

Chapter 3

THE RAILROAD AND TELEGRAPH

AS COMMERCE SYSTEM AND INTERREGIONAL MARKET SPACE

[N]o doubt, the most significant object in the office was the ticker.... The offices of the ranches were thus connected by wire with San Francisco, and through that city with Minneapolis, Duluth, Chicago, New York,... During a flurry in the Chicago wheat pits, Harran and Magnus had sat up nearly half of one night watching the strip of white tape jerking unsteadily from the reel. At such moments they no longer felt their individuality. The ranch became merely the part of an enormous whole, a unit in the vast agglomeration of wheat land the world round,...

Frank Norris
The Octopus (1901)

[A]s the organized type of society develops, the fusion of the various elements entails the fusion of the markets into one single market... The result is that each industry produces for consumers who are dispersed over the length and breadth of the country, or even the whole world.

Emile Durkheim
The Division of Labor in Society (1891)

Communications and Commerce

When Swift began sending shipments of beef from Chicago to New England in the late 1870s, the communications revolution of rails and telegraphy -- the precondition for the Company's long-distance system of production and distribution -- was already in an intermediate stage of build-out. Two critical attributes of the infrastructure at this stage enabled Swift to reconceptualize the existing practice of beef slaughter and sale, and create an enormously innovative network for producing and distributing beef in large volumes on a national scale.

In the first place, the rail and telegraph system had essentially become a *commerce* system. It had evolved into an infrastructure for moving freight, and facilitating the exchange of information and messages needed to coordinate such movement of commodities. Such a development as a commerce system was not necessarily preordained. Nevertheless, soon after the initial deployment of the rail and

telegraph systems, business uses -- shipping goods and sending messages for buying and selling these commodities -- assumed the dominant form of use on these new infrastructures.

Secondly, Swift took advantage of the rail and telegraph not only as a freight-moving and transaction-facilitating system, but also as an infrastructure with an increasingly national reach. This process of national integration, however, was not geographically uniform in its effects. At the outset of system expansion, linkages between the Northeast and the Midwest emerged far stronger than North-South connections. What resulted was a more vibrant set of trade relationships between the Eastern Seaboard and the agricultural heartland of the Midwest (Fishlow, 1965: 262). Only after the 1870s did North and South become more integrated on the basis of rail and telegraph connections through never to the extent of East-West connections.

The evolution of the dressed beef network created by Swift reflected this spatial pattern. The firm relied upon the more established East-West links forged by the rail and telegraph system in launching its system of fresh beef shipments from Chicago to the Northeast in 1878-1880. Gradually the firm expanded the geographical reach of these shipments so that the network extended into virtually every corner of the country.

This chapter describes how the rail and telegraph revolution became a nationally oriented commercial revolution that provided the Swift Company with the foundations for its production and distribution network. It examines how this communications revolution established an environment of opportunity for innovation. The rail and telegraph revolution created this environment by reshaping the geography of markets, thereby redefining what was economically viable and efficient for firms. This chapter also reveals how the politics and rulemaking environment for these enlarged markets evolved as Swift and other large-scale firms, sought to protect the national networks they had created. Finally, this chapter reveals how the rail and telegraph revolution rearranged trade linkages in the U.S. urban system, and created mass markets in cities that Swift learned to exploit in its innovative search for profit.

Infrastructure Interconnection

The commerce-oriented transport and communications system that provided Swift with the preconditions for his network, began to take shape over the territory of the United States in the decades after 1850 (Fishlow, 1965: 262; Thompson, 1947; Du Boff, 1983). Evolving from myriad locally-based rail and telegraph operations, the national character of this infrastructure emerged most dramatically when the Atlantic and Pacific coasts were breached by telegraph wires in 1861 and by rails in 1869. Although these two events captured the imagination of the country, and inspired subsequent historical accounts of the rail and telegraph system, the story of how this infrastructure became a national system occurred in the nation's interior. Alongside the bi-coastal reach of rails and telegraph wires, expansion in the total mileage within the agricultural heartland of the country, and the connections such interior growth represented, were decisive in the creation of a nationally integrated rail and telegraph transport and communications system.

Yet, while expansion in rail and wire mileage provided the basis of a nationally-oriented transport and communications system, it was the symbiotic development of rails and telegraphy that enabled this expansion to occur. Despite very different technological origins, the rail and telegraph infrastructure developed its national orientation after 1850 as an essentially single transport and communications system. Telegraph wires expanded along railroad rights of way, and telegraphic communication became indispensable by the mid-1850s in enabling the railroads to operate safely. In 1849 the New York and Erie Railroad pioneered the use of the telegraph on its lines to control operations. Five years later, the telegraph was standard equipment for the scheduling of all rail operations. Railroads furnished transportation and materials for the construction of telegraph wires, and operated telegraph offices from their depots. By 1870, U.S. railroads had funded, and were managing two-thirds of Western Union's 12,000 telegraph offices (Chandler and Cortada, 2000: 12). Although the capital and labor requirements to build and operate the two infrastructures were vastly different, rails and telegraphy became fused as the "twins" of nineteenth century commerce (Field, 1992).¹

¹Field concedes, however, that while rails and telegraphy emerged in tandem, "they were surely one of the most disproportionate pairings in the annals of economic history (Field, 1992: 401). He notes huge differences in capital and operating costs, total capital value of the built systems (\$8 billion for railroads, \$70-147 million for the

Prior to the Civil War, however, the rail and telegraph system suffered from innumerable obstacles to interoperability. These problems were due in no small part to the large number of firms in each industry. In 1850, roughly five years after initial commercialization of the telegraph, there were already hundreds of telegraph companies (Jones, 1852; Thompson, 1947). During this same period, there were at least an equal number of rail firms, a number that eventually reached over 2000 (Chandler, 1965). As a result of such unbridled competition, railroad track gauges, locomotives, and rail cars varied throughout different regions of the country. Seven different track gauges were still in use in 1860 (Friedlander, 1995). Similarly, telegraphy operated on competing Morse, Bain, and House technologies. Points of transshipment between competing lines, whether rail or telegraph wires, were sources of bottlenecks where freight and messages had to be modified in order to accommodate the standards on the next leg of the route. These transshipment points added both time and costs to the movement of freight and messages over the rail and telegraph infrastructure. Without standards for interconnection, the rail and telegraph system was not able to exploit fully its technological capabilities for efficient long-distance transfer of goods and information.²

As the builders of these systems consolidated after 1850, they gradually addressed many of the most urgent problems of long-distance interconnectedness. Rail and telegraph builders began to establish uniform standards for track gauge and telegraph wires that eventually integrated rail and telegraph lines into a more unbroken network for freight and message traffic. They improved the technology of locomotives and freight cars that enabled the system to increase the size and speed of freight shipments. At the same time, builders agreed on construction standards for both track and wires. Steel replaced iron rails, and iron became the standard over less durable copper telegraph wires. Finally, railroads managed to overcome the problem of multiple local time standards in the U.S. where in 1870 there were still

telegraph industry), and total employment. The contribution of the telegraph lay in its capital-saving capability, enabling it to offset the capital-using bias of the railroad (Field, 1992: 412).

