront of the opposition to the 'nuisance of two systems' in towns where competition is first suggested," noted the American Telephone Journal.[27]

Some independent spokeman responded that the very redundancy of which the businesspeople complained was of great value:

> When a subscriber says that two telephones are a nuisance, he means that the two instruments sitting on his desk are an inconvenience, they are irritating to his vision. He objects to two bells ringing simultaneously, maybe once a month or so. But two telephones on a man's desk, reaching two different companies in active competition with each other...are vastly beneficial to that man. His ability to reach everyone in two different manners through different sources is of immeasurable value, as is the ability to have everyone in the community reach him over two different ways.[28]

Other independent spokesmen pointed out that businessmen accepted fragmentation and duplication as a normal and unobjectionable product of competition in other communications-related areas. This argument relied on an interesting analogy between telephones and newspapers as channels for gaining access to the public. At this

time most cities had many competing daily newspapers.

"What forces the business man to take two telephones?" asked Col. Powers of the Louisville Home Telephone Co. "The same thing that forces him to advertise his goods in two newspapers in a town instead of one--in order that he may reach the people."[29] In theory, a newspaper monopoly would relieve the advertiser of the need to place duplicate ads in two or three different papers and would relieve the reading public of the inconvenience of buying and reading two or more newspapers. In actual practice, the competition between papers increased circulation, lowered advertising rates and delivered to the business a larger audience at a savings:

> Take the case of one newspaper in a city with a circulation of 30,000 copies daily; another is started with a circulation of 50,000. The poor business man had been in the habit of advertising in the first paper at an expense of $100 a month, but by reason of the competition and the increased number of readers he feels that he is compelled to advertise in the more progressive paper. [By] reason of the competition he can get the same advertisement in both papers for $150 a year. Now would any sane business man say that it was a great hardship...to be forced to advertise in both papers, and therefore that the new comer...had worked a hardship on the citizens of that place? If men are forced to advertise they do it because their competitors force them. If men are forced to take two telephones in order to reach the buying public, it is because they want to come closer to the people and keep themselves and their business before the people...

Thus while the independents recognized the advantages of universal interconnection, they did not think that it made the telephone industry exceptional.

In assessing the debate over dual service two elements of the contemporary viewpoint must be kept in mind. First, a divided

subscriber universe was generally seen as an inevitable consequence of competition. Thus, eliminating fragmentation was usually associated with returning to monopoly. (The debate over physical connection will be taken up in the next chapter.) To many, the inconvenience of fragmentation seemed like a worthwhile price to avoid subjection to a monopoly, especially with the memory of the pre-patent expiration period still fresh. Second, the subject of telephone rates was always more controversial than fragmentation itself. Unification of the systems seemed like a fine idea in the abstract, but if it would result in a rate increase many preferred to stick with dual service. Later on, many states turned to commission regulation to avoid having to make this trade off. But commission regulation had its problems, too. The President of the Buffalo independent, Burt G. Hubbell, contrasted regulation with dual service as a method of controlling rates, and made a prescient critique of the former. In testimony before federal antitrust authorities, Hubbell showed that Bell's costs in smaller communities were higher than the independents.[30] The disparity was not the result of waste or inefficiency, but was caused by the need for extensive recordkeeping and supervision in a large organization. The independents being exempt from such requirements could operate more efficiently in small cities. The existence of a separate system using a completely different set of operating methods thus provided a standard against which costs could be measured. If there were only one telephone company, this standard of cost efficiency would be lost. Regulatory commissions would have no idea what it cost to provide telephone service outside of what the telephone company itself told them. At best, a commission

could ascertain what a company actually spent. They could not determine whether another company, using completely different methods or technologies, might be able to supply service at a lower price. The argument anticipates the critique of rate-base regulation advanced by economists half a century later.[31]

With a little historical imagination, dual service emerges as a perfectly viable way to run a telephone system. It had its advantages and its drawbacks, as did universal service. It sacrificed a homogenized access universe and the convenience of integration to achieve the price constraints and diversity made possible by competition. The choice was not between a more or less efficient way of doing things. It was a contest between two different sets of expectations, two different conceptions of what telephone service should be.

NOTES TO CHAPTER 7

[1] Caron's Directory of the City of Louisville for 1909. Vol. 39 (Louisville, Kentucky, 1909).

[2] Cumberland Telephone and Telegraph Co., acquisition of Central Home Telephone and Telegraph, Kentucky. Box 39, AT&T-BLA. Letter of Thomas Tracy to U.N. Bethell, Vice President, AT&T., Feb. 11, 1911.

[3] Central Union Telephone Co., form dated December 3, 1909, "Quincy Home Telephone Co." AT&T Legal and Regulatory Dept. records, Regulatory History Project.

[4] "Extract from the Monthly Narrative Report-St. Joseph." May 17, 1911. Box 17, AT&T-BLA.

[5] Cumberland Telephone Journal 10:1 (January 15, 1904).

[6] "Hudson River Tel. Co.--Toll Requirements," p. 14. Doolittle to Cochrane, Jan. 16, 1901. Box 1330, AT&T-BLA.

[7] In one Indiana town the President of Bell's Central Union licensee attempted to break a boycott of its telephone system organized by local grocers by operating competing grocery stores. Sabin to Fish, May 19, 1902. Box 1333, AT&T-BLA.

[8] Telephony 13:2 (February 1907) p.109.

[9] Powers, Paducah Home Telephone Co, to Thomas Tracy, June 15, 1911. Box 39, AT&T-BLA.

[10] See for example "The Story of an Independent Company As Told by Itself." Boston: AT&T Information Department, September 2, 1909. This 10 page pamphlet reprinted bankers' prospectuses and financial circulars of the independent company of Omaha, Nebraska showing its descent into bankruptcy. San Francisco: Pacific Telephone and Telegraph Co. Telephone Pioneers Museum.

[11] "Telephone Development in the U.S." The Atlantic 96:644 (November 1905).

[12] The Atlantic 97:236 (March 1906).

[13] Bulletin of the League of American Municipalities, September 1904 - July 1906. New York Public Library, Room 228. Group 10 document file Misc. #5. For Telephony's attack on the Bulletin see Telephony 12:2 (August 1906) p. 130, and 12:3 (September 1906) p. 186.

[14] Telephony 12:2 (August, 1906) p. 130.

[15] Cited in Delos F. Wilcox, Municipal Franchises Vol. 1 (Rochester NY, 1910) p. 240.

[16] Ibid, p. 241.

[17] Chicago City Council, Committee on Gas, Oil and Electric Light. Communications, etc. November 4, 1907, p. 2023-4. AT&T-L&R.

[18] Ibid, p. 2024-5.

[19] AT&T Annual Report, 1909, p. 22-3; AT&T Annual Report, 1910, p. 39.

[20] AT&T Annual Report 1907, p. 17-18; 1909, p. 22-23; 1910, p. 37.

[21] AT&T Annual Report, 1909, p. 23.

[22] AT&T Annual Report, 1907, p. 18-19.

[23] The Atlantic 111:311 (March, 1913).

[24] Telephony 12:2 (August, 1906) p. 155.

[25] Independent Telephone Association, "Some Comments on the 1907 Annual Report of the AT&T," p. 18 cited in Wilcox, note [15] above.

[26] New York City Bureau of Franchises, "Result of Investigation of the Operation of a Dual System of Telephones in Various Cities," November 21, 1906, p. 8. Cited in Wilcox, note [15] above.

[27] American Telephone Journal X:Y (---, 1906) p. 238.

[28] Burt Hubbell, quoted in "Chicago Hearings in Government-Bell Trust Suit," Telephony 65:22 (November 29, 1913), p. 21.

[29] Telephony 11:6 (June, 1906).

[30] Telephony 65:22 (November 29, 1913) p. 20-21.

[31] Averch, Harvey and Leland L. Johnson, "Behavior of the Firm Under Regulatory Constraint." American Economic Review 52 (December): 1052-69.

Chapter 8

The Independent Movement is Broken

1907 - 1913

With the return of Vail, Bell had a clearly defined goal: the elimination of dual service and the creation of a nationally interconnected monopoly supervised by regulators. Monopoly would bring about universal service and relief from the low rates locked into place by the fierce competitive struggle. Universal interconnection was not the sole object; Bell also wanted to make sure that it administered the system. In order to do so, it had to prevent physical connection with overlapping systems and maintain absolute control of interexchange connections. There was a place for independent companies in this scheme, but only as local feeders to the Bell system. In the major cities, dual service was to be eliminated by buying out the independent and physically consolidating the exchanges. If the independent was dominant, Bell would sell out and enter into a connecting contract with the surviving exchange. Consolidation would demonstrate the benefits of a unified service while permitting the companies to raise rates to their "proper level." In the smaller cities and the country, competition would be eliminated by an aggressive new sublicensing effort. Any overlapping, competing telephone systems that remained were to be isolated and squeezed out as all others were absorbed into the system.

The relationship between interconnection and network competition was the central preoccupation of this period. There were two distinct aspects to the issue. One was the strategic use of interconnection in the Bell-independent rivalry. The other was the attempt of courts, legislatures and regulatory commissions to find an appropriate public policy regarding interconnection. Should competing networks be compelled to connect or not? Did interconnection preserve or destroy competition? Was the strategic use of interconnection rights an anticompetitive practice or a legitimate exercise of the right of contract? Was it necessary to eliminate competition to bring about universal interconnection? These questions moved to center stage, but only succeeded in producing a welter of contradictory decisions.

The watershed event of these years was the Kingsbury committment of December, 1913; the conventional histories are correct in that respect. Unfortunately, historians have passed down a completely erroneous view of that event. As the following account will show, the Kingsbury commitment was not a decisive or even very meaningful change in Bell interconnection policy, and actually prolonged, rather than shortened, the existence of nonconnected telephone systems. The antitrust-inspired commitment was the product of a legal and regulatory system that had not yet come to grips with the fact that its desire for an integrated telephone system was completely at odds with its commitment to the preservation of normal market competition. Its terms embodied the central contradiction of the period. Its only positive accomplishment was to bring Bell's accelerating acquisition of independent systems to a halt for five years, giving the telephone

companies, utility commissions, city and state governments, and federal antitrust officials the breathing room needed to work out a coherent policy regarding telephone monopoly, competition and interconnection.

1. Interconnection as competitive weapon.

From 1898 to 1906 the story of independent development was largely one of building exchanges and short-haul toll lines. After 1906, the independents began to exploit their control of exchange access to develop competitive intercity long distance lines. While independent exchange development peaked around 1904, their long distance activity flourished from 1906 to 1911. Large regional independent operating companies, formed through mergers of several smaller companies, started long distance subsidiaries and went about constructing access universes comparable in scope to that of a Bell licensee company. The presence of competing exchanges in many major cities made it both possible and necessary to build toll lines paralleling Bell's most profitable routes. The independents generally undercharged Bell and their lines often connected into exchanges where Bell had only a public toll station.[1] A typical independent operating company owned exchanges in 10 to 30 key cities and signed long term, exclusive connecting contracts with independent exchanges they did not own. On the borders of their territories, they entered into agreements with the neighboring independent regionals for the interchange of traffic. A sampling of some of these systems:

Missouri and Kansas. The Kansas City Home Telephone Co. was anchored in Kansas City, Missouri, where it served 20,000 of the

city's 40,000 subscribers. Its long distance subsidiary owned 10,000 miles of toll wire in 1909 and offered connections to Topeka, Lawrence, Omaha and many smaller exchanges in the vicinity. The Kansas City Co. was connected to the competing exchanges in St. Louis and St. Joseph over the lines of two neighboring independent regionals, the Kinloch Telephone Co. and the St. Joseph Home Telephone Co. In 1907 the Kinloch Co. had a strong subscriber base in St. Louis and owned 14 exchanges in eastern Missouri and central Illinois. Its toll lines covered an area bounded by Sedalia, Missouri, Springfield, Illinois, Terre Haute, Indiana, and Farmington, Illinois.[2] The St. Joseph Home Co. had connecting contracts with 48 companies in the area, giving it access to 40,000 telephones.[3]

Pennsylvania, Maryland and West Virginia. Several large independent regionals competed with the Bell system. The American Union Telephone Co., centered in Harrisburg, was formed in 1906 through the merger of twelve independent companies. It owned at least 25 interconnected exchanges in central Pennsylvania, including the competing exchanges in Harrisburg, Altoona, Lancaster, Williamsport and Chester. The Keystone Telephone Co. owned exchanges in and around Philadelphia, including Trenton and Camden. The Consolidated Telephone Company covered the territory to the north and west of Philadelphia, operating exchanges and toll lines connecting Allentown, Scranton, Wilkes-Barre and Reading. The Pittsburgh and Allegheny system connected independent exchanges in the western parts of the state. The National Telephone Co. owned exchanges in Wheeling, Steubenville and other towns in the vicinity. Each of these systems were connected to each other

through an organization known as the "Eastern Traffic Association," a clearing house which accounted for and divided joint toll revenues and coordinated maintenance and operations.

Ohio, Illinois, and Indiana. The Inter-state Independent Telephone and Telegraph Co. of Aurora owned 29 exchanges in Illinois, including the cities of Peoria, Springfield, Joliet, and Elgin. In 1911, it reached an agreement with the Illinois Tunnel Co. that gave it access to independent subscribers in the city of Chicago. Its lines connected with the Kinloch system to the west and with the Indiana's New Long Distance Co. to the east. Centered in Ohio, the United States Telephone Company was one of the largest and strongest independent long distance systems. It owned 22 independent operating companies, including exchanges in Cleveland, Columbus, Akron and Youngstown, Ohio. Its long distance lines covered the state of Ohio. After 1906, the financial syndicate controlling U.S. Telephone acquired control of the Home Telephone Co. of Detroit, the Indianapolis independent exchange, and the New Long Distance Telephone Co. The latter connected all of the sizable independent exchanges in the state of Indiana.[4] In 1908, it furnished long distance service to 800 independent exchanges in Ohio, Indiana and Michigan reaching 325,000 telephones.[5]

The U.S. Telephone Co. required its connecting exchanges to sign a contract that guaranteed the long distance company exclusive access to the local company's toll business. The contract was an attempt to secure the same kind of control over interconnection rights that was embodied in the Bell system's license contract. It stipulated that the local exchange was not allowed to make

connecting arrangements with any other long distance company for a term of 99 years.

Comparably sized independent regionals existed in New York state, Kentucky, Southern California, Washington and Oregon, and Minnesota. By 1910, independent systems extended in an unbroken line from New York to Kansas along the east-west axis. On the north-south axis, they ran from Tennessee to Minnesota. With the exception of isolated systems in Dallas, Atlanta, Mobile and Shreveport, they were all physically connected. The independents did not have the technology or the organization to offer talking circuits over 300 miles in length. Nevertheless, it was clear by the time of Vail's return that the independent regionals could become viable competitors for toll traffic as well as exchange subscribers.

Independent toll systems had seized a substantial amount of traffic because of their lower rates and sometimes superior exchange access. The incursions into toll business "not only assist the revenue of the opposition but greatly increase its prestige with the more important telephone customers," noted AT&T's Pickernell.[6] In upstate New York, the effect of independent toll line competition was so severe that the Bell toll earnings had fallen to 1-2 percent. There was a "pronounced loss of business" in AT&T service from Buffalo to Cleveland, Pittsburg and Jamestown.[7]

Vail's competitive tactics were directly aimed at the growth of connectedness among the independents. One of his most important countermoves was to revitalize Bell's sublicensing efforts. The independent companies who directly overlapped and competed with

Bell accounted for only 40 to 45 percent of all independent telephones. The rest of the independent subscribers were in areas unoccupied by Bell. These noncompeting independents, Vail understood, held the balance of power in the competition for universal coverage. If they could be tied into the Bell system, Bell could broaden its coverage without investing in facilities or engaging in local competition. In many areas, whoever won connecting rights with the majority of the noncompeting independents would have access to the largest number of subscribers.

Bell's first sublicense contract had limited the exchange to Bell connections and required the use of Bell telephones. This did prevent the independents from running away with the business in the central states, but by the beginning of 1907 it had induced just 25 percent of the noncompeting independents to join the Bell system. In order to gain access to more independent systems, Vail dramatically liberalized the Bell interconnection policy. Starting in October 1907, independent exchanges connecting with Bell no longer had to use Western Electric instruments, but could keep using independently manufactured telephones as long as they were of "first class" construction and would not impair the quality of service offered over joint lines.[8] Followup letters urged the licensee companies to "pursue vigorously the policy of sublicensing" in the part of their territory which was "more or less unremunerative."[9] These exhortations, however, were followed by a warning to make sure that the Bell licensee controlled all the toll lines connecting the sublicensed exchanges.[10] Vail also allowed Western Electric to begin selling telephones to independent

companies for the first time.[11]

Armed with its new sublicensing policy, Bell licensees made great efforts to attract farmer and mutual company lines. "The opposition [Bell] has shown more activity than ever before in establishing and encouraging rural mutual companies to connect up with its system," wrote Telephony in 1909. Bell was promising rural telephone users service at one-fifth the rate of the independent companies.[12]

The importance of sublicensing as a form of enlarging the Bell system's scope was particularly evident in the areas where strong independent toll systems were developing. In the Missouri and Kansas Co.'s territory in mid-1909, sublicensed toll lines outnumbered the licensee's in mileage, and sublicensed telephones outnumbered Bell-owned telephones by two to one.[13] The Bell licensee in the territory around St. Louis was so dependent on sublicensing for toll connections that an AT&T agent speculated that if the sublicensees should happen to break with Bell "the Bell toll business and the Bell development would disappear, and the opposition would absoutely control most of the territory outside of St. Louis."[14]

Bell went on to liberalize its interconnection policy in a more radical fashion. In an attempt to pry independent subscribers away from the exclusive control of competing independents, Bell began to interconnect with independent exchanges even when they already maintained connections with competing long distance lines. In a few cases, it was even willing to connect its toll lines to an independent exchange that was directly competing with one of its own if the independent had a commanding lead in the number of

subscribers.[15] This tactic was used in Ohio and Indiana, where hundreds of independent exchanges had signed exclusive connecting contracts with the United States Telephone Company (UST). The new policy amounted to soliciting the exchanges to break their contract with UST. Nevertheless, it was an attractive option for the local exchanges, as it gave their customers access to the subscribers and cities controlled by both systems.[16] In 1908, sixteen local independent companies in Ohio and Indiana entered into connecting agreements with Bell in violation of their exclusive contract with UST.[17] UST responded by suing the exchanges.

The dispute over exclusive connecting contracts brings out the complexity of the relationship between interconnection, competition and monopoly. From the viewpoint of the local exchange, an exclusive connecting contract prevented competition by tying all of its long distance traffic to one carrier. From the viewpoint of the subscriber, exclusivity destroyed their ability to choose long distance carriers, and made them accept a system with less than universal coverage. To the United States Company, however, exclusive access to independent exchanges was its chief competitive advantage against Bell. Opening up its connecting exchanges to Bell subscribers destroyed its ability to complete with a much larger system. Protecting consumers' and local exchanges' right to choose toll carriers would accomplish little if enforcing that right left only one carrier in the field.

The legal decisions pertaining to exclusive toll connecting contracts illustrate both the prevailing confusion about the competitive effects of interconnection and the extent to which it was still commonly assumed that telephone service, like railroads

and telegraphs, would remain competitive under laws requiring opposing systems to connect. The UST suit went first to the Common Pleas Court, which treated the case as a simple breach of contract. The court upheld the independent long distance company and ordered the exchanges to sever their connections with Bell toll lines. Bell continued the practice and UST was forced to litigate the case on broader grounds. It sued Bell under the state antitrust laws, charging that its new policy was an attempt to drive UST out of business and monopolize the trade.[18] The decision of the Ohio Supreme Court, however, found not Bell but the United States Company guilty of monopolistic practices. The court invalidated its 99-year exclusive contracts because they gave the independent long distance company a "monopoly" of the local exchange's long distance business.

The decision was based on a broader application of the principle of "nondiscrimination" than had previously been used in telephone cases. In a lively and incisive review of the application of common carrier principles to the telephone, Judge Tayler of the Court dismissed the precedent of the railroad express cases, which for the preceding fifteen years had shielded telephone companies from interconnecting with other companies. The practical demands of railroad operation were completely different from those attending the making of telephone connections, the Judge wrote. While it was physically impossible and unsafe to allow railroad companies to run trains over another company's tracks without the second company's cooperation and consent, the interconnection of telephone companies did not pose the same problems. A long distance company need not be treated differently than any other

individual subscriber:

> Conceivably, 20 long-distance companies might be connected with the local exchange with the same simplicity and with the same absence of confusion which we find in relation to the local subscriber's lines, and there is no more physical difficulty, ...in connecting a subscriber with one of the 20 long distance lines than in connecting a subscriber with another local subscriber served by the same exchange.[19]

As common carriers, telephone companies were required to provide service to all who applied without discrimination. Since the operations required to link subscribers to the lines of a long distance company were no different from those required to set up a connection with any other subscriber, the company's common carrier obligation could and should be extended to long distance companies. The U.S. Supreme Court's earlier doctrine that "common carriers" had no obligation to be "common carriers of common carriers" was no longer valid.

The pro-competitive intent of the decision is clear from its basis in antitrust law and its reference to the possibility of "20 long distance companies" serving a single exchange. Indeed, its reasoning was exactly the same as that underlying the "equal access" provisions of the Modified Final Judgment, which paved the way for long distance competition in the 1980s. In theory and in the received version of telephone history, larger networks are supposed to benefit from the refusal to connect and smaller competitors are supposed to favor joining their system to the larger one. In 1909, however, the dominant network was seeking to interconnect with companies bound to its competitors, and the Ohio Supreme Court decision allowing it to do so was correctly seen as a

setback to the cause of independent long distance competition.

Competition suffered because the court decision interfered with the competing independents' ability to coalesce a critical mass of subscribers and exchanges outside of the Bell system. Joseph Ware, secretary of the national association, expressed the prevailing view among independents:

> Judge Tayler fails to grasp the first great principle in the telephone struggle and business, that, excepting the Independent companies are connected together into one system there can be no competition in the telephone business.[20]

Competition in the telephone business revolved around the scope of access. A few large independent companies were attempting to construct regional access universes that would be competitive with Bell's. In any given region of the country, Bell controlled a far greater number of exchanges than any individual rival. Thus, the many small, scattered independent exchanges held the balance of power. Bell had guaranteed access to a larger number of exchanges to begin with; allowing it to break exclusive contracts binding the small independents to competitive long distance networks would place "50 percent of the Independent force in the doubtful column," a Nebraska independent wrote.[21] If all independents did not hold together as a system, the size of Bell's access universe would easily exceed that of its independent competitors, and Bell would dominate the industry by virtue of its nationwide presence and extensive network facilities:

> If our faction [the Independents] were made up of one

> organization some uniformity of methods could be followed, but to compel an interchange of service under present conditions means elimination of competition in favor of the larger organization and nothing else.[22]

Ostensibly, nondiscriminatory interconnection would also open Bell exchanges to UST, but the independents expressed doubts about whether this would lead to a truly competitve situation:

> The second point which the judge fails to grasp is, that there is no competition where long distance lines are connected into <u>one</u> exchange--where <u>one</u> operator can put messages over all lines. The benefits to the public which come from competition...can only be obtained successfully by having competitive systems, rather than variously owned lines into each exchange, with one long distance company--the Bell. He overlooks the fact that the Bell company has, or had, a competing local exchange in each of the towns where connection was made with a local company having contract relations with the U.S. Telephone Co., and that, co-incident with the connection of the Bell toll lines to the local independent exchange, local competition was eliminated.[23]

The independents were asserting that nondiscriminatory interconnection was fundamentally incompatible with competition. If Bell could gain access to local subscribers through an independent exchange it would not run a competitive exchange. If there were competing long distance lines terminating in a monopoly local exchange, the operators of the exchange would route long distance calls over their own company's lines rather than those of a competitor.

The tendency to apply concepts of nondiscrimination to the telephone business in such a way as to require competing companies to exchange traffic appeared in other important legal decisions of the period, and represented one strand of thinking.[24] The Supreme

Court of New York, on the other hand, upheld the validity of exclusive contracts on the grounds that it preserved competition.[25]

Legal opinions notwithstanding, the liberalized connection policy had a devastating effect on independent competition. The number of Bell-connecting independent telephones jumped from about 300,000 at the beginning of 1907 to 1.2 million in only two years. The competitive impact of the new policy becomes clear when these numbers are expressed as a proportion of the independent telephones not in direct competition with Bell. At the beginning of 1907, only 25 percent of the noncompeting independents were connected to Bell. A year later, 46 percent of them were so connected. By October 1909, 79 percent were connected to Bell.[26]

The facts about independent long distance development require some revision of the conventional view of Bell's success. Bell did not win the competition because of its long lines; i.e., the AT&T intercity circuits of 500 miles or more in length. Nor was its control of the most advanced long distance technology decisive. At this time, 99 percent of all telephone calls were to points less than 100 miles away.[27] A system's ability to offer efficient and universal termination to points within the 100-200 mile area with which most of a subscriber's communication took place was more important than the ability to call cities 800 miles away. AT&T, Vail discovered, had no controlling patents on the technology needed to make connections of this length.[28] For communication over long distances (say, 500 - 1,000 miles), the telegraph was still the dominant and by far the most economical service. As late as 1909, a telephone businessman wrote that while ultra-long

distance telephoning "appeals most strongly to the imagination, it was still "occasional" and "of little commercial or social importance."[29] The true source of Bell's strength was its universality. In any given region of the country, it had a presence in most cities and was able to set up connections between all of its exchanges very efficiently. With the new sublicensing and interconnection policies, Bell retained exclusive access to many cities while eroding the independents' exclusive control of the other areas.

Bell's cooptation of noncompeting independents was supplemented by a price war against selected independent toll lines. The independent long distance companies were able to charge lower rates because they had lower fixed costs. Unlike Bell, they did not attempt to provide complete toll coverage of an area but concentrated their resources on high volume routes. Bell toll lines served both "fat" and "lean" districts and installed enough capacity to handle most of the traffic. By constructing a simple economic model of these conditions, Pickernell discovered that cutting Bell rates in half to secure a larger share of the traffic would hurt the independent more than it would hurt Bell. The independent's profit would be "enormously impaired," while Bell's would fall only slightly.[30] Rate cuts proposed by Pickernell went into effect in May in selected cities of Ohio, the target being the U.S. Telephone Co. The Ohio rate cuts succeeded in increasing Central Union's toll traffic by 53 percent, while reducing its revenue by 12 percent.[31] In New York state, where strong independent systems in Buffalo, Syracuse, Rochester and Erie, Pennsylvania existed, cuts went into effect in July.

The price war made major inroads into the toll business of the United States Telephone Company. In an attempt to stop the loss of its long distance business, it tried to get both companies to restore their rates to their original levels. It approached the Central Union Company through the state independent association, which had come into much closer contact with the Bell licensee due to the growing number of sublicensed independent companies. At the instigation of James Brailey, president of the United States Co., a committee of the Ohio Independent Telephone Association met with the Central Union and argued that the lower rates injured the local sublicensees by reducing their commissions from toll traffic. This argument was merely a cover for the real concern, which was that Bell's price war was hurting U.S. Telephone severely. They asked that the state independent association be given the right to approve or disapprove of any change in toll rates made in the state of Ohio. This price-fixing offer was refused.[32] As a result, Brailey took steps to sell off the United States Co. property. The United States Co. ended up in the hands of J.P. Morgan & Co.

The most direct blows against dual service came from Bell buyouts of competing exchanges. The policy of eliminating dual service in the larger cities through acquisition or sale progressed rapidly during this period. At the beginning of 1907, 59 percent of the Bell exchanges in cities with a population of 5,000 or more had dual telephone exchanges. By October 1913, the number of these cities with competition had been reduced to 37 percent.[33] In smaller cities, mergers of competing exchanges were often followed by the franchising and construction of a new competing exchange. In Marshalltown, Iowa, for example, a new franchise was issued

within a month of the takeover.[34] In the larger cities, however, the losses were irreversible.

