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Interchanging Parts: Productive Railroad Cooperation in the Nineteenth and Early Twentieth Centuries

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Abstract

Although many economic and business historians have examined how American railroads colluded to raise rates or limit service, they have paid less attention to the many ways railroads cooperated to exchange cars and freight between companies and build needed interconnections. This article examines such productive cooperation in three spheres: first, the setting of policies on "interchange", or the exchange of cars and freight between railroad lines; second, the creation of "car service associations" to organize and pay for cars shared between roads; and third, the building of cooperative infrastructure such as belt railways or union stations. Finally, the article will examine how regulatory battles over interchange and interconnection were an underappreciated part of the struggle to regulate railroads.

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Introduction

When historians and economists discuss examples of railroad cooperation, the universal touchstones are the pools created during the late nineteenth century. These pools organized competing railroad lines to keep rates high and prevent discounts to shippers. They sparked widespread political opposition and were an impetus for both the Interstate Commerce Act of 1887 and the Sherman Antitrust Act of 1890, which together effectively banned them. From the perspective of economists, these pools were also an archetypal example of horizontal agreements between competing companies, also known simply as cartels, which tend to be anti-competitive and anti-consumer.

The costs to consumers and to overall output of such pooling agreements are not here subject to dispute. But the focus on pools and cartels ignores the many ways that railroads cooperated productively in the nineteenth and early twentieth centuries to further access to a national transportation network, ensure efficient and universal standards, and lower costs. Like many industries that share natural monopoly or network characteristics, but in which one company does not have a monopoly of a market, railroads needed to integrate their networks. Thus railroads created new contracts, systems, and associations for interconnection, which demonstrates the ability of companies to cooperate to increase, rather than reduce, output.

While most economic theories emphasize competitive market equilibriums, the Austrian tradition has shown how economic agents must continually evolve new market processes, including by building new institutions to lower transaction costs (Peter Boettke 1989; Israel Kirzner 1973). Austrians also have emphasized how diffuse groups can create new types of emergent or spontaneous orders (Paul Lewis 2015).[1] The railroads' cooperative contracts and institutions are prime examples of such emergent orders that lowered transaction costs and increased output. They were an essential part of the process that increased freight ton-miles on measured railroads by tenfold in the 35 years after the Civil War, even while revenue per ton-mile dropped by more than half (Federal Reserve Bank of St. Louis FRED Database).

This article will look at the three main ways railroads cooperated productively in the nineteenth century, which cooperation has been largely ignored by previous economic and business historians (see, for example, Albro Martin 1992; Richard Orsi 2007; Robert Porter 1983; Richard White 2011; Christian Wolmar 2012).[2] It will examine, first, rules of interconnection or "interchange", namely, the sharing of charges, routes, and rolling stock between different companies; second, the creation of "car service associations" to organize and distribute cars and costs across different railroad lines; and third, the organization of belt lines and union stations to connect different lines. The article will then look at the political battles over regulating interconnections, which were an important part of the movement to regulate railroads, but which have received scant attention in the extensive history of railroad regulation (Callen 2016; Samuel DeCanio 2015; James Ely 2001; Mark Kanazawa and Roger Noll 1994; Gabriel Kolko 1963, 1965; Martin 1971). Finally, the article will discuss what these early examples of interconnected networks can teach us about modern network industries.

[1] Of course, the Industrial Organization literature and the New Institutional Economics literature also discuss different types of economic ordering outside of pure competitive markets. See, for example, Oliver Williamson (2002).

[2] Some works described below discuss one or another type of interconnection policy, but rarely as part of a discussion of railroad cooperation. One classic work which does focus on interconnections is George Rogers Taylor and Irene D. Neu (2003 [1956]), but its almost singular focus is the standardization of gauges. There is related literature that describes the potential benefits of cartels for high fixed-cost industries in this period, although it is not focused on railroads. See George Bittlingmayer (1982); J.R. Kinghorn (1996).