²In 1850, telegraphic messages from New York to New Orleans had to be rewritten four or five times at intermediate stations en route before being passed along to the next station. Interconnection problems between competing companies operating on different telegraph technologies created such bottlenecks (Jones, 1852: 87). Similarly railroads had to rely on imperfect interconnections. Hoists were used to lift freight cars off and on different wheel bases at points of transshipment between railroads operating on different track gauges.

roughly 200 local times and 80 different railroad times in use. In 1883 railroads imposed a uniform time that enabled them to end confusion and operate more profitably (Kern, 1983: 12). These ameliorations, technological, structural, and even social resulted in more efficient overland movement of merchandise, and facilitated the message transmissions for both rail companies carrying freight, and business users of the infrastructure shipping and receiving merchandise.

Table III-1

Expansion of Rail and Telegraph Networks

Year	Rail Track Miles (000s)	Freight Tonnage (millions)	Telegraph Wire Miles (000s)	Messages Sent (millions)
1848	5.9	10.6	3.4	.5
1852	12.9	17.6	23.3	1.4
1860	30.6	46.5	56.0	5.0
1870	52.9	147.6	133.6	11.5
1880	115.6	338.9	291.2	31.7
1890	208.2	691.4	848.8	58.4
1902	252.5	1200.7	1307.0	89.7

Source: Alfred Chandler, ed., *The Railroads: The Nation's first Big Business* (New York: Harcourt Brace, 1965), Tables 1 & 2; Richard DuBoff, "The Telegraph and the Structure of U.S. Markets," *Research In Economic History*, Volume 8 (1983), pp. 253-277, Table 1, p. 256; Edwin Frickey, *Production in the United State 1860-1914* (Cambridge: Harvard University Press, 1947), Table 13, p. 100.

Interregional Trade and Mass Markets

The outcome of these improvements was a shift after the 1850s from water transport as the primary means of conveyance for interregional commerce, to a rail- and telegraph-dominated system of overland long-distance trade. In 1850, despite gains by the railroads during the previous decade in hauling freight, boats and barges still dominated interregional transportation of bulk agricultural goods (Fogel, 1964: 22). Of the estimated \$1.46 billion in internal commerce in 1852, almost two thirds traveled over water courses (Schmidt, 1939: 818). Ten years later, however, the situation was reversed. By 1862, rails accounted for roughly two thirds of the long-distance freight traveling from West to East. As rail use expanded, river routes declined. On the eve of the Civil War, the Mississippi had ceased to be

an economically viable transport route used by grain merchants (1860 Census of Agriculture, 1863). The decline in canals stemming from rail competition occurred more slowly but the final outcome was little different than the fate of river routes. Although still widely in use during the 1870s and 80s, canals by 1890 attracted very little business. Rails and telegraphy had subordinated rivers, canals, and lakes to a position of largely secondary importance in the nation's internal trade.

This rail and telegraph revolution was essentially a marketing revolution in the movement of commodities and information. This marketing revolution made possible more rapid, larger, more geographically-extended shipments of goods for delivery at definite times in specific places (Du Boff, 1983: 255). Long-distance overland freight shipments by rail, and long-distance, real-time information exchange by telegraph thus became inextricably linked.

As goods and information circulated over a rail and telegraph infrastructure increasingly national in scope, changes in the nation's structure of markets and system of cities resulting from this circulation, redefined the parameters for the profit-making activities of firms.

The communications revolution of rails and telegraphy opened the boundaries between localized markets prevailing before the 1850s, and created a wider, more spatially-extended market system (Du Boff, 1983; Yates, 1986). This infrastructure enabled economic actors to expand their business operations to more distant locations by diminishing geographical barriers on freight and information movements between market areas, and reducing the time needed for commodities and information to circulate from one area to another. The resulting enlargement of market boundaries led to the establishment of a more geographically-extended system of overland interregional trade.

Alongside this change in the market geography of the country was an equally profound shift in the nation's urban system. By the late 19th century the U.S. had become a much more highly urban society. During the decade of 1860-70 the increase in the American urban population exceeded the increase in the rural population for the first time in U.S. history (Pred, 1966: 18). Existing cities expanded and an enormous number of new urban settlements emerged during the years from 1850-1890. Perhaps more importantly, cities after 1850, especially those in the top ranks of the U.S. urban system, assumed a more multi functional role complementing their traditional commercial functions. Cities

became centers of factory industrialization (Pred, 1977: 85). Within the boundaries of cities, with their burgeoning populations of businesses and consumers, were enormous concentrations of supply and demand. In these urban environments, raw materials entered, intermediate goods circulated, and finished products exited. It was in cities where these items were also consumed in unprecedented quantities by both firms and the urban public. In emerging as concentrations of supply and demand within production economies, cities evolved into entrepôts of *mass markets*.

Ignited by rail transport and telegraphic communications, these changes in markets and cities served as platforms upon which Swift launched its fresh beef network.

The firm linked procurement of cattle raw materials and production in the West, with final marketing of the finished dressed beef output in the East through a distribution network built upon the foundations of wider markets and the system of rail and telegraph-based overland interregional trade. At the same time, cities were the focal point of Swift's procurement, production, and marketing activity. On the buying side, Swift found mass markets for its cattle raw materials first in Chicago and then in other cities on the frontier of the cattle range in the Midwest. The firm established its production facilities and marshaled its factory labor force in these same urban centers. In selling its products, Swift used the expanding populations of cities, first in the East, and later in the rest of the country, as centers of consumer demand, mass consumer markets. The firm in essence appropriated the impacts of the communications revolution on markets and cities. It grafted its own business model of using refrigerated rail transport and telegraphic communications in creating an innovative network linking the mass production and mass distribution of fresh beef. What enabled these two elements, markets and cities, however, to emerge as the foundations of Swift's system was the gradual evolution of the rail and telegraph infrastructure into a unified national transport and communications system. In forging the long-distance connections for this high volume production and distribution system, and focusing his activities in urban centers, Swift reinforced those very transformations in markets and urbanization that made his network possible. In the process, Swift played a critical role in establishing the linkages between production and distribution activities that helped define a national market space.

Markets as Territory

Markets, as territories where economic actors produce, buy, and sell, have boundaries that define them as places. The geographical size of markets is dependent on the costs to, and capacity of market actors to exchange goods and services over distance, and communicate information needed to negotiate exchanges (Du Boff, 1980: 478). Distance, and the time needed by economic actors to bridge distance in transporting merchandise and communicating terms of an exchange, act as limits on the size of markets. Market boundaries become fixed at those points where goods and information cannot circulate beyond barriers of geography in a timely manner. They also become fixed where the costs of moving goods or securing information beyond such geographical barriers drive the prices of merchandise to unmarketable levels, i.e. when the costs of transporting merchandise or communicating the terms of exchange exceed the value of the merchandise at its origin. These “costs of transfer,” that is, the costs of transferring goods and information over distance, limit the size of markets (Ohlin, 1933: 100).

In addition to this calculus of time, distance and costs of transfer, two additional factors -- technology and politics -- shape the boundaries of markets. Historically, transport and communications technologies have conditioned the size boundaries of markets by controlling how merchandise and information circulates, and influencing the costs of such circulation (Du Boff, 1980: 479). Politics also shapes the reach of market areas owing to the role of political authorities in establishing rules for market behavior (Polanyi, 1944; Braudel, 1967; 1977). Political rulemaking influences the extent to which market actors can engage in commercial activity over politically divided territories. Perhaps more importantly, market rules influence the rewards economic actors can expect from such activity in terms of private gain, thereby influencing the choices of whether market activity is worth pursuing in the first place (Zysman, 1994). In effect, time and distance, technology and politics converge in creating a cost structure for market activity that establishes market boundaries. Time and distance, measured by the costs of using transport technology to convey goods and services from one location to another, and the costs to economic actors of using communications technology to secure information integral to an exchange, act in concert with politics in shaping the boundaries of market areas.