Independent companies were particularly susceptible to divide-and-conquer acquisitions. Their decentralization made it difficult to weather extended bouts of competition or to adhere to a common policy. Selling out to Bell offered an appealing way to escape from a variety of financial pressures: the diseconomies of growth, price wars with a competitor who was willing and able to sustain losses for an extended period of time, rate restrictions in municipal franchises, and a constant need to raise more capital. These problems had always existed, however. What precipitated the surge of independent sell-outs between 1910 and 1913 was the collapse of independent attempts to build regionally interconnected systems. This failure was partly the result of Bell's liberalized interconnection policy and partly a byproduct of the financial panic of 1907, which made investors less willing to put scarce capital into dual systems. The stampede of noncompeting independents into connecting arrangements with Bell between 1907 and 1910 prompted many of the more profit-oriented independent system owners to get out while the getting was good. In 1912, the consolidation trend began to chip away at the urban strongholds of the independents. Competition was eliminated in 10 of the 68 cities over 50,000 in population that had had dual service. In that year alone, Bell purchased 136,000 telephone stations and sold 42,650.[35]

The consolidations were not motivated by Bell's ability to achieve supply-side economies of scale, nor did they result in rate decreases. They were effected to eliminate competition and to

clear the way for a rate increase. Bell's cost of providing exchange service was often higher than the independent's.[36] In competing cities, it openly held its rates below its costs in order to hold on to subscribers, subsidizing its losing exchanges with profits from monopolized operations. Bell looked upon the elimination of dual service as an opportunity to recover those losses. Pressures for a rate increase also came from the fact that consolidation increased the telephone company's short-term expenses. The Bell exchange was often unable to use much of the physical plant it had purchased, yet the costs of buying it had to be recovered. The placement of the wires and switchboards of the formerly competing systems usually did not facilitate their combination into one system. If some parts of the telephone exchanges could be combined, money had to be spent on connecting facilities, and in general operations became more complicated as the system grew. The revenue of a combined system was less than the sum of the revenue of both systems prior to consolidation because of the loss of duplicate subscribers. Whatever operating economies were achieved by merging were offset by the increased expenses and lower revenue.[37] Universal service, rather than rate decreases, was the incentive offered for permitting the merger. While the user public and the municipal government generally looked favorably upon unification of the service, support for it could evaporate if it was accompanied by a rate increase.

Early on, Bell takeovers led to the severance of independent toll line connections.[38] After 1910, the mediation of utility commissions made the mergers more orderly and protected the interests of the other independent exchanges in the state whose

users were dependent upon access to the city. In order to ensure that public reactions against severed connections did not threaten the policy of achieving a universal service monopoly through buyouts, Bell announced the "Vail Commitment" in January 1912. The Vail Commitment was a promise that Bell would leave all long distance connections intact when an exchange changed hands. Acquisition would neither enlarge nor restrict the toll access of the exchanges involved.[39]

Vail made his consolidation overtures explicit beginning in the Fall, 1910. During a national independent association meeting in Chicago, Vail and H.P. Davison of J.P. Morgan & Co. invited independent leaders to meet with them at the Blackstone Hotel. About 25 prominent independent representatives responded to the invitation. At the meeting, Vail offered to cooperate with the independents in thoroughly eliminating competition in the telephone business. He told the independents that the destructive warfare between them was costing the Bell Companies millions. He wanted to effect a merger that would end those losses and leave AT&T in control of most of the large cities and long distance lines, while ceding the smaller places to the independents, where, he admitted, they operated more efficiently than Bell. The specific places to be controlled by AT&T or the independents would be settled through negotiations later. With a representative of the Morgan Co. at his side, Vail said that the merged companies could be capitalized liberally to cover the losses that had been sustained.[40]

At Vail's suggestion, a committee of seven independent leaders was appointed to conduct the negotiations. What became known as the Committee of Seven met with Vail and Davison several times over

the next four months.[41] This group became the nucleus of the major mergers that helped create a telephone monopoly. Negotiations concerning the purchase of almost every important independent property were initiated between 1910 and 1913. Though some of these deals were not consummated until a decade later, they represented the beginnings of Bell-independent cooperation in the control of the industry.

2. Interconnection in Law and Public Policy.

The law and public policy regarding interconnection, competition and monopoly took two divergent and ultimately incompatible paths after 1907. The disturbingly rapid acquisition of competing exchanges by Bell set off antitrust alarms all over the country. Antimonopoly sentiment was at fever pitch; public fears that big businesses were strangling the market economy had led to successful prosecutions of the Northern Securities Company, and to the dissolution of Standard Oil and the American Tobacco Company in 1911. Congress passed a new, broader antitrust law, the Clayton Act, in 1913. The institutional response at the state and local level, however, pointed in an altogether different direction. Municipalities weary with dual service began to favor consolidation or connection of competing exchanges. State governments began to create utility commissions with the authority to regulate telephone companies, or to empower existing railroad commissions to do so. The majority of them also passed laws authorizing the commissions to compel the telephone companies to connect their lines. The commissions upheld regulation as a substitute for competition and often encouraged monopoly. The desire to preserve market

competition mingled uncomfortably with an impulse to unify the system. As the courts, commissions, cities and telephone companies groped for a solution to the "telephone situation," it did not become evident that these two approaches worked at cross purposes to each other until the Kingsbury commitment, made at the end of 1913, transfigured the contradiction into a national policy.

The organized independents knew that competition could not be sustained without dual exchanges in as many cities as possible. The weapons they chose to fight Bell acquisitions were state and national antitrust laws.[42] When the national independent association gained wind of Bell's intentions to merge independent and Bell properties in 1908, it formed a litigation committee and raised thousands of dollars from independent companies and associations.[43] The litigation committee prodded the Attorneys General of Michigan, Nebraska, Kansas and Missouri to block Bell purchases of independent companies.[44] A merger in Marion, Ohio in 1908 was also countered by a lawsuit under the Valentine Act, a state antitrust law. In Kentucky, merger negotiations between Bell and the Louisville-based independent were called off because the state constitution prohibited the consolidation of competing common carriers. Prodded by complaints from the Postal Telegraph Company, the state of Mississippi sued AT&T for integrating its operations with Western Union, charging that it was trying to monopolize the telegraph business.[45]

Federal antitrust proceedings were initiated in July 1912, when the U.S. Attorney General in the Portland, Oregon district filed a suit under the Sherman Act, charging Bell with an attempt to monopolize the telephone business in the Pacific northwest. For

the next six months special agents of the Justice Department took depositions from people involved in the telephone industry around the country. As the new administration of Woodrow Wilson took over the Justice Department in January 1913, the outgoing Attorney General turned over the completed investigation amidst widespread rumors that AT&T would be prosecuted.[46]

At the local level, consolidations were opposed by those who feared they would lead to a rate increase or a deterioration of service. Advocates of this position had no trouble finding evidence that Bell rates in noncompetitive cities were higher than those in cities with competition. As Bell and independent plans to consolidate in Kansas City began to be floated, the Kansas City Post waged an effective newspaper war against the merger, noting that while Bell had promised residential rates of $36 a year, the residential rate in monopolized cities of comparable size was $42 or $48 a year. "If the Bell Company charges from $42 to $48 a year for residence phones in other cities, won't it find excuses to do the same thing here if competition is removed?" the paper asked.[47] In many quarters there was still a willingness to rely on the traditional method of competition to control rates and service.

A different approach to the problem was taking shape at the state level. Twenty eight states passed laws creating regulatory commissions or giving existing railroad commissions jurisdiction over the telephone companies between 1909 and 1913. Twenty six states passed laws authorizing some form of compulsory physical connection between telephone companies from 1907 to 1913, inclusive.[48] In 1910 the Interstate Commerce Commission was given

the authority to regulate telephone companies as common carriers. Armed with their new powers to regulate entry, mergers and connections, the utility commissions began to push the telephone system toward a monopolistic structure.

Compulsory physical connection legislation was the most important arena for working out the public policy regarding dual systems. These laws did not end access competition, but merely empowered a utility commission to order connections when petitioned to do so by the telephone users of a specific locality. They required hearings and a finding of public interest, convenience and necessity by the commission, and thus could only be applied on a case-by-case basis. Furthermore, the laws were not yet used to connect urban exchanges engaged in direct competition with each other. More often, they were applied to broaden long distance access. The restricted scope of their application was attributable to the belief, still widespread, that merging the subscriber sets of the telephone companies would harm one of the two telephone systems. In effect, this amounted to a belief that eliminating access competition at the local level was tantamount to the elimination of competition itself, a conclusion that turned out to be not far from the truth. Because there was as yet was no public consensus on the issue of monopoly, the commissions concentrated on cases where dual service restricted communication between different cities.

The interconnection laws were vociferously opposed by both Bell and the organized Independents. Although their motives were different, their arguments about its competitive effects often paralleled each other. Physical interconnection posed a problem

for Bell in that it publicly advocated universal service but was unwilling to bring that goal about by connecting with competing systems. It had to argue that universal service could be achieved best under the administration of one system. A detailed memo outlining its argument was prepared in 1907.[49]

Part of its argument contrasted the standardization, coordination and high quality that could be achieved under a monopoly with the chaotic and uncontrolled conditions that would result from nondiscriminatory connection with a multiplicity of independently owned, overlapping systems. It also attempted to argue that independently manufactured telephones would not work with the Bell system as well as Bell telephones, although this point was easily discredited as Bell went about sublicensing thousands of non-Bell systems.

A more significant argument was that competition between connected networks was inherently imperfect and even parasitic. If a Bell exchange in a dual service city had fewer subscribers than its opponent and Bell was forced to connect its toll lines with it, the independent subscribers could benefit from Bell toll access without subscribing to Bell. Bell would lose all of its exchange subscribers to the larger local company, it was argued. In economic terms, this can be summarized as an argument that interconnection made networks complements rather than competitors. Bell's defenders argued that it laid out telephone facilities to cover an entire district, including what it called the "fat" and the "lean" areas. Even though some parts of the system were not profitable in isolation, connecting everyone could make the system as a whole profitable. Interconnection laws would allow another

company to serve only the profitable areas while benefitting from Bell's access to the "lean" areas.

The independents' motive in opposing compulsory interconnection was to preserve dual systems rather than to eliminate them. A unified, fully interconnected telephone system, they believed, could not possibly be a truly competitive one. They advanced two reasons for this view: first, there was a tension, if not an outright contradiction, between competitive rivalry and the kind of interfirm cooperation needed to set up telephone connections jointly; second, the whole competitive process in telephony was driven by access differentials which would disappear once the systems were interconnected.

Establishing a telephone connection over the facilities of two or more companies involved linking their lines at the same time to form an unbroken channel for voice communication. The workers of the two companies had to cooperate rapidly and efficiently, and their methods had to be compatible. The independents did not deny that this was possible. They did point out that the level of cooperation required was so intricate that two companies involved in it could hardly maintain their status as competitors.

Business firms sufficiently cooperative to exchange traffic could just as easily divide the market, fix prices and cease to compete. By the same token, integrating their operations involved a degree of mutual trust and openness that hardly seemed compatible with business rivalry. Whoever controlled the local exchange, for example, would be in a position to discriminate between the toll lines of the long distance companies when it routed the traffic, or could engage in preferential treatment of one's own subscribers at

the expense of the other's.[50]

The independent defenders of dual systems also believed that dissolving the access differences between the networks eliminated real competition. The January 30, 1909 issue of Telephony contained a vigorous argument against a physical connection law proposed in Texas. "We have scraped along during the past ten years building exchanges and toll lines that we ought not to have constructed except for the purpose of causing the service to be more valuable than that of our adversary," the article stated. If toll lines were forced to connect with competitors,

> Any fellow who feels aggrieved because his call did not reach him promptly when his mother-in-law had cramp colic...can and probably will build a competing line between your most profitable points, hitch onto you at each end, and make you take his calls to all other points on your lines.

If exchanges were forced to connect with competitors:

> If a handful of businessmen [are] hostile to you for any reason, ...they will build a co-operative exchange in the business section of the town--hire an operator or two--install telephones for themselves at a cost of only a collar or a little over a month, take out your telephones, connect to your exchange, ...and you will hold the bag, and eventually lose out entirely.

The article appeared in the independent trade press--but it had been reprinted from the newsletter of Southwestern Bell.[51]

There was at least one advocate of connecting with competing companies within the Bell system: B.E. Sunny, the head of the Chicago Telephone Co. Sunny believed that Bell would benefit from

voluntarily entering into connecting arrangements. In February 1910, he wrote a memo proposing to operate lines connecting the independent exchanges in Indianapolis, Grand Rapids, Racine and Aurora to the Bell system. The arrangement would give independent subscribers in those cities access to Chicago, Cincinnati and Milwaukee. Sunny pointed out that the proposal would have numerous advantages: it would preempt the growing demand for physical connection legislation, allowing Bell to connect on its own terms; it would eliminate the need to grant a franchise to competing companies in cities currently monopolized by Bell; it would greatly increase Bell's toll business, or at least allow them to find out what effects interconnection would have on its traffic; it would reveal the identity of independent long distance users to Bell, allowing Bell to solicit them to take its own service and save time and money by doing away with the costs of transferring calls between two systems. The only disadvantage Sunny recognized was that it might lead to the loss of exchange subscribers in cities where Bell rates were higher.[52]

Sunny's arguments tend to support the independents' contention that interconnection would lead to a single system rather than continued competition. The proposal was not implemented, however, because the national Bell management feared that interconnection would perpetuate dual systems and ease the pressure for consolidation. A particularly shrewd aspect of Sunny's proposal was that all long distance calls from independent to Bell points would have to go over Bell lines the whole way. If an independent user in Peoria wanted to call Chicago, for example, he would not be allowed to use independent toll lines between Peoria and Aurora and

then transfer to Bell lines; Bell would have to carry the traffic between both cities. The independents knew that these kinds of problems were not only possible but likely when interconnecting competing networks, which is why they viewed the prospect with suspicion. Sunny's proposal is also significant because it may have been used as a model for the interconnection arrangements of the Kingsbury commitment.

The flood of physical connection legislation from 1910 to 1913 reflected a change of heart among the independents. There had always been public demands for connecting the separate networks, but the combination of Bell and independent opposition had prevented action. By 1910 many independents were beginning to concede victory in the access competition to Bell. Those who embraced this view, however, did not see interconnection as a means of preserving competition, but were generally the same independents who worked out consolidations and divisions of territory with Bell. Others saw interconnection as a way to minimize Bell competition at the local level by giving their exchanges access to Bell toll lines.

The physical connection provision of Wisconsin's state utility law was defeated in 1907, when the independents opposed it, but passed in 1911, after they had given up hope of establishing an exchange in Milwaukee and the state association had become "dormant".[53] Frank Woods, the president of the National Independent Telephone Association, came out in favor of physical connections with Bell in 1910. Woods embraced the "universal service" concept and advocated laws compelling the interchange of service between all companies under the supervision of the

Interstate Commerce Commission.[54] (Two years later, Woods worked out a consolidation with Bell which eliminated dual service in most of southeastern Nebraska.) In 1911, the NITA national convention followed Woods's lead, passing a resolution for compulsory connection and state and national regulation.[55] The issue of interconnection and cooperation with Bell split the independents, however. A splinter independent association led by the owners of the competing systems in New York, Pennsylvania and West Virginia was formed in January 1913. One of its leaders, Burt Hubbell, explained that the new association "shall be composed of members who represent telephone companies not owned or controlled by the AT&T, directly or indirectly."[56]

Three landmark cases in California, Wisconsin, and Oregon highlight the different facets of the interconnection issue: the attitudes of users toward nonconnected networks, the effects that the telephone companies believed connection would have on their economic viability, and the attitudes of regulators toward competition.

In April 1912, complaints calling for physical connection were filed with the state railroad commission by two rural independent telephone systems in northern California.[57] The Glen and Tehama County Telephone companies had started operation a few years earlier. Prior to their formation in the predominantly rural counties, the Bell system had established exchanges only in the cities, had minimal toll lines, and used obsolete equipment. The new companies built exchanges and toll lines throughout their counties using modern independent apparatus. Their entry provoked Bell into installing modern switchboards, building toll lines

throughout the district and signing interconnection contracts with the many farmer lines in the area. Following the standard pattern of access competition, Bell was forced to duplicate the rural lines of the independent systems and sublicense farmer lines in order to remain competitive. At the time of the proceeding the subscriber breakdown was as follows:

Tehama County

Bell: 629	Tehama Cty. Co: 457	Both: 241

Glen County

Bell: 674	Glenn Cty. Co: 570	Both: 329

Only 30 percent of the Bell-connected stations were telephones leased from Bell. The rest were sublicensed phones owned by farmers. The commission considered connecting the two systems an appropriate solution because the independents offered superior local service while the Bell system had more extensive long distance access.

From the text of the decision it is clear that the local telephone companies viewed interconnection as a way to overcome the competitive advantages given to Bell by its long distance lines. They believed that once the two systems were connected they would win the majority of the local exchange subscribers. The utility commissioners also saw interconnection as a means of eliminating duplicate subscriptions and overlapping exchanges. Its ruling pointedly did not disagree with Bell's contention that it would lose most of its exchange subscribers if telephone users could gain

access to its long distance lines without subscribing to its exchange. Like Bell, the commissioners thought of the telephone as a natural monopoly. That Bell had been forced to extend and improve its service by the new entrants was interpreted by the commission not as evidence for the benefits of competition, but as an indication that a monopoly could and should have been doing better.[58]

In the city of LaCrosse, Wisconsin (pop. 30,000), Frank Winter, a subscriber to the independent company, petitioned the Wisconsin Railroad Commission to connect the toll lines of the two competing systems in 1912. La Crosse was the largest city to undertake a physical connection proceeding at that time. The Wisconsin Telephone Co. (Bell) had 1400 subscribers in the city; the LaCrosse Telephone Co. had 4200. Both companies had toll facilities offering connections throughout the state, but Wisconsin Telephone lines extended to many places not reached by the local independent. Only 8 percent of the telephone users had duplicate subscriptions, and 12-15 large businesses had PBXs connected to the toll lines of both companies. The petitioner's business required almost daily use of Bell toll facilities. When calls for local people not on the Bell exchange came into the city, messengers had to be dispatched to bring the desired party to a Bell station. Winter requested connecting only the toll lines of the two systems, leaving the division of local exchange service intact. The petitioners argued that the arrangement would be more convenient and would benefit the Bell company by increasing its toll business.[59]

Wisconsin Telephone opposed the request with its usual

arguments. It laid most of its emphasis on establishing that interconnection would result in the loss of most of its exchange subscribers. If users could obtain access to Bell toll lines without a subscription to Bell's exchange, they would migrate to the larger independent exchange in order to obtain universal local service in addition to Bell's widespread long distance service. To support its contention it introduced evidence from Canada, where interconnection had been ordered in 8 cities and Bell's growth in subscribers had been reversed while its local competitors grew.[60]

The Wisconsin regulators ordered the connection made. Unlike the California Commission, however, they took seriously the question of confiscation of property. "It is evident that the only inducement to subscribe to the Bell system is the fact that thereby the subscriber is connected with a telephone system covering like net work the entire country." In order to compensate for economic damage to Bell's exchange, the commission imposed a surcharge on users of Bell toll lines who did not subscribe to the Bell exchange. "A subscriber who has not installed the telephones of both exchanges is not entitled to the toll service of both exchanges without paying an additional charge," it said.[61] A surcharge had also been imposed in Canada, however, where it had failed to stop the desertion of the Bell system. In June 1914, the Wisconsin Commission issued another physical connection order pertaining to the city of Janesville, Wisconsin. In this case the connection order included both local exchange and toll service.[62]

Portland, Oregon in 1913 was a dual service city with about 40,000 Bell telephones, 13,600 Home Co. telephones and 7,000 duplicate subscribers. The Hotel Oregon had Home Co. telephones

in its 400 rooms and 45 Bell system phones in the public places throughout the hotel. The hotel's customers objected to the inconvenience of having to walk to the lobby or hallways to call Bell subscribers in the city. When incoming calls came into the hotel over the Bell system, the hotel staff had to contact the patrons and bring them to a Bell station. The switchboards of the two systems were in the same room in the hotel. The Home Co. was willing to set up a connection between the two, but Bell refused to do so. The only remedy Bell offered was to install duplicate Bell telephones in all the hotel rooms, an expensive propostion for the hotel management. On the motion of the hotel owners, the case was brought to the Oregon Railroad Commission. The commission ordered the telephone companies to connect their hotel switchboards and exchange traffic, charging 3 and a half cents for each transferred call.

There were other important physical connection cases in Hamilton, Ohio and Grand Ledge, Michigan. The commission ordered connections, but in each case the decision was appealed. As in the exclusive connecting contract cases, the State Supreme Courts decisions conflicted with each other. Indiana's Supreme Court ruled against compulsory phyiscal connection in August 1909.[63] California's Supreme Court overturned the railroad commission's interconnection order in 1913, calling it "confiscatory." The Wisconsin Supreme Court upheld its commission in 1916.[64]

The regulatory commissions promoted consolidations as well as interconnection. In September 1911, only three months after the bill creating the Ohio utility commission became law, state officials were meeting with representatives of the Bell company to

discuss plans for the elimination of dual service throughout the state. In 1912 the Bell and independent telephone companies in southeastern Nebraska worked out a consolidation in which Bell achieved a monopoly in some territories and the independent a monopoly in the others. The deal was made with the aid and approval of the state commission. The Michigan commission presided over the consolidation of the competing exchanges in Detroit in 1912, and helped to assure the remaining independent companies that the change would not impair their access to the city.[65] Bills which explicitly prevented competition or permitted mergers between competing companies were defeated in Wisconsin, Illinois, and Ohio in 1909 and 1910. Another merger bill with the support of both Bell and the Morgan interests (which controlled the big independent system in the state) was introduced in Ohio in 1911, but failed to pass again. A similar bill was vetoed by the governor of Nebraska in 1911. While the creation of one system had the support of regulators, it was still controversial with the general public.

Municipal governments also were agitating for the elimination of fragmentation locally. A Cleveland city council resolution of January 1908 declared dual service a "nuisance" and instructed its committee on telephones and telegraphs to investigate the feasibility of compelling the Bell and Cuyahoga exchanges to interconnect. A civic committee in another former independent stronghold, Indianapolis, also recommended a return to one system after an investigation of the telephone situation. Kansas City and Los Angeles both experienced political agitation to connect or consolidated their systems.[66] In all cities, however, support for the elimination of dual service was tempered by fears that it would

lead to a rate increase.[67]

The vitality and novelty of the issue of interconnection can be measured by the contradictory nature of the responses it evoked. Exclusive connecting contracts had been declared to be both anti-competitive and the salvation of competition. Their legality had been upheld by one state supreme court and overturned by others. Consolidation of competing telephone companies was being prosecuted under state and federal antitrust laws and actively encouraged by state utility commissions. The commissions could effect consolidations but bills explicitly authorizing them were usually defeated. Physical interconnection was desireable goal, but so was competition, and the two did not seem to be compatible. Compelling physical connection was authorized by law in many states, but had been declared confiscatory and illegal by some state courts.

NOTES TO CHAPTER 8

[1] Pickernell, AT&T to E.J. Hall, AT&T, May 12, 1909. Box 1376, AT&T-BLA.

[2] 1910 Annual Report of the Directors of the Kinloch Long Distance Telephone Company of Missouri. Box 16, AT&T-BLA.

[3] For information about the St. Joseph Home Telephone Co. and the St. Joseph Home Long Distance Co., see Boxes 17 and 18, AT&T-BLA.

[4] Indiana New Long Distance Co. map, Telephony.

[5] 1908 Annual Report of the United States Telephone Co., December 31, 1908. Box 36, AT&T-BLA.

[6] Pickernell, AT&T, to E.J. Hall, AT&T, May 12, 1909. Box 1376, AT&T-BLA.

[7] Pickernell, AT&T, to E.J. Hall, May 21, 1909. Box 1376, AT&T-BLA.

[8] Vail Circular Letter, October 9, 1907. Box 1364, AT&T-BLA.

[9] Vail Circular Letter, February 10, 1908. Box 1364, AT&T-BLA.

[10] Vail Circular Letter, September 10, 1908. Box 1376, AT&T-BLA.

[11] FCC Investigation (1939), p. 138.

[12] Telephony 17:13 March 27 1909.

[13] Pickernell to Hall, note [3] above.

[14] Ibid.

[15] The Richmond, Indiana independent exchange in 1908 had 2,400 subscribers to the Bell exchange's 100. In lieu of consolidation L.G. Richardson, President of the Central Union Co., proposed an interconnection agreement that would connect AT&T and Central Union Co. long distance lines to the independent exchange in the city. Vail disapproved of the idea but Richardson went ahead with it anyway. Richardson to Vail, July 3, 1908. Vail to Richardson, July 7, 1908. Box 1357, AT&T-BLA.

[16] "Our plan of having all toll lines entering our city on one switchboard has been so pleasant and satisfactory to our

patrons that I think that when the [court order] requiring us to remove them becomes known to our patrons, I would not be surprised if some demonstrations on their part would take place expressing their disapproval of being compelled to go back to the old and unsatisfactory way of having more than one toll station in the city." William Shumaker, President, Butler (Indiana) Telephone Co. to L.N. Whitney, Central Union Co., December 1, 1908. Box 1357, AT&T-BLA.

[17] J.B. Smith to J.D. Ellsworth, December 5, 1908. Box 1357, AT&T-BLA.

[18] United States Tel. Co. v. Central Union Co., 171 F.130 (1909).

[19] Ibid, p. 143.

[20] Joseph B. Ware, Secretary, International Independent Telephone Association, Telephony 17:23 (May 29, 1909).

[21] "The Necessity of Independent Long Distance Service to Independent Local Companies," Telephony 17:4 (January 23, 1909) p. 98.

[22] Ibid.

[23] Joseph Ware, note [18] above.

[24] {State ex rel Goodwine v. Cadwallader 172 Ind. 619, 87 N.E. 644 (1909), 89 N.E. 319 (1909). The Supreme Court of Indiana required two competing exchanges in West Lebanon to restore their connections after one of the companies discontinued them. The court rejected the claim that the notion of common carriage as applied to a telephone company required indiscriminate service to competitors. In doing so it restated the rationale of the express cases, noting that the effect of such interconnection would be parasitic or confiscatory.(p.648) But the opinion went on to hold that a telephone exchange that agreed to interconnect with one system in its area was obliged to offer the same privileges and terms to all other exchanges--a departure from, if not a direct contradiction of, the railroad precedents. See also Medina County Farmers Tel. Co. v. Medina Tel. Co., 30 Ohio Dec.Rep. 500 (1911), which relies on the nondiscrimination precedent of Cadwallader and cites U.S. Tel. Co. v. Central Union.

[25] Supreme Court of New York, Wayne Monroe Tel. Co. v. Ontario Tel. Co., 112 N.Y. Sup. 424: "There is no stronger inducement to the managers of a public service corporation to serve the public well than a healthy apprehension that a rival concern will do so. It is sometimes argued that the presence of two telephone systems in a given district is a disadvantage to the community, which is best served by one system reaching all subscribers; but one system will never be made to reach all subscribers as cheaply as would otherwise be the case if the

possibility of competition is destroyed."

[26] AT&T-BLA.

[27] A graph showing the volume of toll calls as a function of distance was prepared by Doolittle for the New York and Pennsylvania Telephone Co. for 1900. For cities with exchanges, 98 percent of all calls were to points within 50 miles. For toll stations in small towns, the percentage was somewhat smaller--about 95 percent. Box 1330, AT&T-BLA.

[28] Thomas Lockwood, AT&T, to Vail, August 8, 1908. AT&T-BLA.

[29] Gansey Johnson, Columbus Citizens Tel. Co., Telephony 17:1 (January 2, 1909).

[30] Ibid.

[31] Thayer to Vail, November 18, 1909. Box 1376, AT&T-BLA.

[32] Richardson to Vail, June 21, 1909. Box 65, AT&T-BLA.

[33] AT&T-BLA.

[34] Telephony 17:8 (February 20, 1909).

[35] FCC Investigation (1939), Table 35, p.140.

[36] An article on the economics of consolidation in Madison, Wisconsin appeared in Telephony 17:13 (March 27, 1909) p.375.

[37] Ibid. See also "Memorandum Regarding Ohio Mergers," February 1912. Box 36, AT&T-BLA. This document contains a detailed analysis of the Bell system's approach to the economics and politics of consolidation in the state of Ohio.

[38] In 1910 and 1911, independents in Adrian, Michigan, Memphis Tennessee, and Clarksville, Tennessee all suffered from severed connections after Bell acquired independently-owned toll lines in the vicinity. The practice was not as common as it has been made out to be, however, as the independents nearly always countered with lawsuits and were fairly influential politically at the state and local levels.

[39] For a glimpse of how the Vail Commitment affected consolidations see J.M.B. Hoxsey, Southern Bell, to N.C. Kingsbury, AT&T, December 17, 1912. Box 39, AT&T-BLA. The independent in Louisville claimed that connections to hundreds of cities in Ohio, Indiana and Illinois had been possible prior to consolidation. Bell suspected that the connections, while physically possible, had never actually been made before and that the independent was exploiting the terms of the Vail commitment to acquire long distance service over Bell lines. Box 39, AT&T-BLA.

[44] Telephony 65:22 (November 29, 1913) pp. 19-23.

[43] The "Committee of Seven" consisted of Frank Woods of Lincoln, Nebraska, E.H. Moulton of Minneapolis, Theodore Gary of Missouri, H.D. Critchfield of Chicago, Arnold Kalman of St. Louis, and B.G. Hubbell of Buffalo. All were owners of large independent systems.

[44] A.C. Lindemuth, Telephony 15:6 (June, 1908).

[43] Minutes of the Executive Committee of the International Independent Telephone Association, May 7, 1908. AT&T-BLA.

[44] MacMeal (1934), p. 187.

[45] Telephony 64:3 p. 32.

[46] Telephony 64:2 p. 41.