Interchange

There are two positive examples of railroad cooperation that are still repeated in most history textbooks. First, railroads concerned about divergent schedules organized a General Time Convention to decide on a single time system for North America. On the noon of Sunday, November 18, 1883, the railroads implemented a system of four American time zones designed by the convention (with a fifth created in the Canadian Maritime provinces) that still undergirds modern timekeeping (Ian Bartky 1983). The second example concerns railroads' once distinct track gauges, which meant trains often could not travel on different companies' tracks, especially those that crossed from North to South. To facilitate exchange, the Southern railroads changed 13,000 miles of railroad track over the days of May 31 and June 1, 1886 to fit with the Northern 4' 8 ½'' standard. This remains the standard US railroad gauge (Daniel Gross 2016).[3]

Yet discussions of these events ignore that time and gauge standardization would bring no benefits if railroads did not allow travel across each other's tracks. The issue of "interchange", or the rules for transferring cars and rolling stock across different companies' lines, was one of the most contentious and frequently debated issues in railroad history, yet it has attracted little historical attention.

In the early years, states offered individual charters for every railroad company, often specifying the exact location of their tracks, and their laws kept these companies' systems separate. This was significant barrier to trade, since, even in 1880, there were still over 1,100 different railroad companies managing over 90,000 miles of track (Census Bureau 1960, Series Q 15-22; E.R. Wicker 1960, 505). In the immediate post-Civil War years, many companies' rolling stock stopped at their own tracks and freight and passengers had to be transported to new trains with new cars.

Express companies like Wells Fargo arose to transport freight across different lines, and some railroad companies formed their own express companies to do the same.[4] Starting in 1866, several railroads formed "cooperative fast-freight lines", managed by otherwise competing railroads, which could use "through bills of lading" or a single bill with a single price for a shipper towards a final destination, even if it crossed several lines.[5] Such freight lines managed their own cars, sometimes painting them distinct colors, giving the groups names such as "Red Line" or "Blue Line" (William Chandler 1979 [1889]; George Denfeld 1921; Joseph Nimmo 1877). These cooperative lines gradually wound down as railroads took on their own traffic management at the end of the nineteenth century.

Railroads themselves encouraged through bills of lading or waybills, allowing a single shipment to be set with a single charge across more than one line, which required negotiation between railroads to set such "through" or "joint" rates together, and to split the income from them. The general rule was for the originating line to receive the price charged to the customer, while it in turn paid each subsequent railroad a mileage fee, often 1.5 cents per car-per-mile (Chandler 1977, 128; Denfeld 1921, 127). One underappreciated job of the pools was making decisions on such through rates. The first major railroad pool, the Southern Railroad and Steamship Association, formally organized and headed by Albert Fink in 1875, helped different

[3] Gross (2016) represents the most detailed study of productive railroad cooperation, although it is focused on a commonly discussed positive example of such cooperation. See typical mention of both time zone and gauge standardization amidst a focus on railroads pools in White (2017, 582).

[4] Independent express companies founded their own cartel which reduced output and raised prices for over half a century. But, similar to the railroads, the companies also organized rules on what was known as the "transshipment" of packages through different companies (Peter Grossman 1996).

[5] Besides Taylor and Neu's discussions of fast-freight companies, Alfred Chandler (1977, 124-137, 535) discusses these, but he says that much of his work came from Taylor and Neu. There is also some discussion of "through bills of lading" and the new "air lines" uniting several independent railroads in Scott Reynolds Nelson (1999, 58-64).

companies negotiate such rates in its Rate Committee. Although the Interstate Commerce Act banned pooling on prices charged to shippers, one railroad expert said that even after the Interstate Commerce Act, "the through rates were, in the main, discussed and arranged as before by the Rate Committee of the [Southern] Association". The Association itself was recognized by the Interstate Commerce Commission (ICC) for this purpose, and several times it provided the Commission evidence about rates (Henry Hudson 1890, 91). Three other major pools also organized a "Joint Rate Committee" to negotiate about joint rates and continued to do so up through the end of the century (J.W. Midgley 1902, 18, 123).

Railroads established a "clearing house" to collect and distribute traffic charges from different lines. The Central Railway Clearing House, formed in 1899 in Buffalo, New York cleared and netted out accounts between different railways, just as its more famous banking cousins did in their sphere. It had 220 employees within two years of its opening, which demonstrates the large, but previously untapped, benefits of coordination. Interstate Commerce Commissioner Martin Knapp argued that the clearing house system was a wonderful example of productive cooperation, which should be adopted by all American railroads (Industrial Commission 1901, 719-730).

Interchange, however, also led to continuous questions about liability for damages to the cars, and about railroads' ability to inspect cars coming to and from different lines. To solve this problem, the Master Car-Builders' Association organized a standard test for examining and inspecting cars as they crossed each railroad junction, to make sure railroads were not charged for any damages that occurred on a previous line. One railway mechanic noted that at most large interchange points, every car was sent to a special receiving yard for inspection based on the Association rules. Damages were met with "M.C.B. Defect Cards" (H. Boutet 1911).