Such a view of markets borrows elements from a longstanding geographical tradition. In the 1930s, the German geographer Walter Cristaller, synthesized ideas about transport, distance, and costs in developing a theory of what he called “Central Places” where goods, businesses, and populations concentrate. At the core of his theory was the “principle of markets” (Christaller, 1933: 72).

For Christaller, the market was a territorial unit. It represented a *range* corresponding to an upper limit in terms of the distance beyond which essential commodities or “central goods” could no longer be exchanged in a cost efficient manner. The central places that formed around markets, however, could be reshaped by two other secondary principles (Christaller, 1933: 76-80). The first was the principle of *transportation*. Conveyance of goods through improved transport broadened the range in which such goods could circulate therefore expanding the market area. The second principle was *politics*. Christaller conceded that markets and central places frequently emerged and grew in conjunction with administrative decisions of government. For Christaller, the three principles interact in defining the boundaries of markets where trade can occur (Christaller, 1933: 76-80).

Christaller's theory has an undeniable elegance in its explanatory power. In focusing on distance, transport costs, and politics, Christaller succeeded in uncovering basic principles of market configuration. For Christaller markets, configured from these three elements, exist as hexagonally-shaped territories delineating central places of varying importance in a hierarchical system of equilibrium. This elegance and simplicity, however, also reveals certain weaknesses. The model suffers from an over reliance on mathematical abstraction. Paradoxically, not only is real geography absent from Christaller's featureless landscape. Missing are meaningful references to the history of how these market areas emerge, and how they change over time.

Pre-Rail and Pre-Telegraph Markets

Prior to rail transport and telegraphic communication, markets for most products and economic activities in the U.S. were predominantly local in scope (Schmidt, 1939: 820; Yates, 1986: 151). These markets, especially in the less populated western areas of the country, were characterized by high levels of self-sufficiency and low levels of trade and exchange (Schmidt, 1939: 818). In these areas of self-

sufficiency there was an underdeveloped division of labor. Products originated, circulated, and were consumed within close proximity. Relatively few transactions occurred across market boundaries (Yates, 1986: 151).

Typical of this local market structure was the early meat industry (Walsh, 1982). Virtually every town had its own abattoir where cattle and hogs were processed, or where farm-slaughtered animals were further butchered (Clemen, 1923). Although the slaughter and consumption of fresh meat possessed unique attributes that, in the absence of efficient transport and refrigeration technology, made it an overwhelmingly local activity, markets for other products, especially consumer perishables but also durable manufactured goods, possessed similar localized patterns of production and consumption (Chandler, 1977).

Highly-variegated conditions of supply and demand for goods and services existed from one local market area to the next. Perhaps even more profound were differences in the prices of commodities from one local market area to the next (Carey, 1988: 216). Such variation in markets had profound impacts on intermarket trade. In the absence of well-developed transport and communications links, variations between markets constrained intermarket economic activity in two principal ways: 1) by limiting exchanges of information between economic actors separated by distance about prices, quantities, and types of goods available in different markets; and 2) by imposing formidable obstacles on the overland movement of goods between market areas. Trade under such circumstances conferred high levels of risk and uncertainty on merchants contemplating intermarket expansion.³ The sources of such risk and uncertainty derive from the role of communications and transport in the act of trade itself. The movement of goods or services through trade has to be preceded by the exchange of information between two types of economic actors. Economic actors on the demand side (a purchasing retailer, wholesaler, or industrial enterprise) need information on supply sources and prices, while agents on the supply side (farmer, wholesaler, manufacturer) need to know outlets of final marketing and what buyers are willing to pay (Pred, 1977: 38-39). Information about the market, in effect, is a precondition to trade. If information

³Risk and uncertainty are not identical. Risk is a known distribution of possible outcomes while uncertainty reflects a situation where the outcomes themselves are unknown (Knight, 1921).

can not be exchanged over distance in a timely and cost-efficient manner, the consequences for markets are increased risk, reluctance by economic actors to engage in trade between distant points, and preservation of market boundaries. Similarly, if goods can not move across geographical barriers owing to underdeveloped transport links, the consequences are the same -- low levels of trade over distance, and market boundaries that remain narrow.

In the pre-rail and telegraph period, intermarket trade imposed formidable costs on most merchants that exceeded the potential gains of such trade (Pred, 1966: 163; Yates, 1986: 5). In the absence of rail transport and telegraphic communication, these costs stemmed from shipping difficulties and information deficiencies related to the barriers of distance between markets. The costs of overcoming distance, and the time needed to bridge distance in sending and receiving shipments and securing information to consummate transactions for such shipments, placed obstacles on intermarket exchange. These cost constraints kept markets localized and hampered intermarket growth -- an outcome lasting into the 1840s (Du Boff, 1983: 257).

Despite the dominance of localized markets and the limitations on intermarket commerce, there *was* in place during the early 19th century a system of long-distance trade. This trade, however, did not go overland. Commodities could not move overland for any appreciable distance without raising their prices to unmarketable levels. In 1816 the freight costs for shipping corn by wagon 136 miles amounted to its selling price (Pred, 1977: 66). Wheat, although less costly to ship by cart, still exceeded its selling price at a distance of 330 miles (Riley, 1911: 94). Clearly, such costs for the overland movement of commodities represented a formidable constraint on intermarket trade.

More daunting than the costs associated with long-distance shipments was the time associated with shipping freight interregionally. In 1817 it took 52 days to ship a load of freight from Cincinnati to New York using available wagon and river routes (Slaughter, 1995: 6-7). By contrast, in 1852 the same freight shipment from Cincinnati to New York took only six days on the Erie Railroad and its feeder lines (Slaughter, 1995: 6-7). Owing to these circumstances, interregional trade during this period circulated overwhelmingly via coastal shipping between coastal port cities (Pred, 1977: 66).

Table III-2

Value to Shippers of Wheat and Corn Hauled by Wagon

	\$ Value to Shippers	
	Wheat (1 ton)	Corn (1 ton)
Value at Market	\$49.50	\$24.75
10 miles from Market	48.00	23.35
50 miles from Market	42.00	17.25
100 miles from Market	34.50	9.75
170 miles from Market	24.00	0
300 miles from Market	4.50	-
330 miles from Market	0	-

Source: Riley (1911): 94.

In the first two decades of the nineteenth century, long-distance commerce between regions occurred along two principal routes: 1) between U.S. coastal ports and European (mostly British) ports; and 2) between Northeastern and Southern coastal ports oriented primarily on the cotton trade (Pred, 1977: 66-70). In many respects, these two routes overlapped. Much of the cotton trade originating from Southern coastal cities was shipped first to Northern ports and then transshipped to British textile mills. This routing formed both a domestic coastal trade, and a foreign export trade. Similarly, a portion of the European manufactures entering U.S. Eastern ports was sent to Southern port cities. Inland from this very narrow corridor of long-distance coastal trade however, localized markets prevailed. Interregional commerce was an export-oriented, coastal-dominated activity controlled largely by Eastern merchants favorably situated between the Southern market and Europe.