[47] Kansas City Post, October 21, and 22, 1911. Box 17, AT&T-BLA.

[48] South Carolina, 1904* Georgia, 1907* Oklahoma, 1907* Texas, 1907* Maryland, 1910* Kansas, 1911* Michigan, 1911* Ohio, 1911* South Dakota, 1911* Washington, 1911* Wisconsin, 1911* Arizona, 1912* California, 1912* Kentucky, 1912* New Mexico, 1912* Oregon, 1912* Colorado, 1913* Florida, 1913* Idaho, 1913* Illinois, 1913* Indiana, 1913* Maine, 1913* Missouri, 1913* Montana, 1913* Nebraska, 1913* Pennsylvania, 1913* New Jersey, 1914* Virginia, 1914* Minnesota, 1915* North Dakota, 1915* Utah, 1917* New York, 1919.

[49] "Physical Connection," a syllabus and brief on the question of statutorily compelled connection of telephone lines owned by different companies. Memo dated April 25, 1907. AT&T-BLA.

[54] An columnist in the independent trade journal Telephony said of making connections over Bell toll lines: "It would be easy to detect discrimination if Bell operators refused to record your calls. But the [switch]board having lots of business, some calls will have to wait. Do you think the Bell calls would wait? No! But do you doubt that your calls would wait? They would wait." Telephony 13:2 (February 1907) p. 98.

[53] Telephony 17:5 (January 30, 2909) p. 129.

[54] Memo dated approximately February 1910. B.E. Sunny collection, Manuscripts, 1879-1920. Copy in AT&T-L&R.

[53] D. Gabel (1987), p. 349.

[54] MacMeal (1934) p. 183.

[55] Ibid, p. 186.

[56] Ibid, p. 196.

[57] The commission's decision is reprinted in Telephony 64:9 (March 1, 1913).

[58] "A reduction of rates...and improvement of service under competition is an indication of one of two things, either that the rates are too high and the service not good enough before the competition arose, or that the rates are made too low and the service too good for the price under the stress of the competition. The former result could and should have been brought about without competition; the second result cannot be permanently maintained even under competition unless the utility according too low a rate is charging too high a rate elsewhere." Ibid.

[59] Telephony 64:20 (May 17, 1913) p. 25-29. See also D. Gabel (1987) p. 360-368.

[64] D. Gabel (1987) p. 362-3.

[63] Telephony 64:20 (May 17, 1913).

[64] D. Gabel (1987) p. 369.

[63] Telephony 18:6 (August 7, 1909) p. 159.

[64] Wisconsin Telephone Co. v. Railroad Commission of Wisconsin 162 W.R. 383 (1916).

[65] MacMeal (1934) p. 194.

[66] "Bells may talk to Homes," Kansas City Star, March 6, 1911. For more information about the Los Angeles situation, see Chapter 9.

[67] Cleveland Plain Dealer October 2, 1911. After passing several resolutions urging the telephone companies to consolidate, the city council passed a resolution on this date stating its opposition to any rate increase following a merger.

Chapter 9

The subtle politics and economics of unification

1913 - 1921

By 1913, Vail's attempt to unify the telephone system had reaped a whirlwind of controversy. AT&T was mired in lawsuits in almost every state. More threatening still, AT&T's pursuit of a single system had fueled agitation for government ownership of the telephone system. Postmaster General Burleson's annual report advocated government ownership of all forms of interstate communication, and Burleson was cooperating with two powerful congressmen in the drafting of a bill to nationalize long distance telephone lines.[1]

Bell's attempt to acquire and consolidate the Morgan-owned independent properties in Ohio brought matters to a head. After extensive negotiations with state and federal authorities, it learned that the consolidations would be considered a violation of the Sherman Act. In order to extract itself from litigation and abate the threat of government ownership, Bell was forced to back away from its pursuit of a unified system. Its vehicle for doing so was the "Kingsbury commitment" of December 19, 1913, so named because it was expressed in a letter from AT&T Vice President Nathan C. Kingsbury to Attorney General McReynolds and G. Carroll Todd of the Department of Justice. The letter eliminated the

threat of federal antitrust prosecution and stilled some of the demands for government ownership.

1. The Kingsbury Commitment.

Nominally, the Kingsbury commitment was a near-complete victory for the view that competition rather than monopoly should be the norm in the telephone industry. AT&T agreed to divest itself of its Western Union subsidiary, despite the important economies of scope gained from joint operation of telephone and telegraph lines. It agreed to stop acquiring competing independent exchanges, thus preserving dual service in the approximately 1,200 cities and towns where Bell and an independent divided the market. And it offered to open up its long distance lines to independent exchanges under certain conditions. The interconnection provisions of the commitment only applied to exchanges that were more than fifty miles apart. Thus, the agreement was intended to preserve a divided, competitive service at the local level while depriving AT&T of the competitive advantage it obtained by tying long distance access to local exchange service. The independents had every reason to congratulate themselves on what seemed to be "the acceptance of the principle of competition in the conduct of [the telephone] business."[2]

In fact, the Kingsbury commitment was at odds with other forces propelling the telephone system towards monopoly. The growing desire of users for universal access, state utility commissions' determination to supplant competition with regulation, and World War I-induced centralization all pointed towards the unification of the network. The Kingsbury commitment thus created a temporary stalemate rather than a complete victory for the

competitive principle. For the next five years, the commitment impeded consolidations while the political, economic, and social forces that favored them continued to build.

The Kingsbury commitment is often misinterpreted as a sweeping interconnection agreement that effectively ended the fragmentation brought about by Bell and independent competition. This is a misconception. Aside from the fact that it left dual service intact within a fifty mile radius, there is no evidence that any sizable independent company availed itself of the opportunity to connect with AT&T under its terms. Bell's own statistics on the number of telephone subscribers connected to itself through independent companies show no quantum leaps in 1914 or 1915. On the contrary, the rate of increase in the number of connecting stations, which advanced rapidly during the sublicensing craze of 1907 to 1910, declined steadily from 1913 to 1916.[3]

The reason for the commitment's lack of impact becomes apparant as soon as its actual provisions are examined. The commitment was carefully crafted to preserve Bell's competitive advantage, and its terms were far from generous. To make long distance connections over the Bell system, an independent had to build its own lines to the nearest Bell exchange and pay, in addition to the regular toll charges, a 10 cent fee for every call handled. Most physical connection agreements ordered by utility commissions established a surcharge one half to one third that size. The agreement also stipulated that the entire toll circuit should be over Bell facilities and under the control of Bell operators. Independent long distance lines, in other words, could not be used to make up any part of the circuit, except to get the

call to the nearest Bell switchboard in cases where there were no Bell lines. This prevented competitive long distance companies from serving the long distance traffic flowing from independent to Bell telephones. Just as the sublicensing contracts opened up a significant number of independent subscribers to Bell connections without allowing independents access to any part of the market exclusively served by Bell, so the Kingsbury commitment was designed to open up parts of the long distance business heretofore exclusively controlled by independents to Bell, without any reciprocal concessions to the independents. More restrictive still, the agreement only permitted independent subscribers to terminate calls in Bell exchanges; it did not allow Bell subscribers to place calls to users on independent systems.

The terms of the commitment were so disadvantageous to the independents that they were immediately dismissed as "absurd" and "insane."[4] The independents still viewed it as a victory, however, because the commitment was interpreted as the first proposal in a bargaining process that would eventually lead to acceptable terms. Those hopes were dashed when major independents entered into post-Kingsbury interconnection negotiations. In 1914 the President of Buffalo's independent Federal Telephone Co. made an inquiry about interconnecting with Bell toll lines. In his correspondence with vice president Kingsbury he quickly discovered that AT&T would make no concessions to reciprocity.[5] The independents complained to the Department of Justice. Late in 1916 their national association charged that Bell had failed to live up to the spirit of the interconnection agreement.[6] Apparently the protests had no effect.

2. Three Great Consolidations.

The Kingsbury commitment's moratorium on acquisitions was far more important than its ineffectual interconnection agreement. Hundreds of ongoing negotiations for Bell purchases of major independent properties were suddenly suspended. In many cases, the commitment prevented mergers where the independents were willing to sell, Bell wanted to buy, the city and state authorities approved, and voters had expressed their desire to unify the service by large majorities. The moratorium on acquisitions left intact independent operating companies rooted in major cities and possessed of significant levels of toll interconnection. From all appearances, dual service could have continued indefinitely after 1913. Nevertheless, within three years of its publication a series of great consolidations of independent and Bell telephone systems in major cities began. Many were concluded by 1918, well before a 1921 federal law nullified the Kingsbury commitment. This chapter examines three of these consolidations: those in the cities of Los Angeles and Buffalo, and in the state of Kentucky.

Bell had a distinct method and agenda to its approach to the consolidations. Universal service was used to develop public support for the change, but to the company itself the elimination of competition was primarily an opportunity to increase rates. Bell promoted consolidations cautiously, making sure that it had the support or at least tacit consent of telephone users and all relevant government authorities. The reckless acquisitions and disconnections of earlier years had been left behind for good. Technically, new acquisitions violated the Kingsbury commitment, but Bell had learned that it could obtain the Justice Department's

approval if the merger had the support of the public and the approval of state and local officials. The only form of restraint imposed on Bell was that it could not come out of the transaction with control of a larger share of the nation's telephones. This made it possible for Bell and the independents to merge by trading territories. The independent would assume control wherever it was dominant or firmly entrenched, while Bell would take over the territories where it had a commanding lead. The Attorney General would then be presented with a list of the exchange territories being swapped which showed that Bell was losing control over as many telephones as it was gaining. The antitrust officials generally granted their approval to these trades.

Fragmentation of the subscriber universe was always a critical factor in driving the consolidations forward. What is equally interesting, however, is how the unification process affected and reflected the interests of people located in different levels of the communications hierarchy. The issue was not merely whether the public wanted universal service or not, but also who would gain and who would lose because of the transition. This issue comes out most clearly by examining the way rates were adjusted following a consolidation.

The Federal Telephone Company, Buffalo.

The Buffalo-based Federal Co. was run by Burt G. Hubbell, a prominent national independent leader and one of the ablest and most sincere supporters of telephone competition. Hubbell's company had an ownership interest in 35 independent exchanges in western New York, including the systems of Buffalo, Rochester and Jamestown. The Jamestown independent exchange had more subscribers

than its rival Bell exchange; the Rochester exchange was roughly equal to its competitor, while Bell's subscriber universe in Buffalo outnumbered the independent by nearly three to one. In 1916 Hubbell observed a tendency among subscribers served by two exchanges to gravitate toward the larger of the two systems. His Buffalo exchange was having a harder and harder time attracting new subscribers, and the size of its list was decreasing. According to Hubbell, "the natural tendency of the public to patronize the company with the largest number of subscribers ...has led to a segregation into telephone districts in each of which one of the two competitors has usually acquired a great predominance of subscribers." As a result, large numbers of users in western New York were unable to communicate with each other by telephone.[7]

In a memo to the U.S. Attorney General seeking his approval for a consolidation, Hubbell pointed out that the Federal Company had used every means at its disposal to reverse the downward trend. It had waged an advertising campaign touting competition, local control, and lower rates. It had financed, purchased and installed an automatic switching system in Buffalo. Automation had resulted in rapid and efficient service, but failed to reverse the migration of subscribers to the Bell system. Hubbell concluded:

> A careful and painstaking analysis of this situation has brought the company to the conclusion that through a change in sentiment (entirely beyond the control of this company to direct or influence) the public, in the territory occupied by the company, now feels that its best interests can be served through a unified telephone system under state Public Service Commission control, rather than through the support of two companies giving a divided service.[8]

Bell's New York Telephone Company pursued the consolidation in the manner characteristic of the Bell companies at this time. During the consolidation, it worked closely with the Buffalo Chamber of Commerce to secure its approval of the rate changes it wanted to make. It insisted that the majority of telephone users express their approval of the consolidation by petition or a local referendum before the companies applied to the Attorney General for a waiver of the Kingsbury commitment.[9] As in many other localities in this period, Bell skirted the prohibition of the Kingsbury commitment against the acquisition of competing independents by trading territories with its former competitor. In this case, Bell acquired control of the Buffalo area while the independents gained a monopoly over Rochester and Jamestown and vicinity.

The Buffalo Chamber of Commerce approved the consolidation after a special committee conducted a detailed investigation of telephone rates in the city. The first of the committee's conclusions:

> No permanent and satisfactory telephone situation can be established which contemplates the division of our people into two separate groups. General inter-communication is the essential requirement for adequate and complete telephone service, especially for business men.[10]

The most interesting aspect of the report is its proposal to completely overhaul the telephone rate structure upon consolidation. The report claimed that neither telephone company was making an adequate return under present conditions and could, if they so requested, obtain approval for a rate increase from the

Public Service Commission. This, it claimed, "would prove an added burden to the telephone users of this city, and particularly to those who use both services." As an alternative to rate increases under continued dual service, the report proposed a system of measured rates and a move away from party line service. Consolidation would result in reduced operating expenses, while the proposed rate changes, the committee asserted, would reduce rates for most subscriber groups while justly assigning a larger share of the costs to those who used the telephone the most. In its assessment of the impact of the rate change, the committee relied almost entirely on information provided by New York Telephone.

The structure of the proposed rates yields important clues about who wanted universal service and who was expected to pay for it. One effect of the new rates was to dramatically increase the charges of the 1,000 or so large business users at the top of the hierarchy. One such user, the Postal Telegraph-Cable Co., entered an emphatic protest with the city council, pointing out that its payments for telephone service would triple under the proposed rates.[11] The Postal Company circulated its own petition for continued competition to counter the Bell-Chamber of Commerce petition favoring merger. The leaflet carried a list contrasting the rates of cities with and without competition.[12]

The Chamber of Commerce report tried hard to make it look as if residential and small user rates would be unaffected by the change. But it is fairly certain that the rates of users on the bottom of the hierarchy were being subtly increased, too. All business party lines were to be eliminated, and half the business subscribers of both companies were served on a party line basis.

The lowest measured service rate allowed a business subscriber to make only about two calls a day without incurring extra charges. Four-party residential lines, currently priced at $24/year, were to be put on a measured basis, while individual and two-party residential lines were to be offered on a flat-rate basis at much higher rates. Although the four-party residential line preserved the old monthly rate, it now came with a limit of 600 messages, beyond which there would be an additional charge of 4 cents per call. If each person on a 4-party line made only one call a day they would exceed that limit by 840 calls, leading to extra charges of $33/year.

The discouragement of party lines was a predictable characteristic of a telephone system that no longer had to compete for access to subscribers. Party lines had flourished during the competitive period because each network wanted to get as many subscribers as possible onto its system at the lowest possible cost. As competition waned, the telephone companies took access for granted and concentrated on maximizing their revenues from usage.

If the consolidation increased rates for users at the top and bottom of the hierarchy, it probably saved money for business users located somewhere in the middle, assuming that they were single-line users before. Savings would be especially pronounced for businesses with a moderate level of calling who had paid for two subscriptions before. Consolidation gave them universal access at a price about the same, and possibly lower, than the price of a subscription to a single system before the change.

Southern California.

The political response to dual service in Southern California was particularly revealing. By 1916 the Bell and the independent systems had split the telephone business of the region almost exactly in half. Bell's Pacific Telephone and Telegraph Co. had 11 exchanges serving 67,000 stations in the area; its toll lines offered connections to most of the Bell exchanges west of the Rockies and AT&T connections to the rest of the U.S. The independent Home Telephone and Telegraph Co. operated 14 local exchanges and one long distance exchange using automatic switching equipment. In 1916 the Home Co. had 60,300 subscribers and toll connections to many other independent exchanges in Southern California. Despite the fact that the Los Angeles city council had imposed artificially low rates on both companies, forcing them to operate at a loss, both systems were financially sound and in good physical condition.[13] The unremunerative rates harmed the credit of the independent company and made it difficult for it to raise money for expansion, but its effect on the Bell company was equally severe; only its financial ties to AT&T and the rest of the Bell system kept it solvent. Assuming reasonable rates, then, dual service could have been maintained indefinitely in Southern California.

Yet as the telephone saturated the area, political agitation against dual service and for some form of unification took hold. Organized demands for change began around 1910, when the city created its own municipal Public Utilities Board. Three remedies were discussed: 1) compulsory interconnection of the competing exchanges; 2) municipal ownership of the telephone system; and 3) consolidation into a privately owned but publicly regulated

monopoly. The first option, which appeared to leave both competition and the existing companies intact, was the most popular. In April of 1910, the Municipal League of Los Angeles asked the Board of Public Utilities to investigate the feasibility of establishing a method of interconnecting the two rival telephone systems.

As the Board prepared its report, agitation against dual service by the business community grew. In 1912, the Southern California Hotel Men's Association created a committee to prepare a plan to eliminate the use of both telephones in hotels.[14] The Hotel Association's approach to the problem boiled down to an attempt to coordinate users to select one telephone system over the other as a bloc. The same year a group calling itself the Telephone Reform Assocation initiated a campaign against dual service and for consolidation.[15] By 1914 the Association had changed its name to the "One Phone League," and claimed 1200 members. There was no doubt that the policy of interconnecting the two companies enjoyed widespread public support. A municipal referendum of June 1, 1915, saw 63,194 voters express their preference for compulsory interchange of service, while only 14,921 voted against it. Also in 1915, the Socialist Party put a referendum on the ballot authorizing the city to take over and operate the telephone system. The proposition was defeated with 20,000 votes in favor and 30,000 votes against.

If the opposition to dual service is broken down by subscriber group a familiar pattern emerges. Earlier in Chapter 7 the correlation between telephone users' duplication rate and their position in the calling hierarchy was demonstrated. Organizations

at the top of the hierarchy--i.e., those whose usage was large both in volume and in geographic scope--had high duplication rates. Telephone users at the bottom of the hierarchy tended not to duplicate. In the political reaction to dual service we see the same hierarchy. A survey taken by an economics student at the University of Southern California in 1916 asked telephone users, "Are you ever troubled about not being able to get people by telephone because they have the other service?" The survey interviewed 50 "business men," 50 "professional men," and 50 "housewives." The answers are shown below: [16]

Business Men	Yes: 100	No: 0
Professional Men	Yes: 96	No: 4
Housewives	Yes: 66	No: 34

The strongest objections to dual service came from businesses in the middle of the calling hierarchy. The unanimity with which they opposed dual service is striking. The data as reported here contain a measure of ambiguity. The surveyed population is small, we do not know how the samples were selected, nor do we know what the economic status of the housewives was. It is reasonable to assume, however, that most of the businessmen were "troubled" not because they were unable to get people by telephone--many of them would have been duplicate subscribers, after all--but because they objected to the additional expense of subscribing to both systems. As noted before, telephone rates had been a volatile political issue in the city since 1907, with the voting public demanding, and politicians supplying, rates that could not recover the companies'

costs. Business and professional users of the telephone provided the political constituency for those actions.

The corresponding lack of unanimity among housewives is equally striking. Although a majority of them answered "Yes" to the question, one in every three of them was willing to say that she was not troubled at all by an inability to reach half the telephone subscribers in the region. This is even more remarkable when we keep in mind that almost none of the housewives would have been duplicate subscribers, so that they, unlike the business and professional users, really were unable to reach subscribers on the other system. The demand for homogenization was widespread, but the most vigorous calls for it came from the upper levels of the communications hierarchy.

The Los Angeles Board of Public Utilities issued its report on the subject of interconnection April 28, 1914. The report had been conducted by the Utility Department's Chief Engineer, James Barker, and was viewed by all concerned as an objective and impartial study. The Barker report effectively destroyed compulsory interconnection as an option by showing how expensive it would be to build and operate the facilities required to transmit, switch and record calls between the two systems. Although Barker concluded that interconnection was "physically possible," the expense of joint service was increased by the technical incompatibility of the two systems. Bell relied on manual and the Home Co. on machine switching, and both operated at different voltages. The main problem, however, was the sheer size of the two systems. Compulsory interconnection had never been carried out on a scale involving more than 100,000 telephone subscribers before.

Most of places in which it had been tried, such as Janesville and La Crosse in Wisconsin, or Pasadena in California, had only a few thousand subscribers and one central office for each company.

To connect the two large regional systems in Southern California, Barker observed, required one of two methods. One could, first, build direct trunk lines between all of the Home Co.'s central offices and all of the Pacific Co.'s central offices. While this was the most technically desireable method, Barker concluded that:

> The expense in connection with this plan is so great as to preclude its adoption. The initial investment and fixed charges on the necessary equipment are prohibitive. Under this plan it would be necessary to practically duplicate the present trunking equipment of the companies and make extensive changes in the switchboards. In order to carry out this plan it would be necessary in some instances to enlarge the quarters in which the switchboards themselves are contained. In view of these difficulties, and the enormous expense involved, this plan presents so many obstacles that it appears commercially impracticable.

The other method of interconnecting the two exchanges was to establish what would now be called a tandem switching center, an exchange office where calls between the two systems would converge to be switched. Barker estimated that such a switching center would have to be able to handle a peak load of 20,000 calls an hour, and calculated that building and operating it would require about $400,000 in capital investment and another $500,000 to $600,000 per year in expenses. This figure represented about one-third of the total annual operating revenues of both companies combined. Barker concluded by saying:

> By far the best plan for obtaining the desired results is, in my opinion, through a consolidation of the two systems. By this means all duplication and unnecessary investments are avoided and operating and overhead costs are reduced to a minimum, and in the end the patrons will be given a better service and at the lowest rates commensurate with the necessary investment.[17]

After the Barker report, consolidation became the most popular strategy for unification. Municipal acquisition had been repudiated by the voters. "There seemed to be a hesitancy," a contemporary wrote, "about adding to municipal enterprises another institution with annual deficits of nearly $400,000."[18] The Bell Company's franchise expired in November 1916, and the city seized on this opportunity to require a consolidation by refusing to grant its request for a renewal. The product of the merger, the Southern California Telephone Company, was Bell-owned. It began operation on the first of May, 1917. The three-sided struggle over rates between the city's telephone users, the regulators and telephone companies continued, but the question of dual vs. universal service had been settled.

From the Barker report it might appear as if telephone monopoly in Souther California was the product of scale economies. Barker had shown convincingly, after all, that it was less expensive for one telephone company to provide universal interconnection than two. But to view the problem this way is to overlook the most important question in the emergence of telephone monopoly: why did Southern Californians, like Americans almost everywhere else at that time, decide that they wanted <u>universal</u> interconnection? It is clear that the least expensive thing to do for the 88 percent of the subscribers who did not duplicate was to

maintain dual service. To view telephone monopoly as a product of economic efficiency is to reverse the order of causation. Southern Californians decided that they wanted universal telephone access first, and then sought the least expensive way of bringing it about.

The State of Kentucky.

Bell's principal competitor in Kentucky was the Central Home Telephone Company. Central Home owned 19 exchanges in the state in 1910, as well as its own long distance company. After a financial failure in 1907, the system was successfully rehabilitated by the committee of bankers who assumed control of it. As they were not interested in remaining in the telephone business, the bankers approached Bell about selling out near the end of 1910. When Central Home initiated its negotiations, its facilities were generally in better shape than Bell's and its exchanges had more subscribers.[19] In Louisville and its suburbs, for example, the independent had gained over 3,000 subscribers while Bell had lost 1,200 since 1907. The company claimed that this growth had been achieved without any extraordinary promotional measures, but suggested that they would become more aggressive if Bell did not buy them out.

Bell, however, was only mildly interested in acquiring Central Home in 1911. There were two serious obstacles to a merger from its point of view. Already embroiled in controversy and litigation, Bell was not interested in acquiring a major telephone property unless it could be done openly and legally, and the Kentucky constitution contained a flat prohibition of mergers of competing common carriers.[20] The other problem was a city

ordinance in Louisville fixing the rates for telephone service. The president of Bell's Cumberland Company advised Kingsbury that the rates imposed by the city would preclude any possibility of making a profit on a consolidated investment. He went on to say:

> I am of the opinion that the two companies will be compelled to operate for several years, until the people there get tired of two systems and join with us in formulating a plan by which the two companies can be consolidated and fair rates charged.[21]

This comment illuminates both the nature of Bell's commitment to universal service and its antipathy toward physical interconnection in this period. Bell was confident of the ultimate victory of the universal service idea and expected it to come about through a process of public negotiation in which reasonable regulators balanced the interests of the telephone users and the telephone companies. Until that happened, the benefits of a unified service were to be withheld, and used as leverage for bringing the interested parties around to a consolidation that would allow the surviving telephone company to increase its rates. There would be no universal service without a rate increase. Given this policy, pressures to interconnect with competing exchanges in major cities had to be rebuffed because they would deprive Bell of its bargaining power over the unification process.

In an internal letter, Kingsbury admitted that the only reason he was interested in buying Central Home was the possibility that independent subscribers in Louisville and other parts of Kentucky would begin to demand a connection to Cincinnati.[22] A major metropolis only 100 miles from Louisville, Cincinnati attracted a

substantial part of Kentucky's commerce and communication, yet had always been a Bell monopoly town. If a substantial number of telephone users in Kentucky remained on independent systems, especially one as politically well-connected as the Central Home, there was a danger that Bell could be ordered to supply long distance connections to its exchange there, or that a competing exchange would be established there. Late in 1911, in fact, the Postal Telegraph Company, which had an outlet in Cincinnati, offered to provide four heavy copper long distance circuits between the Louisville independent exchange and Cincinnati.[23]

If the Central Home Co. knew definitely that it was not going to be purchased by Bell, it would either adopt more competitive tactics or, worse, cause legal and political trouble for Bell throughout the state. Kingsbury advised his local operatives to keep them mollified so as to avoid potentially "embarassing" and "annoying" actions on their part. While he was not able or willing to buy out the independent, he had to convince them that a Bell purchase was imminent or possible in the long run.[24] Kingsbury bided his time for two years, conducting an appraisal of the property and encouraging its owners to be patient, but negotiations were broken off in November 1912. The Kingsbury commitment, made about a year later, laid the matter of a sale to rest.

During the lull created by the antitrust agreement, Bell and its allies addressed themselves to the political situation in Kentucky. The company's unpopular litigation against municipal rate regulation in Louisville was settled in 1914, with the company accepting the city's dictates. Its rate litigation with the city of Paducah, which had led to the massive boycott of 1911, was

settled by the U.S. Supreme Court in 1915. In the meantime, support for one telephone system had been growing. A new utility bill was passed in 1912, giving the railroad commission the power to compel toll connections. It also contained a provision allowing the railroad commission to authorize consolidations of telephone companies when they were supported by the municipalities involved. The part of the law legalizing mergers was an attempt to skirt the constitutional prohibition on consolidations that eliminated competition. A few months after its passage, the railroad commission approved a merger of the competing systems in Christian and Todd counties [25] but expressed doubts about the constitutionality of the ruling. Pending test litigation neither the commission nor Bell felt ready to proceed with any further consolidations.

Dual service reached its numerical peak in Kentucky in 1914, when there were competing exchanges in 63 of the 159 cities with exchanges. Public support for it, however, was rapidly waning. Having extracted itself from its unpopular rate litigation and repaired its relations with the state officials, Bell was in a position to promote the final step needed to eliminate it. In 1916 the legislature passed a constitutional amendment specifically exempting telephone consolidations from the merger prohibition. To become law, the amendment had to be ratified by the state's voters. The vote was scheduled for the November, 1917 elections. Hunt Chipley of Southern Bell, who had been instrumental in building up political support for the move, wrote to Kingsbury that the passage of the bill reflected a major change in public attitudes toward Bell since the Kingsbury commitment:

> The legislature passed this bill because it was made plain to them, from all quarters of the state, that the public were tired of supporting dual systems of telephones and that the companies should be put in a position, under proper regulations, to remedy this situation.

The proposed amendment passed with 63 percent of the vote. It was supported by every major newspaper and board of trade in the state, and passed through the legislature almost unanimously. In singling out the telephone for a special exemption from laws intended to preserve competition, Kentucky anticipated the federal Willis-Graham Act of 1921. Even the political composition of the coalition that brought the change about--an alliance of Bell and independents who claimed that they needed to be able to consolidate to maintain their economic viability--was reproduced at the national level four years later. Although the legal prerequisites of a monopoly telephone system had been supplied, Bell did not actually acquire the Central Home system until 1924.

3. The substitution of regulation for competition.

In large cities such as Buffalo, Louisville and Los Angeles public policy was consumed with the problem of what to do with existing competitors. Given the heavy capital requirements and the entrenched position of the existing firms, there was little threat that a new company would enter. This was not true of the small towns and rural areas, however. There telephone competition continued with the vigor of the early 1900s. When confronted with competitive entry, the state utility commissions generally suppressed it. The April 24, 1909 Telephony reported that the independent telephone companies of New York opposed commission

regulation "because of the prejudice of that body against competition in public utilities."

