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THE REGULATORY HISTORY OF A NEW TECHNOLOGY: ELECTROMAGNETIC TELEGRAPHY*

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Attitudes toward economic regulation in the United States have, since colonial times, been influenced by an almost schizophrenic oscillation between dirigiste and laissez-faire ideology. The laissez-faire tradition maintains that within a legal system providing elementary guarantees against force and fraud, business enterprise should be allowed the maximum possible freedom. The dirigiste tradition, on the other hand, recommends government intervention in a variety of situations, including those where the social return may exceed the private rate of return to research and development spending, in cases of natural monopoly, or where a firm has erected barriers to entry that give it effective control over bottlenecks and the ability to extract rents from them. Direct government economic influence on the telegraph industry over its roughly fourteen decade history reflects this schizophrenia. Laissez-faire ideology helped forestall intervention when it might have been beneficial. Dirigiste ideology helped bring about regulatory intervention when allowing a sick industry a natural death might have been better policy.

A NEW COMMUNICATION TECHNOLOGY

Many observers think of the era of modern telecommunications as beginning with the invention of the telephone by Alexander Graham Bell in 1876. But it was the magnetic telegraph that brought us into the modern era, with its ability, in principle, to send data as fast as electrons could move along wires.¹ Throughout the early nineteenth century, Americans and others were fascinated with the possibility of sending information over long distances

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1. See Alexander J. Field, *Communications, in* HISTORICAL STATISTICS OF THE UNITED STATES, MILLENNIUM EDITION (forthcoming 2003); *The Magnetic Telegraph, Price and Quantity Data, and the New Management of Capital*, 52 J. ECON. HIST., June 1992, at 401-13; *The Telegraphic Transmission of Financial Asset Prices and Orders to Trade: Implications for Economic Growth*, 18 RES. ECON. HIST. 145 (1998).

faster than horses could ride or ships could sail, or, as the nineteenth century progressed, locomotives could travel. This hunger for fast communication is reflected in the fact that as of 1820, forty-five U.S. newspapers had incorporated the word “telegraph” in their mastheads.² So when the first line began operation in the United States in 1844, there was no novelty to the idea of telegraphy itself.

But the technology that gave birth to the industry at mid-century was radically different from what most citizens had anticipated. The telegraphs people had in mind prior to Morse’s demonstration, did not, in general, make use of the principles of either electricity or magnetism. Throughout the first four decades of the nineteenth century, state of the art technology was optical, its highest achievement reflected in the French system using semaphores, telescopes, and code books pioneered by Claude Chappe in the last decade of the eighteenth century.³ Optical telegraphy was a well-developed and proven technology, albeit one with limited bandwidth, inability to transmit at night, and vulnerability to fog, snow, rain, or temperature inversion. Nevertheless, at its peak, Chappe telegraphs, government owned and operated, extended over 5,000 kilometers of French territory.

Americans were familiar with semaphores, since they were used in commercial centers such as New York or San Francisco to announce the impending arrival of ships – thus San Francisco’s Telegraph Hill. Beginning in 1807 and continuing through the next three decades, there were repeated attempts to get Congress to vote funds to build and operate a U.S. system using French technology. The last effort took place in 1837 and was endorsed by President Jackson’s Postmaster General, Amos Kendall. The proposal anticipated a line of semaphores along the Atlantic and Gulf coasts from New York to New Orleans.⁴ The political viability of the system was based on demand by New Orleans merchants to get the latest money market rates from New York and by New York merchants to obtain the latest cotton prices from the entrepôt at the mouth of the Mississippi.

Samuel Morse lobbied energetically against this proposal, angling instead for federal funds to support his own radically different design. Today, optical telegraphs are considered of interest mostly to antiquarians, boy scouts and midshipmen at the Naval Academy, and we take for granted the use for long

2. See RICHARD JOHN, *SPREADING THE NEWS: THE AMERICAN POSTAL SYSTEM FROM FRANKLIN TO MORSE* 87 (1995).

3. See Alexander J. Field, *French Optical Telegraphy, 1793-1855: Hardware, Software, and Administration*, 35 *TECH. AND CULTURE*, April 1994, at 315.