During this period, the western interior of the U.S. as a marketplace was of marginal interest to Eastern merchants or Southern cotton shippers (Pred, 1966: 18-19). This interior area known as "The West" engaged in comparatively little interregional commerce. Isolated geographically from the other two regions of the country, less settled, and without direct access to the Atlantic and Gulf coasts where the nation's interregional trade took place, the West had an even more localized and self sufficient system of markets than the other two regions (Schmidt, 1939: 800). The region was overwhelmingly agricultural

although some manufacturing oriented mostly for the farm, was part of the settlement pattern in the West from the very beginning (Page and Walker, 1991: 282).

Trade in the West was overwhelmingly *intraregional*. Exchanges of agricultural commodities and locally-produced manufacturers occurred primarily among the region's river ports as the territory developed its own internal trade system (Pred, 1977: 69). This intraregional system of trade reinforced the region's localized markets structure in which producing, buying and selling occurred in largely self-contained geographical areas. Farmers in the West were caught in a cycle of inertia. Lacking easy access to long-distance markets, western farmers had little incentive to produce surpluses in sufficient quantity for export outside the region (Schmidt, 1939: 800-806). Without surpluses, western producers had little reason to seek long distance interregional markets.

The Beginning of Interregional Trade

After 1820, however, as population and economic activity continued to expand west of the Appalachian Mountains, and as cities notably Cincinnati and St. Louis became trading centers, this pattern of self-sufficiency was disrupted and the West emerged as the source for a very different pattern of long distance interregional trade. Sparked by the growth of Western agriculture, this new pattern of interregional trade diverted long distance freight shipments away from the coastal routes, and oriented it along an East-West axis. More importantly, as the West became the nation's agricultural breadbasket, this East-West commerce shifted from water routes to the rails. Thus, in the broad sense, the route to the rail- and telegraph-based system of long-distance interregional trade emanated from what was perhaps the most compelling feature of American historical geography during the early 19th century, the expansion of population settlements and economic activity in the region west of the Appalachian Mountains (North et al., 1983: 111).⁴

⁴In 1893 historian Fredrick Jackson Turner proposed an enormously influential thesis on the origins of this expansion. He argued that the availability of free land in the area drove the boundaries of the American frontier in a continual westward direction. While Turner elevated the pioneering spirit of the white settlers in this expansion, in truth, much of this free land owed its origins to government policy. A long history of national legislation, culminating in the Homestead Act (1862) reflected efforts by government to encourage settlement and development of western lands. By granting title at low costs to those willing to settle the area, along with ceding land to businesses, notably railroads and mining companies willing to exploit the area, government shaped Western development. Critics, however, assailed Turner's approach as an apologia for the Indian conquest (cf. Cronon, 1991

While western agricultural development provided the stimulus for the rail and telegraph-based interregional trade system, long-distance freight shipments to, and from the West began on water. Steamboats and canals provided western farmers with their first opportunity to sell in distant markets. These early forays by the West into long-distance trade occurred initially in the markets of the South where cotton specialization had left the region in demand of grains and foodstuffs (Schmidt, 1939: 801, 806). By the 1830s, the South had become dependent on the West for grains and foodstuffs (Schmidt, 1939: 803).⁵ In responding to this demand, however, western farmers also exploited opportunities to sell in the Eastern market by shipping agricultural commodities on steamboats and barges down river to New Orleans. There, western farm exports were either distributed to Southern market centers for consumption on the plantations, or were transshipped to the East. In both cases, access to long-distance markets through the river trade enabled western agriculture to change from a largely self-sufficient activity, to a surplus-producing industry that by the 1840s, rivaled the great grain producers of Europe.

This transformation of western agriculture into an export-oriented activity played the central role in shifting the mode of conveyance for long-distance freight shipments from water courses to the railroads. At the same time, the surplus-producing agriculture of the West, coupled with the population growth of the Northeast, diverted the primary direction of interregional trade along an East-West axis. The sequence of events that triggered this transformation in both the directional axis and mode of conveyance for long distance trade, begins with the completion of the Illinois and Michigan Canal in 1848.

Built in response to the expansion of grain production in the Illinois River Valley, the Illinois and Michigan Canal enabled wheat and corn from Illinois to be routed to New York and the Atlantic through the Great Lakes, the Erie Canal, and the Hudson River. This Canal-Lake course also sent Western grain

on the debate). Despite the controversy of Turner's thesis, there is little denying the expansion of population and economy in the Ohio and Mississippi River Valleys and the Great Plains -- and the impacts of this expansion on the creation of a rail- and telegraph-based system of interregional commerce. Ironically, Turner's thesis coincided with the pronouncement by the Superintendent of the 1890 Census that the frontier had disappeared.

⁵Admittedly the importance of the Southern market to Western agriculture and the extent to which the South was dependent on the West for foodstuffs remains the subject of debate. See especially Fishlow, 1965: 276-288. What is beyond debate is the expansion of surplus-producing agriculture in the West that acted as the catalyst for the system of East-West, rail-dominated long-distance trade.

through the St. Lawrence to Montreal. The impact of this route was to divert Illinois and Western grain intended for Eastern markets away from the river route, bypassing both St. Louis and New Orleans. Perhaps more significantly, it created a strategic point in this East-West trade at the Southern tip of Lake Michigan where a small but growing urban settlement and grain market existed. This settlement was the City of Chicago.

Table III-3

**Shipments of Grain and Flour from Chicago, 1840-1861
(Bushels)**

	Flour & Wheat	Corn	Total Grain and Flour
1840	1 0,000	--	10,000
1842	586,907	--	586,907
1845	1,024,620	--	1,024,620
1847	2,136,994	67,315	2,243,201
1848	2,386,000	550,460	3,001,740
1851	799,380	3,221,317	4,646,521
1855	7,115,270	7,517,678	16,633,645
1861	23,885,553	24,372,725	50,511,862

Source: 1860 Census of Agriculture, Table H, p. cxlix.

Table III-4

**% of Western Exports
Shipped Via New Orleans**

	1839	1844	1849	1853	1857	1860
Flour	53%	30	31	27	34	22
Meat	51	63	50	38	28	24
Corn	98	90	39	37	32	19
All Foodstuffs	49	44	40	31	27	17

Source: Fishlow (1965: Table 39, p. 284).

During the first season of the canal's operation in 1848, corn shipments from Chicago, situated at the key crossroads of the canal-lake route, increased eightfold from 67 thousand bushels to 550 thousand as farmers discovered the advantages of shipments away from the Mississippi and New Orleans (Cronon, 1991: 64). Perhaps more significantly, the canal and lake route, in establishing a direct link between East and West, shifted the direction of long-distance interregional trade along an East-West axis. This axis of trade, in turn, reinforced a convergence of interests evolving between the West and the East. With an expanding agricultural surplus and a resulting growth in incomes, the West became increasingly attractive to the East both as a source of foodstuffs and as a market for manufactures. The East in turn, represented a far more lucrative market outlet for western grain farmers than the South. An entirely new system of extended markets and long distance trade was thus emerging on the basis of a new relationship between the regions of East and West in which the interior of the country occupied the primary interests of the nation's business class (Pred, 1966: 16-18; 1977: 66-70).