The state of Ohio affords a revealing case study. The state law authorized the PUC to prevent telephone companies from "invading the territory" of another company without a certificate of public interest, convenience and necessity from the commission. When numerous farmer and small town telephone companies came to the commission to obtain permission to compete with an existing company, showing that they could supply better service or offer lower rates than the existing company, the commission refused whenever it had the authority to do so. In a case involving the Village of New Washington, the PUC denied permission to set up a new phone system even though the proposed service was at lower rates and the application was supported by a pleading filed by the Village government.[26] Entry was suppressed because prevention of a "multiplicity of telephone systems" and the confinement of telephone service to "one well regulated company" was "the whole intention of the [utilities] Act," a judge ruled.[27] When another small town company attempted to enter the territory of a neighboring company because of the latter's failure to maintain its facilities in proper working condition, the PUC's opinion denied that this was a legitimate reason for competition. The filing of a complaint before the PUC, it said, could compel any company to improve its facilities. In other words, the commission was determined to substitute regulatory remedies for problems of service and rates formerly addressed by means of competition. In part, this adamant reliance on regulatory solutions reflected a movement that embraced all utilities, whether communicative or not.

What gave the arguments about "natural monopoly" their peculiar force in application to the telephone, however, was the problem of a divided subscriber universe.

After the end of World War I there were still competing exchanges in 1,000 locations, including 12 major cities. Further consolidations were blocked by the Kingsbury commitment and more importantly by the Clayton antitrust act.[28] The telephone companies inability to consolidate, they claimed, made it impossible for them to raise money to rebuild their systems. In a movement that had the active support of both Bell and independent interests, Congress amended the Transportation Act to permit the consolidation of dual telephone systems with the approval of the Interstate Commerce Commission. In introducing the Willis-Graham Act of 1921, Senator Graham stated:

> I think I am stating the opinion of most men who have considered the matter, that it is believed to be better policy to have one telephone system in a community that serves all the people, even though it may be at an advanced rate, properly regulated by State boards or commissions, than it is to have two competing telephone systems. There is nothing more exasperating, nothing that annoys the ordinary business man or the ordinary person more than to have two competing local telephone systems, so that he must have in his house and in his office two telephones, on neither one of which he can get all the people he wants to be in communication with.[29]

The passage of the Willis Graham Act gave the imprimatur of the U.S. Congress to the elimination of the last vestiges of competition. It cleared the way for major consolidations in Ohio, Kentucky and elsewhere, although such consolidations had been taking place gradually since 1916.

The historical achievment of telephone monopoly is too often confused with AT&T's rise to dominance over the telephone industry. AT&T helped to articulate the goal of a unified system, and certainly exploited its advantages adroitly, but the outcome of an integrated telephone system was by no means its own doing. A single system was sanctioned and enforced by city councils, state commissions, and federal legislators, and demanded by vocal segments of the telephone users themselves.

NOTES TO CHAPTER 9

[1] Government ownership report.

[2] Telephony 65:26 (December 27, 1913).

[3] The number of independent stations connected to the Bell system increased by 8 percent from 1912 to 1913 and by 4 percent from 1914 to 1915. The rate fell to 3 percent from 1915 to 1916. Additional sublicenses rather than the Kingsbury commitment almost certainly account for this growth. FCC Investigation (1939) Table 32, p. 129.

[4] Telephony 66:3 (January 17, 1914) p. 29-30.

[5] N.C. Kingsbury to B.G. Hubbell, October 1, 1914. B.G. Hubbell to N.C. Kingsbury, October 8, 1914. AT&T-L&R.

[6] MacMeal (1934) p. 221.

[7] B.G. Hubbell to U.S. Attorney General, August 30, 1916. Box 25, AT&T-BLA.

[8] Box 25, AT&T-BLA.

[9] Federal Tel. & Tel. Co., Rochester Tel. Co., Home Telephone Co. of Jamestown, New York Telephone Co., "An Analysis of the Present Unsatisfactory Telephone Conditions now Existing in Western New York and a Plan for Remedying Them." October 5, 1917. Box 25, AT&T-BLA.

[10] Telephone Committee's Report. May 5, 1916. Buffalo Chamber of Commerce, p. 10.

[11] "Telephone Merger." Pamphlet dated August 28, 1916 addressed to the City Council of Buffalo, New York from the Postal Telegraph-Cable Co.

[12] The Postal Telegraph Company had been an opponent of AT&T ever since the latter's acquisition of Western Union in 1909. It opposed consolidations because it feared that the telephone giant would use its market power in the telephone arena to dominate the telegraph industry.

[13] A letter from Henry Robinson to N.C. Kingsbury, July 27, 1915, notes the improved financial condition of the Home company and urges Kingsbury to consummate a merger before the market value of the independent company's shares improved and its stockholders began to oppose a merger. Box 18, AT&T-BLA.

[14] Los Angeles Times, June 22, 1912.

[15] For a complete chronology of the political opposition to dual service in Los Angeles, see "Summary of Information Furnished to the Department of Justice in Connection with Los Angeles Telephone Consolidation Case," March 23, 1917, Box 18, AT&T Bell Labs archives.

[16] Lloyd Heck Marvin, "The Telephone Situation in Los Angeles," Master's Thesis, Department of Economics, University of Southern California, January 7, 1916, Plate II.

[17] The text of the Barker Report, which was released in April 1914, is printed in the Annual Report of the California Railroad Commission, 1914 p. 62. AT&T-L&R.

[18] 1926 book on LA exchange, Pacific Co. [9] Thomas Tracy to UN Bethell, AT&T, February 3, 1913. Box 39, AT&T-BLA.

[20] Section 201 of the Constitution of Kentucky read: "No...telegraph, telephone...company shall consolidate its capital stock, franchises, or property, or pool its earnings, in whole or in part, with any other ...telegraph, telephone...company, owning a parallel or competing line...or acquire by purchase, lease or otherwise, any parallel or competing line or structure, or operate the same."

[21] W.T. Gentry, Cumberland Co. to Kingsbury, October 8, 1912. Box 39, AT&T-BLA.

[22] N.C. Kingsbury to George W. Leverett, AT&T General Counsel, Decembor 1, 1911. Box 39, AT&T-BLA.

[23] Thomas Tracy to N.C. Kingsbury, November 21, 1911. Box 39, AT&T-BLA.

[24] Kingsbury to W.T. Gentry, October 10, 1912. Box 39, AT&T-BLA.

[25] The Kentucky Railroad Commission, Opinion and Resolution, "Application of the Christian-Todd Telephone Co., the Cumberland Telephone and Telegraph Co., the Hopkinsville Home Telephone Co., and the Todd County Home Telephone Co. to Consolidate." July 22, 1912. Box 39, AT&T-BLA.

[26] In the matter of the application of the Cranberry Home Telephone Co. for authority to construct a Telephone System in the Village of New Washington, Ohio. Ohio Public Utilities Commission, Case #204, July 11, 1912. AT&T-L&R.

[27] Clinton Telephone Co. v. New Burlington Telephone Co., Ohio Public Utilities Commission, September 1912.

[28] Section 7 of the Clayton antitrust act prohibited mergers

which created a monopoly.

[29] Congressional Record, June 1, 1921, p. 1966.

Chapter 10

Summary and Conclusions

This study presented the history of the telephone industry from 1894 to 1921 as a history of the rise and decline of access competition. In colloquial terms, access competition meant that separate telephone systems divided subscribers into two camps as they battled to become the dominant system. A more technical definition would describe it as a race to offer users demand-side economies of scope in a market characterized by high levels of demand interdependence. There have been several historical treatments of the competitive period, but the centrality of noninterconnection to the story has never been adequately identified and explored. Yet hardly anything about these events--from the rate policies to the business strategies, from the effects on telephone development to the rise of regulatory intervention--can be understood without reference to it. The unique thing about the so-called competitive period was not competition per se, but the presence of a distinctive kind of rivalry. The Bell-independent struggle was completely different from the kind of competition that has characterized the telephone industry since the 1970s, for the latter has thrived on regulations requiring nondiscriminatory interconnection of competing carriers.

Indeed, economic theorists have only recently begun to identify the unique features of access competition, and many economists would still define it as an anti-competitive practice.

The U.S. experience with access competition is of interest because of its implications for history, economic theory, and policy. Perhaps the most significant historical conclusions to be drawn concern the subject of "universal service." Universal telephone service, an important historical achievement in its own right, is an enduring ideal in communications policy. The goal of a universal communications network was enshrined in the 1934 Communications Act and has remained a touchstone of state and federal policy throughout the turmoil of technological change and the divestiture. Yet the historical data assembled here challenges some deeply engrained assumptions about what it meant and how it came about.

The period of Bell-independent rivalry can be said to have invented universal service. There are two senses in which this is true. First, the name itself was coined at this time to express a particular philosophy about how telephone communications should be organized. The U.S. was forced to directly confront the issue of universality because of the existence of two or more competing, noninterconnected telephone systems in the same territory. Philosophy aside, the events of this period also had the effect of making a nationwide voice communications system a physical and economic possibility. A telephone system that could reach every city and bring voice communication within the reach of a majority of the population was merely a speculative fantasy until the Bell-independent rivalry accelerated development to previously

unheard-of levels.

Universal service, however, did not mean the same thing then that it means now. From 1907 until the 1920s, "universal service" meant the interconnection of all localities and telephone users into a single system. It did not mean a telephone in every home, nor was universality in that sense considered to be a matter of policy significance. True, the diffusion of the telephone was hailed as a desirable thing. Trade journals and the popular press marvelled at its rapid penetration of farm areas and residences, and interpreted this as a sign of the inexorable progress of the industrial age.[1] Where the 1880s and early 1890s saw the telephone as a specialized device of limited appeal, no one in the 1900s or 1910s would have disagreed with an assertion that eventually there would be a telephone in every home. But this progress was seen as something that would occur naturally as industrialism increased wealth, lowered prices and improved technology. Universality in this sense posed no special policy issue, required no government action.

Universal service in its native historical context meant complete system interconnection--the elimination of both geographic and competitive barriers between telephone users. The policy issue at that time was whether the telephone would develop under the guise of separate, competitive systems or as an integrated monopoly. The U.S. in the early 1900s was willing to entertain a radically different vision of the telephone's role in society. It was, for a time, willing to accept fragmentation of the subscriber universe in exchange for the benefits of system competition. Both sides in this debate equated competition with noninterconnected

systems and saw regulated monopoly as the only feasible way to eliminate fragmentation. Contrary to the implications of later historical work, the country was aware of the possibility of interconnecting competing exchanges, but this option was rejected for a variety of reasons. The most historically significant reason was that interconnection seemed to contemporaries to be incompatible with true competition. Real competition meant access competition. Interconnecting competing exchanges led to problems of cream skimming and parasitism, and also entailed such close integration of the plant, planning and operations of the two companies that they might as well be merged anyway. One could also say that the progressive-era experts had become convinced that certain utilities should be treated as regulated monopolies, and the telephone seemed to them to be one of them. Nevertheless, it was unification of the service rather than lower unit costs that served as the rationale for telephone monopoly. By 1921, universal interconnection had been adjudged to be more important than competition in virtually all quarters. The concepts of monopoly and universal interconnection had become inseparable.

Once a nationwide, fully interconnected network was established, universal service took on a new meaning. As telephone communication came to be considered one of the basic necessities of life, universal service began to mean a telephone in every home. As this happened, universal service became a great mythical creature invoked by both AT&T and the telephone regulators to legitimize themselves. AT&T's corporate propaganda claimed that it had invented the idea and generally succeeded in taking credit for its achievment in the U.S. In this construction, universal service

was a product of AT&T's integrated structure, its nationwide scope, its operating efficiency, and its ability to improve technology.

Later on, state regulators also claimed credit for universal service. In their version of history, universal service was a product of government subsidies. The telephone, they claimed, was extended to rural areas because of revenue settlements and Rural Electrification Administration loans in the 1930s. Small independent telephone systems in rural areas were kept afloat because of cross-subsidies created by the regulatory commissions' control of rates. Penetration reached universal levels because regulation kept basic subscription rates low. As new competition began to threaten this system in the 1970s and 80s, state regulators began to assert that deregulation and universal service were incompatible goals. Competition threatened to unravel the rate subsidies on which the whole system was based. Increasingly, universal service was presented as something that had to be preserved or defended against the onslaught of competition; it was a "social goal" that would never arise in an undirected market economy.

There are elements of truth in both of these constructions of history. AT&T's vertical integration and commitment to long distance development <u>did</u> create the backbone of a nationally interconnected network. Basic subscription rates <u>were</u> kept artificially low and many small rural systems <u>were</u> sustained by the cross subsidies of the regulated monopoly. But these partial truths have been advanced at the expense of a more fundamental fact about the telephone's history: the <u>most important</u> factor contributing to extensive coverage and high penetration in the U.S.

was twenty years of intense rivalry between telephone systems that were not connected to each other. The infrastructure of universal service was created by access competition, not by AT&T or the regulators. Had access competition never existed, the highly developed, ubiquitous telephone system of the United States never would have come into being.

The dynamic underlying this rapid development was described in detail in Chapters 6 and 7. By denying the two rivals access to each other's facilities, noninterconnection gave a competitive advantage to the larger network, and thus set in motion a race for universality. As a result, the U.S. by 1920 attained levels of telephone coverage and penetration unmatched by other developed countries until the 1960s or '70s. The independents occupied the rural areas and connected them to the cities because it gave them exclusive control of access to large numbers of telephone users. This in turn gave them the leverage needed to enter the cities. Bell was forced to extend its toll and exchange facilities to smaller towns in order to counteract this access advantage. To an almost unbelievable extent, the Bell system occupied small towns and rural areas not by building its own facilities but by interconnecting with independent exchanges. This willingness to interconnect was a product of access competition, not of regulation or of AT&T's commitment to universal service, for such interconnection was a quick and inexpensive way to enlarge its own access universe while diminishing that of its rivals.

In dual service cities, competition spurred both companies to price access as low as possible in order to develop the critical mass required to attract and maintain high levels of

subscribership. Indeed, many of the rate structures that were later claimed to be a product of regulation were in fact established in the competitive period as responses to system rivalry. During the competitive era, the policies of underpricing basic residential subscription rates, of subsidizing exchange access with revenues from toll usage, and of establishing exchanges in unprofitable locations in order to provide a more universal service were set in place. Regulators simply maintained these practices after competition had ceased; they did not invent them.

Thanks to access competition, an infrastructure that made universal service (in the modern sense) attainable was in place by 1925. There were exchanges in almost every city and near-complete interconnection of the system. Subscription levels were high enough to support social and well as commercial uses. One third of the farm houses and one fourth of the city households subscribed to the telephone system; public telephones were widely accessible in bars, drug stores and on streets; virtually all businesses had a telephone. Complete universality in the modern sense (98 percent household penetration) was still many years down the road, but to attain this level of penetration at that point in time would have required massive subsidies beyond the resources of the richest government. The effect of regulation was simply to hold the infrastructure and rate structure established in the competitive era in place. As average income levels rose consistently after World War II, penetration gradually increased to "universal" levels. It is generally conceded that the rise in income levels after World War II had more to do with the increase of penetration than subsidization of rates. The effect of regulation was

stabilizing, gradual and conservative; access competition was the truly creative and revolutionary force in development.

The historical experience with access competition also has interesting implications for the economic theory regarding industrial organization. As Chapter 2 explained, economists and historians have attempted to explain why the industry was a monopoly for some time, but the results have been inconsistent and unsatisfactory. The older natural monopoly literature attributed monopoly to supply-side economies of scale. The new theories of standardization offered a more convincing approach to the problem but suggested that a single system came about because of demand-side economies of scale. The historical data makes it clear that the first explanation is dead wrong and the second is improperly formulated. The unique industrial organization of the telephone industry emerged because of demand-side economies of scope.

As Chapter 3 explained, a telephone system is not one product but a combination of many different products. In effect, each pairwise connection between telephones is a separate product, a unique output. Under these conditions, it is fruitless to look for "economies of scale." Two telephone systems with different subscriber sets are not producing "more" or "less" of the same output, they are producing entirely different products. (Scale economies are significant only with respect to the efficient loading of traffic on lines.) The most important issues revolve around scope economies, i.e., the efficiency with which many different products (connections) can be combined into one system.

It is clear that the telephone industry in this period did not

enjoy significant or decisive supply-side scope economies. Larger telephone exchanges were more expensive than smaller ones.[2] When large telephone systems in the same city consolidated, the result was generally a modest increase in unit costs to the supplier. The increased efficiency of a unified system occured almost entirely on the demand side. A telephone user in a dual system had to pay for two subscriptions to obtain access to all users. Unification eliminated the need for duplication, and thus was more efficient from the subscribers' point of view. This was true even when the rate for a single subscription went up as a result of a consolidation. As long as the price of access to a single system did not double, unification tremendously enlarged a single telephone's communicative scope at a net savings over a duplicate subscription.

The logic of demand-side economies of scope explains why competition was tolerated at first but eventually came to be seen as a problem. In the early years of dual service, the entry of the independents resulted in vast increases in the scope of telephone access. Despite the division of the subscribers into two camps, from 1895 to about 1910 the Bell-independent race led to huge gains in the number of people and locations telephone users could contact. Telephone users were suddenly being offered access to five or ten times as many subscribers and locations for a rate that was significantly lower than what they had paid the Bell monopoly. Once the rapid growth in subscribership of the early 1900s ceased, however, competitive fragmentation became an obstacle to the achievement of greater demand-side scope economies. After 1913, the increased access that could be achieved by adding subscribers

to one of the two systems was insignificant compared to the increases that would result from consolidation and interconnection of the competitors.

The analysis of the actual process of unification in Chapters 8 and 9 confirms this analysis. Had the telephone monopoly been a product of supply-side cost efficiencies, we would have seen Bell driving out its rivals by undercutting their rates, and consolidations would have resulted in significant rate cuts. In fact, Bell rates were higher than the independents' in most cases, and it promoted consolidations in order to be able to increase rates. Most importantly, Bell's desire for a monopoly was not the most important social force leading to its creation. Significant pockets of dual service survived the holocaust of 1907-1913, and the Kingsbury commitment gave them legal protection. Some of the remaining independents strove valiantly and often successfully to modernize and extend their systems. Despite these efforts, from 1910 to 1920 there was widespread political agitation by user groups, city governments, and utility commissions to unify the system. The user groups, as one might expect, were led by business subscribers in the middle range of the communications hierarchy. These users needed access to all telephone users but objected to the cost and inconvenience of two subscriptions. Unification allowed them to realize very direct and positive scope economies. While these middle-range business users led the opposition to dual service, their cause enjoyed widespread support among many other elements of the public, even though users lower down in the hierarchy often got higher rates as a result and had a less pressing need for universal telephone access. Even in cities where

there was no political agitation for consolidation, such as Buffalo, users showed a long term tendency to gravitate toward the larger of the two systems, making sustained competition impossible.

Bell's aggressive and often shrewd business policies ensured that it would emerge as the dominant figure in the emerging telephone monopoly. But the issue of why we ended up with a single telephone system cannot be equated with or reduced to the question of why AT&T in particular dominated it. The economic and communicative forces driving the system toward interconnection were very strong, and probably would have led to a single system in most cities regardless of how large or small AT&T's share of the total system turned out to be.

The emergence of a telephone monopoly must be analyzed from the standpoint of communications as well as economics. The ability of users to realize economies of scope depends on the specific pattern of communicative interdependence. As Chapter 3 explained, the outcome of coordination models is strongly affected by how concentrated the communications hierarchy is, how large the population of communicants is, and whether the communication patterns are fairly self-contained or highly interdependent. Under certain conditions separate systems can be as efficient as one system. It is interesting that with the advent of regulation public utility commissions eliminated dual service rivalry in areas where it continued to be viable, i.e., in small towns and farm areas. The PUCs also formalized the monopoly status of the telephone by legally closing off the possibility of new entry. This overreaction reflected the triumph of an ideology rather than a rational assessment of the situation. Regulators convinced

themselves that any duplication and competition was inefficient almost by definition.

From a policy standpoint, the historical experience with access competition provides a very useful contrast with the current competitive revolution in telecommunications. The approach to network competition taken after 1894 was almost the opposite of that prevailing now. Today, regulators have promoted competition by enforcing nondiscriminatory interconnection of competing carriers. This means that the competitors all have access to the same subscribers and compete exclusively on the basis of price and service quality. Instead of having to completely duplicate the system of the existing telephone companies, a new rival can build substitute lines along certain routes and rely on other carriers for access to all other points. Unlike the early 1900s, for example, a competing long distance carrier does not have to own an exchange or negotiate an exclusive connecting contract to be able to terminate calls in a city. It can connect its lines to the local exchange regardless of who owns it, on the same terms offered to all other long distance carriers. This approach appears to reconcile the chief policy dilemma of the earlier competitive period: it permits competition without fragmentation or, what is another way of saying the same thing, it provides universal service without monopoly.

The successes of the new interconnection policy are readily apparent: by easing the entry of new telecommunications suppliers it has encouraged the proliferation of many new services, including a host of new microwave- and fiber-based long distance carriers. The price of long distance service has plummeted. A business

telecommunications user can now assemble the private line and switched services of a multitude of local and long distance carriers to create a network for virtually any purpose and of any scope.

The problems created by the new interconnection policies are more subtle. The most significant issue is that nondiscriminatory interconnection seems to prevent competitive pressures from ever reaching the basic exchange access line. Indeed, the price of basic subscription service has increased after the divestiture. The benefits of competition are confined to the top of the communications hierarchy. By fostering disaggregation of the telephone system, the policy enables new entrants to serve only the most profitable segments of the network while relying on the facilities of the established utility to serve smaller users and thinner routes. Unlike the early 1900s, there is no competition for the bottom of the hierarchy, nor is it likely that there ever will be as long as new entrants can rely on interconnection rather than new construction to reach the bulk of the population.

The new interconnection policies create a network that is universally connected, but some of the linkages are served by multiple competitors while many are still monopolistic. This mixture of competition and monopoly is inherently unstable and makes setting prices, assigning costs, and regulating the dominant local exchange carrier an extraordinarily complex matter. Although one of the objects of the new policy was to create a deregulated market for telecommunications services, the promotion of open interconnection has increased regulation in many areas. For example, the equal access obligations of local exchange carriers

has led to detailed government oversight and control of the technical terms of, and the rates charged for, interconnection. The demand for equal access has also led to the imposition of drastic line of business restrictions on the divested Bell operating companies. In order to prevent them from using their exclusive control of access to local subscribers to the detriment of other companies, they are kept out of the long distance market, information services and equipment manufacturing. From a technical and economic point of view, these prohibitions are completely arbitrary. Yet they seem necessary to prevent the exercise of the kind of "bottleneck" market power that was accepted as the norm during the early competitive period.

Whatever the merits of the current approach to interconnection, the fact remains that it was accepted largely by default, with very little analysis of the problems it posed and the long term consequences it might have. The example of access competition offers an alternative approach to interconnection policy and an alternative model of a competitive telecommunications system. Like the current policy, it has its weaknesses, but an awareness of its possibility can only sharpen the policy dialogue. Regulators grappling with the entry of new long distance carriers in the late 1970s and early 1980s could have learned a lot about what kind of issues they would have to face and what the effects of their policies might be had they examined the debates over compulsory interconnection legislation in the early 1900s.

The experience with access competition contradicts many of the assumptions about the economic effects of interconnection underyling current policy. The growth of the independents from

1895 to 1902, for example, makes it clear that the refusal of an established network to connect with its competitor does not necessarily make survival of the competitor impossible, even when the established network has a 20 year head start and dwarfs the newcomer in size. Bell's use of sublicensing shows that a larger competitor may interconnect with smaller networks without legal coercion if it fears that failure to bring them into its system will isolate it from signficant markets and/or provide the nucleus of a larger competitive system. In other words, smaller competitive networks do have appreciable bargaining power in their relations with larger networks when the established network is unable to develop the market fully. The case of sublicensing also indicates that interconnection can be a powerful method of pre-empting rather than promoting competition. Networks have a strong incentive to enter the same territories and compete when they are not interconnected, because the absence of a connection forces them to build duplicative facilities to gain access. When they are connected, they tend to cooperate and divide territories and markets.

Competition between separate systems avoids many of the problems inherent in the present scheme of regulation. Under a dual service regime, there would be no need for government supervision of network interfaces or access charges, and no need for arbitrary line of business restrictions. Where nondiscriminatory interconnection appears to discourage the development of a universal infrastructure by allowing competitors to cream skim, access competition rewards competitors who make their system universal in scope. It would also create its own set

of problems. Users might be more fragmented than they would like; competition may prove to be transitory if one of the contestants attained a significant advantage over the other. System competition seems to be most appropriate in the developmental stage of a network, when it is necessary to assemble critical mass and to develop the basic infrastructure needed to cover a territory. Its example may be most useful to developing countries, where the telecommunications facilities are as limited and as biased toward urban centers as the Bell system was in 1894.

The transition from dual service to universal service is more than a matter of business, economics and regulation. At some point between 1913 and 1918, a preponderance of telephone users came to the conclusion that a divided subscriber universe was intolerable. After being accepted and encouraged for 15 years, dual service was described as an "annoyance," a "burden," a "calamity." Competition, which had once stimulated and expanded communications access, came to be seen as an arbitrary barrier. Above all else, telephone monopoly was chosen as an institutional structure in order to bring about universal interconnection. It represents the homogenization of real-time communications access on a national scale. This was part of a broader social transformation in which a decentralized, predominantly agricultural country became an integrated, urban, industrial nation.

Historians have grappled with the Progressive era for many years, using a variety of labels to express what all sense was a revolutionary change.[3] Here is a very concrete manifestation of the nature of that change: voice telecommunication, which had been supplied by local, fragmented, overlapping and competing systems,

became the basis of a vertically and horizontally integrated, nationwide monopoly, regulated by public authorities and capable of connecting users almost anywhere in the country. The probabilistic model in Chapter 3 demonstrated that a population with a higher degree of interdependence is more likely to converge on a single network or standard than a population with very specific, concentrated communication patterns. Telephone communications increased the interdependence of the population. By extending voice communication it helped to create a social structure based on increasingly impersonal, far-flung relations of communication. As this occured, Theodore Vail's admonitions about the need for universal service began to ring true: "the telephone network must be a system that will afford communication with anyone that may possibly be wanted, at any time."[4] It became necessary to have access to people, places and institutions one did not know in advance and could never predict one would need.

The origins of a universal monopoly becomes even more interesting as the era of a single telephone system recedes into the past. In 1918, the demand was for integration and homogenization. Today, the pendulum swings in the opposite direction. The scope of telecommunications services has become so large, the technology of accounting for, recording, and discriminating between user groups so refined, the population so heterogenous that the growth of specialized networks serving separate segments of the people seems inevitable. In the age of computerized data bases, even "mass" media like weekly news magazines can tailor their advertisements or articles to the specific demographics or geographic location of the receiver.

Increasingly, communications media respond to and reflect the differences in the population. If magazines, television and radio stations, computer bulletin boards, and information services are all broken down on the basis of population differences why not voice communication? Do we still need a universal telecommunications network? What would be the consequences of its absence? For seventy years, universal telephone service seemed to be the divinely ordained way of doing things. Dual service was both historically invisible and unthinkable as a policy option. The tables are turning, but our ability to understand the social consequences of the change is still imperfect.

NOTES TO CHAPTER 10

[1] Commenting on the growth of residential subscribership in New York city, a trade journal wrote: "...it will not be long before no moderately well appointed residence will be considered completely equipped if it is not connected to the telephone system." Electrical Review 31:15 (October 13, 1897) p. 180. For similar expressions, see "The farmer and the telephone," Electrical Review 31:11 (September 15, 1897) p. 126, and "Making [social] calls by telephone," Electrical Review 30:13 (March 31, 1897) p. 146.

[2] Chapter 4, p. 81-84. See also the American Bell cost study cited in Chapter 4, note [15].

[3] For a comprehensive, synthetic statement of this view see Robert Wiebe, The Search for Order: 1877-1920. (New York: Hill and Wang) 1967.

[4] 1909 AT&T Annual Report, p.23.

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Long Lines: AT&T's Long-Distance Network as an Organizational and Political Strategy

The primary importance of long-distance telephone service to the American Telephone and Telegraph Company in the first two decades of the twentieth century was not commercial but organizational and political. The so-called Bell System was not a single firm before 1910 but was, rather, an association of regional companies with considerable autonomy. As AT&T's leaders worked both to overcome independent competitors and to curtail the autonomy of their own local affiliates, long-distance service offered them a powerful technological justification for the consolidation of control. Outside the Bell System, long distance also served as a vivid symbol of interconnection and integration. Long distance proved central to AT&T's campaign to convince Americans of its own legitimacy and that of nation-spanning corporations in general.