4. See *TELEGRAPHS FOR THE UNITED STATES: LETTER FROM THE SECRETARY OF THE TREASURY TRANSMITTING A REPORT UPON THE SUBJECT OF A SYSTEM OF TELEGRAPHS FOR THE UNITED STATES*, H.R. DOC. NO. 25-15 (1837).

distance communication purposes of nonvisual portions of the electromagnetic spectrum. But at the time, semaphores were a well-established technology, whereas electrical telegraphy had about it the same aura as did practitioners of mesmerism and proponents of perpetual motion machines: these were technologies prudent legislators and investors steered clear of.

But Morse persisted, and he, not the proponents of the semaphores, got a government grant of \$30,000 to build a demonstration project. When he constructed a line from Washington to Baltimore in 1844 and transmitted to Washington the results of the Whig nominating convention in Baltimore in advance of the arrival by train of the information, it swayed some critics. But apparently not enough. Morse had assumed from the start that a telegraph system would be publicly owned and operated, and that he would make his money by selling his patent rights to the government. This he promptly offered to do, and the offer was rejected. One reason: between April and October 1845, revenue on the Washington to Baltimore line was a little over \$400, whereas operating costs were over \$4,000.⁵ Another reason: defaults on state owned and operated railroad and canal projects in the 1830s left a bad taste in the mouths of some federal legislators for government-owned internal improvements, particularly those that risked being a drag on the Treasury. In any event, federal funding for internal improvements had been a contentious political issue at least since Gallatin's 1808 plan.

CHAOS, CONSOLIDATION, AND CONGRESSIONAL CONCERN

The next two decades were a period of rapid, and at times chaotic, growth of the telegraph industry under private ownership.⁶ In this period, systems were set up based not only on the Morse patents, but also on those of Bain, House, and Hughes. Some conservative investors stayed away because of fears the government might change its mind and step in to build or acquire its own system. Many of the fledgling firms faced difficulties raising cash, and thus acquired assets or other companies using stock, laying the foundation for later complaints about "watering." Eventually, in a process culminating in 1866, shakeout occurred with consolidation under one firm.

Congress did not adopt a completely hands-off attitude during this period. For strategic reasons, the government desired a telegraphic link to the West Coast. Western Union indirectly received \$400,000 of public funds – \$40,000 per year for ten years – in exchange for government access to the line,

5. See REPORT OF THE POSTMASTER GENERAL, DECEMBER 1, 1845, S. DOC. 29-1, at 860 (1845).

6. See ROBERT LUTHER THOMPSON, *WIRING A CONTINENT: THE HISTORY OF THE TELEGRAPH INDUSTRY IN THE UNITED STATES, 1832-1866* (1947).

as well as subventions from the California legislature to encourage construction of a transcontinental telegraph. Construction was done through companies nominally distinct but actually under the control of Western Union.⁷ The completion of the line in 1861, eight years before the golden spike was driven at Promontory Point, spelled the quick demise of the short-lived Pony Express.

Congress watched the consolidation of the telegraph industry with growing unease. Whether or not Western Union was a natural monopoly, there is little question that it exercised monopoly power over national telegraphic traffic for at least two decades. This period extends roughly from 1866 to 1885, when the Postal Telegraph Company, subsequently part of ITT,⁸ entered as a competitor, and the telephone arguably began to serve as a competing technology within some heavily-trafficked intercity routes, particularly the Boston – New York – Philadelphia corridor.