From Water, to Rail- and Telegraph-based Trade

In bridging the two regions, the lake route actually served as a catalyst for development of the rail and telegraph trade system by creating a privileged position at the base of Lake Michigan for Chicago as a concentration point and primary market for the East-West grain trade. It was this position as a primary grain market in turn, that made the city attractive as a rail head. The Galena and Chicago Union Railroad completed in 1849 marked the first step in this evolution. Illinois grain farmers now had access to the Chicago market via a rail route.

During the 1850s, Chicago became a terminus for 21 different railroad lines. The four Eastern trunk lines converged on Chicago as the rail system began to develop its long distance East-West linkages. The remaining 17 lines extended into the City's tributary agricultural area as small agricultural towns competed fiercely for rail stations (Riley, 1911: 88-89).

The construction of these Roads from Chicago into the West, however, did not occur as a massive building project ahead of demand. Nor did the railroads create settlement and economic development in open territory as some exogenous force. Instead, railroads followed grain cultivation. Rail infrastructure

was routed to western areas that were already surplus grain producers (Fishlow, 1965: 165-235).⁶ This geographical bias is reflected in the relationship between the rail routes and the grain-growing areas. By the end of 1853 more than 60% of new railroad construction in Illinois occurred in the eleven leading wheat and corn growing counties of the state, areas which represented only 25% of total statewide land area (Fishlow, 1965: 173).

Table III-5

Rail Receipts at Chicago for Various Commodities (1852-56)

	1852	1854	1856
Flour (barrels)	124,316	234,575	410,989
Wheat (bushels)	937,496	3,038,935	8,767,760
Corn (bushels)	2,991,011	7,490,753	11,888,398
All Grain (bushels)	4,195,192	15,726,968	25,817,248
Lumber (000 feet)	147,816	238,337	441,962
Coal (tons)	46,233	56,774	93,020
Hogs	65,158	138,515	220,702

Source: Riley (1911: 94).

From its location at the base of Lake Michigan where it had become a primary grain market, Chicago established a hegemonic position as a rail center. In the process, it emerged as the crossroads for a new system of long distance trade between West and East. It was the railroad and telegraph and the focus of this new infrastructure system on Chicago that differentiated the new system of long distance trade from the earlier water-based system.

A small trading post of 4,853 inhabitants in 1840, Chicago grew to 29,963 by 1850 when the first large shipments of grain began to arrive in the City. By 1860, as railroads linked it with the East and traversed its agricultural hinterland, Chicago exploded, its population reaching 110,000 people. It was the center of the nation's grain trade, a commercial enterprise described at that time as a “revolution” and

⁶Fishlow points out that the sequence of railroads traversing undeveloped territory, and inducing economic development “bears no resemblance” to the real world (166). He attributes this idealized scheme of construction ahead of demand to Schumpeter who, in *Business Cycles*, insisted that Midwestern rail construction “meant building ahead of demand in the boldest acceptance of that phrase...” (Fishlow, 1965: 165; Schumpeter, 1939: 328).

“one of the chief marvels of modern commercial history” (1860 Census of Agriculture, 1863: cxxxv, clvii; Fishlow, 1965: 289). Central to this revolution is the story not only of how the rail and telegraph trade system succeeded in replacing water routes for moving grain from the Western grain belt to the East, but also how Chicago emerged as the privileged location for this rail- and telegraph-based activity. By 1862, as Chicago asserted its centrality in the rail system, freight carried from Chicago on the Pennsylvania, Erie, New York Central, and Baltimore and Ohio Railroads reached 6 million tons or roughly two thirds of total internal trade of just over 9 million tons. “In one word,” notes the 1860 Census, “railroads did what could not have been done without them”(1860 Census of Agriculture, 1963: clxvi).

Table III-6

**Flour and Grain Shipments Received At New York, 1860-90
(millions of bushels)**

Year	1860	1870	1880	1890
Water	41.1	36.3	71.1	30.2
Rail	16.0	34.2	98.0	90.2

Source: Schmidt, 1922: 105.

Advantages of the Rail and Telegraph System

As a means of conveyance for freight, the rail and telegraph system had a number of key cost advantages over water routes.

The most obvious advantage was *speed*. The velocity of shipments by rail enabled it to shrink distances much more dramatically than any previous form of transport (Cronon, 1991: 74). Not only was freight able to arrive faster. The railroads' liberation from geographical and seasonal constraints gave it other advantages over competing river and lake routes in terms of *reliability*. The river route south was extremely risky for grain shipments. River navigation during summer months, especially in drought seasons was often impassible. At the same time, the risk of damage to grain and flour from overheating

as well as moisture were of particular concern to grain shippers. Such risks imposed costs in the form of high damage insurance rates, and warehousing costs where shipments were interrupted and rerouted due to impassible navigation. Similarly, the lake route during winter months was plagued by the uncertainty of freezing during the winter months. Although freight rates on rivers and canals were considerably lower than rail rates, premiums for certainty and speed narrowed such differences. Clearly, the pattern of freight shipments beginning in the 1850s, in which ever-larger quantities of commodities began to move over the rail and telegraph system, revealed the extent to which shippers discounted differences on paper between freight rates on water and rates on the rails.

In addition to its operational advantages of certainty and speed, and the cost benefits for shippers from such attributes, the rail and telegraph marketing system was able to expand owing to the benefits conferred on rail and telegraph companies by government. Both rail and telegraph builders profited enormously from privileged access to the system of entitlements -- especially development rights and land grants -- provided by government as incentives to expand their systems (Berk, 1994). Political rulemaking thus worked in tandem with technology in giving decided advantages to rail and telegraph builders in opening markets and creating a rail and telegraph-dominated system of long distance interregional commerce.

Map III-1

Rails, Telegraphy and the Livestock Trade⁷

While the grain trade was decisive in creating the conditions for a rail and telegraph-dominated system of long-distance trade, it was the shipment of livestock from the Western range areas to Eastern markets that revealed most clearly the capacity of the rail and telegraph infrastructure to extend market boundaries and expand overland interregional commerce. Unlike grain and other bulk commodities, the livestock trade did not have an alternative and competitive means of conveyance over water courses for live animal shipments. Livestock had never been transported any appreciable distance on boats or barges. Hogs were far too difficult to manage on such trips while cattle was too large and unwieldy. In the absence of rail transport and telegraph communications, markets for the slaughter of live hogs and cattle were overwhelmingly local in scope.

