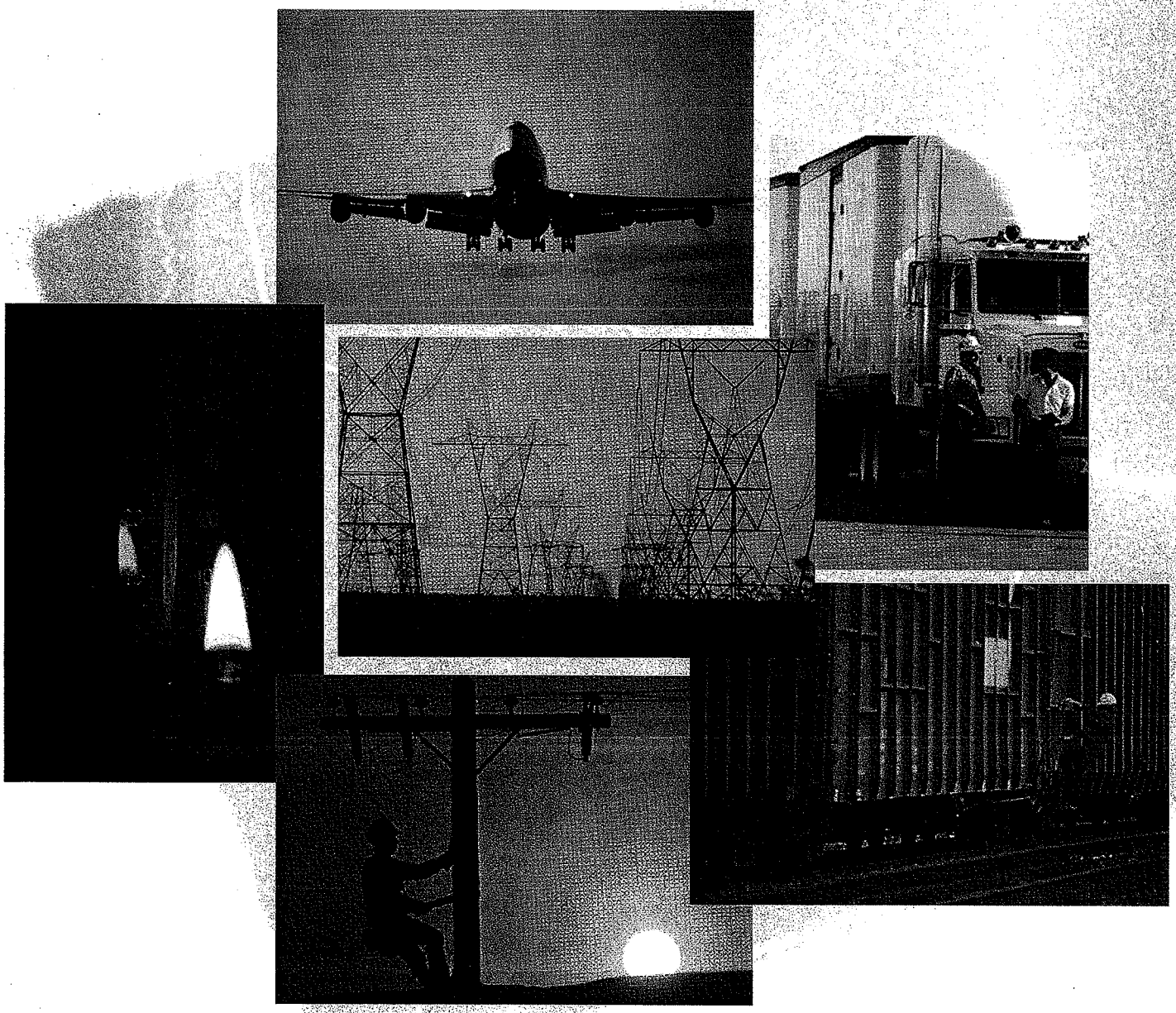
Economic Deregulation and Customer Choice: Lessons for the Electric Industry



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Executive Summary

Policymakers and regulators are engaged in an ongoing debate about introducing customer choice in electric service. The most comprehensive legislative proposals envision a market in which all customers could choose their electricity suppliers. Electric utilities would no longer have monopoly rights to sell electricity to particular groups of customers. Instead, they would become transporters of electricity, and they could also compete in the generation marketplace. The price of the electricity would no longer be regulated, although the price of transportation still would be.

During the past two decades, numerous industries with many economic similarities to electricity have already undergone price and entry deregulation in at least part of the industry. The most significant include natural gas, telecommunications, airlines, trucking, and railroads. Like electricity, these are "network" industries. Suppliers and customers are connected via a network of pipes, wires, air routes, roads, or rails, and the decisions of one network user can affect the ability of others to use the network.[1] The experience of these five industries can therefore serve as a guide in the debate over customer choice in electricity.[2] A review of the evidence reveals several broad conclusions about the effects of deregulation, and each conclusion carries with it a policy implication.

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[1] Because of this fact, analysis of these five industries is more relevant to the electricity debate than that of nonnetwork industries that were deregulated at similar times, such as oil production, stock brokerage, or savings and loans.

[2] We are hardly the first to notice the similarities between electricity and other deregulated industries. In August 1996, the National Regulatory Research Institute released a report whose substantive findings largely agree with ours (Costello and Graniere 1996).

Summary of Trends Following Regulatory Change

Industry	% Real price reduction after... 2 years	5 years	10 years	Annual value of consumer benefits due to deregulation
Gas	10-38% (1984-86)	23-45% (1984-89)	27-57% (1984-94)	N.A.*
Long Distance Telecom	5-16% (1984-86)	23-41% (1984-89)	40-47% (1984-94)	$5 billion
Airlines	13% (1977-79)	12% (1977-82)	29% (1977-87)	$19.4 billion
Trucking	N.A.**	3-17% (1980-85)	28-58%*** (1977-87)	$19.6 billion
Railroads	4% (1980-82)	20% (1980-85)	44% (1980-90)	$9.10 billion

Note: All figures are real, in $1995. Consumer benefit figures in the last column measure *total* consumer benefits, including both price reductions and changes in service quality.

Source: For price reductions, see Appendix and/or text of study for data. Consumer benefit figures are from Crandall (1991), Morrison and Winston (1995), and Winston et. al. (1990).

N.A*: For natural gas, no controlled studies quantify the separate effect of deregulation on gas prices. Winston (1993, 1274-75) speculates that the consumer benefits exceeded economists' prederegulation predictions, which were in the range of $2-4 billion in 1995 dollars. If gas prices had remained at 1984 levels, consumers would have paid $50-60 billion more for gas in 1995.

N.A.**: For trucking, no studies have documented the effects for the first couple of years.

***No trucking figure is available for 1980-90; figure quoted is for 1977-87, from Corsi (1994). Because regulation made it difficult to cut trucking rates, the bulk of these rate reductions occurred after 1980.

- **Finding: Deregulation and customer choice lower prices.**

In each of the five industries, prices paid by customers fell significantly as a result of deregulatory reforms. Within the first two years of deregulation, prices had fallen by 4-15 percent, and sometimes more for certain groups of customers. Within 10 years, prices were at least 25 percent lower, and sometimes close to 50 percent lower. Of course, not all of these changes were due to changes in the regulatory regime, but scholarly studies consistently show that regulatory reform created billions of dollars worth of consumer benefits. Consumers gained substantially—not just because of rate reductions, but also because of improvements in the quality of service. All broad consumer groups shared in the price reductions, though some benefited more than others.

Policy implication: *Competition is desirable.*

Policymakers concerned about consumers should open electric service to competition, deregulate rates, and promote consumer choice as quickly as possible.

- **Finding: Deregulation and customer choice align service quality with customer desires.**

The only declines in service quality attributable to deregulation or regulatory reform occurred when regulation previously limited customer choice, forcing customers to pay premium prices for gold-plated service. Crucial social goals like airline safety, reliability of gas service, and reliability of the telecommunications network were maintained or improved by deregulation and customer choice.

Policy implication: *Service quality is no excuse for delay.*

Concerns about reliability and other aspects of service quality are reasons to expedite regulatory reform. Under deregulation, service quality choices will enable consumers to select the services that best meet their needs.

- **Finding: Consumers have experienced genuine benefits, not just reallocation of costs among customer classes.**

Regulatory reform is not a zero sum game; it has generated genuine gains for consumers and society as a whole. It is possible to find narrowly defined groups of customers in special circumstances who paid somewhat higher prices after deregulation, but the gains to the vast majority of consumers far outweighed the effects on these small groups.

Consumers gained for two reasons. First, deregulation or regulatory reform aligned prices more closely with costs, leading to a more efficient use of resources by both firms and customers. Second, firms faced greater incentives to adopt cost-reducing or quality-enhancing innovations in technology, marketing, and business strategy, which often were not predicted beforehand.

Policy implication: ***Transition costs are no excuse for delay.***

Based on the experience in other industries, electricity regulatory reform should produce gains well in excess of the transition costs. Therefore, the presence of transition costs is no excuse for delaying or avoiding reform.

- **Finding: The lower the barriers to customer choice, the greater benefits customers receive.**

Rates fell faster in parts of the market where regulators permitted greater customer choice. In telecommunications, for example, long-distance rates fell faster in the interstate market than the intrastate market, because state regulators have been less tolerant of competition and price cutting. Similarly in the airline industry, during the 1970s proponents made a powerful case for deregulation by showing that tickets were less expensive on the less heavily regulated intrastate routes of Texas and California.

Policy implication: ***Choice for* all *customers for all competitive services will provide the most benefits.***

The best way to let all customers reap the benefits of competitive electric service is to let all customers choose their electricity suppliers. Policy proposals that deregulate only the wholesale electricity market, or allow only large customers to choose their suppliers, are thus inferior from a consumer perspective. For similar reasons, states that refuse to allow competition from out-of-state suppliers do their own citizens a disservice.

- **Finding: Competitive markets continue to evolve in response to consumer needs.**

Although prices fell noticeably in response to deregulation, adjustment to the new, deregulated environment was far from immediate for incumbent firms. Regulation affects not just the structure of incentives facing a firm, but also its corporate culture—the shared assumptions about what types of activities generate business success. Regulation can change relatively quickly, but corporate culture often changes slowly, and so corporate strategies may also adjust slowly to the deregulated environment. For the five industries in this study, significant changes and adjustments are occurring even after 10 years. Benefits of regulatory reform continued to accrue long after the market was first opened.

Even if some firms adjust quickly to the deregulated environment, that environment changes much more quickly than the regulated environment. The industries in this study did not move from a "monopoly equilibrium" to a new "competitive equilibrium." Rather, they moved from a fairly stable regulated environment to an evolutionary environment in which competitive rivalry continually forces producers to improve their performance. Since it is unlikely that firms will ever stop learning, and consumers are never satisfied with the status quo, a stable equilibrium is extremely unlikely.

The five industries in this study present a plethora of examples of innovations that were not foreseen or planned beforehand. These include natural gas hubs, airline hub-and-spoke

systems, and a multitude of types of new services and customer-premises equipment in telecommunications. Such developments should give pause to anyone who claims to be able to predict either the likely or the optimal market structure.

Policy implication: ***Open and competitive markets should be allowed to evolve.***

Legislators and regulators should resist the temptation to elaborately plan either the structure of markets or the transition process. The temptation to overplan takes many forms, including mandates that power must be bought and sold through a central "POOLCO" and proposals that would restrict the range of contracts that generators can make with customers.

In any move toward greater reliance on markets, transition problems must be addressed. But the significant ones where government must play a role, such as those dealing with transition costs, involve the assignment or reassignment of property rights to various market participants. The proper role of policy is not to "design market mechanisms" but to create and protect a framework of property rights that allows market institutions to evolve on their own.

Introduction

As the policy debate over customer choice in electricity unfolds, both sides cite the results of deregulation in other industries to bolster their claims. The heat of legislative and regulatory battles often encourages selective citation of statistics, and the electricity debate is no exception.

To encourage more informed discourse, this study reviews data and academic literature analyzing changes in prices, quantity, and quality of service in five industries that were fully or partially deregulated during the 1980s: natural gas, telecommunications, airlines, railroads, and trucking. In most of these industries, regulation had blocked or delayed entry of new competitors on a variety of "public interest" grounds. In some cases, such as trucking and airlines, regulators required that the potential entrant demonstrate that its proposed service was not available from incumbents. It was not sufficient that the entry would improve service quality or lower rates. Indeed, regulators often viewed lower rates as undesirable since lower rates reduced the source of cross-subsidies for the regulators' favored customers or services. In other industries, such as telecommunications and natural gas pipelines, regulators often implicitly acceded to the view that the regulated firm was a natural monopoly and that entry would only reduce market efficiency if it were possible at all. Without this entry, however, there was little pressure for low-cost production, service-quality improvements, or rate reductions.

In addition, the regulatory mechanism itself typically increased the cost of service and stunted innovation. Cost-based regulation severely dulled the incentive for efficiency improvements because the regulated firm would be denied a large share of the benefits of such improvements. For this reason, modern regulators typically attempt to find "incentive-compatible" forms of regulation that reward firms for improving efficiency.

Given these sources of inefficiency under regulation, we would expect deregulation to improve economic wellbeing in a number of different ways:

- A reduction of regulatory costs, which reduces the burden borne by both customers of the regulated industry and taxpayers
- A closer alignment of prices to costs, eliminating a variety of cross-subsidies created by regulators in response to political pressure
- Improved producer efficiency through the entry of new, competitive service providers and the elimination of cost-based regulatory mechanisms
- The introduction of new services and pricing plans

In virtually every case, the economic benefits from deregulation or regulatory reform have exceeded economists' predictions. (Winston 1993). The record shows that deregulation has generally led to lower prices, expanded output, and improved choices of service quality. These improvements have occurred for two reasons. First, deregulation has let market participants allocate scarce resources to more highly valued uses; this is the traditional type of economic efficiency discussed in most textbooks. Second, and perhaps more importantly, deregulation has unleashed entrepreneurial creativity and innovation. New products, new services, improved business organization, and lower costs emerged wherever deregulation offered an opportunity to profit from innovation.

While each of the five industries in this study is unique in some ways, they all share significant economic similarities with electricity, as Figure I-1 shows. In each of these industries, a supplier delivers a product or service that requires use of a network infrastructure. The relevant infrastructure usually involves large economies of scale and substantial sunk costs. In some cases, government owns parts of this infrastructure (airlines, trucking); in other cases, it is privately owned (gas, telecommunications, railroads). Currently, most observers agree that the "production" stage in all of these industries can support many competitors, and hence price and entry regulation are inappropriate. The real controversies focus on access to, and pricing of, the transmission and distribution infrastructure.

Figure I-1: A Comparison of Network Industries

	"Production"	Transmission	Distribution
Electricity	Generating plants	High-voltage lines	Local power lines
Gas	Gas wells	Interstate pipelines	Local distribution companies
Telecom	Telecom terminal equipment	Long-distance cos. and local telcos	Local telcos
Airlines	Aircraft	Air traffic control	Airports
Trucking	Trucks	Highways	Local streets
Railroads	Trains	Trunk lines	Local sidings

Given the history of natural gas, telecommunications, airline, railroad, and trucking regulation, is it reasonable to expect that customer choice in electricity could generate consumer benefits? The experience of all of these industries suggests that the answer is a resounding "Yes." At various times, all of these industries experienced wide-open competition, followed by some initial regulation, followed by additional layers of regulation to plug gaps in the previous regulation. By the 1970s, the distortions created by regulation had become so onerous that momentum built for at least partial deregulation. Figure I-2 shows when deregulation of production and open access occurred in each industry.

Figure I-2: Network Industry Regulatory Reform

	Deregulation of production	Open access
Gas	Begun in 1978, completed 1993	Begun in mid-1980s
Telecom	Begun in 1970s	Begun in 1970s
Airlines	1978	Publicly owned infrastructure
Trucking	1980	Publicly owned infrastructure
Railroads	1976-80	Long-standing federal authority

By the mid-1980s, all of these industries saw dramatic regulatory reforms that largely deregulated production and promised some measure of open access to bottleneck facilities. In each case, service providers found themselves subject to enhanced competition. And in each case, customer choice lowered prices, expanded output, and led to quality levels that better reflected consumer desires. Recent state commission inquiries into retail customer choice and bills introduced by Reps. Dan Schaefer (R-CO) and Tom DeLay (R-TX) are now propelling the electric industry in the same direction.

Natural Gas

The natural gas industry includes competitive producers who transport their product through a network of pipes owned both by interstate gas transmission companies and by local gas distribution companies. Pipelines, like electric grids, are similar to a tub that various parties alternately fill and draw from. A gas shipper is like a person who pours an agreed-upon amount of water into the tub at one end. The buyer draws the agreed-upon amount out at the other end, but the buyer does not necessarily receive the same molecules deposited by the shipper. The modern gas market involves bilateral contracts between buyers and sellers, yet molecules of gas withdrawn by the buyer need not be the same molecules placed in the pipeline by the seller.

Major regulatory reforms

The contemporary structure of the gas industry traces its history back to regulation-induced shortages of natural gas created during the 1960s and 1970s. The *Phillips* decision in 1954 gave the Federal Power Commission the job of regulating the wellhead price of gas sold in interstate commerce. Subsequent empirical economic analysis demonstrated that the gas producers possessed no monopoly power, and even the federal courts agreed (MacAvoy 1962, Hubbard and Weiner 1991). The political issue was not monopoly, but "fairness." Wellhead price regulation was an explicit attempt to transfer profits from gas producers to gas consumers (Kitch 1968). Predictably, price controls eventually created shortages. During the late 1960s, the shortage first took the form of declining additions to interstate gas reserves. By the 1970s, the reserve shortage turned into a production shortage, as producers failed to supply as much gas as customers were willing to buy at the regulated price (MacAvoy 1971, MacAvoy and Pindyck 1975, Breyer and MacAvoy 1974).

Congress responded to the gas shortage with the Natural Gas Policy Act of 1978. The legislation established a timetable for deregulating the wellhead price of most natural gas. By 1985, when all gas discovered after 1976 was freed from federal price regulations, gas prices began a steep plunge.

In the new era of cheap natural gas, producers and pipelines found themselves holding long-term contracts at prices well above free-market levels. Customers at the end of the pipeline sought freedom to contract directly with producers for less expensive gas supplies, but they still needed access to pipelines to transport the gas. Starting in 1985, the Federal Energy Regulatory Commission (FERC) cleared the way for competitive gas markets with a series of decisions (Orders 436, 500, and 636) that transformed pipelines from gas merchants into "open access" transporters of gas owned by others.

FERC issued its final open-access order, Order 636, in 1992. As of this writing, the interstate gas transmission industry is characterized by deregulated supply prices, open access, and customer choice. On the federal level, interstate pipelines are still regulated according to traditional cost-of-service principles, though FERC has proposed an experimental program to relax this regulation for certain types of transactions. FERC has also invited pipelines to propose "incentive-rate" plans that would expose pipelines to more risk while permitting them to earn higher returns if they make efficient decisions.

On the state level, local gas distribution companies are regulated in a variety of ways, depending on the state. More than a dozen local utilities have proposed or implemented plans that let residential customers choose their own gas suppliers.

Price effects

Instead of freeing all gas prices simultaneously, the Natural Gas Policy Act of 1978 deregulated different classes of gas at different times, depending on when the gas was discovered. This legislation initially sent gas prices spiraling upward for three reasons. First, the oil price shock associated with the Iranian revolution pushed up fuel prices generally. Partially freed from price controls, gas prices rose along with oil prices. Second, federal ceilings had held the price of gas well below its actual value to consumers.[3] Finally, after the curtailments of the 1970s, pipelines felt pressure from regulators and legislators to lock up long-term gas supplies almost regardless of cost. They competed intensely for the small, high-cost, deregulated supplies.