On January 25, 1915, the American Telephone and Telegraph Company (AT&T) held the first of many lavish ceremonies to commemorate the United States' first coast-to-coast telephone call. Alexander Graham Bell in New York spoke by telephone to his old assistant Thomas A. Watson in San Francisco. "Mr. Watson, come here, I want you," Bell said, repeating the words he had spoken in the very first telephone call, nearly forty years before. Watson delivered the punch line, such as it was: "Why, Mr. Bell, it would take me a week to do that now!"[1] Bell's words traveled 3,500 miles from New York to San Francisco, across 13 states and over 130,000 telephone poles supporting

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[1] The inauguration of the transcontinental line was described in numerous company publications. See, for example, *The Story of a Great Achievement: Telephone Communication from Coast to Coast* (New York, 1915); "Coordinating the Nation," *Telephone Review* (Jan. 1915): 24; Arthur Pound, *The Telephone Idea: Fifty Years After* (New York, 1926); and John Mills et al., "A Quarter-Century of Transcontinental Telephone Service," *Bell Telephone Quarterly* 19, no. 1 (1940).

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nearly 3,000 tons of copper wire. Another circuit connected President Woodrow Wilson in Washington and AT&T president Theodore Vail in Georgia. And the real achievement, AT&T executives were quick to point out, was not simply this call but the system in its entirety, a now truly national long-distance network said to connect more than 9 million telephones from coast to coast.[2]

The ceremony was held to coincide with the Panama-Pacific Exhibition in San Francisco celebrating the completion of the Panama Canal. The telephone company's boosters compared this other spectacle of technology to their transcontinental network and judged the Canal wanting. The United States government had spent $310 million constructing the Canal, one AT&T pamphlet reported; the telephone company had spent twice that amount constructing "this other canal, this even more intimate connection between the two seaboards." The transcontinental telephone network was "the highest achievement of practical science up to today," AT&T's publicists declared. "No other nation has produced anything like it, nor could any other nation. It is *sui generis*, it is gigantic—and it is entirely American."[3]

Historians typically turn to the story of the railroads to explain how large managerial corporations emerged in the United States, but the history of the telephone may tell us more about how and why those institutions gained wide popular support. At a moment in American history when an economy populated by modest local firms was giving way to one dominated by sprawling national corporations, the universal telephone network served the advocates and architects of the new order as a symbol and spectacle of integration and consolidation. AT&T's long lines cost the company millions of dollars, but Theodore Vail and his colleagues ultimately considered this money well spent. The national long-distance network was not profitable—it would not be for many years—but it was instrumental in consolidating control of the Bell companies and the telephone industry in general and in helping to convince Americans that the nation-spanning corporation was not an enemy but a friend.

The festivities at the Panama-Pacific Exhibition were only the first of many occasions used to celebrate AT&T's transcontinental lines. Hundreds of demonstrations followed, first in major cities and then in a sort of traveling show that toured for over a year, exhibiting the long-distance telephone to chambers of commerce, service clubs, and other

[2] It is somewhat anachronistic to use the abbreviation "AT&T" for the American Telephone and Telegraph Company in this era; I do so only for brevity. Some documents in this era did refer to "the A.T. & T. Co.," but the familiar acronym "AT&T" only came into general use in the 1930s or after.

[3] *The Story of a Great Achievement*, 11–16.

audiences all around the country.[4] The coast-to-coast telephone call was even the subject of a lavish song-and-dance production called "Hello 'Frisco" that became one of the highlights of Florenz Ziegfield's 1915 Ziegfield Follies.[5] In public and in private, AT&T executives in the second decade of the twentieth century sang the praises of long-distance communication and the utopia of peace and prosperity it might one day achieve. Vail, prime mover behind the construction of the transcontinental line, was always ready to wax rhapsodic on the subject. "Intercommunication" was "the basis of all civilization," he declared in a February 1913 speech, and "prosperity is in direct relation to its completeness and perfection." Once the universal telephone network was completed, Vail told another audience, "distance will be annihilated, and the whole world will be united in common interests, common thought, [and] common traditions."[6]

The fanfare surrounding the transcontinental call was out of all proportion to any commercial importance of the long-distance telephone at the time. In spite of the emphasis AT&T publicity placed on transcontinental telephone service, there was no great clamor for coast-to-coast calling before 1915, or even decades after. In its first years of operation, AT&T's coast-to-coast network averaged only two calls a day.[7] As late as 1935, the company would estimate that less than 10 percent of the Bell System's revenues came from interstate traffic and less than 1.5 percent of telephone calls crossed even one state line.[8] Vail's successor Walter Gifford admitted in 1928 that the long-distance network was still "a seventh day wonder" to most Americans, rather than a real part of their everyday lives.[9] The truth of this admission was con-

[4] H. H. Nance and R. M. Oram, "The Circuits Go Up," *Bell Telephone Quarterly* 19, no. 1 (1940).

[5] Joel Dinerstein, *Swinging the Machine: Modernity, Technology, and African-American Culture between the World Wars* (Amherst, Mass., 2003), 185–87.

[6] Theodore N. Vail, *Views on Public Questions: A Collection of Papers and Addresses* (New York, 1917), 99, 313.

[7] Nance and Oram, "The Circuits Go Up," 35.

[8] James M. Herring and Gerald C. Gross, *Telecommunications: Economics and Regulation* (New York, 1936), 213; David F. Weiman, "Building 'Universal Service' in the Early Bell System: The Coevolution of Regional Urban Systems and Long-Distance Telephone Networks," in *History Matters: Essays on Economic Growth, Technology, and Demographic Change*, eds. Timothy W. Guinnane, William A. Sundstrom, and Warren Whatley (Stanford, Calif., 2004), 331–32. Also, a very small minority of telephone customers accounted for the great majority of early long-distance business. The Northwestern Bell Telephone Company reported in 1923 that 5 percent of telephone subscribers made more than 95 percent of the company's long-distance calls. Richard Gabel, *Development of Separations Principles in the Telephone Industry* (East Lansing, Mich., 1967), 10.

[9] Conference of Publicity and Personnel Representatives of the American Telephone and Telegraph Company, *Proceedings*, 11–13 Apr. 1928, Historical Collections, Baker Library, Harvard Business School (hereafter HBS), 89.

try. In each part of the United States, local agents and entrepreneurs established their own operations and then contracted with Bell in Boston for an exclusive right to lease its telephones and offer service in their own respective areas. In 1880, four years after the telephone's invention, there were over one hundred such companies, providing telephone service in nearly one thousand American cities and towns. American Bell owned stock in several of these undertakings, particularly the largest and most profitable exchanges like New York and Chicago, but many more were the product of local capital and local enterprise alone.[15]

When first organized in the late 1870s and early 1880s, the various Bell operating companies were extremely limited in size and scope. Many served only one city or town. As the 1880s continued, however, a wave of mergers and consolidations reduced the total number of Bell licensees while increasing the size of the territory each served. In 1880, the operating companies' national association counted eighty-six companies among its members. By 1887, that number had dropped to thirty-four.[16] American Bell's annual report for 1882 noted this trend and warned that it "should not be encouraged" if it meant shifting control of telephone operations out of local hands. But the same report the very next year praised the consolidation of local operating companies and predicted further centralization in years to come. "The tendency toward consolidation of telephone companies . . . has continued," read the 1883 report, "and is . . . in the interest of economical and convenient handling of the business." The reason for this change was the dawning emergence of long-distance telephone service: "The connection of many towns together . . . made it of importance to bring as large areas as possible under one management," American Bell's directors reported. "As methods are devised for making the telephone commercially useful over long lines, the advantages of this centralization of management will be still more apparent."[17]

That 1883 report bore the signature of American Bell's president William Forbes, but it is likely that these were the words of the company's general manager, Theodore Vail. Vail was at this time American Bell's most active and energetic executive, and this argument, that long-distance communication required the consolidation and centralization of management, was the central theme of his long and spectacular career. A telegraph operator in his youth, Vail first made his name as a manager for the United States Postal Service in the 1870s, where he centralized procedures and oversaw initiatives like the Fast Mail and the Railway Mail, two striking examples of systems integration in the service of long-distance communication.[18] Vail left the Postal Service in 1878 to become American Bell's first general manager.[19] There he became the company's, and probably the nation's, first and most influential advocate of long-distance telephony, and there he championed the idea of uniting all the nation's telephone exchanges in a single universal system.[20] "The Bell System was founded on the broad lines of 'One System, One Policy, Universal Service,'" Vail declared in 1910. This meant, he said, "the idea that no aggregation of isolated independent systems, not under common control . . . could give the public the service that the interdependent, intercommunicating, universal system could give." Although that slogan only appeared in 1908, Vail claimed the idea was not new. "In fact," he said, "the theory was evolved and developed before the business, and the business has been developed on that theory."[21]

This version of history would have been a surprise to the many managers of Bell's local operating companies in the 1880s. They valued their independence highly and resisted efforts by Vail and others to bring the industry under common control. Morris Tyler, the first presi-

[15] Theodore N. Vail, "Report on the Operations of the Telephone Business," 19 Mar. 1880, box 1080, AT&T Historical Archives (hereafter ATTA); Robert W. Garnet, *The Telephone Enterprise: The Evolution of the Bell System's Horizontal Structure, 1876–1909* (Baltimore, Md., 1985). For a detailed history of one regional operating company and the complex relations between American Bell's agents, subagents, and local licensees, see J. Leigh Walsh, *Connecticut Pioneers in Telephony* (New Haven, Conn., 1950).

[16] National Telephone Exchange Association, *Report of the Proceedings of the National Telephone Exchange Association*, HBS, 1880, 1887. Membership in the NTEA was voluntary, so these numbers do not necessarily include every operating company in the country. Nevertheless, a majority of the Bell-affiliated operating companies certainly belonged, and the general trend among operating companies of growth in size and reduction in numbers is noted by the members of the NTEA and borne out by other evidence.

[17] *Annual Report of the Directors of the American Bell Telephone Company to the Stockholders*, HBS, 1882, 3; 1883, 4.

[18] Richard R. John, "Theodore N. Vail and the Civic Origins of Universal Service," *Business and Economic History* 28 (Winter 1999): 71–81; Richard R. John, "Recasting the Information Infrastructure for the Industrial Age," in *A Nation Transformed by Information: How Information Has Shaped the United States from Colonial Times to the Present*, eds. Alfred D. Chandler Jr. and James W. Cortada (New York, 2000). For Vail's life, see Richard R. John, "Vail, Theodore Newton," *American National Biography Online* (Feb. 2000), Web site: http://www.anb.org/articles/10/10-01671.html; Albert Bigelow Paine, *Theodore N. Vail: A Biography* (New York, 1929). For a broad sample of his writing and ideas, see Vail, *Views on Public Questions*.

[19] Technically, the company Vail joined in 1878 was the Bell Telephone Company, not American Bell. The original Bell Telephone Company, founded in 1877, was reorganized as the National Bell Telephone Company in 1879 and again as the American Bell Telephone Company in 1880.

[20] It is not clear when this vision was first born in Vail's mind. Sometimes he said it was "co-existent with the business." At other times, he claimed he could not say with any certainty when the idea of "one great big general system" first came to him. Certainly, it was implied by the expansive language in AT&T's founding charter, written in 1885. *Annual Report of the Directors of the American Telephone and Telegraph Company to the Stockholders*, HBS, 1909, 18–19; New York State, Joint Committee of the Senate and Assembly Appointed to Investigate Telephone and Telegraph Companies, *Report* (Albany, N.Y., 1910). The AT&T charter (quoted below) is reprinted in Frederick L. Rhodes, *Beginnings of Telephony* (New York, 1929), 196–97.

[21] *AT&T Annual Report*, 1909, 18–19.

dent of the National Telephone Exchange Association, scolded American Bell in 1885 for trying to standardize the operations of its many licensees. "While treating everybody alike, the fact has been overlooked that everybody is *not* just alike," he complained. "Questions of most grave importance connected with this matter of the relation of licensor and licensees are now staring us suddenly in the face."[22]

Few local managers shared Vail's enthusiasm for the long-distance telephone. Their companies were in the business of providing local telephone service, and they were reluctant to commit to constructing expensive long-distance lines. "Will it pay?" local management always asked.[23] The answer was far from clear. The technology needed for long-distance transmission remained uncertain in the 1880s and 1890s, as did the public's demand. Though "fondly . . . regarded" by some, long-distance service had "always been a source of actual loss to the company," Morris Tyler declared in 1885.[24] Tyler's own operating company, the New Haven–based Southern New England Telephone, had gambled on long distance in the early 1880s and deemed those experiments a resounding failure.[25] His fellow managers also scoffed at the sort of pronouncements on the bright future of long distance to which Vail was given: "It was almost suggested that the life of the average American would be incomplete were he to omit from his daily routine the pleasure of telephoning to his friends in Japan," said one.[26] Doubters gave an unprofitable line from Boston to New York City the name "Vail's Folly."[27]

Vail left American Bell in 1885 to become president of the American Telephone and Telegraph Company, a new subsidiary of American Bell with special responsibility for the construction and operation of long-distance telephone lines. AT&T's founding charter, drafted by Vail and his lieutenant Edward Hall Jr., suggested the scope of their ambitions:

> The lines of this association . . . will connect one or more points in each and every city, town or place in the State of New York with one or more points in each and every other city, town or place in said state, and in each and every other of the United States, and in Canada and Mexico; and each and every other of said cities, towns and places is to be connected with each and every other city, town or place . . . and also by cable and other appropriate means with the rest of the known world.[28]

[22] NTEA, *Proceedings*, 1885, 14–15. Emphasis in original.

[23] Ibid., 62.

[24] *Annual Report of the Directors of the Southern New England Telephone Company to the Stockholders*, 1885, quoted in Walsh, *Connecticut Pioneers*, 145–46.

[25] Walsh, *Connecticut Pioneers*, 110–18, 136–47.

[26] NTEA, *Proceedings*, 1885, 61. (AT&T did not offer telephone service between the United States and Japan until 1934.)

[27] Herbert N. Casson, *The History of the Telephone* (Chicago, 1910), 172.

[28] Rhodes, *Beginnings of Telephony*, 196–97.

The name of the new company suggested a further ambition. Vail ultimately hoped to unify all wire communications in America—telephone and telegraph—under his company's control. An 1879 contract between Bell and the Western Union Telegraph Company partitioned the industry, establishing that Bell would agree to stay out of the telegraph business and Western Union would give up any designs on the telephone. But as early as 1879 or 1880, Vail later recalled, he was looking forward to "the ultimate absorption of the 'telegraph' business" as a means to providing universal long-distance communication. Vail achieved this goal only briefly in 1909, when AT&T acquired working control of Western Union. In 1913, his company agreed to relinquish its holdings in Western Union to ward off antitrust action by the federal government.[29]

Despite its ambitious prospectus, however, AT&T in the 1880s had no authority over the various Bell operating companies, and Vail could not force their managers to cooperate with his plans for long-distance service. One of his first major undertakings at AT&T, for example, was a long-distance circuit from New York to Philadelphia. The lines were erected in 1886, but neither of the local companies on either end made the technical adjustments necessary to connect their systems to AT&T's wires. The Philadelphia company in particular did not show "any disposition . . . to cooperate," reported Edward Hall, and "the purpose for which the line was intended [was] practically defeated."[30] Calling his position in the company "embarrassing and unpleasant," Vail resigned the presidency of AT&T in 1887.[31]

The technology of the telephone, and the long-distance telephone in particular, improved rapidly in the 1890s and 1900s, but positions in the industry debate over long-distance telephony remained remarkably consistent. Advocates of centralization like Vail and Edward Hall were invariably also boosters of long-distance construction, while defenders of local management like Morris Tyler—and later, the Bell System's independent competitors—remained skeptical about the commercial importance of long-distance lines. On both sides of this question, arguments over the physical shape of America's telephone networks and the proper organization of telephone management were repeatedly combined and conflated. The technical debate and the organizational debate were tightly intertwined.

[29] David Hochfelder, "Constructing an Industrial Divide: Western Union, AT&T, and the Federal Government, 1876–1971," *Business History Review* 76 (Winter 2002); Garnet, *The Telephone Enterprise*, 152–54; Theodore N. Vail to Frederick Fish, 14 Apr. 1906, as quoted in Hochfelder, "Constructing an Industrial Divide," 719.

[30] Edward J. Hall Jr. to John E. Hudson, 21 Jan. 1888, box 1011, ATTA. See also Garnet, *The Telephone Enterprise*, 79–81.

[31] Quoted in John Brooks, *Telephone: The First Hundred Years* (New York, 1976), 85. Vail stayed on as president of New York's Metropolitan Telephone Company until 1889.

In 1889, telephone engineer John J. Carty presented a paper at the annual meeting of the National Telephone Exchange Association (NTEA) called "The New Era in Telephony." Carty's paper, coauthored by Angus Hibbard and Frank Pickernell of AT&T, began by asserting the importance of long-distance telephone service and praising the work of the American Telephone and Telegraph Company in bringing such service about. Rising demand for a "perfected" long-distance system "may be said to have created a new era in telephony," Carty and his coauthors declared. This new era, they argued, had three major elements, all intertwined: long-distance service, interconnection between operating companies, and uniform technical standards across the system. "During the past, very much has been lost by a lack of uniformity," Carty said. "The methods of the east and the west have differed widely. . . . In this 'new era' in which a perfected service is to be given, such engineering cannot possibly be successful." Local management must begin "adhering to uniform practices," he insisted, and "remedy . . . the loose methods of past years."[32]

The "New Era" paper, dubbed "seminal" in later years, proved highly controversial at the time. It amounted to an attack, in the name of long-distance service, on the autonomy of local operating companies and their ability to set technical standards on their own. Appreciating the negative reaction he might receive from an audience of local managers, Carty did not read his paper to the entire membership of the NTEA but presented it to a special closed-door executive session. The few local managers who were present at this session demanded to know whether Carty's paper was officially "backed" by AT&T or amounted to "simply the opinion of three of their experts." No answer to this question was forthcoming. A vote had to be held on whether or not to publish Carty's paper in the minutes of the conference. The motion to publish was carried by a close vote of eleven to nine, but was immediately followed by passage of a resolution that the NTEA took no responsibility for any papers presented at its meetings.[33]

At the NTEA's next annual conference, Edward Hall extrapolated from the "New Era" paper, arguing that the human organization of the telephone industry should be standardized along with its technical operations. Hall began by calling the Bell corporate system an "artificial person," but the metaphor at the heart of his paper was that of the corporation as a mechanism or machine. "I do not see why we should not go at this [organizing the corporation] just as we would at the construction of any piece of mechanism," Hall said. "Surely [our corporation] is more complicated and more delicate than any of our electrical apparatus, and at the same time, its motions are attended with such consequences that we cannot afford to make any mistake." Hall criticized the "tangled . . . old-fashioned 'rule of thumb' method" in practice at most local operating companies, and he displayed organizational charts—a novelty in 1890, the first some present had ever seen—that made explicit his analogy between telephone circuits and lines of managerial communication and control. Hall's view of the "new era" was a simple extrapolation of Carty's and Vail's. The connection of wires across the country required the connection of telephone companies across the country, and that, Hall argued, required centralization of authority and power. "As all the parts [of the Bell corporate system] are inter-related," Hall said, "it is evident that there must be somewhere a single central authority, or division means chaos."[34]

[32] NTEA, *Proceedings*, 1889, 34–43.
[33] Ibid., 44–45.

Debate was lively, but few of the regional operating companies rushed to adopt Hall's new scheme. "Will it not always be true that the parent Company must vitally depend on men who are in charge locally?" E. B. Field, president of the Colorado Bell Telephone Company, asked in later years. Field challenged Hall's machine metaphor directly, saying, "I would rather be building an organization that makes *man* supreme and not the Company, that is, all round intelligence, which administers the Company's affairs, and not a machine."[35]

Financial and organizational developments, not metaphor, would drag reluctant managers into the "New Era" of long-distance telephony and centralized control. In 1900, New York–based AT&T replaced Boston-based American Bell as the parent company of the Bell organization. This was not a hostile takeover, but served as a voluntary stock swap designed to take advantage of New York's more liberal regulatory environment. But transforming the long-distance subsidiary into the parent company of the entire organization proved to be more than a symbolic change. With capital obtained from a circle of New York financiers, including George F. Baker and John Pierpont Morgan, AT&T began to increase its ownership of the various regional operating companies, while the New York bankers increased their own control of AT&T. At the turn of the century, AT&T controlled just 45 percent of the total voting stock of all the local and regional licensees. By 1910, that figure was more than 80 percent. Eventually, distinctions between the parent company and its subsidiaries would be almost meaningless; by 1934, AT&T owned at least 99 percent of the stock in sixteen of the twenty-one operating companies.[36]

[34] Ibid., 1890, 43–56. Angus Hibbard remarked on the novelty of Hall's charts in Angus Smith Hibbard, *Hello, Goodbye: My Story of Telephone Pioneering* (Chicago, 1941).
[35] E. B. Field to John J. Carty, 8 Sept. 1909, box 2029, ATTA. Emphasis in original.
[36] Federal Communications Commission, *Proposed Report, Telephone Investigation* (Washington, D.C., 1938), 26–28.

Carty's New Era could truly be said to have arrived in 1907, when the Baker-Morgan syndicate completed its takeover of AT&T. The New York financiers then forced the resignation of the Bostonians, who had led the Bell companies since 1880. The new owners installed Theodore Vail as president of AT&T, returning him to the office from which he had resigned twenty years before.[37] J. P. Morgan's personal influence over the Bell System has probably been exaggerated by histories of the company in the robber-baron mold, but the affinity between Morgan and Vail was real. Like Vail, Morgan was a builder of systems. Both men believed in stability and profit through corporate consolidation. It was Morgan's investment firm, more than any other, that imposed order and oligopoly on the American railroad industry in the 1880s and 1890s, combining dozens of regional railroads into a few giant systems.[38] In the 1890s and early 1900s, it was often rumored that Morgan was planning to take over the independent telephone movement in the same way, merging thousands of local systems into one great telephone network. Yet, in the end, it was the Bell companies that the House of Morgan would help to consolidate and control.[39]

Stock ownership may not necessarily translate into managerial control, but Vail and his lieutenants clearly thought that it should, and they used AT&T's new financial leverage to consolidate the formerly autonomous Bell operating companies into one single, centrally controlled "Bell System." "When we acquire the ownership of all the stock of any company, we are in a position for the first time to say just how it should be handled," Edward Hall wrote with evident satisfaction in 1909.[40] Vail named John Carty to be AT&T's chief engineer, and he expanded the power of Carty's department over the engineering practices of the operating companies. Carty centralized research and development in New York, shutting down laboratories in Boston and Chicago, and he ordered Western Electric, the manufacturing arm of the system, to stop taking orders for equipment from regional offices. In order to eliminate what Carty called "excessive and uneconomic diversity," all decisions regarding equipment and operations would be made thereafter by the central engineering department of AT&T.[41]

[37] J. Warren Stehman, *The Financial History of the American Telephone and Telegraph Company* (Boston, 1925); N. R. Danielian, *A.T.&T.: The Story of Industrial Conquest* (New York, 1939), 57–66.

[38] Alfred D. Chandler Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass., 1977), 158–75, 195–203.

[39] See, for example, "Consolidation Talk," *New York Times*, 30 Dec. 1899, 11. See also Stehman, *Financial History of AT&T*, 56–59; and Harry B. MacMeal, *The Story of Independent Telephony* (Chicago, 1934), 112.

[40] Edward J. Hall Jr. to Theodore N. Vail, 27 Sept. 1909, box 1010, ATTA.

[41] John J. Carty to Edward J. Hall Jr., 17 July 1907, box 6, ATTA; Hugh G. J. Aitken, *The Continuous Wave: Technology and American Radio, 1900–1932* (Princeton, N.J., 1985),

As Carty centralized control of AT&T's technical systems, Vail and Edward Hall worked to systematize and centralize the human organization of the Bell System too. All problems "must be dealt with on broad lines," Hall wrote, "and by methods which are applicable to the whole territory."[42] In the spring of 1908, Vail and Hall restructured AT&T's management completely, beginning with long-distance operations, in order to centralize decision-making and standardize procedures.[43] Reorganization of the regional operating companies followed. These changes faced "pockets of resistance on the part of local management," in the words of one internal company history, but such resistance was gradually broken by Vail's unshakable commitment to system integration, a constant drumbeat of publicity and propaganda from New York, and the steady extension of AT&T's financial control.[44]

The long-distance network was a crucial weapon in this fight. In 1908, Vail and Carty vowed that AT&T would inaugurate transcontinental telephone service before the completion of the Panama Canal. Company histories praise Vail's boldness in making such a promise, for in 1908 the technology to transmit an intelligible conversation across three thousand miles did not yet exist.[45] But such histories do not mention how long distance, and the transcontinental project in particular, served AT&T in curtailing the autonomy of local operating companies and in justifying this change. AT&T's growing holdings of operating-company stock made it possible for Vail to centralize control of the Bell System. What the transcontinental network gave him was a compelling reason to do so.

"A nationwide intercommunicating system . . . requires uniformity in operating methods and instrumentalities," Vail wrote in 1914 as the transcontinental network neared completion. "It requires coordination of effort and co-operation in the highest degree, which can be obtained only through one system, one policy, one centralized administration." In local telephone service, he conceded, a variety of methods might be

78–79; Neil H. Wasserman, *From Invention to Innovation: Long-Distance Telephone Transmission at the Turn of the Century* (Baltimore, 1985), 110; Louis Galambos, "Theodore N. Vail and the Role of Innovation in the Modern Bell System," *Business History Review* 66 (Spring 1992): 95–126.

[42] Edward J. Hall Jr. to Frederick Fish, 30 Oct. 1902, ATTA.

[43] "Application of Some General Principles of Organization," Oct. 1909, box 2029, ATTA; Garnet, *The Telephone Enterprise*, 135–38.

[44] "The Central Union Telephone Company/Chicago Telephone Company," *Case Histories on the Development of AT&T's Horizontal Structure* [1980?], ATTA, 1.

[45] Nance and Oram, "The Circuits Go Up," 23. On the technical history of the transcontinental line, see Frank B. Jewett, "Transcontinental Panorama," *Bell Telephone Quarterly* 19, no. 1 (1940); Fagen, ed., *Engineering and Science in the Bell System*, 195–348; Aitken, *Continuous Wave*, 233–45.

adequate, but in long-distance service there could be only one best way. "When the supreme test comes," Vail said, ". . . the best and only the best can be used." No aggregation or loose affiliation of smaller systems, he argued, could have achieved a coast-to-coast telephone call. "For interconnecting service and distant communication, uniformity in methods of operation and apparatus is necessary, in fact, imperative." The transcontinental telephone call was the "supreme test" of the Bell System, perhaps the only application that truly demanded the kind of integration and centralized control Vail worked so hard to attain. Whether or not anyone would actually pay to use it was almost beside the point.[46]

AT&T publicity returned repeatedly to this theme, not only in material meant for the general public but in internal publications too. Bell employees received a steady diet of speeches and memoranda explaining and justifying the system's corporate reorganization. They were even led in songs at company gatherings that extolled the virtues of centralization and standard operating procedures. The "Blue Bell Song," one melodious example out of many, described the three branches of the reorganized company to the tune of "My Country 'Tis of Thee": "'Contract' quote proper rate / 'Plant' keep the wires straight / 'Traffic' all woes abate / Ring clear the Bell."[47] For the transcontinental telephone system to succeed, Bell employees were told again and again, local management had to surrender its old autonomy and authority. Embedded in the project of the transcontinental telephone system was the technological justification for this otherwise unpopular organizational change.

The success of this program can be read in the archives of the Cumberland Telephone and Telegraph Company, a Bell licensee based in Nashville that served a territory stretching from Indiana to Louisiana between 1880 and 1911. Cumberland's executives prided themselves on their independence and autonomy from the parent company, and they resisted attempts by American Bell to take control of their operations in the 1880s and 1890s. "The American Bell Telephone Company does not own a dollar stock in our company," boasted one of Cumberland's directors in 1885. "Our company is the only one [of the Bell licensees], or at least one of the very few, of which this statement may be truthfully made."[48] There was a regional element to Cumberland's prized independence: its managers strove to keep it "a company that [was] controlled by Southern men, financed with Southern money, and its affairs

[46] *AT&T Annual Report*, 1914, 42–43.

[47] *Everybody Join In: The Blue Bell Songbook* (New York, [1920?]), Donald McNicol Collection, Queen's University Special Collections.

[48] "The Telephone in Indiana," *Electrical World* (26 Sept. 1885): 132.

directed by Southern brains."[49] But there were deeper differences in policy and outlook between Nashville and New York. Leland Hume, a Cumberland manager, questioned AT&T's insistence on state-of-the-art equipment and scientific management. "I sometimes get afraid that when we are studying so much about the higher classics of the telephone business we will sorter [*sic*] forget the business itself," he said in 1903. Cumberland president James Caldwell resisted the cost of long-distance construction while urging the extension of low-cost telephone service to middle- and working-class homes. Long distance was not a priority for him or his customers.[50]

But in 1911, when AT&T finally did acquire a controlling interest in Cumberland Telephone and Telegraph, James Caldwell conceded to the takeover in language that seemed to come directly from Theodore Vail. In a letter explaining the purchase to his shareholders, Caldwell specifically cited the alleged imperatives of the transcontinental network. "The absorption of your Company into the national system was both logical and inevitable," Caldwell wrote:

> The very nature of the art and the public convenience compelled it, for the telephone on the desk must be in contact with, and in speaking reach of every other telephone throughout the continent, and this can only be done through one unbroken homogenous system where every hand that touches has an incentive to push in the same direction. . . . Practically and psychologically that one universal system can only be the American Telephone and Telegraph Company.[51]

It is remarkable how thoroughly Caldwell capitulated to Vail's determinist line of argument. There must be a single, national, long-distance network, Caldwell said. And the technology seemed to demand that such a network be organized in a certain way. Therefore, the argument went, the corporate system that operated the network must also be organized in the same fashion.