The large-scale, high-speed, overland movement of livestock, and the establishment of an elaborate system of long distance trade in live animals, was entirely a creation of the rail and telegraph era (Fishlow, 1965: 68). Prior to the completion of railroad trunk lines, however, there was some overland movement of hogs and cattle. Hogs raised on western farms in the Ohio and Illinois River Valleys were driven overland relatively short distances to Cincinnati and numerous other smaller packing centers in Southern Illinois. There the animals were slaughtered, butchered and packed during winter months. Seasonality in the trade was essential because the curing process needed the refrigeration of winter so that the meat would not spoil as it cured (Walsh, 1982). Cattle, by contrast, *was* driven great distances overland from the Western cattle ranges to Eastern markets, especially during the 1840s. These celebrated cattle drives, however, often covering over 1000 miles, imposed significant costs on the cattle grazer and cattle shipper. Cattle lost weight on such drives -- anywhere from 150-250 pounds -- and had to be fed and watered along the route. Along with the labor costs of droving, the losses accruing to cattle shippers amounted to roughly \$12-20 per head depending on the length of the drive and the quality of the stock (Fishlow, 1965: 68-69). At an eastern price of 8 cents per pound for a 1000-pound beaver or roughly \$80 per head of cattle, such charges for long distance cattle shipments amounted to as much as a quarter of the animal's value at market. Beginning in the 1850s, however, the railroads began to offer

⁷For more detailed analysis of information in this subsection see Chapter 4.

competitive rates to ship live cattle from the western range areas to Chicago, and then from Chicago to Eastern slaughterhouses. As a consequence, the business of live cattle shipping grew spectacularly during the 1850s (Table III-7). The same forces that made Chicago the largest interior grain market in the country had essentially elevated the City to the greatest collecting point for livestock (Chicago Board of Trade, 1864: 46). This development had actually encouraged the cattle grazing business to migrate further west to cheaper grazing areas where an increasing percentage of the nation's cattle was being raised. As a consequence, live cattle shipments emerged during the 1850s as one of the most lucrative businesses of the railroads (Chandler, 1988: 230). By 1860, livestock shipments accounted for roughly 33% of total eastbound tonnage, and about 50% of eastbound freight charges (Fishlow, 1965: 79). On the eve of the Civil War, as the railroads assumed more and more control of the long distance cattle traffic, the cattle driving business had actually become obsolete (1860 Agriculture Census, 1863: cxxxi).

Table III-7

Live Cattle Shipments from Chicago, 1852-61

Year	1852	1854	1856	1858	1860	1861
# of Cattle Shipped	77	11,221	22,502	42,638	97,474	124,146

Source: Schmidt, 1922: 105.

With the railroad and telegraph, the market in live animals reached from the Western plains to the Atlantic Coast. The consequences of this rail and telegraph-based system long distance trade not only redefined the livestock business. It fundamentally reshaped the geographical structure of markets in which this business operated.

Institutionalization of Interregional Trade

The system of enlarged markets and East-West interregional trade became strengthened and institutionalized through the creation of formalized commodity exchanges. The establishment of Boards

of Trade in Buffalo (1845), Chicago (1848), Toledo (1849), New York (1850), and St. Louis, Philadelphia and Milwaukee (1854), and the emergence of the Chicago Board of Trade as the country's central commodity exchange, marked the stages in this process of institution-building and market integration. Rails and telegraphy played a defining role in the way these institutions formalized a system of long-distance intermarket trade.

The rail and telegraph system provided unique attributes to buyers and sellers of commodities in terms of shipping and communications that were essential in reducing the risks necessary for promoting intermarket activity. By accelerating the speed of shipments, providing new levels of certainty in transporting goods over geographical barriers, and conveying information to traders about supplies and delivery schedules, rails and telegraphy enabled both shippers and buyers to negotiate the transfer and arrival of commodities across different market locales. Pivotal to this more extended intermarket system of buying and selling were two critical innovations pioneered by the newly-institutionalized commodities markets that were dependent on the rail and telegraph. These innovations were the forward, "to arrive" futures contract, and the system of standardized grades for commodities.

Prior to these innovations, long-distance trade between bulk commodity shippers and buyers occurred on the basis of the consignment system. The high levels of risk to both parties in this system undermined intermarket commerce. In the consignment system, sellers of bulk commodities delivered by rail a small representative sample from their larger lots of bulk goods to Eastern buyers who would examine the sample and bid over the telegraph for the remainder. By the time the shipment reached the buyer, however, prices might have already changed.

The solution to this dilemma resided in the futures contract in combination with the system of standard commodity grades. Once grades of commodities were standardized, buyers and sellers could complete a transaction by telegraph without need for a specially-shipped consignment. The buyer would know what was being purchased because commodities of a particular grade would be fundamentally identical, while both parties, in turn, could lock-in a price through the futures contract on delivery of the grade specified. Furthermore, futures contracts provided buyers and sellers with other types of risk-reducing flexibility. In contrast with the consignment system, futures contracts permitted commodities to

be transported and delivered at chosen future dates when processors of agricultural goods -- millers, butchers, etc. -- were ready to refine them, or when retail grocers were ready to sell (Du Boff, 1983: 259). The impact of this system was to spread more uniform, and less risky exchange practices over a wider territory while involving a more geographically dispersed pool of buyers and sellers in long distance trade. As a result, commodities moved farther and faster while market areas, widened by the expansion of the rail and telegraph trade system, and the institutionalization of commodities exchanges, became more fully integrated and uniform (Du Boff, 1980: 479).

Price uniformity across geographical areas generally reflects an absence of barriers to trade resulting from distance. When geographical barriers to trade diminish owing to such phenomena as new transport and communications systems, the result is greater levels of intermarket activity. As intermarket trade expands, prices tend to equalize across geography (Ohlin, 1933). In the absence of specific data on intermarket trade, the movement toward price uniformity or dispersion across geography is actually a proxy for levels of intermarket activity in the economy. Thus commodity prices in different geographical locales are a measure of the degree to which the economy of the U.S. was moving toward a more unified national market tied together by interregional trade. The effect of the rail and telegraph was clear. These systems evened out markets in space (Carey, 1988: 217).⁸

Commodity price data suggest (Table III-8) that the prices of commodities in different regions, which had started to equalize during the antebellum period due to intermarket economic activity from canals and steamboats, continued to converge, perhaps at an even faster pace, after the Civil War (Slaughter, 1995; Jue, 1999). Variations in regional markets did not disappear entirely. There remained critical issues of interconnection on the rail system not fully resolved until the 1880s with the use of one single standard track gauge. In addition, the South, largely excluded from the system of East-West trade that had evolved in the decade prior to sectional conflict, was still not fully integrated into the interregional compact that continued to evolve between East and West after Reconstruction.

⁸Price dispersion in turn, can be conceived as a measure of *risk* in intermarket trade while risk is a reflection of barriers among them, distance. The greater the differences in prices between regions, the greater is the level of risk in intermarket economic activity, measured by friction in shipping and communicating. The higher the levels of risk, the lower the levels of intermarket trade.

Nevertheless, as the railroad and telegraph became more interconnected and interoperable in the post civil-war period, and as these systems enhanced the overland transfer of goods and enabled information to become more widespread and evenly distributed, this infrastructure created an environment of greater certainty in the long distance shipment of merchandise. The result was an enormous expansion in the overland movement of freight and information over rails and telegraph wires, and as a consequence, a greater equalization of prices across geographical space. As commodity shipments expanded, and as commodity prices equalized, a far more nationally-oriented interregional trade system emerged by the last quarter of the nineteenth century. It was this market structure and system of trade that served as a platform for the long distance production network of Swift.

Table III-8

Relative Wholesale Price Indices in Different Cities*
(New York = 1)

	Baltimore	Chicago	New Orleans	New York	St. Louis	S. Francisco
<hr/>						
Average						
1866-68	1.099	1.055	1.068	1.000	1.102	1.133
1889-91	0.976	0.969	0.919	1.000	0.944	0.980
<hr/>						
Standard Deviation						
1866-68	0.212	0.219	0.166	0.000	0.250	0.318
1889-91	0.083	0.073	0.117	0.000	0.087	0.170
<hr/>						

* These indices comprise eight commodities for which comparative data is available (Beans, Candles, Coffee Flour, Rice, Soap, Sugar, Tea).
Source: Jue (1998), Table 1; U.S. Senate, Committee on Finance (1893), Volume 4, Table XVIII.