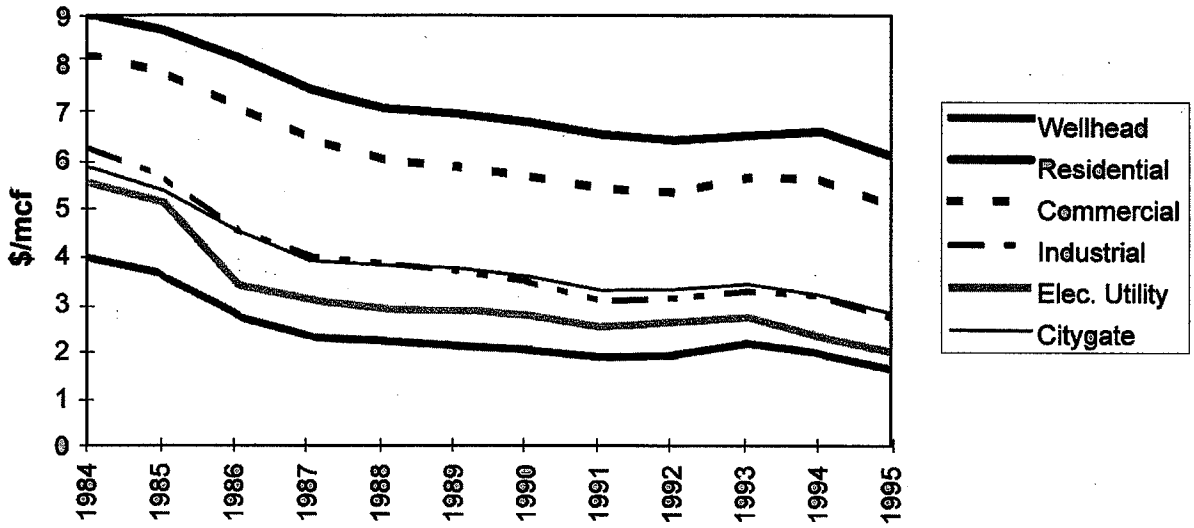
Critics of deregulation predicted that gas prices would "fly up" once the last controls on recently discovered gas were lifted in 1985. These predictions were based largely on the fact that regulation held gas prices well below the price of oil yielding an equivalent amount of heat (Cooper 1982, 372). In fact, gas prices subsequently plunged.

As more and more new gas became deregulated, producers of low-cost deregulated gas received greater incentives to expand production. Low-cost deregulated gas began to capture markets from high-cost deregulated gas. In addition, contrary to many experts' predictions, oil prices crashed in the mid-1980s, taking gas prices with them.

Figure G-1 demonstrates that gas prices declined markedly after the price of new gas was fully deregulated in 1985. Adjusted for inflation, wellhead prices fell by 60 percent between 1984 and 1995. Prices paid by all classes of customers quickly followed. Prices paid by local utilities for gas at the "city gate" dropped by 52 percent. Residential and commercial customers saw their gas prices drop by 32 and 38 percent, respectively. Industrial and electric utility customers both saw their gas costs fall by about 60 percent.

[3] In contrast to today's electricity market, where often regulation holds prices *above* competitive market levels.

Figure G-1: Natural Gas Prices, 1984-95 ($1995)



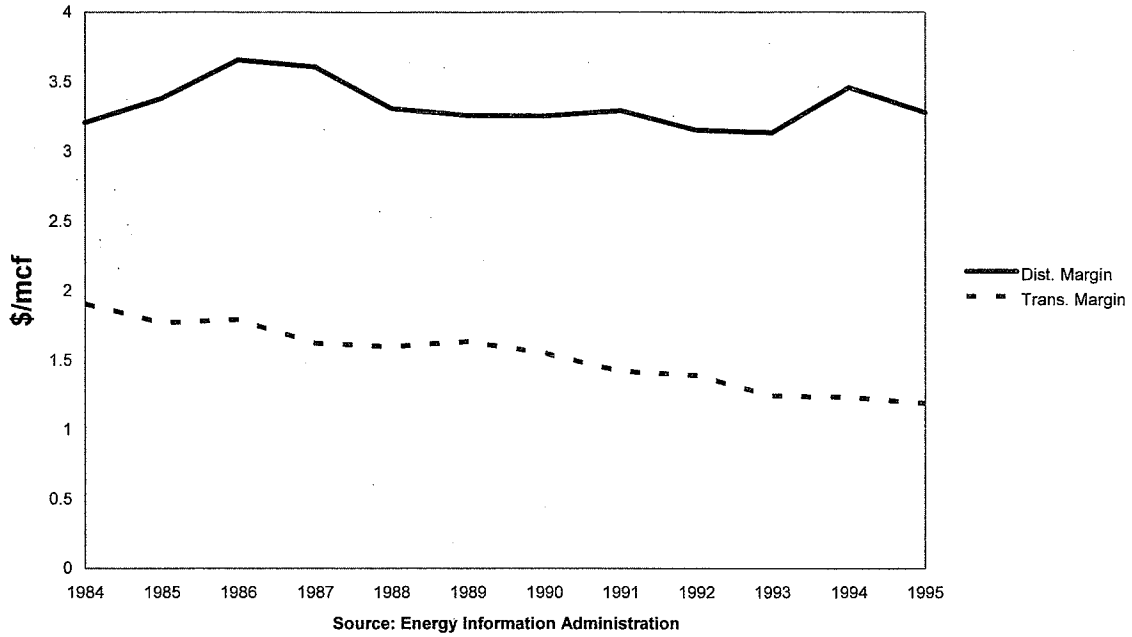
Source: See Appendix for data.

Industrial and electric utilities experienced larger percentage decreases in delivered prices, but not because they got a much better deal on the gas itself. The delivered price of gas includes the cost of transportation, which differs significantly across customer classes. Residential customers typically pay a premium for "firm" transportation. That means they pay higher transportation rates in order to be first in line to use the pipeline on cold winter nights. Industrial and electric utility customers, on the other hand, typically buy "interruptible" transportation, which costs less because service might be interrupted. The cost of the gas itself represents about 28 percent of the residential gas bill, whereas it accounts for 60-75 percent of industrial and electric utility gas bills. Simple mathematics then dictate that any reduction in the wellhead price of gas resulted in a smaller *percentage* decrease in the delivered price to residential consumers (General Accounting Office 1993, 109). It is also worth noting that electric utility and industrial customers could choose their own gas suppliers, while regulation held most smaller customers captive to the local utility.

More detailed analysis suggests that regulatory reform also reduced the cost of interstate pipeline transportation. Figure G-2 illustrates this point by charting changes in the distribution and transportation margins. The "distribution margin" is the difference between the citygate price and the residential retail price. The "transportation margin" is the difference between the wellhead price and the price paid by local distribution companies at the city gate. Transportation margins fell in the wake of regulatory reform, declining by 37 percent in the 10 years following 1984. Distribution margins fluctuated between $3.10 and $3.60. This fact suggests that open access has placed strong pressures on interstate pipelines to reduce their costs and pass the savings through to their customers. Local distribution companies, which are still regulated and

largely protected from competition by state regulatory commissions, have faced less pressure to cut costs and rates.

Figure G-2: Transportation and Distribution Margins ($1995)



Source: Energy Information Administration

See Appendix for data

Surprisingly, there is a paucity of economic studies that tries to separate the effect of regulatory reform from other factors influencing gas prices between 1984 and 1994. However, a series of statistical analyses focuses indirectly on the contribution that open access made toward reducing consumers' gas bills. Open access saved pipeline customers money on gas to the extent that it allowed them to substitute low-cost gas for the high-cost gas offered by the interstate pipeline under existing contracts. Several studies analyze the effectiveness of open access by correlating gas prices in field, pooling area, and citygate markets around the country. If all gas prices move together, that is a sign that it is easy to substitute one gas supply for another, and therefore a wide array of consumers can reap the benefits of lower wellhead gas prices.

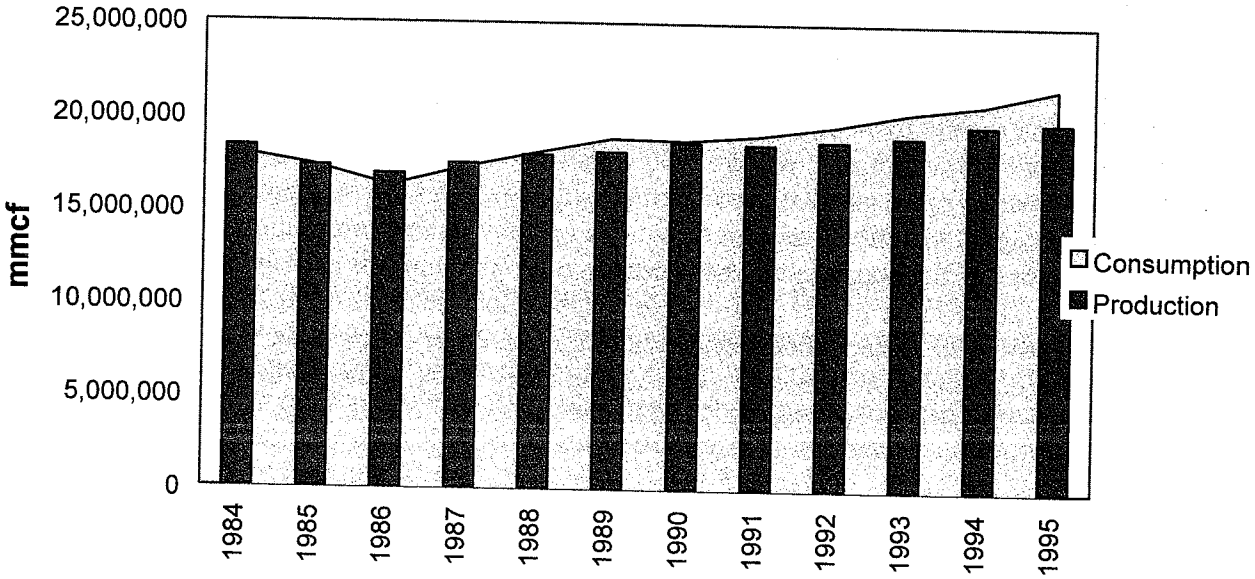
Most major pipelines became open access transporters by 1987. Gas prices in the nation's five major producing regions, which previously moved independently of each other, began to move in concert during that year. (DeVany and Walls 1994). By 1990, natural gas prices at different locations all across the country moved virtually in lockstep (DeVany 1996, 213-17). In fact, "Points served by one pipeline exhibit price behavior that is no different from points served by many pipelines" (DeVany and Walls 1994, 755). Thus, open access gave many customers access to low-cost gas almost immediately, depending on their location and the pipelines serving them. Customers benefited more rapidly the sooner the pipelines serving them

moved to open access. Within three years, customers in all regions were reaping the benefits of regulatory reform.

Output effects

During the 1970s, the regulation-induced shortage of natural gas convinced many commentators that the United States was permanently "running out" of gas. In reality, once price controls were removed, both consumption and production quickly responded to market incentives. As Figure G-3 shows, consumption rose by 21 percent between 1984 and 1995, reflecting a variety of new industrial uses and a significant expansion in gas purchases by electric utilities. Perhaps most important to the average person, families buying new homes actually have the option of choosing natural gas heat—an option that was unheard of during the 1970s, when many state public utility commissions imposed moratoriums on new gas installations.

Figure G-3: U.S. Gas Consumption and Production



Source: See Appendix for data.

Quality and reliability effects

Traditional economic regulation is often defended on the grounds that it ensures reliable service. In reality, regulation contributed mightily to declines in gas service quality. As new gas reserves were discovered in the 1960s, producers dedicated them to intrastate markets, where prices were not regulated. Interstate customers may have received lower gas prices, but they effectively received less secure service as the reserves dedicated to serving them shrank. The

costs associated with reduced service quality actually outweighed the value of the income redistributed to consumers as a result of the lower regulated prices (Breyer and MacAvoy 1974).

The costs of regulation were more than just theoretical calculations. During the cold winters of 1971-72 and 1976-77, factories and schools in the East and Midwest closed because there was simply not enough gas available at regulated prices to serve all customers. Although household consumers generally retained gas service, many of them were laid off from work as lower priority industrial customers had their service curtailed.

Wellhead price deregulation and the accompanying reforms substantially enhanced service reliability by ending large-scale service curtailments. Since the mid-1980s, gas shortages have been virtually nonexistent, and no shortages have occurred because of price ceilings. Where shortages have occurred, they have resulted either from extremely cold weather (which would tax any pipeline system) or shortages of pipeline capacity created by remaining federal or state regulation.[4]

Some observers feared that open access would lead to less-reliable gas service, either because decentralized contracting would make it harder for pipelines to manage transportation efficiently or because nonpipeline merchants would be less able to honor their contractual obligations to deliver gas. Such fears have proven unfounded.

The most significant test of service reliability in the open access era occurred during the winter of 1995-96. Gas-consuming regions of the country experienced unseasonably cold temperatures and unusually heavy snowfall. Gas-producing regions also experienced temperatures well below normal. Severe cold weather in late January followed three cold months during which more gas than usual had already been withdrawn from storage. As might be expected, some interruptible customers lost gas supplies or transportation rights for a time. A minuscule number of firm customers lost access to their gas supplies or primary firm transportation. These latter losses of service occurred either because of weather-related problems that would have happened regardless of the regulatory regime, or because of miscellaneous contractual problems that can be prevented in the future without eliminating customer choice (American Gas Assoc. 1996).

[4] California, for example, experienced several gas service curtailments during the mid-1980s because there was not enough interstate pipeline capacity serving the state. At the same time, California's utility commission and its largest utilities were fighting the proposed construction of new FERC-regulated pipelines to serve the state (Ellig 1995).

Innovation

Regulatory reform promoted several types of innovations in the natural gas market. Two of the most prominent are market hubs and new financial instruments for managing risk.

Market hubs

Prior to the 1980s, the natural gas market was balkanized. Transmission pipelines linked particular producing basins with particular consuming areas. A chain of long-term contracts ultimately linked particular producers with particular customers (DeVany and Walls 1994, 78-79). The price a customer paid for gas from an interstate pipeline depended on that particular pipeline's weighted average cost of gas.

Wellhead deregulation and open access set in motion a process that gave all customers access to a vastly larger number of suppliers. Customers freed to shop among many gas producers naturally sought out the suppliers who offered the best combination of price and service. To give shippers access to a wider array of receipt and delivery points, interstate pipelines began interlinking at strategic geographical points, called "market hubs." Because of market hubs, a gas buyer in Chicago is now physically connected to a larger number of potential suppliers, and a producer in Texas is physically connected to a larger number of potential customers. This flexibility allows gas flows and prices nationwide to adapt quickly to new circumstances, such as increased demand in a particular place or a new supply in a particular field. Such adaptation increases competitive pressures on suppliers and enhances reliability.

Risk management

Another source of innovation in the gas industry lies in financial management techniques that allow parties to manage risk better. Gas consumers, producers, merchants, and transporters all face unpredictable risks, because gas prices depend on both the weather and uncontrollable events in world energy markets. These risks increase costs of exploration, production, installation of fuel-switching capabilities in new factories, and construction of new gas-fired electric plants.

During the 1960s and 1970s, the industry dealt with risk through long-term contracts. Interstate pipelines signed long-term contracts with producers, and local gas utilities signed similar contracts with the interstate pipelines. Since the utilities have statutory monopolies and could pass on all prudently incurred costs, a great deal of risk was ultimately borne by the utilities' customers.

Today, those who do not wish to shoulder these risks can purchase "insurance" through natural gas futures, options, swaps, and various types of privately negotiated contracts. Residential customers, of course, do not yet buy such insurance, in part because state utility commissions have not yet introduced retail open access on a large scale. As a result, ratepayers still bear much of the risk associated with changing gas prices. Even under open access, few homeowners will likely play the futures market. Instead, as in the heating oil market today, gas marketers will hedge their risks with sophisticated financial instruments, which will then let them offer price guarantees to residential customers.

The gas market's financial innovations could not occur until wellhead deregulation and open access created a national market for natural gas. During the late 1980s, market participants first responded by crafting contracts that shifted risks in mutually beneficial ways. In 1990, the New York Mercantile Exchange introduced its natural gas futures contract, and options trading began in 1992. These financial instruments reduce the risk associated with various types of capital investments, thus reducing capital costs and making a greater amount of investment possible (Abbott 1996).

Lessons for electricity

Deregulation cut costs, enhanced quality

Regulatory reform in natural gas transformed a balkanized market with government-set prices into a national market with competitive prices. Contrary to critics' predictions, gas prices declined after wellhead deregulation. In addition, market pricing increased service quality by removing the threat of artificially created shortages. These benefits occurred not because regulatory reform shifted costs but because it created pressures to reduce costs.

Transition costs are easily overstated

"Stranded costs" are currently an important issue in electricity. Therefore, it might be useful to analyze how natural gas regulatory reform coped with a similar problem. During the 1980s, interstate pipelines had to resolve outstanding contractual obligations to buy gas at above-market prices. During the 1990s, they had to deal with additional costs associated with Order 636, the order that finalized the regulatory framework for open access. Gas producers bore some of these costs by agreeing to renegotiate contracts; the remainder were borne by pipeline shareholders and by customers. The actual transition costs were far less than originally predicted. Based on data furnished by pipelines, FERC estimated transition costs of $44 billion; actual transition costs were $13.2 billion (INGAA 1966, 2).

It is worth noting, however, that most of these "transition costs" eventually would have been paid by customers even if regulation had not changed. For example, a significant portion of the transition costs involved pipeline buyouts of high-priced contracts for gas from producers. If regulatory reform had not given rise to the buyouts, the contracts would have remained in force, and the pipelines and their customers eventually would have had to purchase the high-priced gas. Therefore, the buyouts merely sped up payments that gas customers would have made anyway. By way of illustration, the U.S. General Accounting Office (GAO) estimates that of the $4.8 billion in "transition costs" pipelines attribute to Order 636, only $300 million represents new expenditures that pipelines would not eventually have made in the absence of the Order (GAO 1993, 63).

Similarly in electricity, many "stranded costs" are not new costs. Consumers are already paying above-market electric rates to pay for high-cost generating plants and uneconomical power contracts. They will continue to do so in the absence of regulatory reform. Thus, it is highly misleading to assume that customer choice in electricity will generate huge new costs, on top of what customers already pay. Even if utilities receive full recovery of "stranded costs," consumers will bear no new costs as a result of regulatory reform.

There are big benefits net of transition costs

Though Order 636 has been in place for only a short time, analyses show that the gains to consumers from previous regulatory reform far outweighed the transition costs. Figure G-2 shows that transmission margins have declined since 1984 in spite of the transition costs. Figure G-1 shows that these cost reductions were passed through to consumers in the form of lower delivered prices. In 1995, the gas industry's total revenues were $38 billion less (in $1995) than in 1984, even though gas consumption rose by 20 percent (DOE 1996). Clearly, the benefits of regulatory reform to consumers outweighed the transition costs—most of which were already in the regulated rates.

We expect a similar scenario to unfold in the electricity industry. If utilities receive full recovery of "stranded costs," consumers will at worst pay no more than they would have paid in the absence of deregulation. Even under full stranded cost recovery, regulatory reform will likely generate incentives to lower costs, improve productivity, and develop new services; consumers will thus be better off than if policymakers do nothing. Of course, if utilities receive less than full recovery of "stranded costs," then consumers' electric bills will be concomitantly lower. For this reason, consumers have a significant stake in policies that mitigate "stranded costs."

Telecommunications

Like the electric industry, telecommunications involves the transmission of electrons over wires. Real-time telecommunications services, like electric current, cannot easily be stored for later use; they must be produced and consumed simultaneously.[5] Local telephone companies are also economically similar to local electric companies. For most of this century, local phone companies enjoyed statutory monopolies on local, wired phone service. In addition, homeowners and many small businesses use the local phone lines to "ship" long-distance calls to their long-distance carriers. Like the gas industry, the long-distance telecommunications industry uses a form of bilateral contracting. Each phone subscriber chooses a primary long-distance company, and the subscriber can even bypass his primary long-distance carrier by dialing a few more digits.

The 1934 Communications Act established the Federal Communications Commission (FCC) as the federal regulator of telephone service, telegraph service, broadcasting, and the electromagnetic spectrum. The states share the responsibility for regulating the telephone industry, controlling the rate structure for local telephone service and intrastate long-distance service. Between the two world wars, federal and state regulators allowed and even encouraged the development of an integrated, national monopoly telephone service, dominated by AT&T and several smaller independent telephone companies, such as GTE, Continental, Rochester, and United. Telephone subscribers throughout the country had one franchised local monopoly provider, either an AT&T operating company or an independent, and one supplier of long-distance service, AT&T. The dominant position of AT&T was partly the result of numerous acquisitions of smaller independent telephone companies in the interwar period.

Major regulatory reforms

By 1938, the FCC began to worry about AT&T's ownership of its own equipment-supply company, Western Electric. The U.S. Justice Department, however, waited until 1949 to file a Sherman Act suit against AT&T, seeking the separation of AT&T's manufacturing and operating companies. The suit was settled without divestiture in 1956, leaving AT&T's domestic position untouched.