For decades, historians of technology have argued against simplistic theories of technological determinism, and for decades, historians of technology have marveled at the persistence of such ideas.[52] Why are arguments asserting the imperatives of technology so common and so

[49] *Cumberland Telephone Journal* (15 May 1903): 12.

[50] Hume, quoted in *Cumberland Telephone Journal* (15 May 1903): 15. For Caldwell, see the *Annual Report of the Directors of the Cumberland Telephone and Telegraph Company*, HBS, various years.

[51] James E. Caldwell to Cumberland Telephone and Telegraph Company stockholders, 27 Dec. 1911, HBS. Caldwell retired after writing this letter, and AT&T moved the headquarters of Cumberland Telephone and Telegraph from Nashville to Atlanta.

[52] See, for example, Merrit Roe Smith and Leo Marx, eds., *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, Mass., 1994).

resilient? It is probably because they are so useful. We understand intellectually that decisions about technology are made in order to promote various social, commercial, or political arrangements, but if such arrangements can be ascribed to technological imperatives, it removes them from the realm of political debate. Much as the assembly line and scientific management made it possible to shift the balance of power between worker and employer in the late-nineteenth-century American factory, in the same way the technical and organizational integration that long-distance service was deemed to require helped shift the balance of power in the telephone industry for nearly a century to come.[53] For AT&T, however, it was not the factory worker whose power had to be curbed but, rather, men like Morris Tyler and James Caldwell, the entrepreneurs who operated America's urban and regional telephone networks, both inside and outside the Bell System. The coast-to-coast long-distance network was most useful to AT&T as a means of effecting this change.

Alternative Networks

The "very nature of the art," James Caldwell said, "compelled" the construction of a coast-to-coast telephone network, and the technical demands of that network "compelled" the absorption of regional operating companies like his own. While AT&T remained the largest corporation in the world, such determinism was easy enough to assent to. Today, after the breakup of AT&T's regulated monopoly and the reemergence of competition in both local and long-distance telephony, it is harder to argue that a single, centralized Bell System was the inevitable outcome of technological change. Theodore Vail and others used the language of inevitability and technological determinism to argue for their particular vision of consolidation and horizontal integration, but this does not mean there were no alternative models available to the industry at this time.

The most obvious competing model advanced for the organization of the telephone industry came from the Bell System's independent rivals. After the expiration of Alexander Graham Bell's original patents

[53] The literature of scientific and systematic management was candid in asserting this goal. See, for example, Frederick Winslow Taylor, *The Principles of Scientific Management* (New York, 1911); Robert F. Hoxie, *Scientific Management and Labor* (New York, 1915). On the balance of power in the American workplace, see James Livingston, "The Social Analysis of Economic History and Theory: Conjectures on Late Nineteenth-Century American Development," *American Historical Review* 92 (Feb. 1987): 69–95; David Montgomery, *The Fall of the House of Labor: The Workplace, the State, and American Labor Activism, 1865–1925* (New York, 1987); Robert Kanigel, *The One Best Way: Frederick Winslow Taylor and the Enigma of Efficiency* (New York, 1997).

on the telephone in 1894, Bell-affiliated companies faced several years of vigorous competition from thousands of smaller telephone systems, known collectively as the independent telephone movement. The independents reached their zenith in 1907, when they controlled more than half of the six million telephones then operating in the United States, and just under half of the telephone traffic.[54] In some areas, notably the Midwest, independent telephones outnumbered Bell telephones by a factor of five or six to one.[55]

Vail and other AT&T executives argued that the independents would and should be defeated in the marketplace because of their inability to offer long-distance service on a truly national scale. "It is extremely important that we should control the whole toll line system of intercommunication throughout the country," AT&T executive George Leverett wrote in 1901. "We need not fear the opposition in a single place provided we control the means of communication with other places." [56] Histories of the company have assumed for decades that long distance was essential to AT&T's ultimate victory over the independents.[57]

It is certainly true that the independent telephone movement in America failed to build a long-distance network on the scale of AT&T's. Some independent companies did make efforts to interconnect with one another and offer long-distance service across their territories, but these efforts never rivaled the reach of AT&T's transcontinental lines. It is far from evident, however, that this was the fatal weakness AT&T's

[54] In 1907, the Bell System operated roughly 3,013,000 telephones and connected an average of 15,760,000 calls per day. Independent companies operated roughly 3,106,000 telephones and connected an average of 14,024,000 calls per day. U.S. Bureau of the Census, *Historical Statistics of the United States*, vol. 2 (Washington, D.C., 1975), 783.

[55] U.S. Bureau of the Census, *Telephones and Telegraphs and Municipal Electric Fire-Alarm and Police-Patrol Signaling Systems: 1912* (Washington, D.C., 1915), 35. Independent competition in American telephony has not been closely studied by historians. Many recent histories of the telephone, based on the corporate archives of AT&T, pay little or no attention to independent competition. Earlier works typically describe independent competition only to lament it as an error or aberration. Claude S. Fischer, "The Revolution in Rural Telephony, 1900–1920," *Journal of Social History* 21 (Fall 1987): 5–26, and Milton L. Mueller, *Universal Service: Competition, Interconnection, and Monopoly in the Making of the American Telephone System* (Cambridge, Mass., 1997), are both useful. The only really detailed histories of independent telephony, however, are celebratory works by self-interested participants. See MacMeal, *The Story of Independent Telephony*; Paul A. Latzke, *A Fight with an Octopus* (Chicago, 1906); Charles A. Pleasance, *The Spirit of Independent Telephony* (Johnson City, Tenn., 1989).

[56] George Leverett to Frederick Fish, 17 Oct. 1901, box 1375, ATTA.

[57] *The Telephone: A Description of the Bell System with Some Facts Concerning the So-Called Independent Movement* (Boston, 1906), telephone pamphlets, Widener Library, Harvard University (hereafter TPH), 19; Robertson T. Barrett, "The Growth of America's Communication Needs," *Bell Telephone Quarterly* 12, no. 4 (1933); John V. Langdale, "The Growth of Long-Distance Telephony in the Bell System: 1875–1907," *Journal of Historical Geography* 4, no. 2 (1978); Mills et al., "A Quarter-Century of Transcontinental Telephone Service"; Walsh, *Connecticut Pioneers*, 200.

publicity held it to be.[58] Many independent telephone executives disavowed any interest in offering long-distance service. Their customers were happy without it, they said. "Ninety-eight percent of all telephoning is local, and of long distance telephoning, ninety-eight percent is to points within a radius of one hundred miles," said Frederick Dickson, the president of Cleveland's Cuyahoga Telephone Company, in 1905. "The Bell argument is that if we would connect with them, we could talk to Boston, New York, etc.," said William Crownover, the director of a small telephone system in rural Iowa. "True, we can if we have money enough to pay the bill," he continued, "but telephone service is not valued by the number of miles of naked wire we have at our disposal, but by the number of patrons in our immediate vicinity."[59]

Long-distance lines were expensive, both to the customers who used them and to the companies that built them. The Bell System's decision to emphasize long-distance service imposed, or at least implied, other technical choices, including more powerful transmitters in each telephone, higher-quality wires, and sacrifice of local coverage for long-distance construction. Many subscribers "strenuously resist[ed]" the company's efforts to replace their early telephones with the more expensive instruments needed for long-distance transmission. The *American Telephone Journal* reported in 1907 that Bell customers in Wisconsin would "throw aside" their telephones rather than pay for instruments "of the 'long distance' type."[60]

Given the high costs, the low revenues, and apparently limited demand for long-distance service, one could argue that the independents' failure to construct a transcontinental network gave them some competitive advantages over the Bell System.[61] Successful independent telephone systems found a market niche by offering less expensive service and a different sort of coverage than the incumbent. While the Bell companies were building long lines to connect the nation's major urban centers, their independent rivals built cheaper, middle-distance networks, in particular connections between medium-sized towns and their nearby rural areas. By 1907, independent leaders declared it an "undisputed fact" that these rural connections were "the potent weapon in the hands of the independents."[62]

[58] If long-distance service was not the reason for the Bell System's eventual success against the independents, what was? A complete answer would go beyond the scope of this paper but must surely include a number of key patents, dominance of the country's most lucrative urban markets, a canny public-relations campaign, and a general preponderance of both economic and political clout.

[59] William Crownover, "Should Independent and Mutual Companies Co-Operate," *Telephony* (May 1907): 309; Frederick S. Dickson, "Telephone Investments—and Others," (Cleveland, Ohio, 1905), HBS, 40.

[60] "Low Rates and Local Service," *American Telephone Journal*, 17 Aug. 1907.

[61] This argument is suggested in Kenneth Lipartito, The Bell System and Regional Business: The Telephone in the South, 1877–1920 (Baltimore, 1989), 116.

Unlike AT&T's publicity, independent spokesmen drew a sharp distinction between regional and truly national long-distance service. While the coast-to-coast service championed by Vail remained "a seventh day wonder" to most Americans, there was a genuine market in the first two decades of the twentieth century for calls across distances of about fifty to one hundred miles. Indiana independent Charles Tarte distinguished between what he called "short haul" and "long haul" long distance. "Ninety per cent, at least, of so-called long distance messages go to points within fifty miles of the originating station. There seems to be no limit to business of this character." He and other independent leaders urged independent operators to seize this business, leaving the less profitable "long haul" service to AT&T.[63]

There is some evidence that the local owners of Bell-affiliated operating companies saw matters in a similar way. Morris Tyler, perhaps the leading spokesman for Bell's local operating companies in the 1880s and 1890s, was often skeptical of Vail's coast-to-coast long-distance dreams. Yet Tyler believed in regional toll business. In 1883, he made plans to consolidate his own Southern New England Telephone Company with nine other Bell affiliates serving Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine. The New England operating companies intended to buy control of their region's business away from American Bell, creating a wholly independent regional network. American Bell's opposition to such an initiative seems to have thwarted the scheme.[64] In 1901, Pacific Bell president John I. Sabin moved from San Francisco to Chicago to take control of the beleaguered Central Union Telephone Company, which was suffering greatly from independent competition in the Midwest. Sabin's plan to save the company involved taking over the "short haul" and "medium haul" long distance, transferring responsibility for all traffic under two hundred miles from AT&T to Central Union. Such a move was strongly opposed by AT&T policymakers like Edward Hall, who remained committed to a single national network under one company's control. AT&T rejected Sabin's proposal. He resigned his post in Chicago and returned to California in 1903.[65]

[62] G. F. Wonbacher, "Proper Development of the Rural Telephone," *Western Telephone Journal* (July 1908): 242.

[63] Charles E. Tarte, "Long Distance Service—Its Development and Possibilities," *Sound Waves*, July 1907.

[64] Walsh, *Connecticut Pioneers*, 126–27.

[65] "The Central Union Telephone Company/Chicago Telephone Company," 5–6. Some of Sabin's correspondence with American Telephone and Telegraph is in box 1313, AT&T Archives, Warren, N.J., but the exact circumstances of his resignation are unclear.

Opposition from the parent company ultimately blocked proposals by Bell's local affiliates for regional control of regional long-distance lines. The fact that these proposals were made, however, demonstrates that alternative models for the development of the long-distance industry did exist. The Canadian telephone industry offers a practical illustration of a more regional model.

Canada's telephone industry developed at the same time as the United States', and it initially followed similar lines. The Bell Telephone Company of Canada was, from its inception in 1880, a semi-independent subsidiary of American Bell, not unlike the local operating companies in the United States.[66] But Canada had no AT&T and no Theodore Vail, and long-distance telephony there took a different path. In the 1880s, Bell Canada's directors decided that they had neither the financial nor the political capital to maintain a monopoly over the entire country of Canada. They chose instead to focus on the regions they considered most profitable: urban centers in the populous provinces of Ontario and Quebec. By 1889, Bell Canada had sold its interests in the west-coast province of British Columbia and the east-coast provinces of Nova Scotia, New Brunswick, and Prince Edward Island.[67] Bell Canada later suffered from a failure to adequately serve French Canadians in Quebec, and in the early 1900s, the newly formed western provinces of Manitoba, Saskatchewan, and Alberta formed government-owned telephone systems that took over Bell Canada's local and long-distance operations there. Though Bell Canada remained the country's largest telephone company, Canada's telephone industry was never centralized like the American telephone industry under AT&T. A patchwork of regional telephone systems emerged in Canada. This outcome was perhaps symptomatic of Canada's more decentralized federalism and distinctly regional economies, but it does raise questions about the historical inevitability of AT&T's united coast-to-coast network.[68]

[66] Graham D. Taylor, "Charles F. Sise, Bell Canada, and the Americans: A Study of Managerial Autonomy, 1880–1905," *Historical Papers* (1982): 11–30.

[67] Bell Canada retained a sizable, though not a controlling, interest in the New Brunswick Telephone Company, and its relations remained close with both the New Brunswick and Nova Scotia firms. *Annual Report of the Directors to the Shareholders of the Bell Telephone Company of Canada*, various years, Bell Canada Historical Collection, NLC. See also Christopher Armstrong and H. V. Nelles, *Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830–1930* (Philadelphia, 1986), 109; Robert E. Babe, *Telecommunications in Canada: Technology, Industry, and Government* (Toronto, 1990), 74–75; Jean-Guy Rens, *The Invisible Empire: A History of the Telecommunications Industry in Canada, 1846–1956*, trans. Käthe Roth (Montreal, 2001), 81–84.

[68] On the "decentralized alternative" in another industry and in other countries, see Gerald Berk, *Alternative Tracks: The Constitution of American Industrial Order, 1865–1917* (Baltimore, 1994); Andrew Davies, *Telecommunications and Politics: The Decentralised Alternative* (London, 1994).

What is also striking about the Canadian comparison is the way Bell Canada's own spokesmen remained rhetorically committed both to a unified coast-to-coast network and to the argument that coast-to-coast long distance demanded centralized control, even as events in Canada belied these determinist claims. In 1905, a parliamentary commission investigated the telephone industry in Canada, with an eye toward giving municipal government control of local telephony and the federal government control of Canada's long-distance lines. Bell Canada's representatives at the hearings argued strenuously against any plan to divide the network. "It is all one system," Bell counsel Allan Aylesworth told the commission, in language reminiscent of Theodore Vail and AT&T. "It must manifestly be one system, one owned and connecting system." If control of the telephone was decentralized, Aylesworth warned:

> We should have the most unmitigated and unbearable nuisance that could be imagined, namely not one connected system of telephoning from town to town and from house to house in different parts of the country, but a series of disconnected cells, so to speak, not having any connection with another, not being under any one general management, but each part of it under a different and continually changing management.[69]

This is essentially what Canadians created: seven separate regional systems, each enjoying a monopoly, or near monopoly, within its own territory. But the "manifest impossibility" of connecting independent telephone systems did not prevent Bell Canada, AT&T, and British Columbia Telephone from completing the first telephone call from Montreal to Vancouver in 1916, just one year after AT&T's New York to San Francisco connection. Nor did it prevent Canada's seven major telephone companies from coming together in the 1920s to build an all-Canadian coast-to-coast line. Yet even after the system had been in operation for decades, some at Bell Canada insisted it should not function as well as it did. Engineers at Bell Canada dubbed the country's decentralized long-distance network "the bumblebee of communications," referring to the myth that it is "scientifically impossible" for bumblebees to fly.[70] Such was the strength of the philosophy the Canadians inherited from AT&T that not even their own success in constructing an alternate form of technical and corporate organization convinced them that it could actually be done.

[69] House of Commons, Canada, Select Committee Appointed to Inquire into the Various Telephone Systems in Canada and Elsewhere, *Report* (Ottawa, 1905), 771–72, 76.

[70] Edmon B. Ogle, *Long Distance Please: The Story of the Trans Canada Telephone System* (Toronto, 1979), 9; Robert MacDougall, "The All-Red Dream: Technological Nationalism and the Trans-Canada Telephone System," in Adam Chapnick and Norman Hillmer, eds., *Cross-Currents: Twentieth-Century Canadian Nationalisms* (Montreal, 2006).

The importance of these historical alternatives is not that they would necessarily have been "better," in terms of either efficiency or equity, than the centralized monopoly AT&T ultimately constructed. They are of interest because they simply demonstrate the range of choices available to Americans at the time. For nearly seventy years, regulators, the public, and AT&T executives themselves all regarded the Bell System as the most natural of monopolies. But no monopoly is wholly "natural." Claims that the telephone industry must inevitably be organized in any given way were not descriptive but prescriptive arguments. AT&T's long dominance of the telephone industry depended less on technological imperatives than on its ability to shape the political and cultural context of telephony. Regulatory support was crucial to AT&T's ascendancy. In winning that support, AT&T convinced policymakers and the public that a national telephone network could not have been constructed in any other way.[71]

Long Distance and the Nation

The commercial threat that independent competition posed to the Bell System was beginning to fade soon after 1910. While the independents remained significant in certain regional markets, and the absolute number of independent telephones in the United States would continue to rise until the 1920s, independent market share declined precipitously after 1907.[72] Still, AT&T's leaders did not feel secure. As independent competition declined, the threat of antitrust action or even nationalization by the government became more real. Each time a Bell company bought out a smaller telephone system, independent entrepreneurs lobbied state and federal authorities to block the purchase under antitrust laws. In January 1909, there were twenty-two state antitrust cases pending against Bell in Ohio alone and eighteen in Indiana.[73] In 1913, the Department of Justice filed a federal antitrust suit against AT&T after it bought out an independent long-distance company in the Pacific Northwest.

AT&T took the threat of government takeover even more seriously than antitrust laws. Many European states had taken over their national telephone systems by the turn of the century. Canada came close

[71] On the history of natural monopoly theory, see William W. Sharkey, *The Theory of Natural Monopoly* (Cambridge, U.K., 1982), 12–28. On the difficulty of applying natural monopoly theory to the telephone, see Babe, *Telecommunications in Canada*, 137–49; Milton L. Mueller, *Universal Service*, 11–20.

[72] *Historical Statistics of the United States*, 783.

[73] "To Bring Telephone Suits," *New York Times*, 22 Jan. 1909, 16; A. C. Lindemuth, *Telephone Mergers Illegal* (Chicago, 1911), TPH.

to doing so in 1905, and three Canadian provinces did in fact acquire the telephone networks that the Bell Telephone Company of Canada had built.[74] In the United States, agitation for public ownership began with a move to bring the telegraph under control of the postal system in the 1860s and crested in the "home-rule" movement for municipal ownership of utilities around the turn of the century. The first decade of the twentieth century saw a flurry of new state regulation of telephony and movement toward federal regulation by both major parties.[75] In 1913, Woodrow Wilson's postmaster general, Albert Burleson, wrote a major report calling for the government to take over the telephone and telegraph industries, and Representative David Lewis of Maryland pressed Congress to adopt the plan. Internal memos at AT&T reported that at least twenty senators and forty-four congressmen approved nationalization of the industry.[76]

Top executives at AT&T also worried about a broader crisis of corporate legitimacy. The size and power of America's leading corporations had grown immensely in this era. In the merger moment between 1898 and 1902, more than 2,600 American companies were absorbed by mergers and combinations. The one hundred largest corporations in the United States increased their aggregate size fourfold in those four years and gained control of more than 40 percent of the nation's industrial capital.[77] Such rapid growth provoked a powerful political and cultural backlash. Agrarian populism, urban progressivism, a militant labor movement, antimonopoly sentiments, and municipal home rule—all these movements can be seen as reactions to the growth of giant nation-spanning corporations and assaults on what Louis Brandeis famously called "the curse of bigness."[78] Such movements may also be understood as hostile reactions to what was often called "action at a distance"—the increasing power of corporations and others to exert influence on ordinary lives from far away.[79]

[74] Babe, *Telecommunications in Canada*; Eli Noam, *Telecommunications in Europe* (Oxford, 1992).

[75] Jeffrey E. Cohen, "The Telephone Problem and the Road to Telephone Regulation in the United States, 1876–1917," *Journal of Policy History* 3, no. 1 (1991): 42–69.

[76] Postmaster General, *Government Ownership of Electrical Means of Communication* (Washington, D.C., 1914). The AT&T memo is by Chester I. Barnard, "Review of the Government Ownership Situation," 6 Mar. 1917, box 1364, ATTA.

[77] Naomi R. Lamoreaux, *The Great Merger Movement in American Business, 1895–1904* (Cambridge, U.K., 1985); William G. Roy, *Socializing Capital: The Rise of the Large Industrial Corporation in America* (Princeton, N.J., 1997).

[78] Louis D. Brandeis, *Other People's Money and How the Bankers Use It* (New York, 1914).

[79] Thomas Haskell, Roland Marchand, Robert Wiebe, and others have argued that as the American economy and society became more obviously interdependent in the late nineteenth and early twentieth centuries, it became harder and harder to imagine individuals as solitary masters of their fates. Traditional sources of meaning and order close at hand—the family, the parish, the small community—lost "causal potency" as the prime movers of conditions

In such a climate, the construction of a national telephone network was a highly charged idea. For American telephone users in the early 1900s, choosing between the regional telephone networks of the independents and the more national network of the Bell companies became both a personal and a political choice. What kind of network did these Americans want to be a part of? Where did their livelihood and their interests lie? The choice between AT&T's national network and the regional clusters of the independents amounted to a kind of referendum on alternate visions of America's economic life. The local and regional lines of the independents were among the final artifacts of an old economic order that was regionally oriented and locally controlled. AT&T's transcontinental system, by contrast, both represented and facilitated an increasingly integrated national economy.[80]

"It is a dangerous thing to be a monopoly at the present time," AT&T vice president Nathan Kingsbury told an audience of telephone executives in February 1914. "Business is uncertain, harassed, worried." What worried Kingsbury were muckraking journalists, crusading politicians, and a public inclined to see large corporations like AT&T as greedy, swollen trusts. Men like Kingsbury and Vail considered public hostility to big business frightening and very real. "Many predict panic and disaster . . . the old barriers seem to be forced aside by the spirit of universal discontent and universal unrest," Kingsbury said. "Already the results of this new movement . . . [have] been economically and socially greater than the results of the French Revolution."[81]

Two years earlier, the leaders of some of the largest industrial and financial concerns in the country had met to confront the very crisis Kingsbury described. Present were financier J. P. Morgan, Standard Oil heir John D. Rockefeller Jr., and others. These men discussed plans to develop a bureau of investigation and publicity that would promote the legitimacy of the great business interests and counter public hostility to

and events receded farther and farther away. It was not the size or the tactics of large corporations that stirred protest in this era, Marchand argued. It was the ability of corporations and other nation-spanning organizations to act upon no-longer isolated "island communities" from a great geographic distance. Thomas L. Haskell, *The Emergence of Professional Social Science: The American Social Science Association and the Nineteenth-Century Crisis of Authority* (Chicago, 1977), 15, 40; Roland Marchand, *Creating the Corporate Soul: The Rise of Public Relations and Corporate Imagery in American Big Business* (Berkeley, 1998), 2–5; Robert H. Wiebe, *The Search for Order, 1877–1920* (New York, 1967).

[80] This contest also played out in other industries, of course. See, for example, Berk, *Alternative Tracks*; Marc Schneiberg, "Organizational Heterogeneity and the Production of New Forms: Politics, Social Movements, and Mutual Companies in American Fire Insurance, 1900–1930," *Social Structure and Organizations Revisited* 19 (2002). On correlations between trade networks and long-distance telephone lines, see Weiman, "Building Universal Service."

[81] Nathan C. Kingsbury, address before the Telephone Society of New York, 17 Feb. 1914, TPH, 3–6.

the consolidation of corporate power. Nothing came of their meetings directly, but those present praised one among their number for already doing just the sort of work they all believed was required. "Mr. Vail, as president of the Telephone Company, has done this kind of work . . . for many years with great success," Rockefeller said. "He has made it a regular business . . . [and] he constantly and persistently kept up a campaign of education." Writing only months after the breakup of Standard Oil, Rockefeller was envious of Vail's achievements. "The fact that his Company, one of the greatest, if not the greatest single monopoly in the country, is allowed to continue unmolested . . . is indication enough of his success," Rockefeller said.[82]

What had Vail done that so impressed Rockefeller? He had embarked on a seminal public-relations campaign for AT&T and the Bell System, a campaign that historian Roland Marchand called "the first, the most persistent, and the most celebrated of the large-scale institutional advertising campaigns of the early twentieth century." The AT&T publicity bureau not only ran advertisements; it also courted reporters, authors, politicians, libraries, and schools. It planted press releases with friendly editors, subsidized flattering books about the company and the telephone, and produced a flood of "educational" pamphlets, booklets, and films.[83]

Given public anxiety about corporate "bigness," one might have expected AT&T's publicity to deemphasize the size and the unity of the Bell System. Given the regional basis of so much anti-Bell populism, one might have expected a retreat from arguments about the way long distance was shrinking and unifying the nation. But AT&T's publicity did neither. Instead, the company offered a positive defense—indeed, a celebration—of economic integration and corporate consolidation. "The nation became an organized body as it increased its use of the telephone," according to commemorative publicity for the transcontinental call, "and there was no loss of the spirit of self-help and democracy that was its birthright."[84]

[82] The quotations come from a letter Rockefeller wrote to a family adviser one week after the meeting. John D. Rockefeller Jr. to Frederick T. Gates, 27 July 1912, reprinted in John M. Jordan, "'To Educate Public Opinion': John D. Rockefeller, Jr. and the Origins of Social Scientific Fact-Finding," *New England Quarterly* 64 (June 1991): 292–97. Vail's proposals are described in Theodore N. Vail, "Memorandum Concerning a Proposed Economic Bureau," Rockefeller Foundation Draft Report, Apr. 1914, quoted in David M. Grossman, "American Foundations and the Support of Economic Research," *Minerva* 20 (Spring/Summer 1982): 59–82. Discussions apparently trailed off, because Rockefeller wanted to create a research institute, while Vail and Morgan only wanted a public-relations bureau. See also John Ensor Harr and Peter J. Johnson, *The Rockefeller Century* (New York, 1988), 127.

[83] Marchand, *Creating the Corporate Soul*. See also James D. Ellsworth, "The Start of General Magazine Advertising," Jan. 1931, box 1066, ATTA.

[84] "Coordinating the Nation," 24.

Others have studied this justly famous campaign and have shown how AT&T publicists like James Ellsworth and Arthur Page deployed many arguments and themes that other companies would later borrow.[85] AT&T wrapped itself in a mantle of public service, fairness, and reliability. It offered a vision of the company as a shareholders' democracy, owned by the customers it served. What has not been as widely noted is the centrality of the long-distance network to these advertisements and themes. "American business men have been made neighbors through contacts over the wires of a nation-wide telephone system," proclaimed a typical piece of advertising copy. "Drawn together by bonds of communication . . . America's industries operate not as individual and isolated enterprises, but as closely coordinated parts of a gigantic mechanism that ministers to the nation's needs." Long distance, it was repeatedly said, made "a single community out of our vast, busy continent," or "a neighborhood of a nation." "The completion of the transcontinental telephone line . . . brings new light to a united nation," said one particularly effusive ad, promising the defeat of "sectionalism and race feud" by the long-distance telephone.[86]

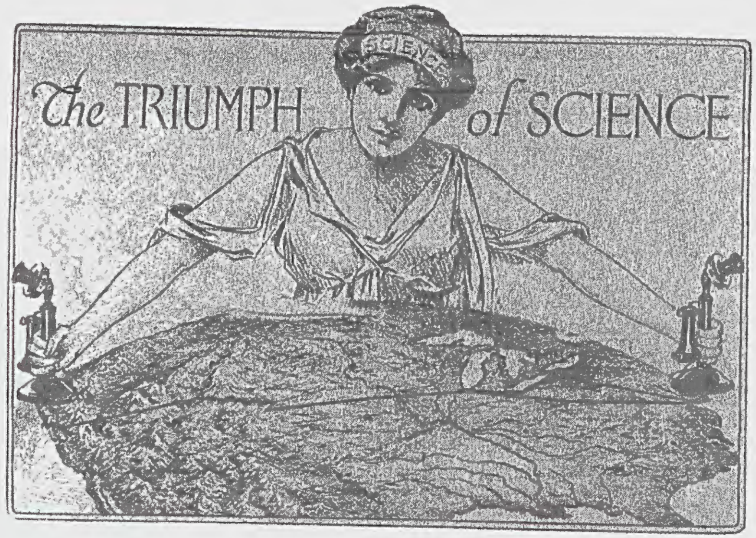
As a visual answer to the monstrous octopus so popular in independent caricatures of the Bell System, AT&T ads offered striking images of giant businessmen and giant female operators, arms stretched from coast to coast, looming over a nation the telephone made manageable and small. Such publicity emphasized not the reach and power of the telephone company itself but the power long distance provided to subscribers. "Your line is connected with the great Bell highways, reaching every state in the union," another advertisement read. Long-distance service was used in this way to recast threatening images of action at a distance. Telephone users were not acted upon by distant forces but were given power to effect action at a distance themselves. AT&T publicity asked Americans, in particular the businessmen who were the principal market for long-distance service, to imagine themselves as those colossal telephone users, empowered rather than threatened by the network's size.[87]

When one compares public debate about the telephone industry in the years between 1900 and 1920 to similar debates concerning the telephone in later years, it is striking how successful AT&T was in defining or redefining the terms that people would use to talk and think

[85] Noel L. Griese, *Arthur W. Page: Publisher, Public Relations Pioneer, Patriot* (Tucker, Ga., 2001); Noel L. Griese, "James D. Ellsworth, 1863–1940: P. R. Pioneer," *Public Relations Review* 4 (1978); Marchand, *Creating the Corporate Soul*, 48–87.