By the turn of the twentieth century, even after the formal dissolution of the rate pooling system, the railroads had created numerous rules and associations to interchange traffic across each other's lines. Unlike the restrictive pools, both the goal and the result of these was an increase in traffic across tracks that might otherwise only compete.[6]

Car Service Associations

Once railroads began interchanging railroad cars, they faced the problem of how to manage and keep tabs on expensive rolling stock traveling across different lines. They also dealt with the problem of shippers who kept cars for extended periods without returning them. The railroads had long charged fees, known as "demurrage", on shippers holding cars for extended periods. But different rates and "free time" periods left both shippers and traffic managers confused, and led to extended delays in returning cars, especially when they moved across different lines. New England in particular, with its confusion of small lines, was known as "the graveyard for cars" (Midgley 1902, 21). One railroad president told the Railway Association of America in 1873 that one of the most important issues in railroading was "how to secure full work or fair pay and fair treatment of cars running over foreign roads far from home and long absent" (Midgely 1902, 15). The Association created a special Committee on Interchange of Cars to facilitate such fair treatment and set standardized rules (Midgley 1902, 15).

Railroad companies that had termini in Omaha, Nebraska took a further step of corralling "foreign cars" on October 1, 1887, just months after the passage of the Interstate Commerce

[6] Some modern literature suggests the high interconnection charges in network industries can be used to allow incumbents to maintain their position—see, for example, Michael Carter and Julian Wright (1999). Although some interchange and through rates could have been used to advantage one railroad over another, or to collude against some shippers, the fact that rates were reciprocal for agreeing lines, and that most railroad laws in the late nineteenth century prevented discrimination between similarly situated customers, limited the use of these associations for colluding against the public or competitors.

Act, when they formed the first "Car Service Association" to manage cars crossing each other's lines, a model soon adopted elsewhere. Car service associations or car service bureaus kept their own cars, with their own markings, kept accounts on the use of cars, and collected fees on them. They generally set a rule of 48 hours free time for shippers for the loading and unloading of cars, followed by a set daily charge after the free time period was over, usually $1 a day (H.V. Elliot 1907; Nimmo 1893, 34). Within three years, there was a National Association of Car Service Managers, which tried to set standardized management practices across different lines. By the turn of the century there were 36 local car service associations (Midgley 1902, 15). Soon after the formation of car service associations, the average time of cars held by shippers dropped from about 6 to 1.5 days (Nimmo 1893, 34).[7]

To further the efficient use of cars, car service officials advocated that not just shippers but railroads be charged a uniform per diem against holding cars. The per diem would be in addition to the usual interchange mileage fee, which did not create sufficient incentive against railroads holding onto non-moving cars (Midgley 1902, 82-86). The April 1902 meeting of the American Railway Association created a "Per Diem Rules Agreement" to collect uniform per diem charges against railroads, in effect, a productive tax against themselves (American Railway Association 1921, 9). The tax became important during a national "car famine" or car shortage of 1906 and 1907, caused by an unprecedented amount of tonnage crossing the nation's tracks during an economic boom. To alleviate the famine and encourage faster turnover of cars, the Association increased its per diem charge from 25 cents to 50 cents. It dropped the rate back down again after the shortage had ended (National Association of Railway Commissioners 1909, 130-131).

Many recognized the services provided by the car service associations in creating a national railway network and allowing easy interchange. As early as 1893, railroad expert Joseph Nimmo argued that "I cannot fail to make special mention of the inestimable service performed by the car-service associations of the United States" in creating unified rail transport. "Perhaps there is no other feature of the co-operative relationships which have sprung up among the railroads of the country which so strikingly illustrates the organic unity of the American railroad system as the work performed by car-service associations" (Nimmo 1893, 34-35).

Belt Railroads and Union Stations

Railroads could not use interchange or car service rules unless their tracks physically connected with each other. Although occasional small yards and sidings at junctions allowed such interconnections, in large cities railroads often had to cooperate to create substantial infrastructure for switching and exchanging rolling stock. The two most important types of such infrastructure were belt roads and union stations (for a description of New York City interconnection infrastructure, see Jameson Doig 2002, 1-96; Keith Revell 2005, 15-98).