In 1866, the Senate queried the Postmaster General on the advisability of establishing a government-run telegraph system. When a report discouraging direct ownership returned, Congress passed the Post Roads Act of 1866. Some of its provisions were explicitly intended to encourage competition in the telegraph industry. In particular, the Act specified that any telegraph company accepting its terms would be granted rights of way across public domain, post roads, and navigable streams, and the privilege of taking land, timber, and stone from the public domain to maintain stations and facilities. Western Union, along with other companies, promptly accepted the conditions of the Act, thus providing new entrants no competitive advantage over the industry leader. The Act did nothing to restrict Western Union's growing monopoly power.

Between 1870 and 1896, at least twelve proposals emerged from congressional committees for government participation in the sector. The U.S. postal service, run by the federal government, as well as European systems, in which both post and telegraph systems were government-owned, provided examples that fueled political pressure for nationalization, for government entry as a competitor, or for government subsidy of a competitor.

Complaints levied against Western Union echoed many of those raised against railroads at the time. High rates, of course, figured heavily. Average message rates in the United States fell from \$1.09 in 1867 to \$0.30 in 1898,

7. See H.H. Goldin, *Governmental Policy and the Domestic Telegraph Industry*, 7 J. ECON. HIST., May 1947, at 53, 55.

8. Postal Telegraph got its name because of repeated government proposals to strike a deal offering space in post offices for a private telegraph system competitive with Western Union. The deal was never consummated but Postal Telegraph liked the name, even though the firm was as private an entity as Western Union.

although the economy-wide deflation over this period would have accounted for about half of this decline. Whatever one's views of the legitimacy of Western Union's rate structure, however, there is consensus that, as a result of it, much more so than was true in Europe, the telegraph in the United States remained predominantly an instrument of commercial rather than individual household use.

Other complaints included poor service: errors of transmission, delayed messages, and violation of secrecy; the ability of stock speculators to obtain preferential access to the telegraph; free telegraph privileges granted to public officials to influence their votes; discrimination among regions and communities with respect to rates; long-term contracts with press agencies, such as the Associated Press, and with hotels and railroads that created barriers to entry for potential new entrants; and unfairness to workers, through long hours, low wages, and poor conditions, and to stockholders through stock watering. Perhaps the most damning complaint was that of technological unprogressiveness, particularly in comparison with some of the European systems.

According to the company's own reports, of every dollar of revenue taken in between 1865 and 1885, \$0.30 - 0.40 was net profit. A Senate committee estimated in 1884 that the reproduction cost of the company's capital was approximately \$30 million. Between 1866 and 1899, the company distributed about \$40 million in cash dividends and \$57 million in stock dividends.⁹ For a period of time in the nineteenth century, Western Union was a veritable gold mine, a blue chip stock; its stranglehold on fast intercity competition generated a large, steady and predictable revenue flow with which executives were generally reluctant to tamper by introducing too many changes. During these years, it would have been a prime target for federal antitrust policy, had one existed. By the end of the century, however, the telegraph industry, which by and large consisted of Western Union, had already begun its long downhill slide.

In a private sector replay of what was arguably a governmental error in 1845, Western Union turned down an offer to buy the Bell telephone patent rights in 1877. "What use," Western Union's CEO said famously, "could this company make of an electrical toy?"¹⁰ The company soon after tried to undo its mistake, changing course rapidly when it discovered that some of its employees at one of its subsidiaries, the Gold and Stock Exchange company, had ripped out printing telegraphs and replaced them with telephones. Developing its hardware on the basis of patents other than those held by Bell,

9. See Goldin, *supra* note 7, at 58.

10. HERBERT CASSON, *THE HISTORY OF THE TELEPHONE* 59 (1910).

Western Union built telephone systems in fifty-five cities. Its patent war with Bell, however, ended badly, with Bell triumphant. As part of the peace settlement, Western Union agreed to withdraw from the telephone business, with Bell acquiring its existing systems.

There is little doubt that as telephone networks were extended, there were real efficiencies to be reaped by having one company offer both telephone and telegraph service. In most instances, Western Union did not place terminals in users' homes or offices; messengers carried the telegram the final mile, a distance, of course, that telephone wires increasingly traversed. In 1909, in what must have been a historically humiliating turn of events, AT&T acquired Western Union.