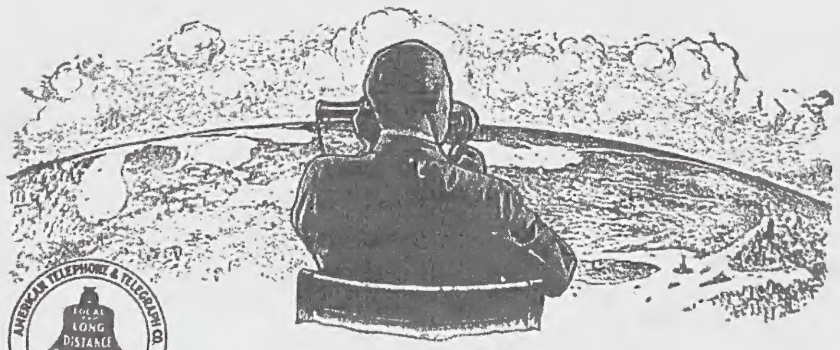
[86] American Telephone and Telegraph Company, *Telephone Almanac* (New York, 1928); "Coordinating the Nation," 24.

[87] AT&T Advertisements, *Life*, 15 Jan. 1914, 91; *Life*, 17 Dec. 1914, 1137.



Making a Neighborhood of a Nation

THE TRANSCONTINENTAL TELEPHONE LINE



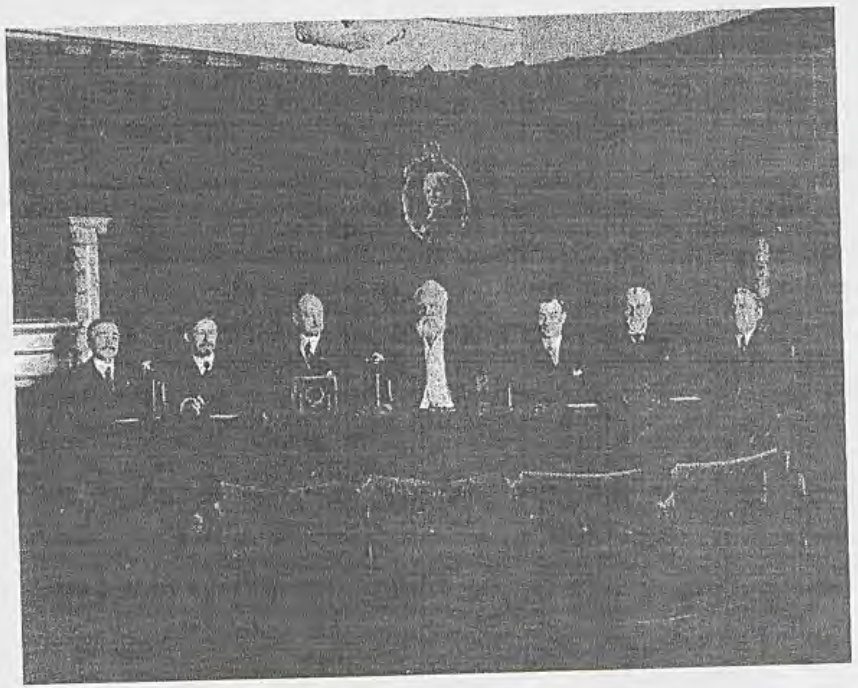
Your Telephone Horizon

Ads for the long-distance network offered striking images of giant businessmen and giant female operators looming over a nation the telephone made manageable and small. (Source: AT&T Archives and History Center, San Antonio, Tex.)

about their industry. The long-distance network would not erase local communities; it would turn the entire nation into one close-knit neighborhood. The telephone did not threaten the autonomy of middling entrepreneurs; it would magnify their power. The telephone was not an instrument of giant corporate trusts; it was an instrument that might transform those trusts into more dynamic, democratic institutions. In many ways, the arguments AT&T made about the telephone still form a kind of default rhetoric that we use in discussing new communication technologies today.

Images of the Network

Two photographs, taken on January 25, 1915, appear in numerous histories of the transcontinental telephone system. The first photo shows Alexander Graham Bell sitting with New York mayor John Purroy Mitchell and other dignitaries at the New York end of the first



Alexander Graham Bell (center) with Mayor John Purroy Mitchell of New York (at Bell's right) and other dignitaries at the official opening of transcontinental telephone service, New York, January 25, 1915. Above Bell is a portrait of AT&T president Theodore Vail. (Source: Plate 4.644, *The Pageant of America* Photograph Archive, volume 4: "The March of Commerce," New York Public Library.)

transcontinental call. The second shows Thomas Watson in San Francisco with a similar collection of West Coast notables. Conspicuously absent from both pictures is Theodore Vail. (In the New York photograph, Vail's portrait appears on the wall behind Bell.) There is a third photograph, however, which does not appear in any of AT&T's official corporate histories. It shows Vail participating in the inaugural call from his vacation home in Georgia. At his side are four men. Two of them are architects, there to consult with Vail on the AT&T Building then under construction in New York. The other two men are William Rockefeller and J. P. Morgan Jr.

One can guess why AT&T might choose not to publicize this particular photograph in the days of muckrakers and trustbusters. It made perfect sense, however, for Vail to be joined by a Rockefeller and a Mor-

AT&T President Theodore Vail (on the telephone), with William Rockefeller (seated), J. P. Morgan Jr. (behind Rockefeller), and two architects, participating in the opening of transcontinental telephone service from Vail's summer home in Georgia. (Source: Photo 95-1292-2, AT&T Archives, Warren, N.J.)

gan at the inauguration of his coast-to-coast network. Vail had integrated his industry and created what was to become the largest corporation on earth. In the years surrounding the completion of the transcontinental circuit, AT&T beat back the challenge of independent competition, escaped antitrust action, and cemented its near monopoly over the telephone in America with congenial government regulation.

When Vail retired from the presidency of AT&T in 1919, the structure of the telephone industry for the next sixty years was essentially in place. Regulation at the state and federal levels legitimized AT&T's control over the Bell System and its near monopoly over the telephone in the United States. The Communication Act of 1934, which created the Federal Communications Commission, and the FCC's investigation of AT&T from 1935 to 1938 only entrenched this durable regulatory arrangement.

Many histories of the telephone industry pinpoint as the origin of this arrangement the Kingsbury Commitment of 1913, a compromise between AT&T vice president Nathan Kingsbury, the U.S. Justice Department, and several independent telephone leaders that defused federal antitrust action against AT&T and normalized relations between Bell and the independents.[88] The Kingsbury Commitment was significant—particularly AT&T's divestiture of Western Union, a rare defeat in Vail's campaign for universal systems integration—but it was not the only commitment AT&T made to secure its long-term goals. The Bell System's commitment to providing high-quality service and continued technological innovation, demonstrated and embodied by the transcontinental telephone network, was a key reason for public and regulatory acceptance of its monopoly. In building and promoting the transcontinental line, AT&T built a consensus around its chosen vision of the industry—a single telephone network controlled by one company with connections from coast to coast—that would survive until the 1980s.

Long distance was crucial to AT&T's strategy and ultimate success, though not in the way many have assumed. AT&T's long lines were not a decisive competitive weapon between 1900 and 1920. They were, however, a crucial political and indeed cultural tool. The transcontinental telephone network justified consolidation of AT&T's power within the Bell System and facilitated acceptance of its monopoly in the

[88] The Kingsbury Commitment involved AT&T's promise to do three things: give up control of Western Union, sell the stock holdings in the telegraph company it acquired in 1909; agree to stop taking over competing independent systems; allow all independent systems that did not compete directly with Bell to connect to its long-distance lines. Nathan C. Kingsbury to Attorney General James C. McReynolds, 19 Dec. 1913. The letter is reprinted in *AT&T Annual Report*, 1913, 24–26.

nation at large. AT&T not only used long distance to polish its own public image; it also employed the symbol of the national network in an ambitious effort to legitimize all nation-spanning corporations and commerce. The ideals of the coast-to-coast telephone system were sent forth "to do battle with the slogans of the 'curse of Bigness,'" according to one AT&T executive in 1915.[89] For the better part of a century, the ideals of long-distance interconnection and consolidation would remain supreme.

[89] Quoted in Marchand, *Creating the Corporate Soul*, 86.

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talk about how other countries – UK, France, Germ, Japan, Spain – did their telcos

the telegraph in those countries had been kept under govt operation bc of postal ops + central govt wanting to control dissidence

Postal – telegraph – telephone

there were inventors but that didn't impact op cos ownership – tie to

proposals bfpk + after
WWII to nationalize
AT+T - Vail moved
about that

Even though govt took AT+T
over in war, they gave it
back

it anamoly privately owned
Come back in 60's w/
Com. Satellite Act + again
at end of cent when other
countries forced to be privatized

Theodore N. Vail and the Civic Origins of Universal Service

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Vail force behind universal service — does this = LD?

In 1907, AT&T President Theodore N. Vail proclaimed universal service to be a key corporate goal. The following year, at Vail's prodding, AT&T popularized this goal in a major publicity effort that historian Roland Marchand has termed "the first, the most persistent, and the most celebrated of the large-scale institutional advertising campaigns of the early twentieth century" [Marchand, 1998]. Over the course of the next decade, Vail himself explored its ramifications in a remarkable series of reports and addresses [Vail, 1917]. Though historians quarrel about precisely what Vail meant by universal service, few doubt its importance. For the next three-quarters of a century, it played a major role in the firm's business strategy and was a central element of its corporate culture.

Historical scholarship on universal service has been greatly influenced by the antitrust suit against AT&T that culminated in its breakup in 1984. While this work is often suggestive and revealing, it tends to be far more concerned with the consequences of universal service than with the context out of which it emerged. This paper—which, I should emphasize, is preliminary and exploratory, and an invitation to critique—points the discussion in a different direction. It has three sections. The first section surveys the literature on the origins of universal service. The second proposes an alternative account. The final section makes a few observations about the implications of this alternative for the Galambosian "organizational synthesis"—and, in particular, for its characterization of the main lines of institutional development in the nineteenth-century United States.

Historical scholarship on the origins of universal service typically link the concept with the subject of inquiry. Historians of AT&T, for example, almost invariably trace it back to the beginnings of the firm. Characteristic of this genre are the essays collected in Ithiel de Sola Pool's *Social Impact of the Telephone,* a project that grew out of a conference that AT&T sponsored in the mid-1970s at MIT. Though Pool declared in his introduction that AT&T exerted no influence over the contents of this volume, it would be hard to imagine a scholarly work that was more congenial to the sensibilities of its patron [Pool, 1977, p. x]. With minor variations, all of the essays in the volume share a sim-

[1] I would like to thank Sheldon Hochheiser and Kenneth Lipartito for their suggestions and advice.

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Pool attributes universal service idea to 3 men

ilar point of view, making it possible to treat them collectively as the product of a single mind.

From a Poolian standpoint, the origins of AT&T's commitment to universal service could be found in the intentions of the founders of the firm. From the outset, these men—telephone inventor Alexander Graham Bell, telephone promoter Gardiner Greene Hubbard, and telephone manager Theodore N. Vail—envisioned that the new technology would eventually become incorporated into an integrated network that, under a single management, would bring the promise of telephony to families as well as businesses throughout the country and around the world. Given the prescience of Bell, Hubbard, and Vail, the subsequent rise of the Bell System was a "self-fulfilling prophecy" that sprang, as it were, more-or-less fully clad from the brow of its creators [Pool, 1977, p. 132].

The key to the founders' success was their ability to comprehend the essential nature of the new technology. They saw the future with "such clarity"—or so Pool contended—because of the congruence between their outlook and the "very technology of the telephone" [Pool, 1977, p. 8]. From a Poolian standpoint, it was but a short step from Bell's first telephone patent in 1876 to the establishment of AT&T as a long-distance subsidiary in 1885 to the consolidation of the Bell System as a legally sanctioned national monopoly in the 1910s. In this decidedly whiggish and resolutely triumphalist narrative, the rise of independent telephony was but a footnote, as was the role of law, public policy, and the regulatory state.

When read today, fifteen years after the break-up of the Bell System, these essays can be read as *proof texts* of a kind of technological determinism that seems startlingly hubristic and naïve. The political message was plain. AT&T's greatness—or so explained John R. Pierce, a scientist at Bell Laboratories, and a contributor to the volume—was attributable to a unique combination of technological virtuosity and visionary leadership. Both were imperiled by governmental meddling. Telephone networks, Pierce reminded us, were the "largest and most complex systems in the world." And the foremost of these networks was the Bell System. Yet, if it came to be imperiled by "drastic government actions" aimed at bringing it in line with "current ideology," it might swiftly "degenerate" in a very few years [Pool, 1977, pp. 181, 187]. Though Pierce was a bit vague about the kinds of degeneracy he had in mind, he expressed special concern about the evils of interconnection. Should some government regulator, for example, have the temerity to permit telephone users to attach a non-Bell telephone to the network, serious injury or even electrocution might well be the result [Pool, 1977, p. 192].

Vestiges of the Poolian tradition lived on in George David Smith's *Anatomy of a Business Strategy* and Robert W. Garnet's *Telephone Enterprise,* the first two volumes of the Johns Hopkins/AT&T series in telephone history. Like the Poolians, Smith and Garnet found in the earliest years of the Bell Company the seeds of its later glory. For Smith, a key turning point was the acquisition of Western Electric in 1881—an event that set the stage for Bell's preeminence

in industrial research; for Garnet, it was the firm's establishment, beginning in the late 1870s, of close relations with the operating companies—a precursor to the Bell System. Interestingly enough, one historian who appeared to dissent from this view was Louis Galambos—the editor of the series. Indeed, in a notable essay on Vail, Galambos took care to distinguish his business strategy during his first career at Bell—which ended in his departure from the firm in 1887—from the strategy that he pursued in his second career following his return in 1907 [Galambos, 1992].

Both Smith and Garnet grounded their monographs in the structural-functionalist framework that Alfred D. Chandler, Jr., used so effectively in the *Visible Hand* [John, 1997a]. Far different in approach was the fourth volume in the Hopkins/AT&T series—Kenneth Lipartito's study of telephony in the South. In this monograph, and also in a related series of articles, Lipartito moved from an *internalist* toward a *contextualist* understanding of Bell's strategy. It was not technology and markets, Lipartito contended, but skillful entrepreneurship, in conjunction with an "almost irrational" commitment to interconnection, and—most important of all—the active cooperation of state regulatory bodies, that translated universal service into a reality [Lipartito, 1989a, p. 225; Lipartito, 1989b]. Lipartito did not reject outright the possibility that the origins of universal service antedated Vail's articulation of this ideal in 1907. Yet his primary interest was the conjunction of events that Vail's return helped to inspire. Indeed, to a greater extent than any other historian who focused primarily on AT&T, he was open to the possibility that, had AT&T executives not proved so successful in manipulating the political setting, government regulators could conceivably have made a superior "public choice" [Lipartito, 1989b].

Historians whose main interest lies elsewhere than AT&T have been, perhaps not surprisingly, markedly less inclined to trace the origins of universal service to the founders of the firm. A case in point was Milton L. Mueller, Jr.'s., *Universal Service,* the most extensive analysis of the economic dimensions of universal service in American telephony during the opening years of the twentieth century [Mueller, 1997]. If the Poolians read at times a bit like defendants in the AT&T antitrust suit, Mueller was a star witness for the prosecution. In the Vail era, Mueller explained, the concept of universal service had far more to do with the interconnection of existing telephone service than with the extension of telephone service to under-served regions. Only later would the concept become synonymous with the establishment of a nation-wide, low-cost, cross-subsidized residential phone network that, during the antitrust proceedings, AT&T's champions misleadingly claimed to have been one of its defining features all along.

How, then, did Mueller explain the origins of universal service? Its true creators, he contended, were the swarm of daring, imaginative, and (at least implicitly) socially progressive independent telephone promoters who, following the lapse of the Bell telephone patents in 1894, established telephone service for the many regions that Bell managers had declined to serve. Given Mueller's theme, it is, perhaps, not entirely surprising that his book appeared

Mueller's take on universal service

in a series that was sponsored by the conservative, free-market-oriented American Enterprise Institute. After all, it can be read—which, indeed, seems to have been Mueller's intention—as a brief for today's telecommunications upstarts, and a forthright critique of any effort to re-regulate the industry following the breakup of AT&T.

Equally critical of Poolian orthodoxy was Claude S. Fischer's *America Calling*, a prize-winning study of telephone users in the period prior to the Second World War [Fischer, 1992]. Framing his inquiry as an exploration of the "consumption junction," Fischer contended, predictably enough, that it was here that the promise of universal service was first realized. For Fischer, the true champions of universal service were neither Bell managers, as the Poolians and Lipartito had claimed, nor independent telephone entrepreneurs, as Mueller had contended. Rather, they were the millions of rural and small town telephone patrons who pioneered in the social (as opposed to the commercial) uses of the telephone. It was these ordinary Americans, Fischer concluded, who finally persuaded Bell managers to stop thinking of the telephone as little more than a telegraph that talked, and to embrace fully its actual potential as a medium for two-way social communication.

Like Lipartito—and, to a certain extent, the Poolians—Fischer conceived of the Bell managers' outlook as a *mindset* with a distinctive cultural cast. Yet Fischer treated this mindset as an obstacle to be overcome rather than an asset to be exploited. Trapped as they were by their blind reliance on inappropriate telegraphic analogies—or so Fischer assumed—Bell managers failed to recognize the actual potential of the new technology. Not until the 1920s, fifty years *after* the initial establishment of the industry, would customers living in rural locales finally show them the way. Or, to put it somewhat differently, for Fischer, no less than for the Poolians, the founders of the telephone industry were technological determinists—only, now, technological determinism was not a functional *given* but, instead, a cultural *norm*.

Existing scholarship on the origins of universal service highlights the salience of technology and markets, and devotes little attention to developments that antedated the commercialization of the telephone. Yet long before the 1870s, there *already existed* an expansive rationale for communications policy that owed little to electrical science or consumer demand, yet which would exert a major influence on the ideal of universal service as it would later come to be understood. Ever since the campaign for "cheap postage" in the 1840s, countless pamphlets, magazine articles, and government reports had hailed the inexpensive, uniform, and geographically extensive distribution of social correspondence as a public good. And ever since the passage of the Post Office Act of 1792, the government had moved vigorously to hasten the rapid transmission of time-specific information on commerce and public affairs throughout the length and breadth of the United States. This civic rationale for communications policy had little influence at Western Union—which was, in the 1870s, the largest telegraph firm in the country. Yet it was taken for granted at the Post Office Department, which remained, throughout the nineteenth century,

the largest and most influential element of the information infrastructure in the United States [John, 1995; John, forthcoming].

The existence of this civic rationale for communications policy best explains the origins of universal service as a business strategy at AT&T. Universal service was, at bottom a cultural heritage with an unmistakably political cast, rather than an intrinsic attribute of the new technology, or a fortuitous byproduct of the impersonal workings of the competitive market.

The civic rationale for communications policy had a particularly lasting influence on Hubbard—the telephone promoter who, in addition to funding Bell's early experiments in telephony and making several key early administrative decisions at the Bell Company, recruited Vail to become Bell's first general manager.

Hubbard's preoccupation with universal service began well before his involvement in telephony. Its impetus was his dissatisfaction with what he took to be the unduly narrow, business-oriented strategy that Western Union officials pursued following the consolidation of the firm in 1866 as a *de facto* national monopoly. Western Union, Hubbard believed, had conspicuously failed to realize the democratic potential of the new technology. From his standpoint, its rates were too high, its service too limited, and its offices too few. "As a telegraph for business, where dispatch is essential and price is of little account"—Hubbard declared in 1883, articulating a position that he had held for fifteen years—"the Western Union system is unrivaled; but as a telegraph for the people it is signal failure" [Hubbard, 1883, p. 522]. To rectify this situation, Hubbard lobbied Congress repeatedly to charter a "postal telegraph" that would underbid the telegraph giant and provide universal service for all.

Hubbard's critique of Western Union calls into question Fischer's assertion that Bell's founders were trapped by telegraphic analogies. How, one wonders, could this be true of Hubbard—Western Union's most insistent critic? Hubbard's pronouncements also raise questions about Mueller's blanket claim that the concept of universal service dated back no further than the competitive flurry of the 1890s and the 1900s. Few students of nineteenth-century communications policy would find such a claim persuasive. After all, universal access to information on commerce and public affairs had been a goal of postal policy for over a century—and, indeed, had furnished Hubbard with much of the rhetorical ammunition that he deployed in his struggle against Western Union [John, 1998].

Hubbard's critique of Western Union's business strategy led him, predictably enough, to establish the telephone industry on a broader and more inclusive foundation. In marked contrast to telegraph officials, Hubbard took it for granted that, eventually, the new technology would be administered as a public utility, and that it would serve a large, and constantly growing, clientele. Later Bell investors would be decidedly more restrained in their assumptions about the industry's future course, particularly in the years immediately preceding the expiration of the key Bell patents. Yet Hubbard's vision was never entirely eclipsed, and, beginning in 1907, would reemerge, in a distinct, yet rec-

ognizable guise, in Vail's commitment to universal service. By the First World War, the Bell System would come to resemble the other network technologies with which Hubbard was familiar—such as the gas and water works that were beginning to proliferate in American cities and towns, and which, in the years prior to his initial involvement in telephony, Hubbard himself had done a good deal to promote [Carlson, 1994].

Hubbard never doubted that the telephone would be quickly adopted by banks, hotels, and retail establishments of all kinds. Yet he was equally confident that it would one day prove useful within the home. Middle-class Americans like himself—as Hubbard knew well, and as he had frequently contended in his essays on telegraphic reform—were one market that Western Union had conspicuously ignored. To encourage homes as well as offices to install telephones, Hubbard offered residential users special low rates. And to promote its widespread use, he offered subscribers unlimited monthly service for a single fee. This rate structure had the advantage of being relatively simple to administer. Yet other, message-unit-based pricing schemes could have been, and were, devised, particularly in Europe.

Alexander Graham Bell echoed Hubbard's conviction that the telephone would play a major role within the home. In particular, he envisioned the telephone replacing the speaking tubes, pull bells, and other devices that well-to-do Americans had come to rely on to maintain contact with their household staff. Once householders became accustomed to the new technology, he reasoned, they would urge its extension to stores, offices, and other similar locations that would then be linked together by a central exchange. In an age when even modest middle-class households employed one or more servants, this was an ingenious strategy, and one well calculated to insure that the arbiters of taste and fashion would come to regard the new technology in a favorable light. To make his point, Bell cited gas and water companies—though, significantly, not district telegraph firms—as prototypes for the new enterprise [Bell, 1878, pp. 89-92].

Theodore N. Vail's approach to telephony was predicated on a similarly expansive conception of its potential. Indeed, like Hubbard's, it owed a good deal more to postal precedent than to the example of Western Union. This was true even though Vail had himself worked for a time as a Western Union telegraph operator, while his cousin, Alfred Vail, had been a key figure in the early years of the telegraph industry.

Prior to Vail's arrival at Bell, the most formative experience in his adult life—and, indeed, the reason Hubbard offered him a position in the Bell Company—had been his successful tenure as the general superintendent of the Railway Mail Service. Hubbard met Vail during a stint that Hubbard served as chairman of a special postal commission that Congress established in 1876 to devise a better method for allocating railway mail pay. Vail worked closely with Hubbard and prepared an elaborate report on postal costs [Vail, 1876, pp. 8-24; Hubbard, 1877]. Hubbard was duly impressed with Vail's energy, imag-

ination, and capacity for abstract thought, and in 1878 persuaded him to bolt the government to become the first general manager at Bell.

The Railway Mail Service had been established in 1869 and, under the capable leadership of a series of gifted administrators—including Vail—quickly became a key element of the information infrastructure of the industrial age. The purpose of the institution was to speed the movement of the mail by shifting its routing from stationary distribution centers (where it had been located since 1800), to moving railroad cars (where it would remain for much of the next century). In its day, the continuous, train-based sorting scheme that the railway mail clerks oversaw was widely hailed as one of the wonders of the age.

Writing in 1925, Bell historian Arthur Pound drew attention to the significance of Vail's years at railway mail [Pound, 1926, pp. 17-18]. So, too, did Robert Sobel in a perceptive biographical sketch [Sobel, 1974]. The connection was also noted by John Brooks in what remains the single best volume on the history of the telephone industry [Brooks, 1976]. Yet most recent studies of telephone history—including all of the works discussed above—say nothing about it at all.

How, then, might Vail's years in the Railway Mail Service have influenced his business strategy at Bell? Several parallels are suggestive. At the Bell Company, as at railway mail, Vail was firmly committed to retaining complete control over the communications circuit. Like most postal officers, Vail believed that it was incumbent to guarantee that the mail remain under the control of individuals who could be assumed to display a proper degree of "fealty" to the Post Office Department. For this reason, he opposed the practice (which dated back to the stagecoach era) of requiring mail contractors to convey the mail between the train and the post office. This custom, Vail warned, exposed the mail to "all kind of irregularities," since it virtually guaranteed that it would be handled in a haphazard manner by men whose minds were on something else [Annual Report, 1877, p. 151]. Later, as a Bell executive, Vail would display an analogous commitment to systems integration. Following the Bell breakup, it has come to seem odd to treat this "network mystique" as a functional response to a technological imperative. Vail's experience at railway mail suggests an alternative explanation.

To better coordinate the routing of the mail once it was under government control, Vail devised a number of novel administrative procedures and sponsored several conferences with his eight divisional superintendents. One such meeting, in September 1877, lasted a full week. The purpose of this conference, Vail explained, was to improve relations between the government and the railroads, standardize the work of the various divisions, minimize routing errors, and devise uniform procedures [*History*, 1885, pp. 114, 184]. Later, at AT&T, Vail would make similar organizational summits a prominent feature of the firm's corporate culture. Interestingly, there is little evidence that, at this time, similar meetings were held at Western Union.

No feature of the Railway Mail Service was more distinctive than its *esprit de corps*. Here, too, was a cultural norm that anticipated, and that may well have

helped to shape, the meritocratic ethos that was such a distinctive feature of the Bell System under Vail. Unlike much of the rest of the Post Office Department—which remained tied to the patronage-based mass parties—the Railway Mail Service was administered on civil service principles. Promotions were based on performance, and all clerks were required to take periodic tests to demonstrate their skills. "Upon the careful performance of their duties," Vail declared in 1876, "are dependent interests of a magnitude that cannot be estimated." After all, a "single error" on the clerks' part, resulting in the "delay or missending of a single letter, no matter how unimportant it may look, may result disastrously to some individual or corporation" [*Annual Report*, 1876, p. 167]. On the fidelity of the railway mail clerks, Vail added two years later, were dependent interests "beyond estimate" that they had "fully met." If, then, the United States was to boast a postal service of which there was "none superior" then to "these employes is due their share of the credit" [*Annual Report*, 1878, p. 242].

Few features of railway mail intrigued Vail more than the Fast Mail, a high-speed mail link between New York and Chicago that cut the transit time to a mere twenty-five hours—a remarkable achievement that was, in its day, as well known as the Pony Express. Though Vail himself did not establish the Fast Mail, he oversaw its expansion and took great interest in its administration. The project was, Vail declared in one of his annual reports, of comparable import to the initial establishment of the railway mail. Every day, he proudly reported, fast mail clerks sorted no fewer than 529,000 pieces of mail [*Annual Report*, 1876, pp. 163, 165].

Vail recognized that the Fast Mail project was experimental, yet he was confident that it would prove its worth by—among other things—speeding up mail delivery throughout the rest of the country, and ratcheting up administrative standards in the remaining distribution centers and feeder lines. Later, as the first president of AT&T—the Bell Company's long-distance subsidiary—Vail would champion long-distance telephony for similar reasons—seeing in it a competitive advantage that would enable Bell to establish a level of service that no competitor could match.