In many cities, railroads recognized the need for a unified belt railroad around a city, which would both bypass congestion downtown and ease the distribution of rolling stock across different lines. In 1882 five Chicago railroads formed the Chicago and Western Indiana Railroad to connect their disparate tracks outside of Chicago's downtown. The company leased its line to these companies, but was open to other railroads, and soon seven other railroads began leasing (Union Pacific Undated). In 1912 these companies reorganized a cooperatively-owned Belt Railway Company, with $5 million in capital, to sell stock at par for cash to the seven additional roads. All companies were charged by "wheelage", or a charge

[7] In this case, the quicker turnover of cars could extract the consumer benefits of a shipper holding cars for extended period. Even if such charges made the overall railroad system more "productive", it could have reduced consumer surplus.

based on the number of cars using the road and received income from their Belt Railway stock. The Belt Railway also did repairs on locomotives and freight cars and had a clearing yard to organize outgoing trains (Belt Railway Company of Chicago 1913, 5-6). The company today remains cooperatively owned by six railroads and provides services to many more. Its clearing yard alone contains 265 miles of track on over 650 acres.[8]

Similar to belt railroads, and occasionally attached to them, were bridge companies owned by several otherwise competing lines. For instance, several railroads and businesses organized the Louisville Bridge Company to construct a $2.3 million bridge across the Ohio River at Louisville, which was finished in 1872. They set tolls for connecting railroads to ensure a semi-annual 6 percent dividend on the stock and pay down the bonds used to finance construction. In itself the bridge was not supposed to be a money-making proposition, since the tolls would be reduced every year as the bonds were paid down. Soon even the dividends were reduced (Interstate Commerce Commission 1889a, 162-228).

Finally, many railroads recognized the need for central stations to transfer trains between competing lines directly in large cities. Some major stations, such as Pennsylvania Station in New York City, were owned by one railroad company.[9] At other times, competing lines created new companies to build single “union” stations. Not surprisingly, Chicago, the city with the most railroad connections, birthed one of the first union stations in 1874 funded by five separate railroads. In 1913, after the station proved inadequate to deal with increasing traffic, five railroads created a new Chicago Union Station Company, which took as its inspiration architect Daniel Burnham’s famous Plan of Chicago from four years earlier, and which used Burnham’s firm to design the station. The company finished the neoclassical building, one of the grandest in the United States, in 1925 (archive.today 2013; Preservation Chicago 2018). Following a similar trajectory, several railroads formed a Kansas City Union Depot Company, with the depot finished in 1878, and a Kansas City Belt Railway Company, with the companies’ boards of directors composed of officials of the railroads that used the terminal. Within two decades, the desire for a “through station”, where engines could keep traveling in the same direction after dropping off freight or passengers, led the railroads to merge the companies into a Kansas City Terminal Railway Company and construct a grand neoclassical station, which opened to the public in 1914 (William Wilson 1994, 193-212). These union stations and others, which are today some of the most beloved public spaces in America, are a preeminent example of productive railroad cooperation.

The Regulatory Response to Interconnection

In the earliest years of railroading, many state governments had no interest in facilitating interconnections. Many early state laws were designed to *prevent* interconnection. Local merchants at railroad termini desired the benefits of break bulk or wagon transport between different stations, and feared local traffic being diverted to far-off lines. Thus, many early charters forbid interconnections, or established different gauges explicitly to prevent the interconnection of state railroad lines with “foreign” ones (Taylor and Neu 2003). Gradually, however, more charters and general railroad laws authorized connections. The federal

[8] “When it works, the Belt is a model of cooperation between fiercely competitive railroads” (Bob Tita 2015; also, see, Progressive Railroading 2006).

[9] Ironically, Louis Brandeis, as the ICC’s counsel in the famous *Eastern Rate Case* of 1910, used Pennsylvania Station, which the Pennsylvania Railroad President admitted brought little extra returns to the company itself, as an example of wasteful spending, and as a reason for limiting railroad rates in general (Revell 2005, 63-67).

government itself passed a law in 1866 that authorized interstate railroads to carry other companies' freight and passengers, and to form continuous through lines.[10]

Despite the growing interconnections of railroads described above, many smaller railroads complained about lack of access to broader networks. Sometimes too, railroads that were interested in interconnections could not come to agreement on terms. Game theory teaches that when two companies negotiate in a bilateral monopoly situation, the final price is determined by each company's bargaining power, which itself can be determined by each firms' patience (Joel Watson 2008, 203-211). Such situations can lead to extended denials of service or failure to come to agreement, which can inspire demands for government action.