Western Union's technology at the time was little changed from the 1860s. AT&T moved rapidly to modernize hardware by initiating a program of installing automatic multiplexing printers that would take until 1915 to complete. It introduced an innovative rate schedule, offering preferential rates for non-urgent communications that could, for example, be sent overnight. And it brought Western Union compensation policies more directly in alignment with those at AT&T. But driven by fears of economic concentration, the Wilson administration threatened antitrust action. Bell was forced to divest itself of Western Union in 1913, giving up the synergies possible through joint operation. In retrospect, this can be seen as another policy error, perhaps well intentioned, but an error nonetheless. Two decades later, the newly formed Federal Communications Commission would find itself with regulatory responsibility for a relatively undiversified firm in a dying industry.¹¹

Pressures to nationalize the telegraph system in the United States continued. On January 12, 1914, the Postmaster General transmitted to the Senate a report recommending nationalization, basing its recommendation on a comparison of rates and services in the United States as compared with those characterizing telegraph systems elsewhere in the world. The proposal advocated nationalization of the telephone industry as well, but the international comparisons contained in the report are much more unflattering to U.S. telegraphy than to U.S. telephony.¹²

The telegraph system was in fact nationalized shortly thereafter, although only for a two-year period coinciding with United States involvement in World War I. The system, consisting mostly of the assets of Western Union and its smaller competitor, Postal Telegraph, was returned to private ownership in

11. See Carrie Glasser, *Some Problems in the Development of the Communications Industry*, 35 AM. ECON. REV., Sept. 1945, at 585.

12. See A.N. Holcombe, *Public Ownership of Telegraphs and Telephones*, 28 Q.J. ECON., May 1914, at 581.

1919 and muddled through the prosperity of the 1920s, benefitting in part from initiatives begun during the short period of AT&T ownership. But when the Depression hit, the parlous state of the industry became all too evident.

THE DEPRESSION, COMPETITIVE THREATS, AND THE ONSET OF EFFECTIVE REGULATION

In 1910, the Interstate Commerce Commission had been given formal authority to regulate the communications sector. But the ICC was preoccupied with issues in the transportation sector, and in fact there was no effective regulation of the telegraph industry until the Communications Act of 1934, which created the Federal Communication Commission. By this point, the telegraph industry, unlike telephone and radio, was an economic invalid whose rationale, aside from providing employment to its workers, was increasingly unclear. The industry had, for a time, survived competition from the telephone because of its competitive advantage for long distance intercity communication, and because of its provision of a written record of a transmission. But it now faced increased intermodal competition on several fronts.

The telephone became an increasingly formidable competitor for long distance traffic in the twentieth century. In the nineteenth century, before the invention of the loading coil, better cabling, and de Forest's triode, direct phone conversation could not take place over a distance of more than about thirty miles. "Long distance" communication by telephone involved, literally, human repeaters. New technologies in the twentieth century altered these limitations. Direct New York to Chicago service began in 1904, New York to San Francisco in 1915, and the use of multiplexing technologies and other advances dramatically increased the bandwidth of existing cabling, contributing to reductions in message costs. By the 1930s, intercity telephony was a very serious threat to telegraphy in situations where quick communication was desired.

Telegraphy's other competitive strength was provision of a written record of a transaction. In 1931, AT&T, which had been offering private line telegraph service for several decades, introduced teletypewriter exchange service (TWX). Business customers could now compose messages on a typewriter keyboard. Similar equipment at the receiving end printed out the message, providing close to real-time two way written communication. TWX was a "torn tape" system: switching was achieved by reperforating paper tapes and sending the information down different wires. The system is a direct ancestor of today's ubiquitous electronic mail capability.