The Politics of Market Space

If this enlarged structure of markets and system of long distance interregional trade begins with technology, it assumes its more complete form in the realm of politics.

By the 1870s when patterns of national market integration had become widespread, numerous state governments, responding to local business interests, succeeded in creating a web of regulatory barriers to internal commerce. These barriers were designed to protect local business firms in certain

states from the competitive encroachments of firms from the outside the area. As markets areas enlarged and as the boundaries between markets blurred, business firms became more vulnerable to competitors residing outside the former market boundaries. Although efforts by local governments to protect local business interests by restricting commerce between states conflicted with the spirit of the commerce clause in the Constitution, states nevertheless took advantage of their own broadly defined-authority known as states' rights to circumscribe interregional trade within narrow limits. Such protectionist rulemaking on the part of state legislatures contributed to a specific type of market inefficiency. Protections extended to local business firms often enabled local merchants to assume what was effectively monopoly power in those markets where they operated. As late as 1875, the federal courts said nothing that disturbed this impulse of states to intervene and protect local businesses despite the efforts of the constitutional framers to create a single national market (McCurdy, 1978: 635).

States used the doctrine of states' rights to implement protectionist legislation in two ways. Firstly, certain states required non-resident sales persons to pay higher licensing fees than local merchants. In the case of the Singer Sewing Machine Company, these fees aimed at restricting the Firm from setting up its network of retail outlets to compete with the firms of Wheeler and Wilson, and Wilcox and Gibbs. In a Supreme Court case in 1880, *Webber v. Virginia*, the Court, in acceding to the demands of Singer, struck down the rights of state to impose such fees. This decision revealed the extent to which the idea of a unified national market had become an integral part of the nation's legal doctrine (McCurdy, 1978: 642).

The other mechanism implemented by states was the use of local inspection laws for food, most notably in the meat packing industry itself. As the market power of Swift and other large interstate packers expanded during the 1880s, local butchers persuaded lawmakers in Minnesota, Indiana, Colorado and Massachusetts to enact pre-slaughter inspections laws where beef and pork was sold. Claiming to protect the public interest, these laws aimed at eliminating the ability of large packers to sell products transported across state lines. In this case, the remedy upholding the national market space was legislative. In 1891 the Federal government authorized the Federal Meat Inspection service to conduct federal inspections of beef and pork produced for interstate sales.

While these cases reflected the shift toward greater levels of long distance trade, they also revealed the role of corporate political *power* in establishing policy in the marketplace, and new thinking about the market itself (Parrini and Sklar, 1983). In this new thinking, the country was not only better served by long distance commerce and a unified national market. Large oligopolistic firms emerged as the supposedly most efficient organizers of the economic activity within this enlarged market.

Urban Impacts of Interregional Trade

As the rail and telegraph system was reconfiguring market boundaries, it was also engineering the equally profound shifts in the nation's urban system that served as a second platform for the network of Swift. These changes in the U.S. system of cities were marked most decisively by an increase in both the urban population and the overall number of urban places. As market boundaries enlarged, and as market activity assumed a more geographically extended character, trade and production actually became more highly-concentrated in cities. The territorial spread of markets, and the concentration of this spatially-extended economic activity in cities were thus part of the same process of urbanization and economic growth.

This pattern of urbanization and growth was the basis for one of the most far-reaching changes in the late 19th century economy, the advent of *mass markets*. The creation of urban mass markets, in turn, both business and consumer markets, reflected two important consequences of urbanization: 1) a shift in the internal size ranking among the nation's cities, and 2) a change in the pattern of geographical linkages between cities. Mass markets also reflected an even more profound transformation occurring within cities themselves -- the emergence of cities as manufacturing centers (Pred, 1966; 1977). In this role, cities served as the focus of production economies where production factors, supplies of materials, and demand for intermediate goods used in manufacturing, became concentrated.

In this role as mass markets, cities became the centers of powerful transformative feedbacks in the economy. The growth of urban populations, the shifting rank of cities, the changing directional patterns of interurban trade, and factory industrialization emerged as mutually-reinforcing catalysts for economic growth. At the same time, alongside this activity was the continuing expansion, standardization

and integration of the rail and telegraph system. Transport and communications, manufacturing and urbanization, and mass markets in cities thus evolved as interactive elements in a pattern of evolutionary economic change.

Table III-9
**Urbanization, Railroadization and Industrialization of the U.S.
 1850-1900**

Year	1850	1860	1870	1880	1890	1900
Total Population (millions)	23.1	31.5	39.9	50.3	76.1	92.4
% Urban Population	11.3%	19.7%	24.8%	28.1%	35.1%	39.6%
# of Cities with Population > 10,000	62	93	168	223	363	440
Railroad Mileage (000s)	9.0	30.6	52.9	93.3	166.7	206.6
Telegraph Mileage (000s)	12.0	56.0	133.6	291.2	848.8	1307.0*
Index of Manufacturing	--	16	25	42	71	100

* mileage for 1902

Source: Pred (1966: 17); U.S. Bureau of the Census (1975); Frickey (1947: 10-11).

Urbanization and City Rankings

The urban population of the U.S., which reached 5% of total population only in 1830, began to expand dramatically after 1850, when rail and telegraph firms began to standardize their infrastructure and create a more uniform and nationally-oriented transport and communications system.⁹ By the eve of the Civil War in 1860, roughly 20% of the population was living in cities. In 1890, the country's 22.1 million urban inhabitants represented 35% of the total U.S. population. By the end of the century,

⁹Urban places as defined in the Census' of the period, are cities with at least 2500 inhabitants. Figures in the rest of the paragraph taken from Pred, 1977: 86 and U.S. Bureau of the Census, 1970: 11.

roughly 40% of the nation was urbanized. Equally dramatic in this period was the increase in the number of urban places. In 1850 there were 236 cities, that is, places with a population of at least 2500. By 1890, there were 1348 such places. Even more profound was the increase in larger cities. Four cities in 1850 had populations in the range of 50,000-100,000. By 1890 there were thirty of these larger mid-size cities.

As early as 1820, the four largest cities of the Northeast -- New York, Philadelphia, Baltimore, and Boston -- had developed a system of large-city interdependence in terms of both arrivals and exports (Pred, 1977: 67). These cities also dominated the trade with the South where, unlike the Northeast, there was very little intraregional economic activity in the pre-rail and pre-telegraph period. This Southern trade with the cities of the Northeast was controlled by Charleston and New Orleans. Such control established clearly defined patterns of interurban commodity movements between the Southern and Northeast regions. Furthermore, New Orleans was also in a position to control commodity movements from the Ohio and Mississippi River Valleys, to both the Northeast and the South. These goods went by canal and river routes through the Ohio and Mississippi River Systems to New Orleans where they were then transhipped to other southern port cities, or to the port cities of the Northeast. These interurban connections defined the geographical pattern of the interregional trade system in the pre-rail and pre-telegraph period (Pred, 1966; 1977).

As the urban population increased after 1850, the ranking of first-tier cities within the nation's urban system shifted in a dramatic way. One city in particular, Chicago, grew unlike any other after 1850. Its emergence as the nation's second city by 1890 was vastly different from the pattern of rank size city growth from 1820-50 marked by relative stability in the size rank of the nation's very largest cities (Table III-4).¹⁰ The emergence of Chicago transformed the economic interdependencies and the geographical linkages between cities and the regions where they were located. In the process, Chicago helped reshape the pattern of both interurban and interregional commercial relationships that had been established in the mercantile era.