Many states began mandating interconnections between railroad lines and allowing their governments to decide on terms if the railroads could not agree. States also formed some of the earliest American regulatory systems to arbitrate interconnections. In 1842, Maine established a special tribunal, outside of the normal court and legislative system, to determine the "terms of connection" and the "rates at which passengers and merchandise coming from the one [road] shall be transported over the other" if the interconnecting railroad companies failed to agree on terms. This may represent one of the earliest regulatory commissions in the United States. Beginning in 1870, some states, such as Michigan and Pennsylvania, put railroad interchange rules in their constitutions (Supreme Court 1884).[11]

Although most of the discussion of the Interstate Commerce Act of 1887 focused on federal supervision of freight and passenger rates, and especially on the ban on rates decided by pools, other parts of the Act actually demanded railroads work together on the issue of interchange. Section three mandated that all railroads provide "reasonable, proper, and equal facilities for the interchange of traffic".[12] The 1906 Hepburn Act expanded this mandate and allowed the ICC to establish through routes and rates on its own authority (William Ripley 1913, 547-548). For decades, a significant proportion of state and federal regulatory decisions dealt with the terms of and facilities for railroad interconnection (Interstate Commerce Commission 1889b, 81-82, 152; Railroad Commission of Louisiana 1920, 151-153).

Some states also began regulating car service associations, but in this case to counter the associations' efforts. State laws extended the time shippers had to fill or unload cars, slowing down the attempt of car service bureaus to increase shipping speeds. After the 1906 car famine, twenty states enacted "reciprocal demurrage" laws, which forced railroads to deliver shippers' cars in set times after a shippers' request (National Association of Railway Commissioners 1909, 133-138; Railroad Commission of Louisiana 1920). But the Hepburn Act forbid states the power to regulate the delivery of cars for interstate shipments (National

[10] Although the law was only permissive, not mandatory, and said such connections could not be authorized without state sanction, some claimed it established a *de facto* policy of a national railroad network: "This act may properly be regarded as the charter of the American railroad system, for it is clearly in the nature of a grant of power" (US Senate 1897, 121).

[11] For early bank regulatory commissions at about the same time, see Glock (2018). For discussion of commission power on interchange in the 1890s, see Crafts (1893). New York laws demanded each railroad allow interchange "fairly and impartially" from 1847 and allowed temporary commissioners to be appointed to navigate disputes, but these decisions were not delegated to a continuous commission until years later **(**New York Railroad Commission 1886, 497).

[12] For rare mention of this clause during the debate leading to the law, see 18 *Congressional Record* 841, January 20, 1887. Senator Shelby Cullom, perhaps the most important author of the Act, did not understand the importance of the clause to prevent a "'freezing out'" of connecting lines (17 *Congressional Record* 3472, April 14, 1886). Many urged that this be strengthened in the Hepburn Act of 1906 (39 *Congressional Record* 2077, 3421). Charles Francis Adams, one of the premier railroad experts of the era, declared that interconnection was the whole purpose of the English regulatory commission, which "was in fact designed to insure to the community an easy and equitable interchange of traffic over its railroad lines" (Adams 1878, 92). See a similar account of the English commission in Nimmo (1879, 144).

Association of Railway Commissioners 1910; Supreme Court 1913). Many outside the shipping community opposed the new state requirements. The *New York Times* (1908) pointed out that reciprocal demurrage was different from the usual demurrage charged by railroads against shippers and could more easily be analogized to fining shippers for refusing to provide freight to railroads when cars were ready.

Some of the earliest state laws inhibited belt and union stations as well. Railroad expert Joseph Nimmo said in 1894 that "[m]any of us can remember when a union railroad depot was a phenomenom. For years railroad mangers regarded joint traffic as an entangling alliance, and the courts treated such traffic as in the nature of a partnership between corporations and as such *ultra vires*" (US Senate 1897, 120-121) But gradually, the states began authorizing railroad companies to invest in other companies, which could include joint infrastructure companies. Early regulators soon tried to mandate the use and terms of existing infrastructure, by requiring set charges for the use of bridges or stations (see discussion in Revell 2005, 82-92). State and federal commissions also mandated construction of the new infrastructure, including sidetracks and interconnections to new lines, although the Supreme Court said that such orders at least required a hearing before implementation (Statutes at Large 1906, 585-586; Supreme Court 1910; Yale Law Journal 1911). Finally, some states began building their own belt lines or connecting roads, such as San Francisco's State Belt Railway, created by the State Board of Harbor Commissioners in 1890 to move traffic along the waterfront (National Park Service 2015). With existing information, however, we cannot be sure if mandates on the use of private infrastructure reduced the return on it, and thus inhibited its construction, or if the public construction was more costly than private alternatives.