Deregulation of the telephone industry began quite gradually. In 1959, the FCC decided to allow private companies to build their own microwave networks, but they could not share their communications capacity with others. In 1963, Microwave Communications Inc. (MCI) sought the first authorization to become a common carrier and compete with AT&T in the provision of dedicated "private-line" long-distance services to small and medium-size businesses. This authority was finally granted in 1969, and in 1971 the FCC moved to open this market to all applicants. However, the FCC did not authorize entry into ordinary (switched) long-distance service, by which the subscriber may dial any number in the national or international network, nor did it deregulate the private-line services.

Entry into the ordinary interstate long-distance services market occurred clandestinely as MCI simply began to offer this service to businesses in 1974 without FCC authorization. The FCC tried to stop MCI from this adventure but lost in the federal courts. Long distance service

[5] E-mail and video, of course, do not have this characteristic.

was now open to competition. Local telephone service was not generally opened to competition until 1996, however; therefore, the new long-distance competitors were forced to originate and terminate their calls over essentially monopoly local networks throughout the 1970s and 1980s. Federal and state regulators controlled these connection rates, or "access charges," and regulated intrastate and interstate long-distance rates.

At the state level, virtually all carrier rates have been subject to some regulatory scrutiny.[6] For the most part, such regulation has not been designed to ensure that rates for individual services are set at estimated carrier costs. Indeed, rates have typically been approved without any attempt to measure individual service costs. Rather, regulators generally allow the carriers to satisfy their "revenue requirement" while providing below-cost services to favored groups and paying for the resulting deficiency through rates that are far above costs for other services. Because the political demand for such subsidies varies substantially across states, the local companies' rate structures also vary substantially.

Responding to complaints that the vertically integrated AT&T was using its local monopoly bottlenecks to frustrate competition in long-distance service and in the sale of telephone terminal equipment,[7] in late 1974 the Justice Department once again sued AT&T for violating the Sherman Act. This time it was successful, inducing AT&T in 1982 to enter a consent decree that required it to divest all of its local operating companies on January 1, 1984. The seven divested regional Bell operating companies (RBOCs) were barred by the AT&T decree from providing information services, from manufacturing telecommunications equipment, and from offering long-distance service between the nation's 161 local access and transport areas (LATAs). These "line-of-business" restrictions were to remain in place until these companies faced meaningful local competition so as to eliminate the possibility that they would continue to abuse their monopoly bottleneck positions.[8]

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[6]Prior to the passage of the recent 1996 Telecommunications Act, only Nebraska had "deregulated" telephone rates. However, even Nebraska retained the right to review excessive rate increases, and its carriers were forced to maintain geographic averaging of rates.

[7]Terminal equipment or "customer premises equipment" comprises telephone handsets, key telephones, modems, answering machines, fax machines, etc.

[8]The restriction on information services was removed as the result of a court appeal in 1991. The other restrictions are now scheduled to disappear once the carriers have satisfied the requirements of the new 1996 Telecommunications Act.

Equipment market deregulation

In the interim, the FCC opened the market for terminal equipment to competition against strong protests and even a legal challenge from state commissions. Prior to 1970, virtually all such equipment—principally telephone handsets and key telephones at the time—was provided by the local telephone monopolist. Now the Commission was opening this market so that the consumer could choose his or her own equipment, and subsequently, it deregulated the rates paid for such equipment. However, the FCC and the states continued to regulate interstate and intrastate rates long after the 1984 divestiture.

Interstate rate regulation

The AT&T divestiture that was carried out in 1984 exposed the distortions in the telephone rate structure. Prior to that time, the revenues from long-distance services were typically shared between AT&T's long-distance and local-operating divisions through a "settlements" process that concealed the enormous subsidies flowing from long-distance services to local operations. Beginning in 1984, AT&T had to pay these now-independent operating companies "access charges" for originating and terminating their calls. These access charges were initially more than 17 cents per minute in 1984, far above the cost of handling the call, so that the local carriers could continue to defray a large share of their costs of local operations from long-distance services. The FCC was clearly aware that these cross-subsidies were very costly to consumers because they over-priced the services with the highest price elasticities of demand—long-distance services—while depressing rates for services with lower price elasticities of demand—local dial-tone services, and it was concerned that these over-priced local connections would induce long-distance carriers to "bypass" the local telephone companies by seeking other types of connections to their customers.

As a result, the FCC began almost immediately after the divestiture to shift the revenue base of the local companies from (long-distance) carrier access charges to fixed monthly rates by attempting to phase in a fixed "subscriber line charge" that would eventually rise to $6 per month. Unfortunately, political pressures induced the FCC subsequently to lower the target to $3.50 per month for residential subscribers, but the multiline business charge remained at a maximum of $6 per month.[9] Even this lower fixed charge, however, allowed the carrier access rates to fall from 17 cents per conversation minute to about 6 cents today. Nevertheless, these access rates are still far above the costs of originating or terminating a call at the local carriers' local offices, costs that are generally estimated to be between 0.2 and 0.5 cent per minute at each end.

[9] This charge is less than $6 per month in many states because it is capped by an arcane formula involving the divisions of "non-traffic-sensitive costs" between the federal and intrastate jurisdictions. In practice, many businesses avoid this charge through the use of dedicated access lines that are not charged the $6 fee.

Intrastate rate regulation

The state commissions have been very slow to follow the FCC in rebalancing rates. Indeed, rates in most states are still woefully distorted even as competitive entry is being mandated under the 1996 Telecommunications Act. Monthly residential dial-tone rates typically decline with increases in loop length[10] and remain far below business rates. Although there is controversy over the appropriate measure of long-run incremental cost of dial-tone service, the monthly rates for residential subscribers in the less densely-populated areas in most states are surely considerably below long-run incremental cost. (Crandall and Waverman, 1996). Intrastate long-distance rates and carrier access rates are generally higher than interstate rates. And the rates for enhanced, central-office services, such as call waiting or messaging, have been set far above the incremental cost of service. Finally, rates vary enormously across states for similar services even though costs do not because all large local-exchange companies generally employ virtually the same technology.

Recent regulatory reforms

In the late 1980s, the FCC and the states began to experiment with various forms of regulatory "reform." At the federal level, this reform took the form of rate caps. In 1989, the FCC shifted from cost-based regulation to rate caps in its regulation of AT&T as a "dominant" long-distance carrier. Over the next six years, the FCC selectively exempted various AT&T services from regulation and in 1995 finally deregulated all AT&T domestic services. However, AT&T and its rivals must still file tariffs that are allowed to go into effect within one day. The FCC still regulates all local companies' interstate access charges under a rate cap that was established in 1990. This rate cap has been revised to reflect greater productivity growth, but all local companies' access rates remain subject to regulation.

In several states, regulatory reform also began in the late 1980s. Some services were deregulated, but basic local service and intrastate long-distance service continue to be regulated in virtually every state.[11] In a number of states, cost-based regulation was adjusted to allow for revenue sharing so that a carrier would have some incentive to pursue cost minimization.[12] A few others substituted rate caps for rate-of-return regulation, although generally with some revenue sharing.[13] In still others, the local carriers were given some flexibility in adjusting

[10]The distance from the carrier's end office and the subscriber's residence or business is referred to as the "loop length."

[11]Nebraska has deregulated most services, but it can subject controversial rate changes to scrutiny if there is a political demand for such action.

[12]"Revenue sharing" permits a regulated carrier to share in the returns that exceed or fall short of its allowed rate of return. This mechanism is supposed to induce greater attention to cost minimization and service growth than can be achieved through rate-of-return regulation that limits the carrier to a maximum allowed rate of return on capital.

[13]Rate caps limit a carrier's annual rate increases to a measure of economywide inflation less a productivity offset to account for the above-average rate of technological change in telecommunications. This mechanism is designed to decouple costs and rates so that carriers have maximum incentives to minimize costs and no incentive to shift accounting costs between regulated and unregulated sectors in a predatory fashion.

intrastate long-distance rates, but no state allowed full competition with equal-access (1+ dialing) for intraLATA (within the LATAs set up by the AT&T consent decree) intrastate long-distance. As result, intraLATA rates did not come down as rapidly as interLATA (between LATA) rates did.

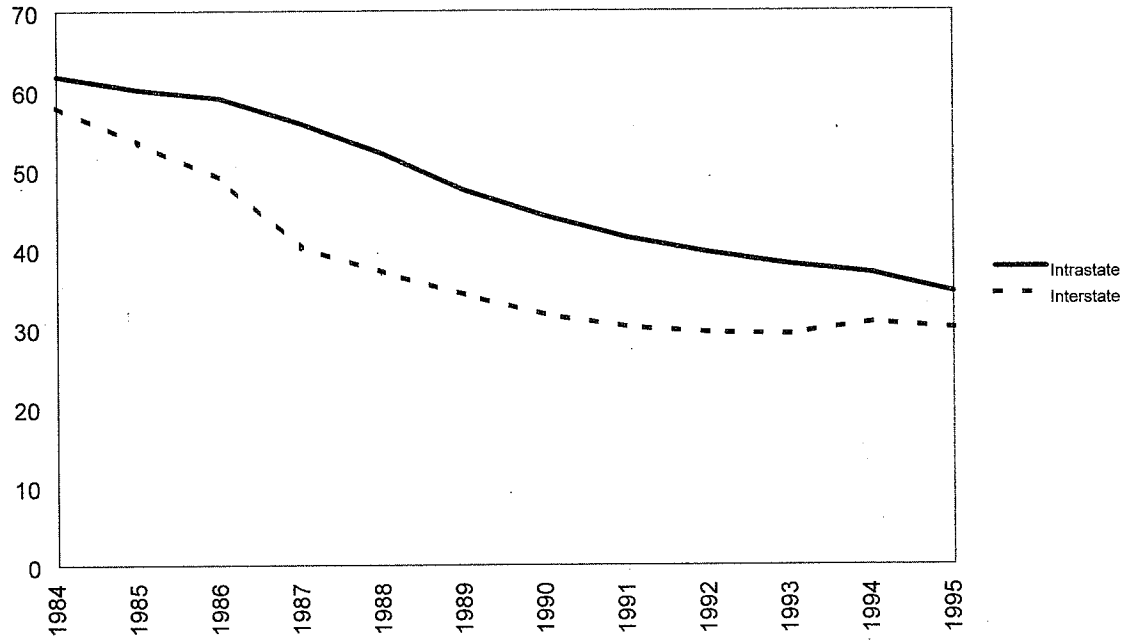
Price effects

The opening of the terminal equipment and interstate long-distance markets to entry has had salutary effects on prices, although the failure of the FCC to deregulate AT&T's long-distance operations until 1995, more than 20 years after the entry of MCI, has surely attenuated the downward pressure on long-distance rates. The deregulation of AT&T's long-distance service in 1995 is too recent to allow us to measure the impact of full deregulation of interstate long-distance rates.

Telephone rates

The effect of entry liberalization on interstate long-distance rates has been open to different interpretations, but the evidence seems to show that the market has become more competitive. As Figure T-1 shows, the official Consumer Price Index for interstate long-distance rates has indeed declined—and at a faster rate than has the price index for intrastate service. The difference is due to the fact that only interLATA services have been opened to competition, while intraLATA services have not been liberalized by most states. The interstate index has fallen at a real rate of 6.0 percent per year since 1984, while the intrastate index has fallen at a real rate of 5.3 percent. Both indexes understate the true degree of decline because they fail to capture the full effect of discount pricing plans.

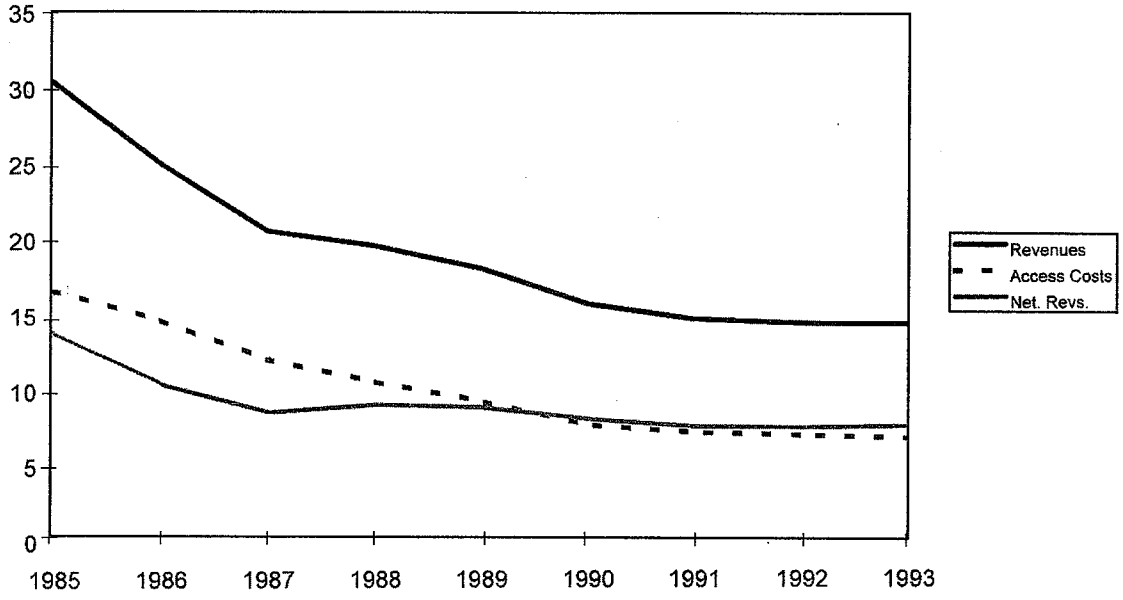
Figure T-1: Real Long-Distance Consumer Price Indexes ($1977)



Source: See Appendix for data.

The academic literature evidences some disagreement over the cause of the sharp declines in interstate service rates. Taylor and Taylor (1993) argue that the decline can be attributed to the FCC's decision to reduce access rates charged by local companies to long-distance companies. MacAvoy (1996) concludes that interstate rates have been held artificially high through tacit collusion that is facilitated by FCC regulation. But Crandall and Waverman (1996) show that despite the fact that access charges declined from 16.6 cents per conversation minute to about 6.7 cents between 1985 and 1993, there has been a real (inflation-adjusted) decline in interstate long-distance rates net of access charges. Revenues per minute fell from 30.4 cents to 14.2 cents during this same period. Therefore, rates net of access charges fell from 13.8 cents per minute to 7.5 cents, or at an annual rate of 7.6 percent (Figure T-2). Given that AT&T's profit margins from long-distance service actually rose during this period, this decline in rates must have been due to productivity improvements in the industry that have been stimulated in part by competition.

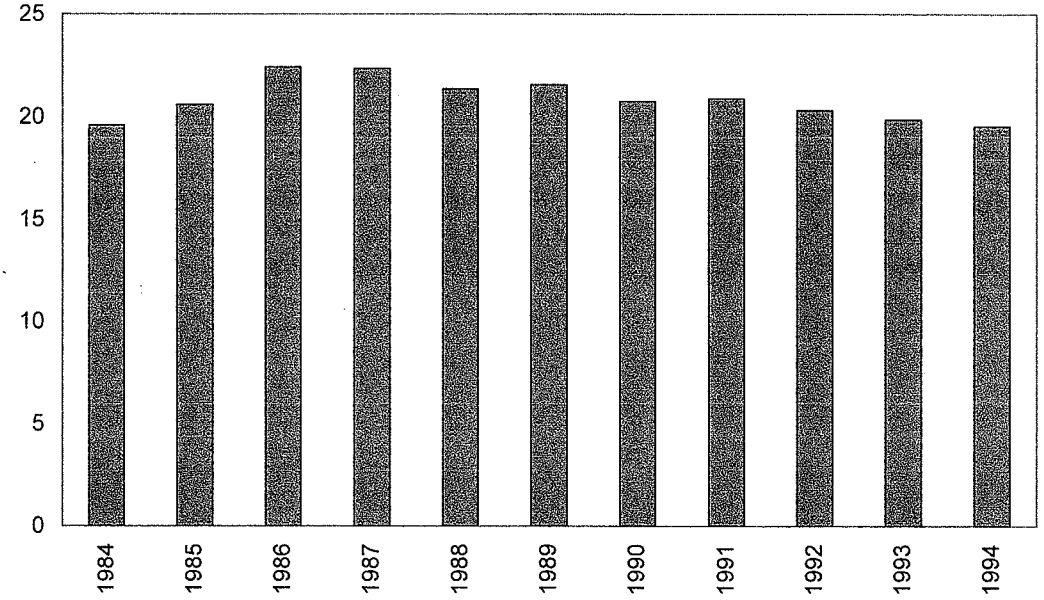
Figure T-2: Interstate Long-Distance Revenues and Access Costs Per Minute (cents, nominal)



Source: See Appendix for data.

Local telephone rates show a somewhat different pattern from long-distance rates, as Figure T-3 demonstrates. In the early 1980s, inflation-adjusted local rates rose by several dollars in response to the FCC's decision to reduce subsidies for local service. By 1994, productivity increases had pushed local telephone rates down to the point that they were almost identical to their level in 1984.

Figure T-3: Real Monthly Local Telephone Rates ($1995)



Source: See Appendix for data.

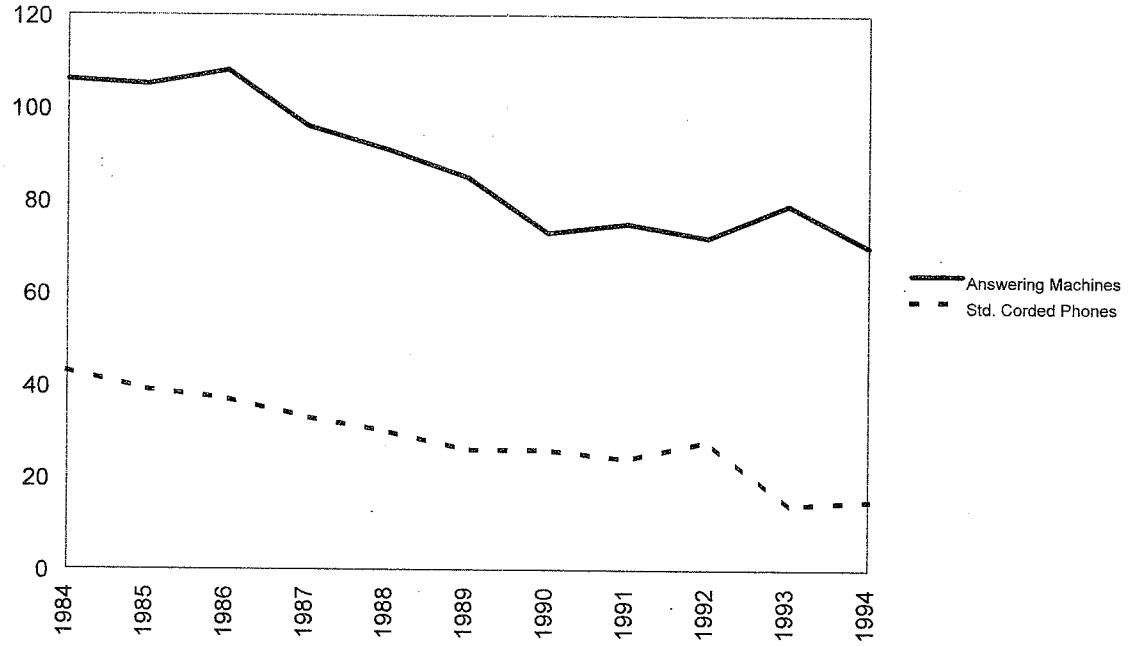
Despite these changes in rates, regulators have continued to keep long-distance rates artificially high through very high interstate and intrastate access charges. Local rates are still far from cost based, and the prices for enhanced services, such as call waiting or voice mail, are still far above costs. The 1996 Telecommunications Act will force regulators to address these distortions. The ultimate result will be much lower long-distance rates for all subscribers. Some residential subscribers, particularly those in rural areas, might face higher local rates, but lower long-distance rates will mitigate this effect. Because a large share of households, even poor households, use long-distance relatively intensively (Larson *et. al.* 1989), consumers will benefit enormously from this movement to cost-based prices. Consumers could gain as much as $45 billion per year from this change, and the gain to the entire economy could be as much as $30 billion per year (Crandall and Waverman 1996).