¹⁰ During this early period the major change in the city system occurred just outside the largest group with the rapid growth of Cincinnati and St. Louis as the nation's sixth and seventh largest cities in 1850 reflecting the primacy of an expanding river-based economy in the Ohio and Mississippi Valleys. By contrast, the rise in rank of cities such as Milwaukee, Cleveland, and Detroit from 1850-90, though not as dramatic as Chicago, and the decline of New Orleans represented a declining river economy and a shift of fortunes to a rail-dominated internal trade system.

Table III-10

**Size Rank of Largest Cities
1820-1850 and 1850-1890**

City	1820 Rank	1850 Rank	City	1850 Rank	1890 Rank
New York	1	1	New York	1	1
Philadelphia	2	2	Chicago	19	2
Baltimore	3	3	Philadelphia	3	3
Boston	4	4	St. Louis	7	4
New Orleans	5	5	Boston	4	5

Source: U.S. Department of the Interior Census Office, 1895: 370-372.

As Chicago expanded by taking advantage of its position of primacy within the rail and telegraph system, and as it evolved into the nation's premier commodities market, it became the focal point of the nation's East-West interregional trade system. Chicago successfully siphoned off flows of grain from its primary competitor, St. Louis. It drove New Orleans and the river economy to a secondary role in the nation's internal commerce system. It relegated the once-dominant pork packing city of Cincinnati to a secondary position both as a livestock market and meatpacking center. Its control of the nation's internal trade, and its emergence slightly later as an industrial center became a source of wonder even to the actors at the Chicago Board of Trade who made this happen.¹¹

Mass Markets and Manufacturing

From 1860-90, the top ranking cities in the U.S. became characterized more by industrial and multi-functional activities, and less by mercantile and trading functions. This manufacturing activity also became increasingly concentrated in fewer, larger cities. In 1860 the ten largest cities accounted for 24% of all U.S. manufacturing value added. In 1890 the figure for the top ten cities was 38% (Pred, 1977: 85).

¹¹ Even Mark Twain, in his semi-autobiographical *Life on the Mississippi* (1883), remarked upon "that astonishing Chicago – a city where they are always rubbing the lamp, and fetching up the genie, and contriving and achieving new impossibilities. It is hopeless for the occasional visitor to try to keep with Chicago – she outgrows his prophecies faster than he can make them. She is always a novelty; for she is never the Chicago you saw when you passed through the last time" (Twain, 1883: 398).

This change toward manufacturing was one of the most significant attributes of the urbanization process that enabled cities to emerge as mass markets.

Owing to this transformation, the channels of interdependence among larger cities within the U.S. urban system increasingly involved commodity flows tied to both manufacturing activities and consumption. Such flows of incoming inputs, and outgoing manufactures, both finished goods for final demand, and intermediate goods for other factories, were not limited to durable products. These flows also included an exploding interurban trade in foods fabricated in factories to feed an increasingly urban manufacturing population (Pred, 1977: 94). Such foodstuffs, produced for an increasingly industrialized and urbanized population, linked agriculture to industry, and production with consumption in a reconfigured interregional and interurban trade and manufacturing system.

Table III-11
**Growth of Manufacturing Employment in U.S. Cities
 1860-1890**

	Manufacturing Employment (000s)		% of Population in Manufacturing	
	1860	1890	1860	1890
New York	106.2	477.2	9.0%	19.0%
Philadelphia	99.0	260.2	17.5	24.9
Chicago	5.4	210.4	4.8	19.1
St. Louis	9.4	94.1	5.8	20.8
Boston	19.3	91.0	10.8	20.2
Baltimore	17.1	83.7	8.0	19.3
Pittsburgh	8.8	56.4	18.0	23.7
Cleveland	3.5	50.7	8.0	19.4
Detroit	2.3	38.2	5.2	18.5

Source: Pred, 1966: 20.

Continued expansion and standardization of the nation's rail and telegraph system, and the dramatic reductions in freight charges and communication costs that accompanied this build-out, enhanced the phenomenon of urban mass production activity. From 1865-90 costs for moving commodities on a per ton-mile basis decreased by roughly 75% (Pred, 1977: 94). These cost reductions, in turn, provided opportunities and incentives for firms to produce in high volumes. As cities evolved into concentrated sources of supply and demand for manufacturing activities within a system of enlarged markets, and as improvements in the transport and communications infrastructure enhanced the capacity of firms to produce in higher volumes, factory production became firmly anchored to cities. In this way, transport economies, information economies, mass production economies, and urbanization economies were connected to a pattern of economic growth focused on urban mass markets. This sequence of transport economies, information economies, internal scale economies, and urbanization economies thus became mutually-reinforcing enabling the rail and telegraph revolution, mass production, and the urban system to evolve along the same trajectory. There was, however, one additional element critical to this trajectory. This element was innovation.

The Platform for Innovation at Swift

Innovation at the G.F. Swift Company was neither wholly fortuitous nor the result of individual genius. It emerged on the basis of broad-based trends ignited by the communications revolution of rails and telegraphy and its build-out.

In the first place, Swift established its network for producing and distributing beef on the foundations of the rail and telegraph infrastructure and the geographically-extended interregional markets created by the build-out of this infrastructure. Such markets differed from the highly variegated and localized markets prevailing at mid-century. Consequently by 1875, when Swift first conceived of ways to reorganize beef production and sale, he had at his disposal for this learning process a transport and communications infrastructure sufficiently developed, and a market structure capable of supporting his idea for a new type of production and distribution network. Infrastructure, market structure and an

interregional commerce system created by the two, thus provided Swift with a critical platform for innovation.

Secondly, Swift built its innovative production and distribution network on the basis of profound changes in the nation's urban system. These transformations, which were linked to the rail and telegraph revolution, elevated cities as manufacturing centers, as concentration points for interregional commerce, and as mass markets. In establishing its business, the G.F. Swift Company took advantage of these urban characteristics, and exploited what was arguably the most defining event in the urban history of the nation during the latter 19th century, the emergence of Chicago as the nation's second city. As the nation's rail center and main commodities market, Chicago forged powerful economic linkages with other cities throughout the country. These interurban connections were critical for Swift. Furthermore, the firm profited from the development of Chicago and cities in the Midwest as mass markets for the purchase of cattle raw materials, and as sites for factory operations. Perhaps even more importantly, Swift exploited cities as burgeoning centers of consumer demand for foodstuffs. The firm developed its beef network on the foundations of these cities, relying on the enormous expansion in the number of urban places as mass consumer markets for his dressed beef.¹² Eventually, the location of the branches in the firm's dressed beef network resembled the map of U.S. cities with populations of 25,000 inhabitants. Innovation at the firm was thus intimately connected to the nation's urban history.

It was upon these structures -- technological, interregional and urban -- that Swift would emerge as an agent for change.

¹²On this point the metaphor of Braudel, in describing early modern European cities as "giant stomachs" that created opportunities for large grain and provisions merchants, is instructive. Braudel argues that expanding urban populations and accompanying consumer demand in cities were critical elements in the interactive development of urbanization and capitalist development (Braudel, 1977: 28).