A second threat came from the air. Government subsidies to the fledgling air transport industry in the form of contracts for airmail carriage cut

deeply into Western Union's overnight letter traffic, which, based on the pricing initiative begun during the brief period of AT&T ownership, had become a valuable source of revenue. Western Union also faced limited competition from radio telegraphy. Thus on the ground, via airplanes, and through the ether, the telegraph industry was under attack. The rationale for the industry's separate wired network was increasingly questionable, given technology that could multiplex telegraph data along with telephone calls on the same wire or, eventually, via microwave.

Western Union's one competitor, Postal Telegraph, went into receivership between 1935 and 1940, and survived the Depression only with the infusion of \$13.5 million of taxpayer funds from the Reconstruction Finance Corporation. The FCC would subsequently encourage and bless the absorption by Western Union of Postal Telegraph in 1943.

In retrospect, and it is always easier to make these arguments in retrospect, a strong public policy rationale can be provided for government ownership, rate and service regulation, or antitrust or subsidy action to encourage competition, roughly from the mid 1860s through the early 1890s. But federal antitrust policy dates from the end of this period, and effective regulation did not begin until 1934. Its history under the FCC included mostly approvals of rate *increases*, support for consolidation and service *cutbacks*, and concern for protecting the investments of stockholders and the jobs of employees in a declining industry. These are not the actions that would have been cheered by an aroused public in the 1870s or 1880s.

Peak telegraph traffic in the United States was recorded in 1945, but this gives an illusory picture of the industry's health. For historical reasons, in part because of their high cost, telegrams continued for a number of years to pack an emotional impact lacking in a letter or a telephone call. Thus, the families of the over 400,000 U.S. soldiers killed in combat would be notified by telegram, and households used telegrams to send messages to which they wished urgent attention paid. But business use of the system, which had provided over ninety percent of the revenue in the nineteenth century, was shrinking.

CONCLUSION

In the 1943 agreement authorizing the merger of Postal Telegraph with Western Union, the FCC had encouraged and anticipated the sale by AT&T of its TWX system to Western Union. The intent was to provide the merged monopoly with at least one service which appeared at the time to have some growth potential, but AT&T stalled. In 1962, Western Union entered the teletypewriter transmission business on its own by introducing to the United States TELEX, a competitor to TWX that had originally been developed in

Europe. In 1970, AT&T finally agreed to sell TWX to Western Union, although the company never could get its two teletypewriter systems to talk with each other.

AT&T's timing could not have been better. The Internet was born in 1969, with the first e-mail messages sent in 1971. With the growth of these systems, and the ubiquity of facsimile transmission over telephone lines, the demand for teletypewriter services withered. With the benefit of hindsight, we can now see clearly that the telegraph industry had been in decline at least since 1900. Whereas its Siamese twin, the railroad, was eventually able to survive intermodal competition in the twentieth century by giving up passenger transport, embracing containerization, and concentrating on bulk freight, Western Union was never able to carve out a new competitive niche. In 1949, the company ended its long-standing agreements with the railroads, giving up all claims to ownership of poles, wire or equipment. The development was more symbolic than substantive, but a visible sign, for those who wished to read it, of an industry entering a long period of senescence and decay, one prolonged by FCC ministrations.

Whenever an organization has persisted for any period of time, there is a natural reluctance to see it vanish. Organizational culture has developed, public awareness and good will may be important assets, and employees and managers have made investments specific to the firm. These must be written off if the organization dissolves, and the same may be true for some of the value of physical capital employed. But when the original economic rationale for a firm no longer exists, and when it has been unable to redeploy its organizational capabilities to other missions, it is sometimes worse from the standpoint of both public and private policy to allow it to persist. Private corporations need sunset provisions as much as governmental organizations and task forces do.

Telegraph service in the United States limped along for four more decades. In 1988, the Western Union Telegraph company finally threw in the towel, selling off its international private line business to a Swiss Company, its Westar satellite to GM Hughes Electronics, and its business services group, – teletypewriters – back to AT&T. The Western Union corporation today focuses almost exclusively on money transfers, its original businesses eclipsed by rapidly changing technologies, its regulatory history a cautionary tale.