Equipment prices

Crandall (1991) shows that the prices of most terminal equipment began to fall in the 1970s, with some falling sharply before the FCC's decision to deregulate was finally affirmed by the courts in 1977. Prices for telephone handsets, key telephones, and PBXs declined at a real rate of 6 to 7 percent per year between 1972 and 1987 (Crandall 1991, 96). This decline moderated slightly between 1975 and 1977, according to AT&T data, while the FCC's decision to liberalize equipment was being challenged in the federal courts by state regulators. The decline accelerated once more when the FCC was upheld and all equipment was deregulated.

Figure T-4 shows that the prices of ordinary telephones and answering machines declined substantially during the 10 years following the AT&T breakup. Because terminal equipment is improving so rapidly, however, these price changes understate the rate of price decline.

Figure T-4: Prices of Consumer Equipment ($1994)



Source: See Appendix for data.

Output Effects

Telephone equipment

The terminal equipment market has obviously changed dramatically in response to the electronics and computer revolution. At the time of FCC liberalization, facsimile equipment, cordless phones, and even cellular telephones were unknown. Modems were primitive by today's standards. By any measure, the growth in output of this equipment has been extraordinary, although much of this growth must be attributed to forces other than competition in producing and selling such equipment. Since 1987, the growth in all major categories of equipment has been at or near double-digit percentage rates, as Figure T-5 shows.

Figure T-5: Terminal Equipment Sales in the United States (Millions)

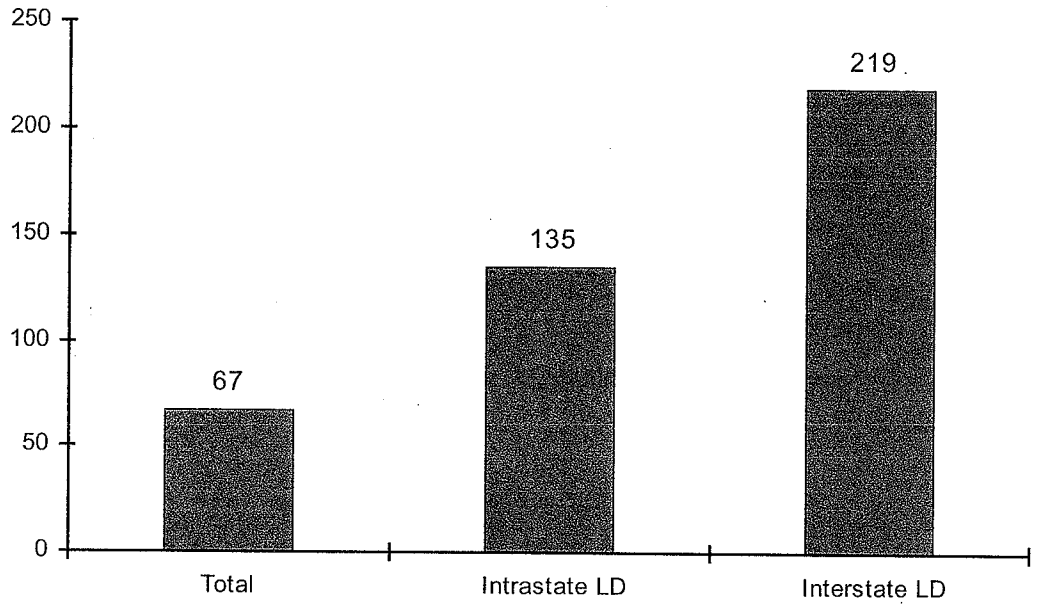
Type of equipment	1987 quantity	1995 quantity	% change
Corded Phones	8.4	11.6	38
Cordless Phones	6.2	20.8	235
Fax Machines	0.5	4.2	740
Answering Machines	9.6	19.9	107
	1987 value	**1995 value**	**% change**
Corded Phones	$203	$ 215	6
Cordless Phones	$605	$2,025	235
Fax Machines	$ 0.8	$ 3.1	288
Answering Machines	$700	$1,358	94

Source: Multimedia Telecommunications Association (1996).

Long-distance calls

Because a substantial share of the long-distance market is accounted for by business calls, it is difficult to measure accurately the output of long-distance services. The FCC collects data on minutes of output from an association of local-exchange companies, but these data capture only those minutes that pass through the local company's switch. Large business customers often have dedicated connections to their long-distance carrier which do not transit the local switch. Therefore, a substantial and growing share of total minutes is likely not to be captured in the official data. Nevertheless, even the official data show a substantially greater growth in interstate long-distance usage than in other components of telephone output (Figure T-6). Since 1980, total measured telephone usage has increased at a 3.7-percent annual rate, intrastate long-distance minutes have expanded at a 6.1-percent annual rate, and interstate long-distance usage has grown at an 8.3-percent rate. A different data series on interstate long-distance output, the number of switched access minutes purchased by long-distance carriers, shows an even greater growth rate—9.9 percent per year—since 1985 (FCC, 1996). As expected, the growth of interstate long-distance service has outstripped intrastate and local usage growth.

Figure T-6: Percentage Growth in Telephone (minutes), 1980-94



Source: See Appendix for data.

Local service

The repricing of telephone service that was begun by the FCC in 1984 added fixed monthly subscriber line charges to business and residential local service and reduced access charges on long-distance calls so as to move prices closer to costs. By 1989, the subscriber line charge for residences had reached its current level of $3.50 per month, substantially less than necessary to bring rates in rough alignment with costs. But even this limited repricing was assailed by the Consumer Federation of America as likely to reduce telephone subscribers among the poor and elderly by as much as 6 million. In fact, telephone penetration has risen from 91.6 percent of all U.S. households in mid-1984 to 94 percent in mid-1995. The lower long-distance rates permitted by reduced access charges have reduced the cost of using the telephone and thus offset the adverse effects of higher local rates.

Quality and innovation

It is obvious that the quality of virtually all telecommunications equipment and services has improved immensely because of the revolution in electronics and its application to telecommunications. Modem speeds are much faster. Facsimile machines have improved dramatically, and a large share of facsimile communication occurs through fast fax modems. Businesses are able to obtain digital services, such as Integrated Services Digital Networks. Cordless and wireless handsets have become increasingly compact. Once again, it is difficult to

attribute all of the quality improvements in to the liberalization of entry and partial deregulation, although some part of it is surely due to the presence of competition. Had AT&T remained a protected monopolist, surely these improvements would have come much more slowly.

An excellent example of the impact of competition may be found in the spread of modern fiber-optics transmission facilities and digital switches. Prior to entry by MCI and other new carriers, there was little fiber optics deployed in the U.S. network. AT&T was experimenting with fiber, but it was not until the new carriers began to build new networks with fiber optics that AT&T had to deploy fiber throughout its network to match their signal quality and efficiency. In 1985, for example, AT&T had only 136,000 fiber miles deployed while MCI and Sprint had a combined total of 206,000 (Figure T-7). By 1994, AT&T had deployed 1.26 million miles of fiber while MCI and Sprint had a combined total of 992,000 miles (FCC, 1995). The growth in fiber optics in the local companies' networks has been even more rapid, motivated in part by their desire to develop greater bandwidth in their network backbones so as to be able to deploy switched broadband or video applications that are now largely deregulated.

Figure T-7: Telephone Industry Deployment of Fiber Optics
(Thousands of Miles)

Company	1985	1990	1994
AT&T	136.2	937.5	1,264.0
MCI	83.9	388.0	525.0
SPRINT	122.4	453.4	467.2
LDDS/Worldcom	8.0	18.3	18.3
All Long Distance Cos.	455.7	2,093.2	2,581.4
All Local Carriers	497.1	3,249.3	8,953.4

Source: FCC (1995).

AT&T was also slow to deploy modern digital stored program control electronic switches prior to divestiture. In the early 1980s, AT&T's New York Telephone subsidiary had to request permission to buy Northern Telecom digital switches for its high-capacity switching centers because AT&T was not building them. Instead, AT&T had moved aggressively to install analog electronic switches in the 1970s. At about the time of divestiture, AT&T introduced its own digital end-office switch, the 5ESS, which began to compete successfully with the Canadian switch built by Northern Telecom. Today, most local companies have digital switches in their larger central offices so as to be able to offer equal access to long-distance carriers and modern central-office services at essentially unregulated rates.

The quality of telephone service has also been enhanced by the introduction of numerous new services that can be offered through digital central offices. Call waiting, call messaging,

automatic number identification, and a variety of information services can now be offered by local telephone companies. Since the local companies are only beginning to feel the winds of competition, these new services cannot be attributed entirely to telephone service-market reforms. However, Taylor *et. al.* (1992) and Greenstein *et. al.* (1994) have found that state regulatory reforms—such as rate caps or revenue sharing—have had a beneficial impact upon these companies' deployment of modern technologies. These new technologies allow the companies to offer much higher speed service, such as high-speed Internet connections. In addition, a much more competitive equipment industry may also be partly responsible for their proliferation.

Productivity

Some aspects of innovation can be captured through productivity measurements. The broadest measure of productivity is called "total factor productivity," which incorporates the productivity of all inputs—labor, land, and capital. Measuring productivity in industries experiencing rapid technological change is notoriously difficult because of the problems in measuring output and the capital stock. Nevertheless, Crandall (1991) and Crandall and Galst (1995) have found that total factor productivity (TFP) accelerated after the FCC liberalized entry into long distance in the 1969-71 period and again after the AT&T divestiture in 1984. Specifically, TFP growth averaged 3.0 percent per year in the 1961-70 period, 3.8 percent in the 1971-83 period, and 3.9 percent in the 1984-90 period despite the fact that the local exchange companies had not yet been deregulated or subjected to competitive entry.

The future

After almost 30 years of selective liberalization of entry and limited deregulation, Congress finally moved toward more complete deregulation by passing the 1996 Telecommunications Act.

The 1996 Act clearly represents a major turning point in U.S. telecommunications policy, forcing largely recalcitrant state commissions to allow competitive entry into all intrastate services. This mandate collides with the enormous rate distortions that these state commissions have allowed to develop. Entry is to be facilitated in a number of ways. First, entrants must be permitted to interconnect with the incumbent carriers at rates initially to be negotiated by the incumbents and the entrants, but ultimately to be based on costs. Second, an entrant may build its own facilities or simply lease such parts of the incumbent's facilities as it chooses. The incumbents are therefore required to "unbundle" all network elements so that such leasing can take place.[14] The rates charged for such unbundled elements must be based on costs, but not as determined through a traditional rate-of-return regulatory process. Finally, the entrants may simply appear as resellers of the incumbent local companies' services. Under the new

[14]This unbundling involves the separation of the carrier's distribution facilities into "loops" (subscriber access lines), "ports" (switching), interoffice transport between end offices or between end offices and tandem switches, and network signaling systems. Each of these facilities is to be available for lease to new entrants. Further divisions may even be necessary under the Act.

legislation, these services are to be priced at wholesale to reflect the incumbents' retail tariffs less the avoided costs of retailing.

The Bell companies are permitted by the Act to enter interLATA long-distance services. They may enter markets outside their own regions immediately but must pass a competitive "checklist" before being allowed to enter markets connecting with their own regions. This checklist involves 14 separate requirements that involve access to or interconnection with the incumbent RBOC's facilities. Telephone companies are now also free to enter the cable television business for the first time. Cable television rates are to be deregulated by 1999 or even sooner. And cable television companies are now free to enter the local telephone market under the entry provisions detailed above.

Unfortunately, the parochial interests of the legislators from rural and lightly populated states, such as South Dakota and Alaska, induced Congress to retain the "universal service" subsidies that are built into current rate structures. The Act even provides for the possibility of extending these subsidies to new services, such as Internet connections. As we have seen, state regulators have allowed rates to be set so that generous subsidies are available to a large number of subscribers, particularly low-usage residential subscribers in areas of low density. These subsidies have flowed from excessive long-distance charges, carrier profits from enhanced services—such as call-waiting and voice messaging—and business connections. Once local entry occurs, the sources of these subsidies will disappear quite quickly as competition places downward pressure on the rates of over-priced services with very favorable effects on overall consumer costs. As a result, regulators will be forced to find new ways to fund services that are offered below cost, to reduce the availability of such subsidized services, or both.

The 1996 Act does not reduce the scope of federal or state regulation of telecommunications services. Rather, it simply complicates such regulation, much as the entry of trucking in the early part of this century complicated the process of regulating railroads by providing competitive downward pressure on railroad rates. The FCC is instructed by the new Act to forebear from regulation if such regulation is unnecessary to ensure "just and reasonable" rates. However, if regulation is essential to allow regulators the ability to support a distorted rate structure without inducing the carriers to risk large capitalized losses or even insolvency, the Commission (or state commissions) may deem it necessary to continue such regulation. Carriers may petition the FCC for regulatory forbearance under the theory that competition can protect consumers from unreasonable rates, but will the Commission or the courts reject such petitions on more grandiose theories of protecting universal service?

Lessons for electricity

Competition reduces costs and prices

Some have argued that telecommunications competition harmed consumers because subsidies for local rates fell as long distance rates fell. This argument ignores the fact that most people use both long distance and local telephone services. The percentage of households with telephones is higher today than it was when long-distance competition began, suggesting that more households today believe that the total cost of telephone service is affordable.

Some of the statistics in this section show why. Long-distance telephone rates fell by a greater amount than the access charges that the local phone companies collect from the long-distance companies. Thus, competition did not just shift costs from long-distance to local service; it reduced costs, and hence reduced prices.

Consumers buy more than one product

Discussions of "the consumer interest" often focus only on local telephone service, as if that were the only service that mattered to consumers. However, most people buy both local and long-distance service, and they pay for business phone service in the prices of the goods and services that they buy. As a result, the only person we can say might have been harmed by long-distance competition is a recluse who purchases only local phone service and very few other goods and services—truly a rare individual. Unfortunately, policy debates in industries like telecommunications and electricity frequently focus only on the most visible price effects, ignoring the fact that consumers ultimately pay the costs incurred by businesses.

This focus on a single product is a narrow-minded view. In considering how to promote competition in electric services, policymakers and regulators should keep in mind that reductions in electric bills for large industrial customers will redound to the benefit of consumers who purchase the goods and services that these businesses provide. The more widespread competition is in electric service, the more likely it is that a given business will be forced by competitive pressures to pass its electricity cost savings through to its customers.

More open markets experienced greater gains

Interstate long-distance service was opened to competition, but many states continued to block competition before the 1996 telecommunications bill was passed. As a result, interstate long-distance rates fell faster than intrastate rates.

Similar results could occur in the electric industry in the absence of comprehensive consumer choice. For example, if only large industrial customers are permitted to choose their electricity suppliers, they will likely experience larger rate reductions than small businesses and homeowners. Alternatively, competition in the federally regulated wholesale market might still generate some benefits for smaller customers, but they would likely receive larger benefits from retail competition.

Make subsidies explicit

In telecommunications as in electricity, many critics opposed competition because it undermined companies' ability to over charge some customers in order to subsidize others. However, using a utility's price structure as a vehicle for subsidies creates two problems. First, subsidies administered in this way impose tremendous hidden costs on consumers. Cross-subsidies do not just transfer wealth; they also alter purchasing decisions by distorting price signals. People make fewer long-distance phone calls due to the inflated price resulting from regulation, and this lost output represents a real harm to consumers.

Second, cross-subsidies often hide the true extent of the subsidies from voters. A telephone customer cannot easily ascertain from his or her long-distance bill how much he or she is overcharged to subsidize local service. As a result, he or she cannot make an informed choice when legislators and regulators seek his or her input on public policy. A truly honest policy debate about subsidies requires that both the costs and the benefits be transparent to citizens.

Airlines

Airlines share more similarities with the electric industry than first meets the eye. The privately owned airline companies are like nonutility generators; they can serve customers in a wide variety of locations. To do so, however, they need access to government-owned airports and the air traffic control system, which are this industry's analogue to electric transmission lines and dispatchers. Like an independent power producer, an airline invests heavily in capital that can be redeployed to alternative markets as long as it has access to the bottleneck facilities necessary to enter those markets. And like any electric generating company, an airline's product is produced and consumed simultaneously: a seat on a flight must be used when the flight occurs, and cannot be stored for later use.

Major regulatory reforms

Before 1978, airlines were subject to both maximum and minimum fare regulation by the Civil Aeronautics Board (CAB). The CAB also controlled entry into the industry as a whole and on individual city-pair routes. CAB regulation distorted the airline marketplace in two ways. First, entry and fare regulation combined to create a government-enforced cartel that kept average fares above competitive levels. Second, the CAB often tried to keep fares on low-volume, short-haul routes below the actual cost of service, subsidizing them with higher-than-competitive fares in the long-distance and high-volume markets.

The CAB began to liberalize its entry and fare policies when John Robson took over as chairman in 1975. In 1977, under Alfred Kahn, the CAB approved a wider range of discount fares and encouraged entry on individual routes. In October 1978, Congress passed and President Carter signed the Airline Deregulation Act, which abolished the CAB as of 1984, opened up entry, and eliminated government-set fares.

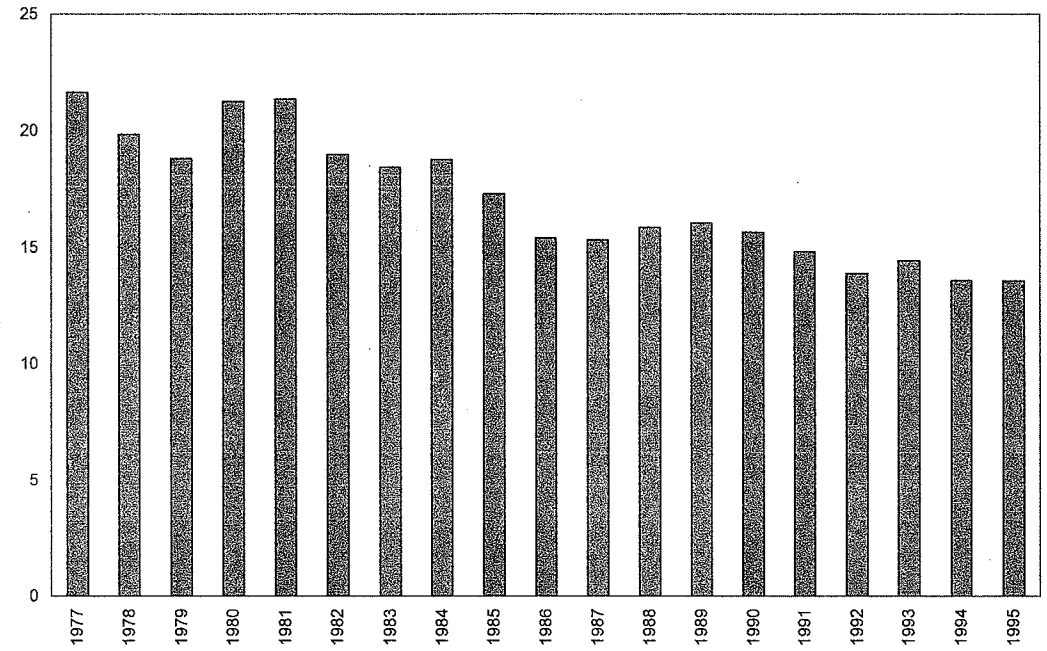
Price effects

Virtually all observers, including airline commissions established by both President Clinton and President Bush, agree that deregulation dramatically lowered air fares. Adjusted for inflation, most fares are substantially lower than they were before deregulation. More importantly, careful analyses that control for other factors influencing fares, such as fuel prices and wages, show that deregulation itself deserves credit for a large portion of the fare reduction.

Analysts most commonly measure airline fare trends by examining the "yield"—the average amount of revenue received per revenue passenger mile (RPM). By this measure, air fares have declined dramatically since deregulation. Figure A-1 shows that, adjusted for inflation, the average yield fell from 21.65 cents in 1977 to 13.76 cents in 1995, a 37-percent reduction. Much of this decline occurred during the first 10 years of deregulation, when the yield fell by 29 percent, from $21.65 to $15.32.

Interestingly, yields fell almost immediately in response to deregulation. They jumped during the early 1980s in response to the Iranian revolution and second oil shock, then generally resumed falling after 1984.

Figure A-1: Real Airline Yield (cents per RPM, $1995)



Source: See Appendix for data.