Regulators cemented their control of railroads' interconnections and infrastructure during World War One, when the government nationalized the railroad companies. The subsequent 1920 Transportation Act, which returned the railroads to semi-private status, mandated that the ICC organize them into national networks. Previous cooperative associations became a subsidiary part of this new system, since the Act demanded that the ICC give recognition to "such rate groups or territories as the Commission may from time to time designate" (Edgar J. Rich 1920, 516). Although many of the railroads' independent organizations survived and continued to advise on terms of interconnection, they lost stature relative to federal regulators.[13]

Conclusion

In the early 1890s, despite the formal abolition of the pooling systems, there were at least 87 different associations of railroad officials working across company lines, in everything from establishing joint rates to the standardization of the inspection of cars (US Senate 1897, 127). Only later were many of these standards, such as those involving automatic car couplings by the Master Car-Builders' Association, adopted by the government (American Society of Mechanical Engineers 2023). Some of these private associations survive into the present. Railinc Corporation, for instance, is a for-profit subsidiary of the Association of American Railroads, which tracks cars across other companies' lines and has a clearinghouse or settlement system to net revenue across them (Railinc).[14]

[13] One writer noted the 1920 Act's power over car service and interchange and said that while this "received little public attention" it was "some of the most far-reaching and important powers which have ever been conferred upon the commission" (Rich 1920, 521-523). But government still relied on the private Car Service Division of the American Railway Association (American Railway Association 1921, 54-62, 103).

[14] For continuing regulatory debates about issues such as "reciprocal switching" see Martha Moore (2019).

This article can only provide a preliminary overview of productive railroad cooperation. While it does not argue that every type of railroad cooperation was beneficial, or that each enhanced consumer welfare, it shows there were many positive examples of cooperation that benefited both the industry and its customers. And although this article can only gesture at lessons for contemporary problems, it can provide some background and insight into contemporary regulatory battles about interconnection, especially in the field of telecommunications.[15]

After the breakup of AT&T in the 1984, and especially after the Telecommunications Act of 1996, the United States federal government has spent substantial efforts to regulate the terms on which different companies can connect to the telephone network. Telephone and telecommunications companies have been declared "common carriers", similar to the railroads of an earlier time, that have a duty to exchange traffic. The Federal Communications Commission has issued decisions on when an existing network has to contribute costs to creating new switches, and the rates and terms of services such interconnections require. Such battles have consumed massive amounts of regulatory effort and private resources (Supreme Court 1999; Stephen Vogel 1996).

The internet, which is generally classified as an "information service", does not have the same regulatory requirements as telephones. The political battle around internet regulation or "net neutrality" has focused on how networks treat producers and consumers of content, which can be easily analogized to the shippers and consumers of railroad goods, and there has been only sporadic concern about network interconnections, or "transit" and "peering", between different internet service providers and companies. Today, these interconnections are often done through cooperatively- managed Internet Exchange Points (IXPs), or provided by "backbone" companies, which charge "transit" for up and downstream travel of information, but which often peer with each other for free transmission.[16] The general lack of public interest in interconnection is the result of its quiet and successful functioning. After all, the "internet" is by definition an "interconnected network", one which relies on standards to operate across different companies' lines.

This article demonstrates that network industries with competing companies are able to create productive forms of horizontal cooperation. It also shows how entrepreneurial companies and groups can create new positive-sum institutions and groups to increase trade. Finally, the article shows that we need to understand such cooperation if we are to understand how one of the most important industries in American history managed to create an integrated network that allowed people, goods, and information to travel seamlessly across the nation.

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[15] There is relatively less literature on interconnections than other network economic issues. For examples see Mark Armstrong (1998); Carter and Wright (1999). For general network literature, see Daniel Birke (2009).

[16] A rare article on the political aspects of internet interconnection is Sarah Morris (2014). See also the brief mention of internet interconnections by President Barack Obama (2014) in his general plea for net neutrality. See discussion of growth of interconnections in Paul Ceruzzi (2008).

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