Vail's involvement with the Fast Mail brought him into contact with William Vanderbilt, the president of the New York and Hudson Railroad. Frustrated by a sudden reduction in mail pay, Vanderbilt briefly tossed the mailbags off his railroad cars—a gesture that Vail regarded as deeply offensive to the citizens who lived in the immediate vicinity, and entirely out-of-keeping with the public-service ethos that had shaped postal policy for eighty years. The government, Vail declared at one point, should be invested with an "absolute power" to determine which trains should carry the mail, and how much room should be provided to facilitate its sorting [*Annual Report*, 1877, p. 151]. Vail always opposed government ownership of the telephone industry. Yet he favored its regulation—and, indeed, was convinced that intelligent government oversight was not only inevitable, but desirable. Here, too, was a habit of mind that may well have been shaped by his years at railway mail.

One of the central tenets of the "organizational synthesis" that Louis Galambos has done so much to popularize is the assertion that, at some point after 1880, American society assumed a new and different form [Galambos, 1970, 1983]. Prior to 1880, Galambos contended, institutional development had been primarily *extensive* in the sense that it involved the settlement of the vast North American interior. This process involved a multitude of Americans, virtually all of whom were engaged in ventures no larger than the artisanal shop or the family farm. With the exception of the railroad, large-scale organizations—in business or government—were unknown. Only after 1880, with the rise of the modern corporation, would this trajectory change in a fundamental way. Henceforth, institutional development would become *intensive*. Rapidly, and in ways that no one could possibly have foreseen, the country was transformed with the elaboration of administrative hierarchies, first in business and then in government. America's rendevous with destiny had come—and it was a rendevous not with liberalism, but with bureaucracy.

The Galambosian bifurcation of the American past into pre-bureaucratic and post-bureaucratic phases has a certain intuitive appeal. Indeed, in various ways, it builds fruitfully upon—and, indeed, supplies a Parsonian gloss to—the frontier thesis of Frederick Jackson Turner —one of the most venerable and seemingly indispensable of historiographical constructs. Yet, whatever its strengths, it renders invisible large-scale undertakings such as the Railway Mail Service—and, in this way, obscures the origins of concepts such as universal service. The Railway Mail Service is anomalous on two counts. Not only is it an "intensive" enterprise that antedated the great divide of 1880, but it is also a governmental institution rather than a business firm.

Vail's tenure at the Railway Mail Service—and, more broadly, the civic rationale for universal service to which he had been exposed during his years in the government—suggests that, long before 1880, the government—and, in particular, the federal government—had been a major seedbed of administrative innovation. This conclusion may perplex late-twentieth century Americans—accustomed, as we are, to according causal primacy to economic and technological phenomena. Yet it would have startled neither Vail nor his more thoughtful contemporaries. Only after 1880, as James L. Hutson has recently suggested, would Americans began to regard economic phenomena as more fundamental than political processes as agents of change [Hutson, 1993; John, 1997b]. The influence of Vail's tenure in the Railway Mail Service upon his subsequent career in telephony suggests that it may well be time to reconsider the merits of this older view. Only then, perhaps, will it be possible to understand the civic origins of universal service—and, more broadly, the cultural and political context out of which the modern corporation emerged.

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Vail, Theodore N., *Views on Public Questions: A Collection of Papers and Addresses of Theodore Newton Vail*, 1907-1917, n. p., 1917.

as such things can be that an offer would have been made; and what we know of Fessenden's financial backers suggests that, after appropriate bargaining, it would have been accepted. But this must remain hypothetical: the financial panic of 1907 caught the Telephone Company badly overextended. In the ensuing financial reorganization control shifted from Lee, Higginson & Company of Boston to George F. Baker and J. P. Morgan in New York, and with this shift in investment bankers came drastic changes in top management and policy. President Fish was replaced by Theodore N. Vail, and Hayes by John J. Carty, formerly chief engineer of the New York Telephone Company. Accompanying these changes was a sharp cutback in research expenses and personnel, the elimination of the Mechanical Department in Boston, and a centralization of control over technical development in the New York office under Carty. One of the first casualties was the proposed contract with Fessenden.[88]

Analysts of the history of AT&T, even those inclined to be critical of the company, usually portray the advent of the Vail-Carty regime as a progressive development. They do so largely because of Hammond Hayes's deliberate and perhaps prudent downplaying of innovative research before 1907, and because they are impressed by the aggressive program of technical development initiated by Carty after 1910. What gets lost to view is the damage done by the drastic retrenchment of 1907-1909. The closing down of the Boston Mechanical Department, where there had been active interest in radio, meant abandonment not only of negotiations with Fessenden but also of a proposed investigation of Lee de Forest's newly invented triode vacuum tube as a potential telephone amplifier.[89] What slipped through the Telephone Company's fingers, in short, was a unique opportunity to come to grips with electronic technology. The time lost had to be made up in a hurry after 1912. But the damage extended beyond the boundaries of that one corporation. Failure to reach agreement with the Telephone Company was a grievous blow to NESCO; indeed, from that setback the company never fully recovered. And it also eliminated for the next decade the possibility of organizing a consortium

[88] For analyses of the 1907 reorganization and its effects, see N. R. Danielian, *A.T.&T.: The Story of Industrial Conquest* (New York, 1939), pp. 50-77, 98-107; John Brooks, *Telephone: The First Hundred Years* (New York, 1975), pp. 122-32; Walker Report, pp. 96-103 and 207-16; Maclaurin, *Invention*, pp. 65-66; Lloyd Espenschied, "Reminiscences" (Columbia University Oral History Collection), pp. 16-18.

[89] Lloyd Espenschied to C. F. Elwell, 23 September 1952 (Espenschied Papers), quoted in Brittain, *Alexanderson*, chap. 3, pp. 6 and 22. Compare Espenschied, "Reminiscences," p. 17.


1893
The Pacific Telephone & Telegraph Co.
Rocky Mountain Bell Telephone Co.
Colorado Telephone Co.
The Northwestern Telephone Exchange Co.
Nebraska Telephone Co.
Iowa Telephone Co.
The Missouri & Kansas Telephone Co.
Pioneer Telephone & Telegraph Co.
The Southwestern Telegraph & Telephone Co.
Wisconsin Telephone Co.
Michigan State Telephone Co.
Central Union Telephone Co.
The Bell Telephone Co. of Missouri
The Cincinnati and Suburban Bell Telephone Co.
Cumberland Telephone & Telegraph Co.
Southern Bell Telephone & Telegraph Co.
The Central District and Printing Telegraph Co.
The New England Telephone & Telegraph Co.
Providence Telephone Co.
The Southern New England Tel. Co.
New York Telephone Co.
The New York & New Jersey Telephone Co.
The Delaware & Atlantic Telephone & Telegraph Co.

Susan Burgess

From: CAUGHLIN, WILLIAM D (ATTSI) [wc2942@att.com]
Sent: Tuesday, May 01, 2007 2:00 PM
To: Susan Burgess
Cc: KUPCZAK, GEORGE (Legal)
Subject: RE: more questions
Attachments: AT&T Predecessors Chart.pdf; Bell System Map 1893.jpg

Susan:

American Telephone and Telegraph Co. (AT&T) became the new parent of the Bell System on Dec. 30, 1899 (not 1896), when it acquired the assets of American Bell Telephone Co. Previously, AT&T had been the long-distance subsidiary of American Bell since 1885. I am attaching a chart that shows the corporate reorganizations up to Divesture on Jan. 1, 1984. I hope this helps.

As far as the use of "Telegraph" is concerned, that was commonplace throughout the industry up to 1983. Starting in the early-1880s, about one quarter of the local Bell operating companies used "Telephone and Telegraph" in their names (for example, The Pacific Telephone and Telegraph Co. or The Southwestern Telegraph and Telephone Co. -- this latter case was reversed). See the attached 1893 map for more.

Best regards,

Bill

William D. Caughlin
Corporate Archivist
AT&T Archives and History Center

4949 Von Scheele, Suite 1
San Antonio, Texas 78229
210.697.1763
210.697.1755 Fax
william.d.caughlin@att.com

-----Original Message-----
From: KUPCZAK, GEORGE (Legal)
Sent: Tuesday, May 01, 2007 12:33 PM
To: Susan Burgess
Cc: CAUGHLIN, WILLIAM D (ATTSI)
Subject: RE: more questions

Susan,

In response to your questions below:

1. American Telephone and Telegraph used the word "telegraph" in its official name because it provided telegraph services in addition to the new telephone service.

2. Attached is a list of the Board of Directors up to 1992. As you can see, it will take some time to gather together a list for each of your designated years because it gives the name of the director and the years served. I tried gathering the information from Annual Reports but the first time the directors are named on the reports is in 1903 for the year 1902. I included that report in the attached. Please note that the number

of directors varied:

1885	5 original directors
1886	7 directors
1892	9 directors
1900	15 directors
1902	18 directors.

I trust that this will meet your current needs. Good luck with your project.

Kind regards,

George

From: Susan Burgess [mailto:susan@cwx.com]
Sent: Friday, April 20, 2007 9:58 AM
To: KUPCZAK, GEORGE - ATTSI
Subject: more questions

Hi George,

I've had a few more questions come up in my research about AT&T's early years, and I'm wondering if you can help me with them.

(1) In 1896, Bell became "AT&T." Where did the "Telegraph" part of "AT&T" come from? At that point, they hadn't merged with Western Union or any other telegraph company as far as I've discovered.

(2) Could I possibly get a list of the AT&T board of directors from 1896 through 1902? As the company moved from Boston to New York, the character of its board changed, and I'd like to try to find out when the first New Yorker joined the board.

Thanks again for all your help,
Susan Burgess

ANNUAL REPORT

OF

THE DIRECTORS

OF

AMERICAN TELEPHONE & TELEGRAPH COMPANY

TO THE STOCKHOLDERS

FOR THE

YEAR ENDING DECEMBER 31, 1902.

PRESS OF
ALFRED MUDGE & SON INC.
BOSTON.
1903.

AMERICAN TELEPHONE & TELEGRAPH COMPANY

OFFICERS FOR THE YEAR 1902.

FREDERICK P. FISH	*President*
EDWARD J. HALL	*Vice-President and General Manager*
WILLIAM R. DRIVER	*Treasurer*
CHARLES EUSTIS HUBBARD	*Secretary*

DIRECTORS.

CHARLES W. AMORY.
GEORGE F. BAKER.
FRANCIS BLAKE.
CHARLES P. BOWDITCH.
GEORGE L. BRADLEY.
JOHN H. CAHILL.
ALEXANDER COCHRANE.
T. JEFFERSON COOLIDGE, JR.
FREDERICK P. FISH.
J. MALCOLM FORBES.
HENRY S. HOWE.
CHARLES EUSTIS HUBBARD.
CHARLES E. PERKINS.
THOMAS SANDERS.
NATHANIEL THAYER.
THEODORE N. VAIL.
JOHN I. WATERBURY.
MOSES WILLIAMS.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

Incorporated March 3, 1885

INCORPORATORS

HALL, Edward J., Jr.		
	Director	Aug. 14, 1885 – May 9, 1900
	Executive Committee	May 27, 1892 – May 9, 1900
	Secretary	Aug. 14, 1885 – Mar. 17, 1887
	Treasurer	Aug. 14, 1885 – May 24, 1888
	Vice President	Sep. 19, 1887 – Sep. 17, 1914
DOOLITTLE, Thomas B.		
	Director	Aug. 14, 1885 – Nov. 30, 1885
	Vice President	Aug. 14, 1885 – Nov. 30, 1885
DAVIS, Joseph P.		
	Director	Aug. 14, 1885 – Sep. 19, 1887
		May 24, 1888 – Mar. 12, 1895
		Mar. 8, 1898 – May 9, 1900
	Executive Committee	May 27, 1892 – Mar. 12, 1895
DODD, Amzi S.		
	Director	Aug. 14, 1885 – Sep. 2, 1885

BOARD OF DIRECTORS

Original Directors.....5

February	24, 1886	7	November	21, 1962	18
March	31, 1892	9	December	16, 1964	19
May	8, 1900	15	April	19, 1967	18
March	26, 1902	18	April	17, 1968	19
March	30, 1910	25	December	15, 1971	18
March	29, 1915	17	August	16, 1972	19
March	25, 1919	19	October	17, 1979	20
May	20, 1942	19	February	20, 1980	21
January	20, 1943	18	April	16, 1980	18
January	15, 1947	19	February	18, 1981	19
March	16, 1949	18	April	15, 1981	17
November	16, 1949	19	April	20, 1983	16
January	18, 1950	18	January	1, 1984	20
February	28, 1951	17	April	18, 1984	19
November	19, 1952	18	November	21, 1984	20
December	17, 1952	19	April	17, 1985	19
April	20, 1955	18	October	15, 1986	20
October	19, 1955	19	March	18, 1987	19
March	18, 1959	18	April	15, 1987	18
June	17, 1959	19	July	15, 1987	19
January	20, 1960	18	November	18, 1987	20
February	24, 1960	17	April	19, 1989	19
November	16, 1960	18	December	19, 1990	20
January	18, 1961	17	April	17, 1991	16
September	20, 1961	18	September	21, 1991	17
February	14, 1962	17	April	15, 1992	16

ADAMS, Charles F. ..... Mar. 26, 1912 – Mar. 26, 1929
Feb. 15, 1933 – Feb. 20, 1952

ALDRICH, Winthrop W. ..... Aug. 20, 1930 – Jan. 19, 1953

ALEXANDER, James S. ..... May 18, 1920 – Jul. 16, 1932

ALLEN, Robert E. ..... Jan. 1, 1984 –

AMORY, Charles W. ..... Sep. 23, 1897 – May 20, 1913

BAILEY, Thomas B. ..... May 9, 1900 – Apr. 17, 1901
Mar. 29, 1904 – Sep. 21, 1904
Mar. 27, 1906 – Dec. 7, 1909
Apr. 12, 1910 – Mar. 26, 1912
Mar. 25, 1913 – Mar. 30, 1915

BAKER, George F.	Mar. 25, 1902 – May 2, 1931
BAKER, George F., Jr.	Apr. 17, 1923 – May 30, 1937
BAKER, Howard H., Jr.	Jan. 16, 1985 – Mar. 2, 1987
BANGS, Charles R.	Mar. 31, 1914 – Mar. 30, 1915
BATTEN, William M.	Dec. 23, 1964 – Apr. 16, 1980
BELL, Edward W.	Mar. 14, 1893 – Dec. 28, 1893
	May 9, 1900 – Jul. 1, 1901
BELL, James F.	Sep. 19, 1934 – Sep. 17, 1958
BETHELL, Union N.	Dec. 17, 1912 – Aug. 19, 1919
BLAKE, Francis	May 9, 1900 – Jan. 19, 1913
BOLENIUS, William C.	Jun. 17, 1959 – Dec. 31, 1963
BOWDITCH, Charles P.	Nov. 30, 1885 – Dec. 24, 1896
	Dec. 12, 1900 – Mar. 20, 1907
BOWMAN, Isaiah	Jan. 21, 1942 – Jan. 6, 1950
BRACE, Lloyd D.	Feb. 20, 1952 – Apr. 16, 1975
BRADLEY, George L.	May 9, 1900 – Mar. 26, 1906
BRIGHAM, Harry H.	Mar. 31, 1908 – Mar. 30, 1909
	Apr. 12, 1910 – Dec. 17, 1912
	Mar. 25, 1913 – Mar. 30, 1915
	Mar. 30, 1920 – Feb. 15, 1921
BROWN, Charles L.	Apr. 1, 1976 – Aug. 31, 1986
BROWN, Lewis H.	Feb. 21, 1940 – Feb. 26, 1951
BUSH, Vannevar	Jan. 15, 1947 – Feb. 1, 1962
CAHILL, John H.	May 9, 1900 – Mar. 18, 1903
CARTER, Edward W.	Apr. 17, 1968 – Apr. 21, 1982
CASHEL, William S., Jr.	Apr. 1, 1977 – Jun. 30, 1983
CHOATE, Charles F., Jr.	Oct. 21, 1924 – Nov. 30, 1927
CLAPP, Channing	Mar. 9, 1886 – May 24, 1888
CLEARY, Catherine B.	Apr. 19, 1972 – Apr. 15, 1987
COCHRANE, Alexander	Jan. 6, 1893 – Apr. 10, 1919
COOLIDGE, T. Jefferson, Jr.	May 9, 1900 – Apr. 14, 1912
COOPER, Charles P.	Jul. 20, 1927 – May 18, 1949
CRAIG, Cleo F.	Aug. 17, 1949 – Dec. 1, 1960

CRANE, W. Murray	Mar. 18, 1903	Oct. 2, 1920
CRAWFORD, David A.	Dec. 15, 1937	Jul. 22, 1957
DAVIS, Archie K.	Apr. 16, 1969	Apr. 15, 1981
DAVIS, John W.	Feb. 20, 1929	Mar. 24, 1955
DAVIS, Joseph P.	Aug. 14, 1885	Sep. 19, 1887
	May 24, 1888	Mar. 12, 1895
	Mar. 8, 1898	May 9, 1900
DAVISON, Henry P.	Dec. 7, 1909	Jan. 20, 1914
deBUTTS, John D.	Feb. 1, 1967	Jan. 31, 1979
	Apr. 18, 1979	Apr. 15, 1981
DEVONSHIRE, Robert W.	May 8, 1890	May 7, 1892
DILLON, C. Douglas	Apr. 19, 1967	Sep. 30, 1971
DINGMAN, James E.	Jan. 1, 1965	Jan. 31, 1967
DODD, Amzi S.	Aug. 14, 1885	Sep. 2, 1885
DOOLITTLE, Thomas B.	Aug. 14, 1885	Nov. 30, 1885
DUFFIELD, Edward D.	Oct. 18, 1933	Sep. 17, 1938
DUMAS, Hal S.	Jul. 18, 1951	Jun. 30, 1956
EGLESTON, Melville	Mar. 12, 1895	May 9, 1900
EICKHOFF, M. Kathryn	Nov. 18, 1987	–
ELISHA, Walter Y.	Jul. 15, 1987	–
ELLINGHAUS, William M.	Apr. 1, 1976	Mar. 31, 1984
ELLIS, Rudolph	Mar. 30, 1909	Mar. 16, 1915
EVANS, James H.	Apr. 19, 1978	Apr. 17, 1991
FISH, Frederick P.	Apr. 17, 1901	Apr. 30, 1907
FORBES, J. Malcolm	May 9, 1900	Feb. 19, 1904
FORBES, W. Cameron	Dec. 17, 1919	Aug. 20, 1930
	Feb. 17, 1932	May 16, 1956
FORBES, William H.	Sep. 2, 1885	Jan. 6, 1893
	Dec. 28, 1893	Sep. 23, 1897
GARDNER, G. Peabody, Jr.	Feb. 15, 1939	Jan. 20, 1960
GARDNER, George P.	Mar. 26, 1912	Feb. 15, 1939
GASTON, William A.	Mar. 25, 1919	Jul. 17, 1927
GERSTNER, Louis V., Jr.	Dec. 19, 1990	–

GIFFORD, Walter S.	Feb. 14, 1922 – Dec. 31, 1949
GILMER, Ben S.	Feb. 1, 1967 – Apr. 19, 1972
GREEN, George L.	Mar. 31, 1908 – Dec. 7, 1909
	Apr. 12, 1910 – Sep. 20, 1910
	Mar. 30, 1920 – Mar. 29, 1921
GREEN, James W.	Mar. 29, 1921 – Jan. 15, 1924
GREENE, Edwin Farnham	Feb. 15, 1921 – Mar. 26, 1929
HAAS, Peter E.	Apr. 20, 1977 – Apr. 19, 1989
HALL, Edward J.	May 7, 1892 – Mar. 14, 1893
HALL, Edward J., Jr.	Aug. 14, 1885 – May 9, 1900
HANIFY, Edward B.	Jul. 19, 1961 – Apr. 20, 1983
HARRIS, Norman W.	Sep. 20, 1910 – Mar. 31, 1914
HAWLEY, Philip M.	Apr. 21, 1982 –
HEALD, Henry T.	Dec. 18, 1957 – Apr. 15, 1970
HENRY, Barklie	Jan. 18, 1939 – Jan. 21, 1942
HERD, J. Victor	Nov. 19, 1958 – Apr. 17, 1974
HEWITT, William A.	Nov. 21, 1962 – Sep. 15, 1982
HIGGINSON, Henry L.	Apr. 12, 1910 – Nov. 14, 1919
HOLCOMB, Alfred E.	Mar. 31, 1914 – Mar. 30, 1915
HOLDEN, Hale	Dec. 17, 1930 – Sep. 23, 1940
HOLLAND, Jerome H.	Sep. 1, 1972 – Jan. 13, 1985
HOUSTON, David F.	Jan. 15, 1924 – Sep. 2, 1940
HOWE, Henry S.	Dec. 24, 1896 – Mar. 2, 1931
HUBBARD, Charles Eustis	May 9, 1900 – Aug. 24, 1928
HUDSON, John E.	Mar. 9, 1886 – Oct. 1, 1900
JAMESON, John	May 7, 1892 – Nov. 24, 1897
JEFFERSON, Edward G.	Nov. 17, 1982 – Apr. 15, 1992
JOHNSON, Belton K.	Apr. 17, 1974 –
KAPPEL, Frederick R.	Sep. 19, 1956 – Apr. 15, 1970
KILLIAN, James R., Jr.	Feb. 13, 1963 – Apr. 20, 1977
KINGSBURY, Nathan C.	Jun. 18, 1919 – Jan. 24, 1920
KREPS, Juanita M.	Feb. 20, 1980 – Apr. 17, 1991

LANGRIDGE, Clarence L.	Mar. 29, 1921 – Feb. 14, 1922	
	Mar. 27, 1923 – Apr. 17, 1923	
LEDYARD, Lewis Cass	Jan. 17, 1911 – Apr. 23, 1920	
LEWIS, Drew	Apr. 19, 1989 –	
LILLEY, Robert D.	Apr. 15, 1970 – Mar. 31, 1976	
LINDHOLM, William L.	Apr. 15, 1970 – Mar. 31, 1977	
LOOMIS, Edward E.	Jan. 18, 1928 – Jul. 11, 1937	
LYMAN, Arthur	May 18, 1920 – Apr. 9, 1933	
MacNAUGHTON, Donald S. .	Apr. 17, 1974 – Aug. 1, 1981	
MARSHALL, Charles	Jan. 1, 1984 – Apr. 21, 1989	
McCAFFREY, John L.	Dec. 17, 1952 – Sep. 16, 1964	
McCLENCH, William Wallace	Mar. 30, 1920 – Mar. 30, 1926	
McCLOY, John J.	Jan. 21, 1953 – Apr. 19, 1967	
McGILL, William J.	Apr. 19, 1972 – Apr. 16, 1980	
McHENRY, Donald F.	Oct. 15, 1986 –	
McNEELY, Eugene J.	Oct. 19, 1955 – Jan. 31, 1967	
MEANY, Edward P.	Mar. 12, 1895 – May 9, 1900	
MILLER, J. Irwin	Feb. 11, 1959 – Apr. 16, 1980	
MILNE, George D.	Mar. 26, 1918 – Mar. 25, 1919	
MITCHELL, John J.	Dec. 7, 1909 – Mar. 30, 1915	
MORTIMER, Charles G.	Nov. 16, 1960 – Dec. 8, 1961	
MURPHY, William B.	Sep. 20, 1961 – Apr. 19, 1978	
NEWMAN, J. Wilson	Dec. 16, 1959 – Jul. 5, 1961	
NORTON, Charles D.	Oct. 18, 1921 – Mar. 6, 1923	
OLNEY, Richard	Mar. 26, 1912 – Apr. 8, 1917	
OLSON, James E.	Feb. 1, 1979 – Apr. 18, 1988	
PAGE, Arthur W.	Mar. 31, 1931 – Feb. 18, 1948	
	Nov. 16, 1949 – Dec. 16, 1959	
PARKER, David B.	May 7, 1892 – Mar. 12, 1895	
PARKINSON, Thomas I.	Nov. 20, 1940 – Nov. 19, 1958	
PATTON, Thomas F.	Feb. 14, 1962 – Apr. 1, 1976	
PEARSON, William C.	Mar. 30, 1920 – Oct. 18, 1921	

PERKINS, Charles E.	May 9, 1900	May 14, 1907
PERKINS, Donald S.	Oct. 17, 1979	
PERKINS, Thomas N.	Mar. 26, 1929	Oct. 7, 1937
PHALEN, Clifton W.	May 16, 1956	Mar. 18, 1959
PIERCE, George W.	Apr. 12, 1910	Jan. 17, 1911
PUTNAM, William L.	Sep. 21, 1904	Jul. 26, 1924
RATHBONE, Monroe J.	Oct. 16, 1957	Apr. 19, 1972
ROBERTS, Owen J.	Mar. 26, 1929	May 21, 1930
ROMNES, H.I.	Jan. 1, 1964	Nov. 19, 1978
ROOT, Elihu, Jr.	Dec. 15, 1937	Nov. 19, 1958
SANDERS, Thomas	May 9, 1900	Aug. 7, 1911
SARGENT, William D.	May 7, 1892	May 9, 1900
SCHACHT, Henry B.	Feb. 18, 1981	
SCHOONMAKER, Sylvanus L.	Mar. 26, 1907	Mar. 31, 1914
SMITH, George F.	Sep. 17, 1958	Apr. 16, 1969
SMITH, Jeremiah, Jr.	Aug. 17, 1928	Feb. 17, 1932
SMITH, Tom K.	Oct. 16, 1940	Feb. 11, 1959
SOVERN, Michael I.	Jan. 1, 1984	
SPEER, Edgar B.	Apr. 16, 1975	Apr. 18, 1979
SPENCER, Kenneth A.	Nov. 19, 1958	Feb. 19, 1960
STOCKTON, Howard	Sep. 19, 1887	May 8, 1890
STOCKTON, Philip	Jan. 20, 1914	Feb. 11, 1940
TANENBAUM, Morris	Jan. 1, 1984	Apr. 17, 1991
TAYLOR, Jay	Dec. 16, 1959	Apr. 17, 1974
TAYLOR, Myron C.	Mar. 26, 1929	Dec. 18, 1957
THAYER, Eugene V.R.	Apr. 12, 1910	Jul. 18, 1934
THAYER, Harry B.	Jan. 20, 1914	Mar. 30, 1915
	Jun. 18, 1919	Aug. 17, 1928
THAYER, Nathaniel	Jul. 1, 1901	Apr. 12, 1910
THOMAS, Franklin A.	Apr. 20, 1988	
TOBIAS, Randall L.	Sep. 1, 1986	

VAIL, Theodore N. ..... Aug. 14, 1885 – May 7, 1892
Mar. 25, 1902 – Apr. 16, 1920
WARNER, Frank E. ..... Apr. 12, 1910 – Mar. 26, 1912
WARNER, Rawleigh, Jr. ..... Jan. 16, 1974 – Apr. 17, 1991
WATERBURY, John I. ..... Mar. 25, 1902 – Mar. 4, 1929
WELLDON, Samuel A. ..... Jun. 10, 1931 – Dec. 16, 1959
WHITE, William ..... Nov. 19, 1952 – Apr. 6, 1967
WIGGINS, A. Lee M. ..... Jan. 18, 1950 – Feb. 1, 1963
WILLARD, Daniel ..... Mar. 30, 1926 – Jul. 6, 1942
WILLIAMS, Joseph D. ..... Jan. 1, 1984 –
WILLIAMS, Moses ..... May 9, 1900 – Aug. 21, 1919
WILLIAMS, S. Clay ..... Jul. 21, 1937 – Feb. 25, 1949
WILLIAMSON, Gilbert P. ..... Sep. 21, 1991 –
WILSON, Leroy A. ..... Feb. 18, 1948 – Jun. 28, 1951
WINSOR, Robert ..... Apr. 12, 1910 – Mar. 16, 1915
WYMAN, Thomas H. ..... Dec. 1, 1981 –

EXECUTIVE COMMITTEE

ADAMS, Charles F. ..... Sep. 7, 1915 – Mar. 26, 1929
Jan. 1, 1939 – Feb. 20, 1952
ALDRICH, Winthrop W. ..... Sep. 18, 1940 – Jan. 19, 1953
ALEXANDER, James S. ..... Jul. 21, 1920 – Jul. 16, 1932
ALLEN, Robert E. ..... Sep. 1, 1986 –
AMORY, Charles W. ..... Sep. 23, 1897 – Apr. 9, 1907
BAKER, George F. ..... Mar. 28, 1911 – May 2, 1931
BAKER, George F., Jr. ..... Mar. 31, 1931 – May 30, 1937
BATTEN, William M. ..... Apr. 19, 1967 – Apr. 16, 1980
BOWDITCH, Charles P. ..... May 27, 1892 – Dec. 24, 1896
BROWN, Charles L. ..... Apr. 20, 1977 – Aug. 31, 1986
CLEARY, Catherine B. ..... Apr. 20, 1983 – Apr. 15, 1987
COCHRANE, Alexander ..... Jan. 6, 1893 – Sep. 28, 1893
Mar. 12, 1895 – Apr. 9, 1907
Jun. 20, 1911 – Sep. 7, 1915