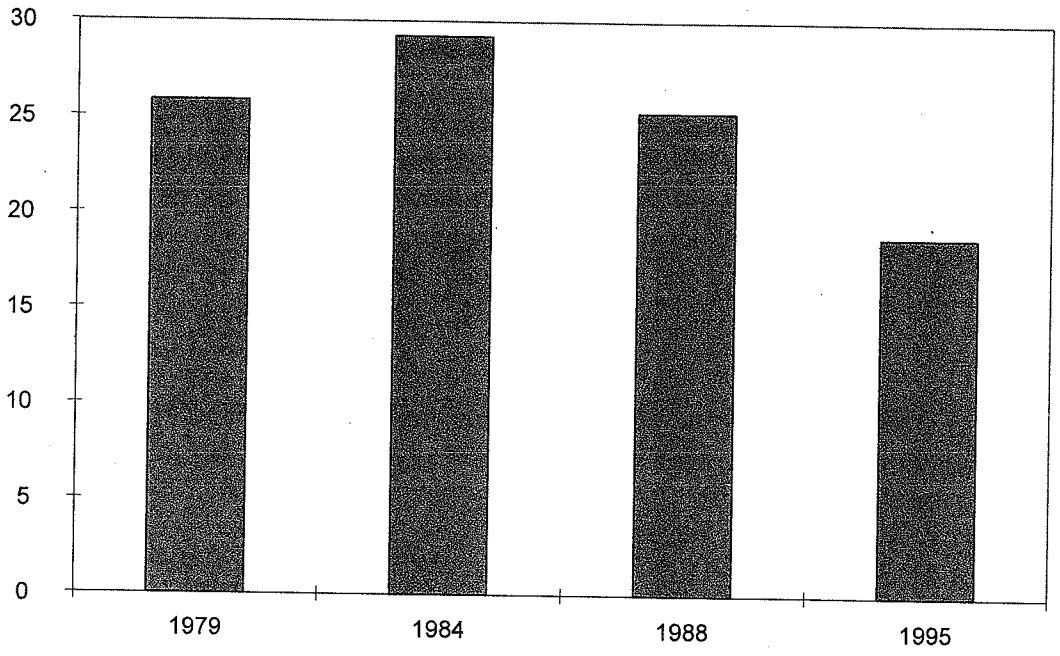
Not all travelers have experienced the same fare changes. Air travel markets can be broken down in a number of different ways—by number of carriers on the route, traffic density, flight distance, and hub vs. nonhub airports. Various policy analysts have raised concerns that travelers on subsets of these routes have not benefited from deregulation. The foremost concerns involve routes served by only one carrier, sparsely traveled routes, short-distance flights, and flights to and from hub airports dominated by one airline.

Figures A-2 through A-5 document fare trends in the submarkets of greatest concern for selected years since deregulation. Unfortunately, the Department of Transportation (DOT) database from which these data are drawn does not have annual data for years prior to 1979. As a result, the graphs omit information from 1977-79, when overall fares plunged in response to deregulation.[15] These graphs begin their story in 1979, after deregulation had already reduced air fares.

As in other markets, real yields rose in the early 1980s as fuel prices rose, then settled back into a downward drift after 1984. In virtually all of these markets that are of great political concern, yields are lower now than in 1979. The sole exception is the shortest distance markets, where regulation had often held fares below the actual cost of service.

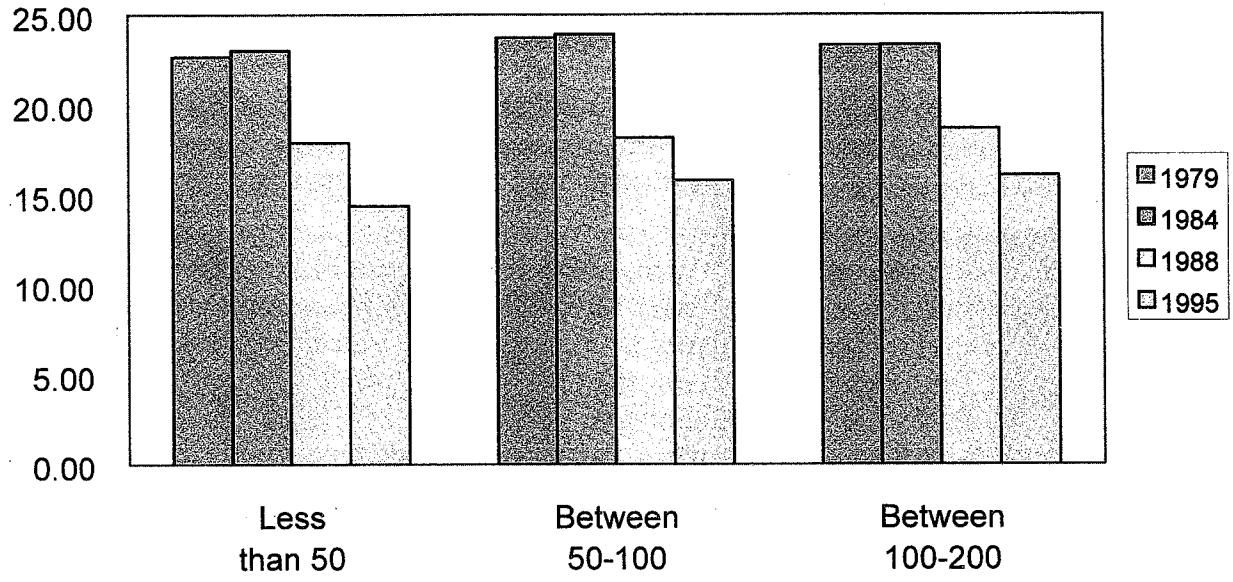
[15] Obtaining these data requires massive runs through very large databases. Our analysis is confined to four-year intervals because the DOT had already extracted data for these years for other studies.

Figure A-2: Yield on Single-Carrier Routes (cents per RPM, $1995)



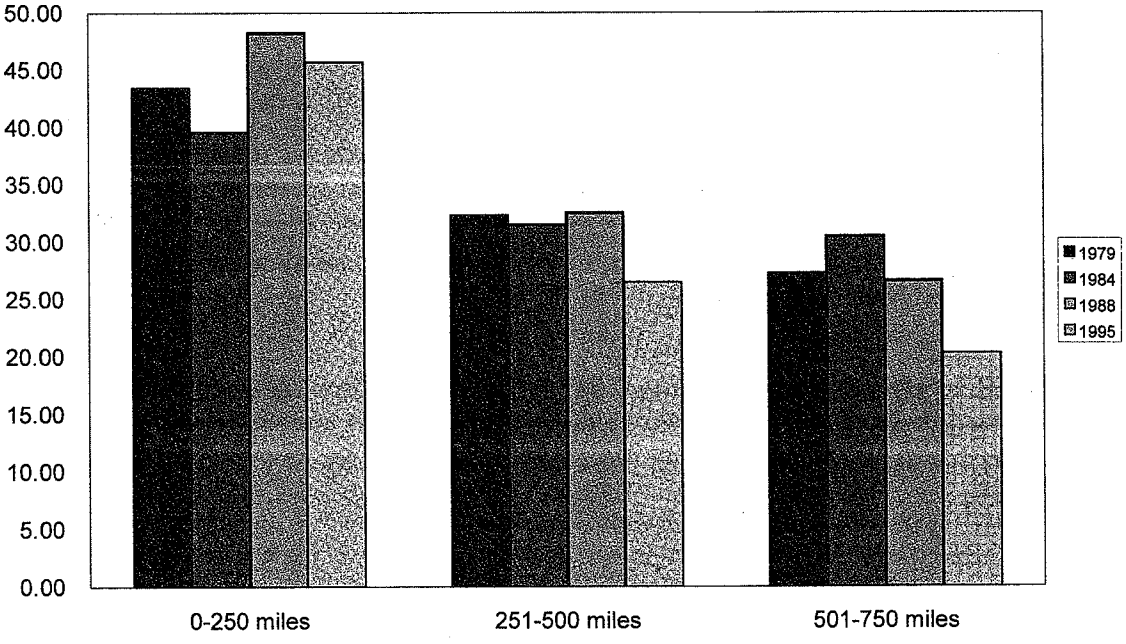
Source: See Appendix for data.

Figure A-3: Yield by Route Density, Cents/RPM ($1995)
(Legend indicates average number of passengers/day)



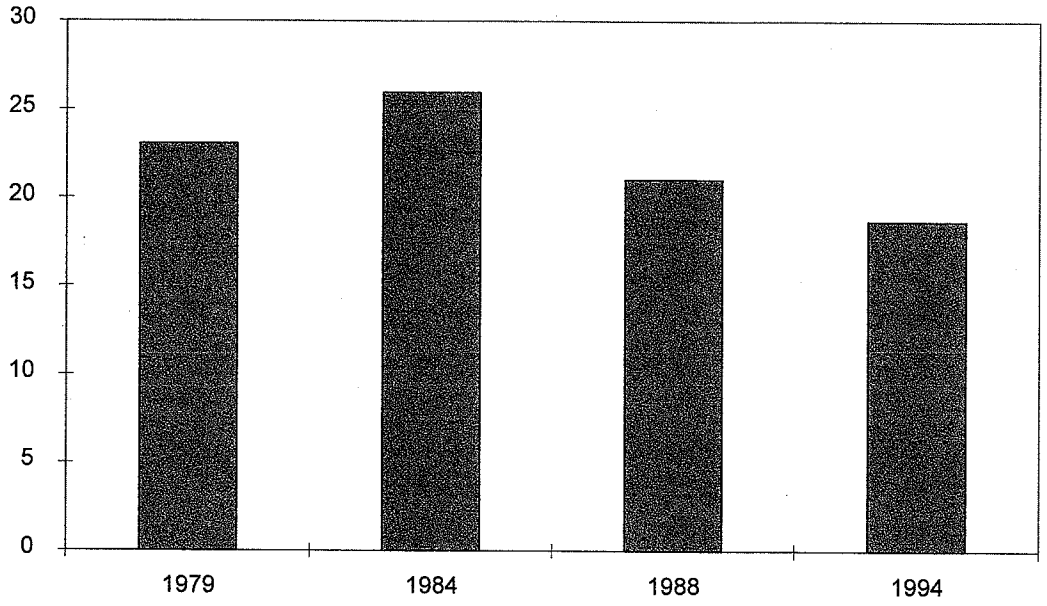
Source: See Appendix for data.

Figure A-4: Yield by Distance Interval, Cents/RPM ($1995)



Source: See Appendix for data

Figure A-5: Yield at Single-Carrier Hubs (cents per RPM, $1995)



Source: See Appendix for data.

Air fares are obviously influenced by fuel prices and the business cycle. Fortunately, a vast scholarly literature has documented the effects of deregulation after controlling for other influences on air fares:

- Steven Morrison of Northeastern University and Clifford Winston of the Brookings Institution (1995, 12-14) estimated that deregulation saved passengers about $12.4 billion annually in 1993 dollars. They reached this result by comparing actual air fares to what fares would have been if they were still set according to the CAB's regulated pricing formula. Deregulation accounted for 58 percent of the reduction in air fares since 1978.

- In an earlier study, Morrison and Winston (1985, 15) used data from 1980-82 to estimate what fares would have been if airlines had not been regulated in 1977. After controlling for other factors, they found that deregulation lowered fares by about 28 percent.

- A Harvard University faculty study estimated that deregulated fares in 1979 were at least 8 percent lower—and possibly 25 percent lower—than they would have been if regulation had continued (Meyer and Oster 1981, 83-84).

- Using data from 1980 and 1981, former CAB member Elizabeth Bailey and two other CAB economists estimated that the presence of a newly-certificated airline on a route lowered average fares by 20 percent, after controlling for other factors (Bailey, Graham, and Kaplan 1985, 164).

Other studies examined the prices paid by different categories of travelers. Numerous policy analysts—most notably the GAO (1990)—have raised concerns that the fares per mile at hub airports dominated by one airline are higher than fares at other airports.[16] Such comparisons ignore significant differences between hub and nonhub flights. Hubs usually involve more nonstop flights, shorter flight distances, a larger percentage of full-fare tickets, higher-cost airlines, and greater opportunities to earn frequent flyer miles on a single airline. All of these factors tend to raise the fare per mile. Correcting for these differences, fares at concentrated hubs are only about 5 percent higher than other fares—making concentrated hub fares still substantially lower than they would have been under regulation (Morrison and Winston 1995, 49).

Another set of issues revolves around changes in fares on different types of routes. Under regulation, the CAB's fare formula tended to hold fares in short-distance, low-volume markets below the actual cost of service. Higher fares in other markets subsidized some of these routes. Deregulation altered this practice, but the fare increases on short-distance and low-volume routes were relatively modest. In 1981, for example, fares in small markets for distances under 500 miles were about 13 percent higher than fares that would have resulted from the regulatory fare formula used by the CAB; all other fares were lower or essentially unchanged (Graham, Kaplan, and Sibley 1983, 122). In 1983, fares on routes under 400 miles with less than 200 passengers per day were 12-14 percent higher than would have emerged from the CAB's fare formula before deregulation. Fares on other flights were up to 60 percent less than they would have been before deregulation (Bailey 1986, 5).

For airlines, the scholarly literature generally confirms the impression presented by the raw fare data. Deregulation lowered most air fares significantly. On some of the low-volume, short-haul routes, where regulation had kept fares below the actual cost of service, deregulation raised fares modestly at first. The overall effect was a large reduction in air fares for most of the traveling public.

Output effects

As most economists would expect, lower air fares led to increased passenger traffic. Air traffic waxes and wanes with the business cycle, but as Figure A-6 shows, it has generally increased since deregulation.[17]

This increase in air travel has not just occurred because the same customers are taking more trips. In 1971, half of the U.S. population had never flown on an airplane; by 1988, 75 percent of Americans had (Labich 1989, 84). The price cutting unleashed by deregulation generated a democratization of air travel, bringing on board customers who previously would have traveled by bus or private auto.

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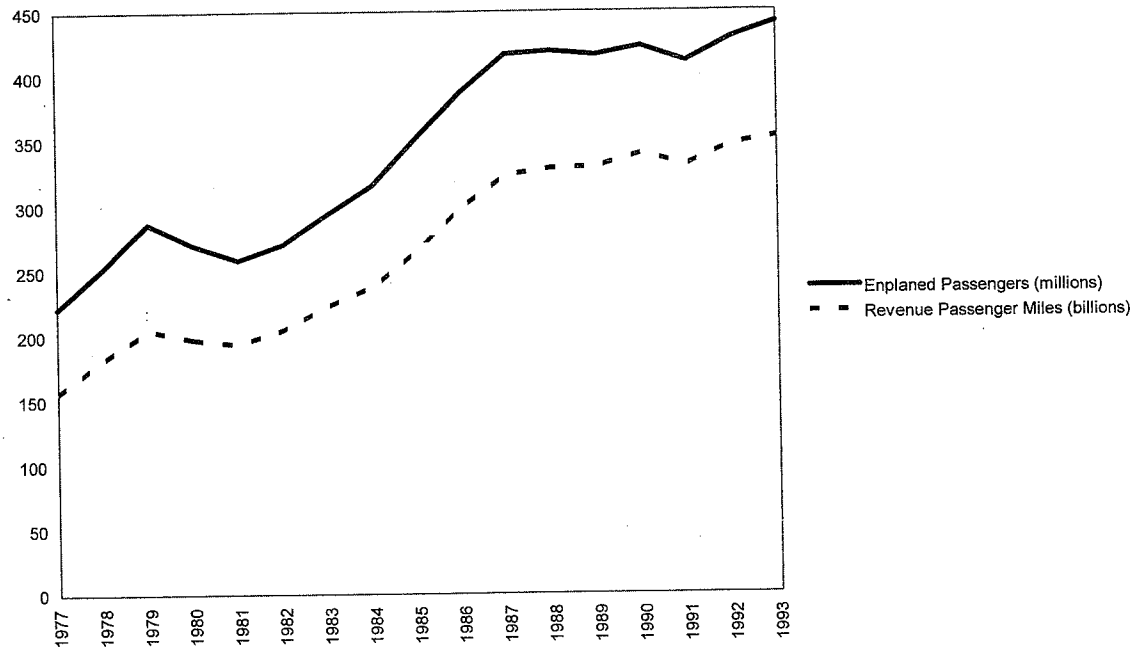
[16] See also Borenstein (1989).

[17] Neither figure in the graph is a "perfect" measure of the number of passengers. Enplanements double counts passengers whose journey involves connecting flights, and revenue passenger miles can vary if the average length of trip varies from year to year.

Figure A-6: Growth of Air Travel, 1977-93



Source: See Appendix for data.

Another politically important measure of output is the number of small cities gaining or losing air service. Here it is especially crucial to remember that just because something happened after deregulation does not mean that deregulation caused it. For example, a Federal Trade Commission study found that while 114 communities lost air service during the first six years of deregulation, CAB regulation would have preserved service to only four of those cities (Ogur, Wagner, and Vita 1988, 13). Similarly, 95 small communities lost air service between 1978 and 1983, but regulation would not have prevented this loss of service, because none of the airlines serving these communities was federally regulated to begin with. In fact, statistical analysis suggests that, in the face of a recession and rising fuel prices, airlines would have abandoned service to *more* cities in the early 1980s had they not been deregulated (Morrison and Winston 1985, 47-50).

Quality effects

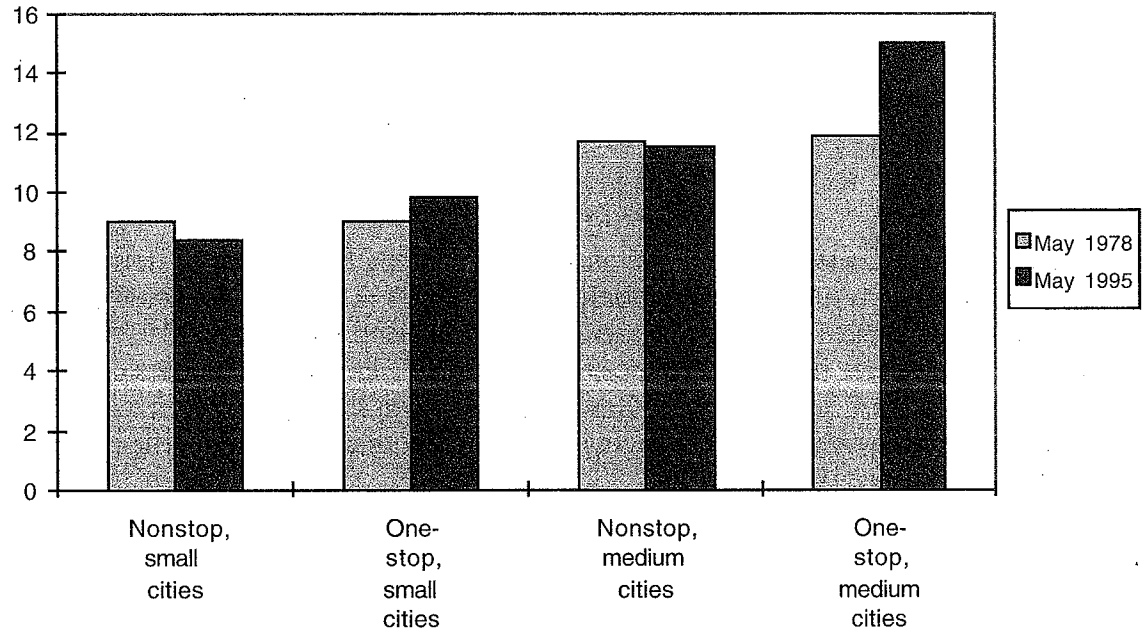
Flight frequency

In some ways, deregulation has improved the quality of airline service. Deregulation has resulted in more frequent flights, more nonstop flights, and more possible connections on the more heavily traveled routes; these changes save time and improve passenger comfort. One study pegged the value of increased flight frequency caused by deregulation at $10.3 billion annually in 1993 dollars (Morrison and Winston 1995, 21).

Although flight frequency increased overall, this effect varies across communities of different sizes. The GAO's 1996 report compared changes in the number of cities served (destinations) and flights (departure frequency) from airports serving small, medium, and large communities. Between May 1978 and May 1995, the average number of destinations increased at all three types of communities (Figure A-7). The average number of departures also increased (Figure A-8). However, small and medium cities experienced a slight reduction in the number of nonstop destinations, coupled with a modest increase in one-stop destinations. This result no doubt reflects the rise of commuter airlines and the development of hub-and-spoke systems, which connect more destinations via one-stop flights.

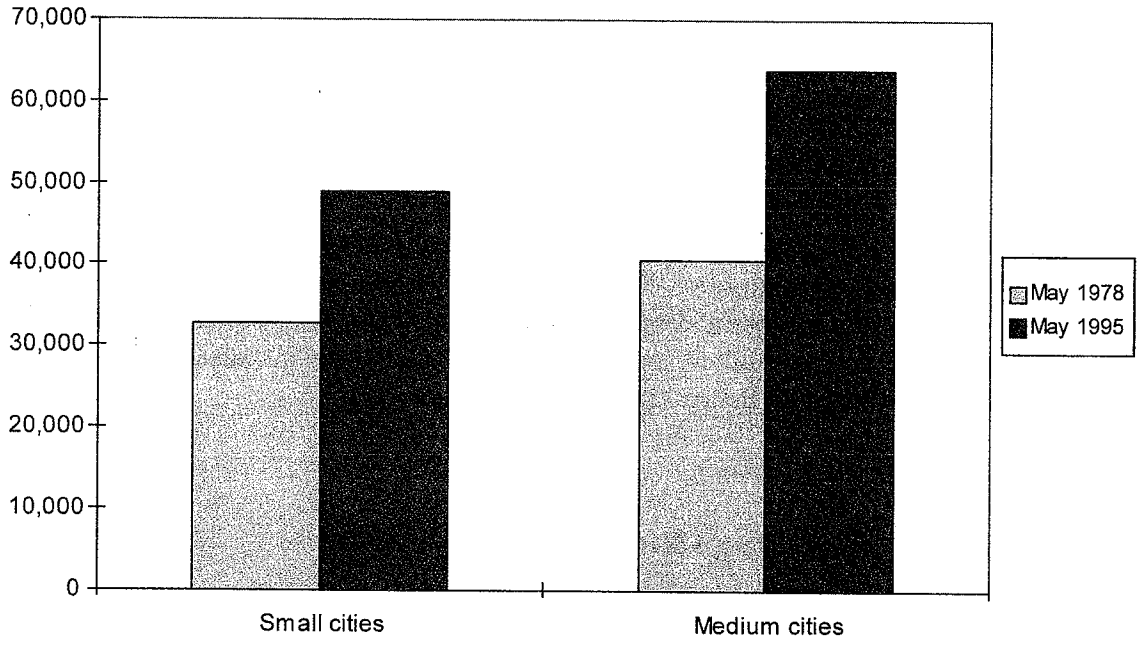
Statistics on traffic at small airports, however, do not tell the whole story of deregulation's effect on small communities. Fares at medium and large airports fell so much that some rural passengers now find it more attractive to drive 50 or 100 miles to a larger airport. Thus, traffic or flight frequency may fall at some small airports, but only because passengers can get a better deal elsewhere (National Research Council 1991, 123).

Figure A-7: Average Number of Destinations



Source: See Appendix for data.

Figure A-8: Total Departures



Source: See Appendix for data.

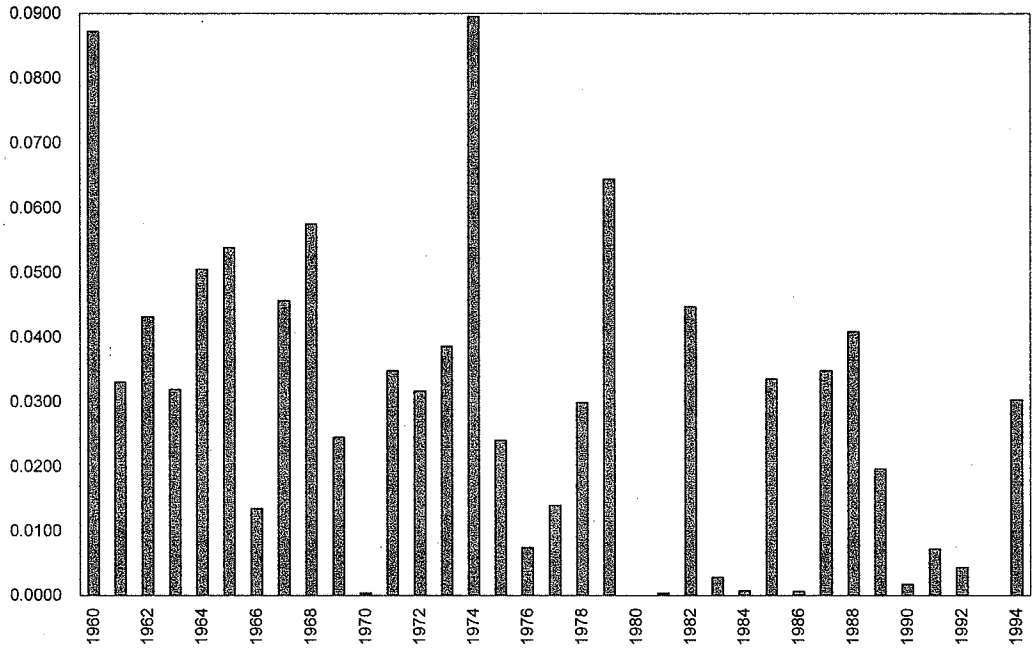
Fewer interline changes

Deregulation also increased quality by dramatically reducing the number of passengers who have to change airlines to reach their destination. In 1978, 14 percent of all passengers had to change airlines; today, about 1 percent of passengers do (Morrison and Winston 1995, 22). Staying on the same airline can reduce the chance of lost luggage, and it often reduces the distance passengers must walk between gates. Research has shown that passengers strongly prefer to remain on the same airline when changing planes, rather than switching airlines (Carleton, Landes, and Posner 1980, 68-74).

Safety

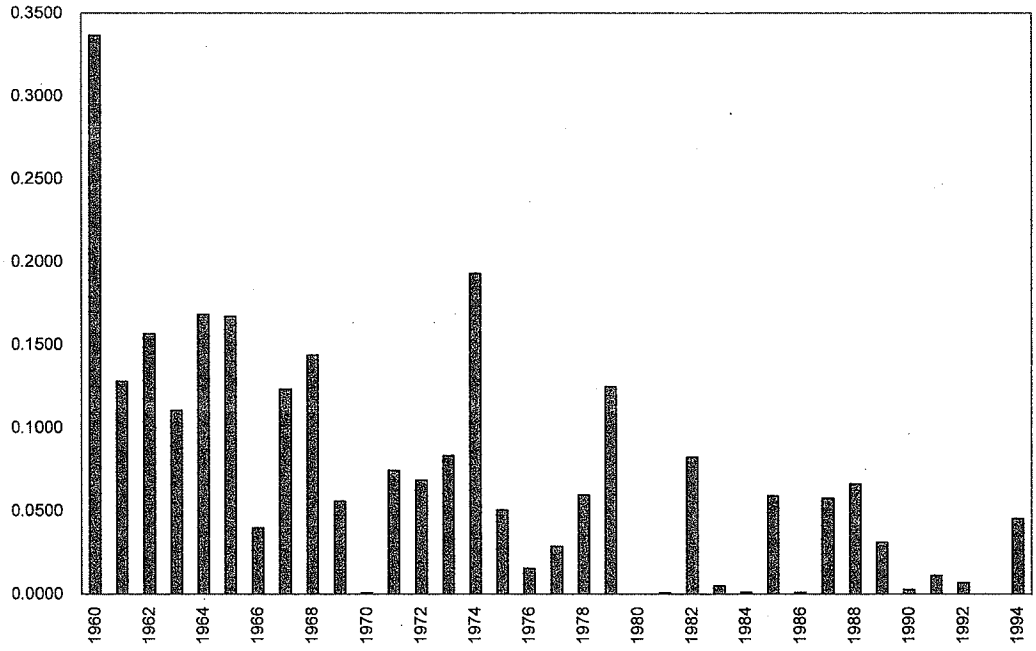
Airline safety is another critical indicator of quality. Many critics of deregulation feared that competition would lead to poor safety records. In fact, air travel has become progressively safer over time, and deregulation has not measurably affected this trend. Many of the industry's safest years have occurred since deregulation, as Figures A-9 and A-10 show. If anything, air travel has become less risky since 1978.

Figure A-9: Passenger Fatalities per 100,000 Departures



Source: See Appendix for data.

Figure A-10: Passenger Fatalities per Million Aircraft Miles



Source: See Appendix for data.

Journalistic accounts frequently speculate that deregulation has reduced safety by prompting cost-conscious airlines to cut corners on maintenance. However, there is no evidence that this has occurred. During the first 10 years of deregulation, the National Transportation Safety Board identified deficient maintenance as the cause of only one fatal accident (Morrison and Winston 1988, 11). The National Research Council concluded in 1991, "No study has established an empirical link between carrier operating practices that might have been affected by deregulation and safety" (National Research Council 1991, 173, 197; also Oster, Strong, and Zorn 1992).

Safety statistics show that air travel is at least as safe since deregulation, and there is no evidence that travel would be even more safe if regulation had continued. The odds of dying in a scheduled airline trip are now less than 1 in 2 million, making airline travel at least twice as safe as auto travel. One of the most exhaustive studies examining the effects of deregulation on airline safety declared, "There is no evidence that deregulation has resulted in a worsening safety record" (Oster, Strong, and Zorn 1992, 5, 40).

Frills and conveniences

A few measures of quality may have declined under deregulation, because regulation forced consumers to over pay for certain frills and conveniences. Because airlines can now compete by cutting fares, they do not compete as vigorously on the quality or quantity of food, beverages, empty seats, or other amenities. Low air fares also frequently come with restrictions, such as advance-purchase or Saturday night stay requirements.

These phenomena, however, suggest that observers must take great care when discussing the effects of competition on quality. After deregulation, any airline had a choice of keeping posh meals, less crowded seating, and high fares. Few found this to be a winning combination in the competition for passengers. Most passengers apparently preferred lower fares and fewer frills; the few exceptions sit in first class and pay for the privilege. Research quantifying the dollar value of various quality attributes bears out this inference. The dollar value of the inconvenience imposed on passengers by more crowded flights, for example, is about one-twentieth the amount passengers save in lower fares. Similarly, the inconvenience caused by new restrictive conditions attached to low fares is far outweighed by the cost savings (Morrison and Winston 1995, 27, 81).

It is thus misleading to view the reduction in frills as a "bad" effect of deregulation. The quality of airline service now more clearly resembles the quality that consumers are actually willing to purchase, given a free choice. The value of lower fares and increased flight frequency far outweighs the types of inconveniences that serve as staples in late night talk show monologues.

Innovation

Several types of innovations have become widespread since the advent of deregulation. The most prominent are hub-and-spoke systems, low-cost airlines, and commuter airlines.

Hub-and-spoke systems

A hub-and-spoke system consists of flights between numerous "spoke" cities and one "hub" city. A passenger at any city in the network can reach any other city by traveling through the hub. As a result, about 60 percent of the seats on airplanes are now filled, compared with approximately 50 percent before deregulation.

Hubbing reduces costs, and it often reduces fares. Statistical analysis of accounting data shows that hubbing lets airlines provide more service at lower cost, largely because they can economize on labor and equipment (Banker and Johnston 1993). A recent study of fares, meanwhile, shows that hubbing also reduces fares for passengers traveling through the hub. Increased traffic through an airline's network at a hub cuts average costs, and fares fall for passengers traveling through the hub because the airline faces vigorous competition with other airlines serving the same destinations through other hubs (Brueckner, Dyer, and Spiller 1992).

Deregulation facilitated development of the hub-and-spoke system. Prior to deregulation, many airlines had to operate planes like inner-city buses, stopping at multiple locations along a government-approved route. Only occasionally could an airline obtain government approval on enough routes from the same city to make hubbing possible. After deregulation, airlines could add the critical mass of destinations needed to make this system work. Once the hub-and-spoke system was in place, airlines could quickly cut fares to gain business and pass the cost savings on to consumers.

Low-cost airlines

Low-cost airlines achieved their competitive advantage by cutting back on frills, making more efficient use of labor, and eschewing unnecessary expenses (Dooley 1994). Southwest Airlines is the most prominent contemporary example; the airline has been consistently profitable, largely because it has achieved unusually large productivity of both labor and capital. Southwest also refuses to let travel agents book flights through other airlines' computerized reservation systems, even though government regulation of these systems is based on the premise that they are an "essential facility" to which any airline must have access if it is to succeed. Instead, Southwest heavily advertises its toll-free reservations number, offering lower ticket prices because it does not have to pay computerized reservation system booking fees. The airline started as an intrastate carrier before deregulation, expanded into the Midwest and Southeast in the late 1980s and early 1990s, and recently announced plans to compete in the Northeast (McCartney 1996).

In 1992, Southwest and American West were the principal low-cost airlines, but the formula proved so successful that numerous competitors started up in 1994 and 1995. The DOT estimates that the low-cost carriers save passengers $6.3 billion annually (April 1996).

Low-cost airlines serve a national market solely because of deregulation. For the 40 years prior to 1978, the CAB refused to approve entry of a single new major carrier. After deregulation, numerous new carriers sprang up. Many initially succeeded using strategies similar to Southwest's, then failed once they started trying to imitate the established trunk carriers. The second wave of low-cost entrants appeared in the early 1990s, contradicting some policy

analysts' warnings that a "tight oligopoly" of major airlines was now inevitable. In a 1996 study of low-cost carriers, DOT noted, "One thing we have learned in the deregulated environment is to expect the unexpected, and we are loathe to assume that the eventual industry structure will evolve purely from some mixture of current competitive strategies" (April 1996, 21). Though airline markets are not perfectly "contestable," freedom of entry creates opportunities for the competitors with the new strategy to undercut the established firms.

Commuter airlines

Commuter airlines boomed in the years following deregulation. For the most part, they arose as a cost effective way of serving smaller communities. Prior to deregulation, the CAB required major airlines to serve many small communities, but the quality of the service was usually left to the discretion of the airline. As a result, many small communities received infrequent jet flights, and these flights were usually part of a "puddle jump" route connecting multiple communities in a straight line. Like bus passengers, air travelers had to sit through numerous stops to get to their ultimate destinations.

Commuter airlines use smaller airplanes to ferry passengers either to their own hubs or to cities served by a major airline. Smaller planes are much more cost effective on low-density routes. They allow the airline to offer more frequent flights, even if the total number of people who want to fly remains unchanged or falls. In the first two years of deregulation, the number of commuter passengers grew by 21 percent annually, and more than 80 percent of that traffic growth came from the addition of new routes (Meyer and Oster 1984, Ch. 4, 140).

Lessons for electricity

Deregulation lowers costs and prices

The general results of airline deregulation have been tremendously positive for most passengers: lower fares, expanded output, more convenient service, and levels of quality more in line with what consumers are actually willing to buy. The benefits materialized quickly, and the primary recipients of lower fares were non-business travelers. Contrary to popular impressions of deregulation, "The *little* dogs ate first."

No threat to reliability or quality

Scholarly research shows that deregulation had no effect on airline safety—the issue that creates a level of worry most nearly analogous to the reliability question in electricity. Other indicators of quality improved or remained unaffected by deregulation. The only reduction in quality of service occurred when passengers freely chose low-fare, low-frills service over high-fare, gold-plated service.

Universal service: It's the wires, stupid!

The effect of airline deregulation on small communities has been a subject of intense debate and scrutiny. This debate reflects the same types of concerns raised in the electricity debate in regard to universal service. As a whole, small communities have gained airline service. A handful have lost service as a result of deregulation, but deregulation preserved service in other small communities.

It would be a mistake, however, to assume that customer choice in electricity would end electric service to even a handful of small communities, because there are some differences between transportation of passengers and transportation of electrons. The most significant and costly factor needed to ensure electric service to small and rural communities is the wires. Current proposals for customer choice affect only electricity generation, marketing, and related services. Transmission and distribution wires will remain in place; transportation rates and service will remain regulated. As long as competing electric companies have access to all customers via the wires, it is difficult to imagine that any community will lose electric service because no electricity supplier will wish to serve it. This difference between transportation of air passengers and electricity highlights the crucial role that wire charges will play in aiding or hindering universal service.

Unforeseen innovations

A final point to keep in mind is that many of deregulation's benefits occurred because of innovations that were not foreseen when deregulation occurred. During the late 1970s, many policy analysts thought that deregulation's main effect would be to break up a government-sponsored cartel, forcing airlines to charge prices that more accurately reflected costs. In addition to this type of change, airlines took several unpredicted actions that radically reduced their costs and changed the nature of the product, stimulating new air travel. Similarly in electricity, policymakers should keep in mind that customer choice will not just force prices to more accurately reflect costs but also stimulate entrepreneurial creativity to reduce costs and develop service enhancements that cannot easily be imagined in the current environment.

Trucking

Trucking companies, similar to independent power producers, do not own the highways that they must use to serve their customers. Like airlines, trucking companies use a government-owned right-of-way that is open to all users—unless it is congested.

The interstate trucking market was brought under federal regulation in 1935, largely to bring "stability" to an industry with declining, unstable rates and to protect the railroads from "destructive" intermodal competition in the Depression era. For more than 40 years, the Interstate Commerce Commission (ICC) maintained restrictive rules on entry by new carriers and even on the ability of existing carriers to provide service to new routes or for different commodity classes. As a result, rates were maintained far above long-run incremental cost, particularly for less than truckload (LTL) services.

The high regulated rates for LTL carriage led large shippers to provide their own trucking services ("private carriage") or smaller shippers to enter long-term contracts with contract carriers who were able to obtain ICC permits. By the end of the 1950s, these two forms of carriage handled more than two-thirds of all U.S. intercity trucking as shippers sought to avoid the artificially high regulated rates of common carriers (Meyer, Peck, Stenason, and Zwick 1964). These high rates were reflected in the high prices paid by common carrier trucking firms to obtain ICC operating certificates from other carriers. By the late 1970s, these operating certificates were worth several billion dollars. In addition, the Teamsters Union was able to capture a large share of the rents from the ICC's restrictive regulatory policy by negotiating very attractive labor contracts with the country's common carrier trucking companies (Moore 1978).

Regulatory reform

By the middle of the 1970s, economic research had clearly demonstrated that surface transportation was performing very poorly. The absence of entry into trucking and the difficulty of introducing new innovative services in conjunction with railroads had resulted in rates that were far above what a competitive market would have produced. With inflation surging, policymakers looked for opportunities to provide one-time downward pressure on prices through various regulatory reforms. As a result, deregulation of trucking and rail services became a high priority for the Ford and Carter administrations. The applied academic literature in transportation regulation had concluded overwhelmingly that the general response to such an exercise in deregulation would be a decline in rates, an increase in service quality, or both (Meyer, Peck, Stenason, and Zwick 1964; Moore 1978). The result was the passage of the Motor Carrier Act of 1980, which virtually deregulated the trucking industry by eliminating collective ratemaking on single-line shipments, allowing new entry, and permitting motor carriers much greater freedom in setting their own rates.

The immediate effect of the 1980 Act was to allow a large amount of new entry into an industry that had been protected from entry for decades. The number of licensed motor carriers doubled between 1980 and 1986 (Winston *et. al.* 1990). Most of this new entry came from new truckload (TL) carriers or small owner-operators who had previously worked for the large

licensed companies. The surge in new entry was followed by a substantial number of bankruptcies and reorganizations as the industry tried to adjust to the deregulated environment.

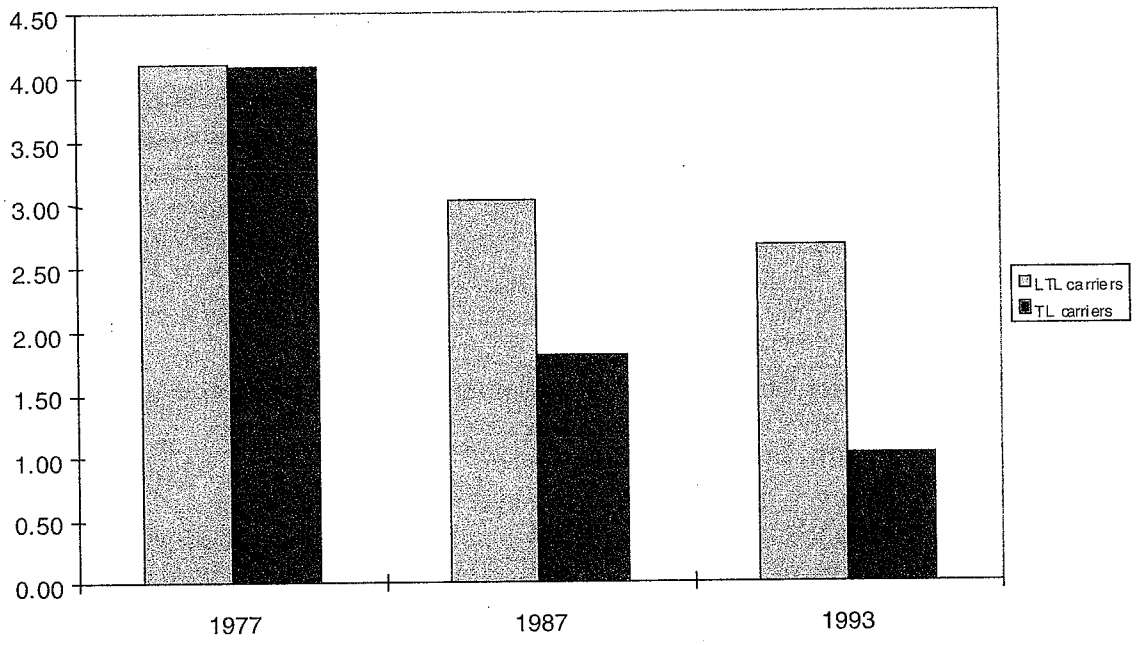
The economies of national and regional network operations subsequently led to a substantial increase in the industry's concentration, particularly in the LTL segment of the industry. By 1993, the largest four carriers accounted for 43.6 percent of all LTL revenues, as compared with just 17 percent in 1976, before the onset of deregulation (Corsi 1996). In the TL segment of the industry, on the other hand, the four-firm and eight-firm share of revenues has declined, although the top 20 firms' share has increased. The TL segment is now dominated by a number of large mega-carriers, such as Schneider, National, J.B. Hunt, and Landstar (Corsi 1996a).

Price effects

The impact of deregulation on trucking rates was immediate and substantial, particularly for the LTL segment. Because trucking services change over time and are extremely diverse over the many commodity classifications and routes, it is difficult to calculate a single national price index for trucking. Moreover, given the volatile nature of fuel prices in the early deregulated period, judgments about the effects of deregulation on rates is difficult without adjusting for changes in factor prices. For these reasons, Winston *et. al.* (1990) used multiple regression analysis on a large sample of rates to obtain estimates of the degree to which rates would have risen in the absence of deregulation and compare this measure with actual rate indexes. They found that in the first five years of deregulation, through 1985, TL rates fell by about 3 percent while LTL rates fell by 17 percent, relative to rates that would have existed under continued regulation. They concluded that by 1985 shippers were saving about $6.8 billion per year in 1977 dollars, or $15.4 billion in 1995 dollars (Winston *et. al.* 1990, Table 3-4). This result is consistent with an earlier DOT study that found the savings to be $10 billion annually (ICC 1992). Thus, rates began to fall almost immediately after deregulation and have continued to decline.

More recently, Corsi (1996) has found that the operating costs per mile of LTL carriers declined at an annual rate of 2.1 percent between 1987 and 1993 after adjusting for inflation. Operating profit as a share of sales remained relatively constant during this period; hence, real LTL rates must also have fallen at about the same rate. During the same period, 1987-93, Corsi (1996a) found that real operating costs per mile for TL carriers declined at about a 9-percent inflation-adjusted annual rate (Figure K-1). An earlier study by Corsi (1994) found that LTL rates declined by 28 percent between 1977 and 1987 after adjusting for inflation, while TL rates fell by 58 percent in the same period. The bulk of these rate reductions occurred after deregulation in 1980, because regulation made it very difficult for trucking companies to cut rates. Thus, real trucking rates have fallen substantially since deregulation.

Figure K-1: Real Operating Cost Per Mile ($1987)

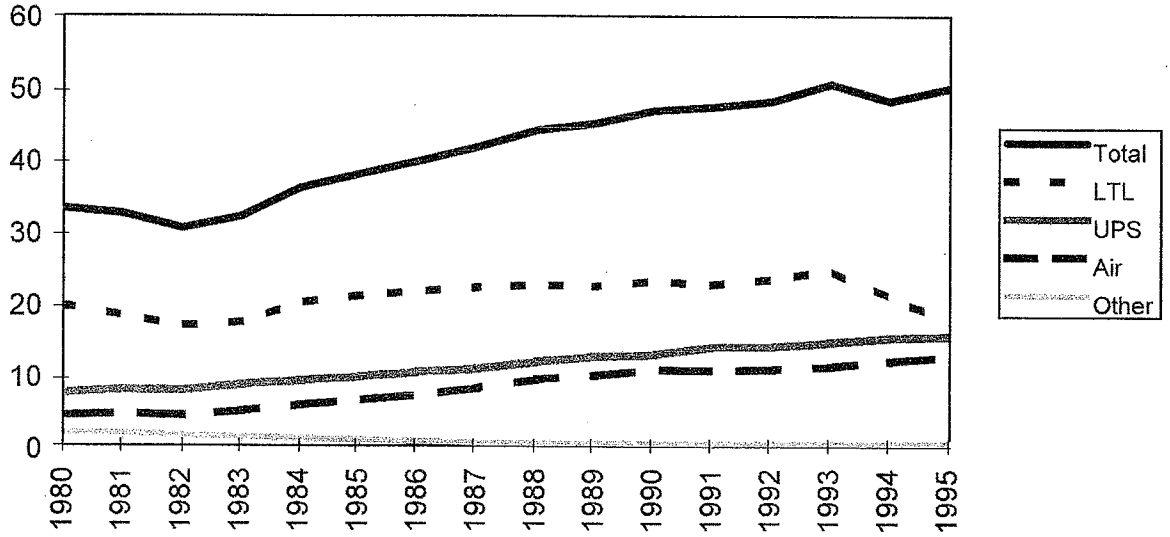


Source: See Appendix for data

Output effects

Clearly, entry into the trucking industry has led to substantial innovation in service quality and, therefore, to a substantial growth in output, but not for the LTL carriers. Corsi (1994, 1996) reports that the LTL segment's revenues declined by 36 percent in constant dollars from 1980 through 1993. This decline was caused by the entry and expansion of new carriers, particularly in the delivery of small packages. UPS, Federal Express, and other air freight carriers have expanded rapidly (Figure K-2).

Figure K-2: Small Shipment Revenues, Commercial Carriers ($1995, billions)



Source: See Appendix for data.

UPS, in particular, was the beneficiary of sharply reduced regulatory restraints due to the passage of the Motor Carrier Act of 1980. Adjusted for inflation, its revenues more than doubled, from $7.4 billion (in $1995) in 1980 to $15.3 billion in 1995. The deregulation of air freight also propelled the air freight express carriers into major competition with the LTL motor freight carriers. Their revenues rose from $4.3 billion in 1980 to $12.5 billion in 1995. These air-freight carriers are not simply invading the small-package business, but they are now moving into the surface-freight business as well. Federal Express, for example, has now announced an "Express Saver Freight" service that will be targeted at shipments up to 3,000 pounds at zone-based rates (Corsi 1996).

Overall, the output of the small-package freight business, including LTL motor-freight shipments, has expanded substantially. Real revenues expanded from $10.3 billion in 1976 to $18.3 billion in 1992, a 76-percent increase after adjusting for inflation. But because rates declined in real terms during this period, the growth in output was much greater. If we assume that inflation-adjusted rates declined by 2.5 percent per year in the 1976-92 period, real shipments expanded by 162 percent over this 16-year period, or about 6 percent per year. This is a far greater growth rate than that enjoyed by the entire economy in this period.[18]

[18] This growth rate is greater than that reported by the Bureau of Labor Statistics for "Trucking, Except Local, SIC 4213" because the BLS series does not capture the output that has shifted to air-express carriers.

Quality and innovation

Deregulation has clearly increased the intensity of competition in both the TL and LTL segments of the trucking industry. This competition is manifested in downward pressure on rates, the search for greater carrier efficiency, and the improvement of service quality. Both the LTL and TL segments of the industry have employed new information systems to provide more efficient, responsive services. In the TL segment in particular, carriers are able to provide customers with more sophisticated tracking and monitoring services. Carriers can now monitor vehicle temperatures, security, and weight through remote communications technologies (Corsi 1996a).

In the LTL segment, the use of third-party logistics firms provides customers with a more precise matching of transportation services with their needs. By 1985, shippers saved nearly $1 billion per year in reduced costs due to more rapid service (Winston *et. al.* 1990, 28). The use of regional, nonunion carriers has weakened the Teamsters Union to the point that it now has conceded to the large national carriers the right to increase dramatically their use of intermodal (rail-truck) services to a level of 28 percent of the carriers' total miles. These improved services would simply have been unavailable under the old regulatory regime.

Lessons for electricity

Deregulation benefited all types of shippers

The trucking industry shows a now-familiar result: Deregulation simultaneously reduced prices and increased the quality of service. All classes of shippers benefited, though to different degrees. Less than truckload rates fell more rapidly than truckload rates, because the presence of private and contract carriage limited the extent to which regulation could inflate truckload rates.

Similarly in electricity, the rates that are most distorted by regulation will probably change the most under competition. These are most likely the rates paid by larger customers. Nevertheless, the trucking experience suggests that all classes of customers can expect lower rates.

Poor pricing creates costs

From a consumer perspective, the deregulated trucking industry has performed quite well. One area where performance could be improved, however, is in the pricing and use of highways. The taxes truckers pay do not accurately reflect the costs that their vehicles impose on the highway system. In general, trucks with heavy weights per axle pay much less than the costs they impose, while trucks with low weights per axle (and automobiles) pay more. One study estimates that marginal cost pricing for road use—such as a fee based on the weight per axle—would reduce road maintenance costs by $6.44 billion annually (Small, Winston, and Evans 1989, 79).

The relevant lesson for electricity is that transmission and distribution charges should accurately reflect the costs that generators and users impose on the system. For example, if a

customer buys power from a nonutility generator but expects the utility to provide backup power, the customer should pay for this "insurance." However, customers who do not want backup service from utilities should not receive it and should not have to pay for it. Proposals to charge "exit fees" to all customers who opt for non-utility generators obviously contradict this principle, since customers would be forced to pay for backup service whether they want it or not.

Railroads

Economically, a railroad is similar to a privately owned electric firm with both generation and transmission. The railroad's generation capacity is its locomotives and freight cars; its transmission capacity is its track. Unlike airlines and trucking firms, however, railroads own and pay to maintain their right-of-way.

The ICC's original mandate was the regulation of railroads, an overbuilt industry even in the late 19th century. This regulation took the form of cartelizing competing railroads, condoning value-of-service pricing, and slowing the retirement of redundant assets. Unlike the trucking sector, the railroad sector was no longer a candidate for major new entry by the time ICC regulation coalesced in the early 20th century.

ICC regulation and federal railroad labor laws combined to mire the railroads in a quagmire of high costs and redundant capacity. Moreover, by limiting entry and innovation in the trucking industry, the ICC reduced the inevitable competitive pressure from this competing mode. And in 1948, the passage of the Reed-Bulwinkle Act legitimized rate bureaus of shippers, railroads, and trucking companies, facilitating collusive agreements that were exempt from the antitrust laws.

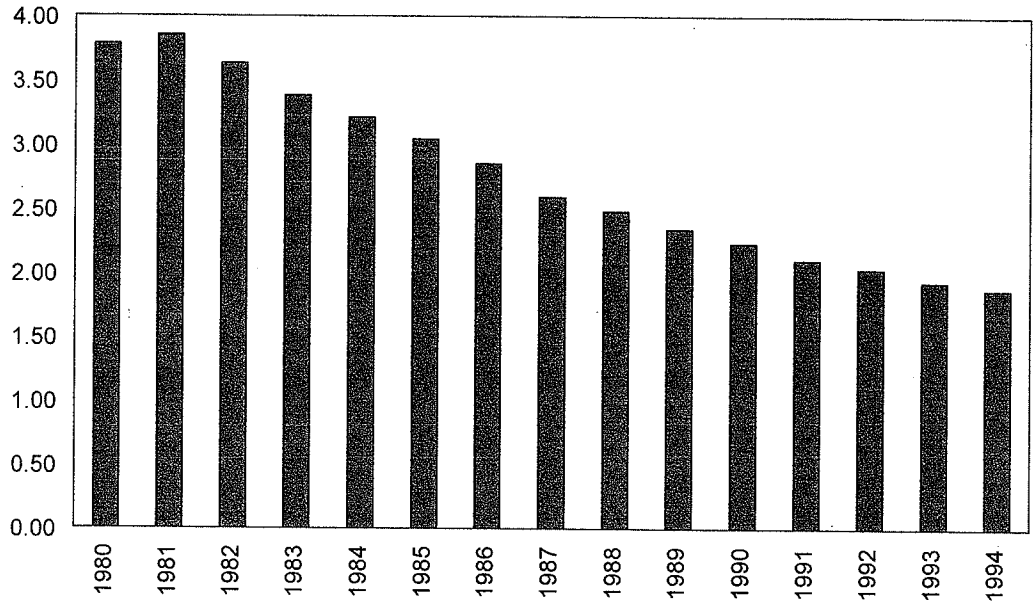
Regulatory reforms

Congress recognized the inefficiency of the U.S. railroads in 1976 after it witnessed the collapse of the merged Penn-Central system. It began to liberalize mergers and to allow greater route abandonments through the Railroad Regulatory Reform Act of 1976. But major deregulation did not occur until the passage of the 1980 Staggers Act that permitted selective deregulation of rates for commodities over which the railroads lacked "market dominance." At first, a railroad was defined as market dominant for any shipment whose rate exceeded 1.6 times the variable cost of the shipment Over time, this ratio rose from 1.6 to 1.8. Moreover, railroads could challenge a determination that they had dominance in shipping commodities where the rate/variable cost ratio exceeded this ceiling. The result was that a substantial share of commodities were deregulated by the ICC. About 90 percent of rail traffic now moves under deregulated rates.

Price effects

The effect of deregulation on rail rates has been far more modest than the effects on LTL truck rates. Winston *et. al.* (1990) found that rail rates in their sample declined only by about 3 percent by 1985 relative to expectations, given changes in costs, average load, and average shipment distance. However, since 1985, the average rates per ton mile have actually declined more rapidly than in the first five years after the passage of the Staggers Act. Figure R-1 reveals that revenues per ton-mile declined at a 4.9-percent inflation-adjusted rate from 1980 through 1995 but at a 5.1-percent rate since 1985, the terminal year of Winston *et. al.*'s analysis. In either case, rates appear to have declined substantially since deregulation.

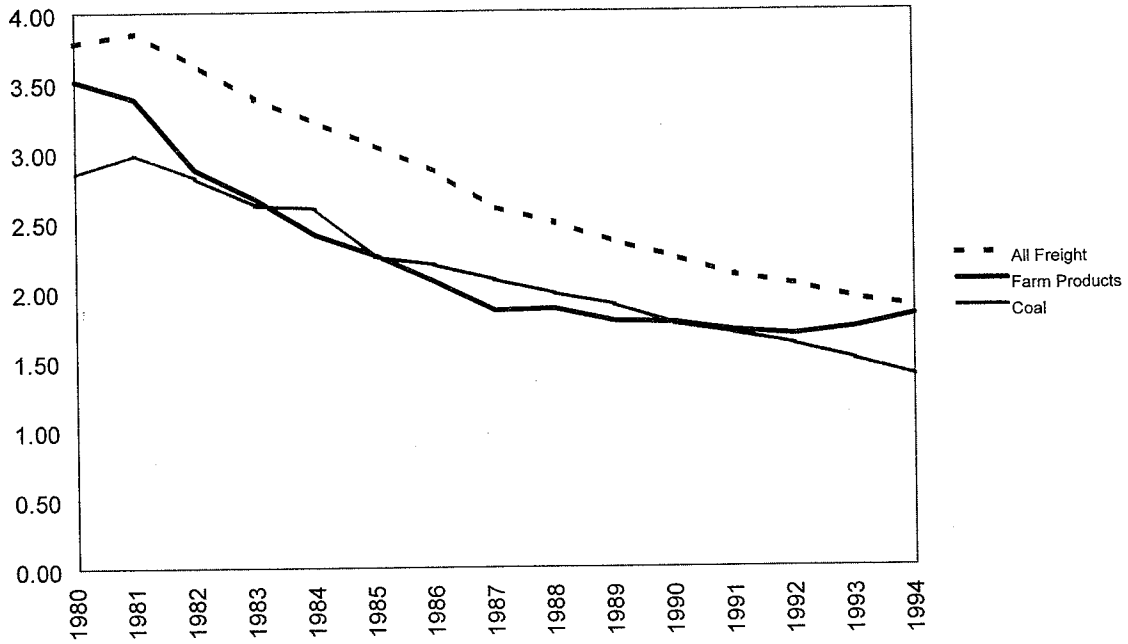
Figure R-1: Real Average Railroad Revenue per Ton-Mile ($1985)



Source: See Appendix for data.

Price declines have occurred even in the markets in which railroads arguably have some market power, such as in the shipment of coal. Figure R-2 shows that revenues per ton-mile for coal and farm products evidence similar declines since 1980. Thus, the benefits of the Staggers Act have been spread rather widely. Rates began to fall rapidly after 1981, when the Staggers Act took effect.

Figure R-2: Rail Revenue per Ton-Mile ($1985)

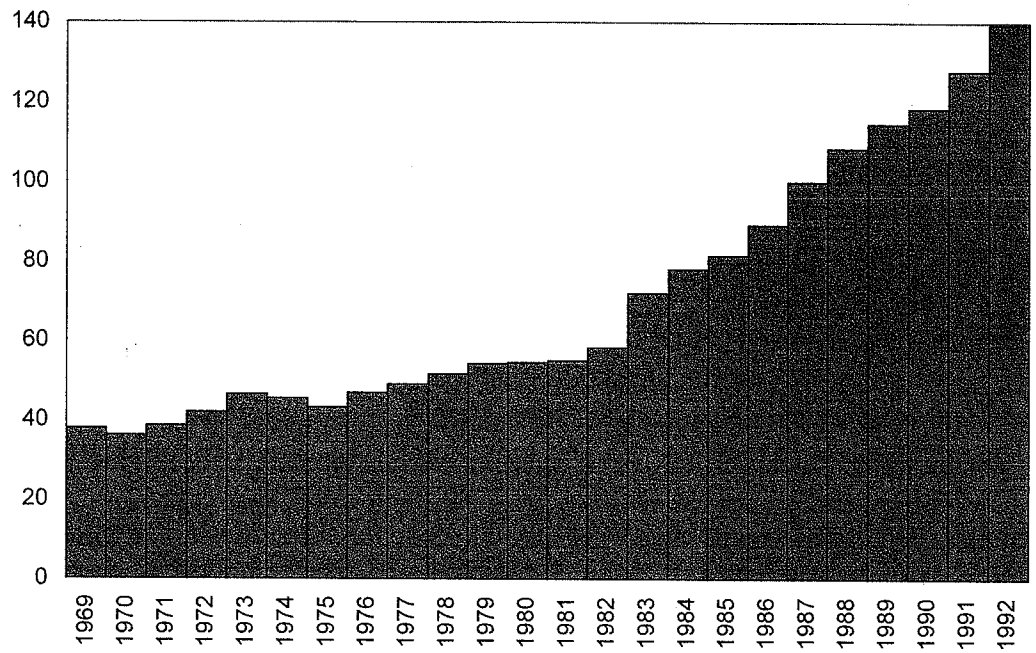


Source: See Appendix for data.

Output effects

One of the reasons for the superior price performance of major railroads since the passage of the Staggers Act is that they have been able to retire or sell unprofitable lines. Since 1980, Class I railroads have reduced the miles of track that they own by almost one-third, from 271,000 in 1980 to 184,000 in 1994. This elimination of unprofitable routes has, in turn, allowed the railroads to increase labor productivity at an annual rate of 7.6 percent since 1980, compared with an average of 2.8 percent between 1960 and 1980 (Association of American Railroads 1995). As Figure R-3 shows, productivity has risen substantially since 1980.

Figure R-3: Railroad Productivity Index



Source: See Appendix for data.

Inevitably, this scaling back of operations has reduced the Class I railroads' annual growth rate, in terms of revenue ton-miles, from 2.4 percent between 1960 and 1980 to 1.9 percent from 1980 through 1994. This reduced growth rate has occurred despite a substantial increase in the growth rate of intermodal traffic from an average annual rate of 4.1 percent in 1960 to 1980 to 7.0 percent since 1980 (Association of American Railroads 1995). Bureau of Labor Statistics data show a similar decline in growth, from 1 percent annually in the 1969 to 1979 period to 0.7 percent in the 1979 to 1992 period.

Quality effects

Prior to deregulation, many shippers considered the term "rail service" an oxymoron. The main reason was that regulation rendered railroads so unprofitable that they failed to invest in maintenance and improvement. In 1976, inadequate maintenance forced trains to operate at reduced speeds on one out of every seven miles of track in the nation. Some track was so poorly maintained that parked railroad cars would actually fall off the track, leading the industry to coin a new term: "standing derailment" (DOT 1978, 27).

Rail deregulation and competition from deregulated motor carriers have placed substantial pressure on railroad management to improve service quality. Railroad delivery time improved by nearly 30 percent by 1985, and the variance in delivery times had improved even more. Even assuming that delivery times had only improved by 20 percent, Winston *et. al.*

(1990) estimated that these improvements made shippers better off by $4.7 billion annually (in $1977) between 1980 and 1985.

Lessons for electricity

Deregulation benefits all customers

Railroad rates show a pattern quite similar to that in other industries. Over time, all major customers groups received lower rates. This occurred even for so-called "captive" shippers with few competitive alternatives. As in other industries, the railroad experience contradicts assertions that deregulation will benefit only the customers who currently have other competitive options.

Consumers buy more than one product

As with telecommunications, the railroad discussion reveals the danger of relying on narrow definitions of the consumer interest. During the 1980s, some public interest organizations and electric utilities argued that railroads should be forced to lower coal rates so that consumers could enjoy lower electricity rates. Similarly in the current electricity debate, some participants focus only on residential electric rates, as if consumers are not affected by the prices that large companies pay for electricity.

In reality, residential electricity costs account for only one portion of consumers' annual expenditures. Lower coal rates would have forced railroads to increase rates on other types of shipments, such as food, clothing, building materials, automobiles, and furnishings. Consumers ultimately would have paid for these higher freight rates in the form of higher prices for these products.

Like the debate over rail rates, the debate over electricity runs the risk of adopting a narrow view of the consumer interest. Consumers do not just buy electricity; they also buy countless products and services that are produced with electricity, and they pay for the electricity in the prices of these products and services. Defining the consumer interest solely in terms of residential rates distorts any concept of the consumer interest beyond reason.

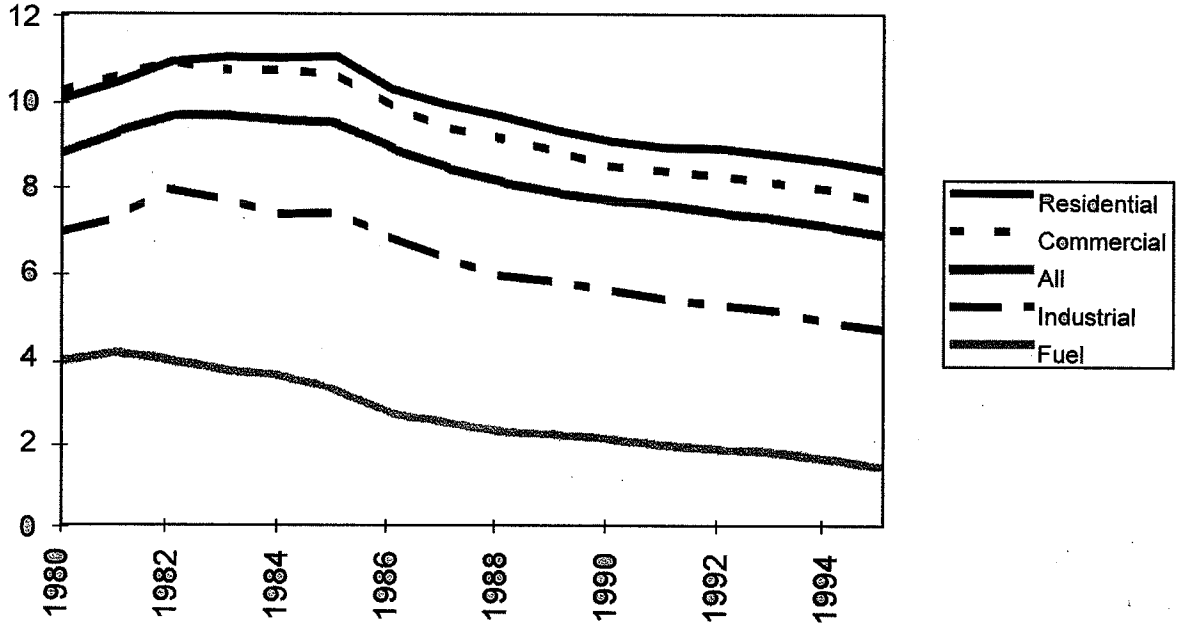
Electricity: Comparable Performance?

For the most part, regulatory reform began in the 1980s. The affected industries responded with significant price reductions and quality changes that cannot be attributed to fuel prices, exogenous technological change, or other factors. Has the electric industry displayed a similar record over this time period?

Electric rates

At first glance, the electric industry seems to have performed quite well in terms of rates. Figure E-1 shows that real electric rates have declined substantially since 1980. The weighted average rate for all customers fell by about 20 percent. Industrial customers, many of whom have the option of generating their own electricity cheaply, received larger rate reductions, while residential customers received somewhat smaller rate reductions.

Figure E-1: Electricity Revenues and Fuel Prices, cents/kwh ($1995)



Source: See Appendix for data.

More careful scrutiny suggests that the decline in electric rates resulted largely from reductions in fuel prices. Figure E-1 shows that electricity revenues per kilowatt hour (kwh) have basically tracked fuel prices paid by utilities—usually with a lag of a year or two. The real

cost of fossil fuel reported to the DOE fell by 59 percent between 1980 and 1995. Similarly, the real weighted average price of all fuel for electric generation fell by 57 percent between 1980 and 1994.[19] Figure E-2 compares the reduction in electricity revenues per kwh with changes in fuel prices. Data from both the Edison Electric Institute (EEI) and the DOE show similar trends.

Figure E-2: Percentage Real Reductions

	1980-94 (EEI data)	1980-95 (DOE data)
Residential electric revenues*	9	16
Commercial electric revenues*	18	24
Industrial electric revenues*	N. A.	31
All electric revenues*	15	21
Fuel*	57	N.A.
Fossil fuel (per MMBTU)	N.A.	59

*Numbers are per kwh.

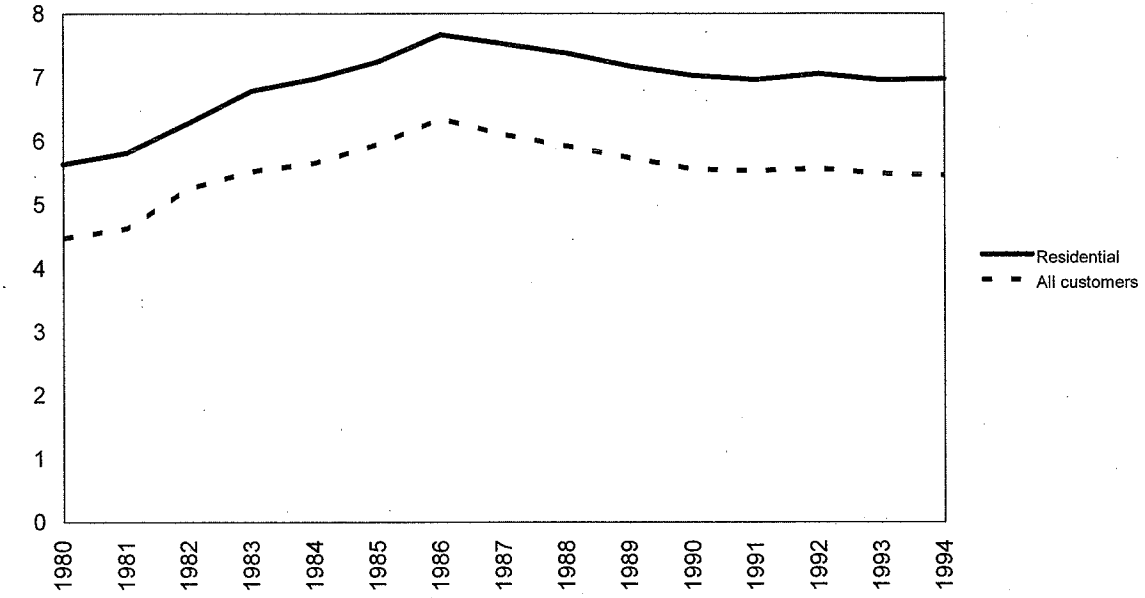
Source: See Appendix for data.

Of course, fuel is not the only cost faced by electric utilities, and so we should not expect electricity prices to fall by a similar percentage. But a comparison of electric revenues and fuel costs per kwh helps ascertain whether the fall in electric rates reflects anything other than fuel price reductions. If utilities merely pass through fuel cost savings, the difference between revenues per kwh and fuel costs per kwh should remain relatively flat. If utilities generate additional efficiencies and pass them through to consumers, then the difference between revenues and fuel costs should shrink, reflecting the fact that other costs have shrunk.

Figure E-3 sheds some light on this issue by showing the difference between fuel costs per kwh for utilities' residential electric customers and for all customers. The data clearly show that until 1986, revenues net of fuel costs actually increased! Fuel costs were falling, but electric rates were not falling fast enough to pass the full savings through to consumers. After 1986, the difference shrank somewhat; electric rates fell by a bit more than necessary to pass through the fuel cost savings to customers. At the end of the period, though, the difference between fuel and other costs per kwh in constant dollars was larger than it was at the beginning of the period. The spread was 24 percent larger for residential customers and 22 percent larger for all customers. There is therefore little evidence that regulated utilities experienced cost-reducing efficiency gains for the period as a whole.

[19] As of this writing, the cost of fuel per kwh is not yet available for 1995.

Figure E-3: Electric Revenues Minus Fuel Costs, cents/kwh ($1995)



Source: See Appendix for data.

Inefficiencies of regulation

In addition to passing through changes in input prices, the five industries in this study produced price reductions that must be attributed largely to the change in regulation. Since the electric industry has not undergone comparable change, it should come as no surprise that most of the savings to consumers during the past 15 years resulted from lower fuel prices.

The past 15 years suggest that the institution of regulated monopoly has not generated significant pressures for increased productive efficiency. This result is consistent with the findings of several classic statistical studies on the effects of state regulation of electric companies. Examining electric rates between 1912 and 1937, a period when a substantial number of states did not regulate electric utilities, George Stigler and Claire Friedland (1962) found that state regulation had no effect on electric rates. Regulated states had lower rates after regulation, but they already had lower rates *before* regulation! In fact, the 25 states that first adopted regulation actually saw their rates rise relative to the rates of unregulated states.

Regulation did not lower rates, but it did raise utility profits. Prior to regulation, electric companies in the "early adoption" states were less profitable than those in other states regulation raised their rates of return to a level about the same as in other states. (Jarrell 1978). Even an analysis using data from 1962, during the "golden age" when regulation seemed to work well, concluded that regulation reduced electricity prices by no more than 5 percent, and probably less than that (Moore 1970).

Other scholars have argued that regulation may have reduced electricity rates during the late 1970s and early 1980s (Wenders 1986). But this rate restraint did not occur because of productive efficiency. Rather, regulators simply refused to let rates rise to reflect fully the soaring cost of nuclear plant construction and general cost increases due to high inflation. Regulation effectively redistributed wealth from shareholders to ratepayers, but it did little to promote efficiency.

Why does monopoly regulation often fail to protect consumers? Several decades of scholarly research have identified a number of inefficiencies created by regulation that tend to keep rates higher than they would be otherwise. These inefficiencies include distorted input choices, political influence costs, and lax entrepreneurial incentives.

Distorted input choices

For much of this century, electric utilities have been subject to cost-of-service regulation. Under this type of regulation, regulators usually estimate costs by examining the firm's costs for one or more "test years" in the past. They then approve a price schedule that they expect will allow the firm to cover its costs, including a "fair" rate of return.

This type of regulation can give a firm incentives to inflate its costs when the allowed rate of return differs from the rate the firm actually needs to earn to attract capital. If the allowed rate of return exceeds the cost of capital, the firm has incentive to invest in more capital than is needed to produce at the lowest possible cost. If the allowed rate of return is less than the cost of capital, the firm has incentives to avoid capital investment, substituting other inputs such as fuel or purchased power.

The direction and size of this type of distortion is a subject of debate among economists. Several empirical studies have found that, in the 1960s, regulation did indeed induce electric utilities to use more than the cost-minimizing amounts of capital. (Hayashi and Trapani 1976, Petersen 1975, Spann 1974). One author actually quantified the effect of regulation on utility costs, finding that excessive capital investment added $437 million to the cost of producing electricity in the United States. This figure was equal to 11.95 percent of total generating costs in 1962 (Courville 1974).

Overcapitalization became less plausible by the early 1980s, for three reasons: high real interest rates raised the cost of capital, regulators effectively lowered rates of return by disallowing about $9.2 billion worth of investments in nuclear plants (Canterberry, Johnson, and Reading 1996, 559), and the Public Utility Regulatory Policy Act encouraged utilities to purchase power from cogenerators instead of building their own plants. What matters for consumers, however, is not whether the utility uses too much or too little capital, but that the utility fails to use the lowest-cost combination of capital and other inputs. In either case, electric rates end up higher than they would otherwise be.

Political influence costs

The regulatory process itself is not costless. In addition to the budgets of the regulatory commissions, the public bears additional regulatory costs in the form of utility expenditures to lobby regulators and legislators. Since these expenditures are current rather than capital costs, they are quickly passed through to the ratepayers.

The current debate over electricity deregulation provides a straightforward example of the cost of seeking political influence. The Edison Electric Institute alone plans to raise $3 million per year in 1996 and 1997 to lobby on electricity deregulation (Stone 1996), but the total amount spent in the policy debate could easily total many times this amount. The electric utility industry claims that it could lose anywhere between $50 billion and $200 billion under deregulation if it is not permitted to recover "stranded costs" from customers. If these estimates are accurate, they imply that the industry has a strong incentive to spend literally billions of dollars persuading lawmakers, regulators, and the general public that deregulation is a bad idea, that deregulation should proceed very slowly, or that the transition to deregulation should include policies permitting stranded cost recovery. Barring a major change in the way regulators permit the pass-through of costs, all of these political influence costs will be borne by ratepayers.

Lax entrepreneurial incentives

Conventional public utility regulation outlaws competition and limits profits. Both policies diminish entrepreneurial incentives to lower costs, improve quality, and develop new products and services. Without competition, electric utilities can allow their costs to drift higher and offer substandard service without facing an immediate loss of business. With limits on their rates of return, utilities have little incentive to invest in highly innovative projects that could generate high returns.

Economic research on these effects of regulation has usually focused on electric utility costs. Various analysts have estimated that the absence of competition raises electric utilities' unit generating costs by between 6 and 10 percent (Stevenson 1983, Primeaux 1977). In addition, a comparative study of monopoly and duopoly electricity markets found that competition reduces transmission and distribution costs by 2-4 percent (Nelson and Primeaux 1988, 345). Although the exact figures are open to debate, both types of results suggest that regulation raises utilities' costs by attenuating entrepreneurial incentives.

Policy Implications

Each of the five industries we have examined in depth— natural gas, telecommunications, airlines, railroads, and trucking—shares some similarities with electricity. Of course, each also has some important differences. The differences among the five industries, however, are just as great as the differences between any of these industries and electricity. To the extent that regulatory reform or deregulation produced a similar pattern across most or all of these industries, we can be fairly confident that it will produce a similar pattern in electricity.

The patterns revealed in this study are quite similar to those found in previous surveys of the deregulation literature. Significant previous work includes a 1996 study by the National Regulatory Research Institute (Costello and Graniere 1996), a comprehensive overview published in the *Journal of Economic Literature* (Winston 1993), and a 1992 assessment by the President's Council on Competitiveness. These diverse researchers agree that economic deregulation generated significant benefits for consumers. The conclusions of the National Regulatory Research Institute study are worth quoting at length:

> Consumers have benefited greatly and the overall efficiency of the deregulated industries has improved greatly as well. Firms in these industries have reduced their costs, lowered their prices, introduced new services and reconfigured old services to better accommodate consumer preferences, and deployed new technologies and practices. Further, distributional effects have not been dramatic. For sure, shareholders have not grown rich at the expense of consumers. In fact, in most instances, consumers have gained much more from deregulation than shareholders. Yet, shareholders have been able to earn adequate rates of return, attributed in part to the greater freedoms firms have enjoyed since deregulation (Costello and Graniere 1996, 1).

Five major findings emerge from the scholarly literature on deregulation. We believe that each finding also implies a policy conclusion relevant to the debate over electricity:

- **Finding: Deregulation and customer choice lower prices.**

In each of the five industries, prices paid by customers fell significantly as a result of deregulatory reforms. Within the first two years of deregulation, prices had fallen by 4-15 percent, and sometimes more for certain groups of customers. Within 10 years, prices were often 25-40 percent lower. Of course, not all of these changes were due to changes in the regulatory regime, but scholarly studies consistently show that regulatory reform created billions of dollars worth of consumer benefits. Consumers gained substantially—not just because of rate reductions, but also because of improvements in the quality of service. All broad consumer groups shared in the price reductions, though some benefited more than others.

Figure P-1: Summary of Trends Following Regulatory Change

Industry	% Real price reduction after... 2 years	5 years	10 years	Annual value of consumer benefits due to deregulation
Gas	10-38% (1984-86)	23-45% (1984-89)	27-57% (1984-94)	N.A.*
Long Distance Telecom	5-16% (1984-86)	23-41% (1984-89)	40-47% (1984-94)	$5 billion
Airlines	13% (1977-79)	12% (1977-82)	29% (1977-87)	$19.4 billion
Trucking	N.A.**	3-17% (1980-85)	28-58%*** (1977-87)	$19.6 billion
Railroads	4% (1980-82)	20% (1980-85)	44% (1980-90)	$9.10 billion

Note: All figures are real, in $1995. Consumer benefit figures in the last column measure *total* consumer benefits, including both price reductions and changes in service quality.

Source: For price reductions, see Appendix and/or text of study for data. Consumer benefit figures are from Crandall (1991), Morrison and Winston (1995), and Winston et. al. (1990).

N.A*: For natural gas, no controlled studies quantify the separate effect of deregulation on gas prices. Winston (1993, 1274-75) speculates that the consumer benefits exceeded economists' prederegulation predictions, which were in the range of $2-4 billion in 1995 dollars. If gas prices had remained at 1984 levels, consumers would have paid $50-60 billion more for gas in 1995.

N.A.**: For trucking, no studies have documented the effects for the first couple of years.

***No trucking figure is available for 1980-90; figure quoted is for 1977-87, from Corsi (1994). Because regulation made it difficult to cut trucking rates, the bulk of these rate reductions occurred after 1980.

Policy implication: *Competition is desirable.*

Policymakers concerned about consumers should open electricity service to competition, deregulate rates, and promote consumer choice as quickly as possible.

- **Finding: Deregulation and customer choice align service quality with consumer desires.**

The only declines in service quality attributable to deregulation or regulatory reform occurred when regulation previously limited customer choice, forcing customers to pay premium prices for gold-plated service. Crucial social goals like airline safety, reliability of gas service, and reliability of the telecommunications network were maintained or improved by deregulation and customer choice.

Policy implication: *Service quality is no excuse for delay.*

Concerns about reliability and other aspects of service quality are reasons to expedite regulatory reform. Service quality choices will enable consumers to select the services that best meet their needs.

- **Finding: Consumers have experienced genuine benefits instead of cost shifting.**

Regulatory reform is not a zero sum game; it generated genuine gains for consumers and society as a whole. It is possible to find narrowly defined groups of customers in special circumstances who paid somewhat higher prices after deregulation, but the gains to the vast majority of consumers far outweighed the effects on these small groups.

Consumers gained for two reasons. First, deregulation or regulatory reform aligned prices more closely with costs, leading to a more efficient use of resources by both firms and customers. Second, firms faced greater incentives to adopt cost-reducing or quality-enhancing innovations in technology, marketing, and business strategy, which often were not predicted beforehand.

Policy implication: *Transition costs are no excuse for delay.*

Based on the experience in other industries, electricity regulatory reform should produce gains well in excess of the transition costs. Therefore, the presence of transition costs is no excuse for delaying or avoiding reform.

- **Finding: The lower the barriers to customer choice, the greater benefits customers receive.**

Rates fell faster in parts of the market where regulators permitted greater customer choice. In telecommunications, for example, long-distance rates fell faster in the interstate market than the intrastate market, because state regulators have been less tolerant of competition and price cutting. Similarly in the airline industry, during the 1970s proponents made a powerful

case for deregulation by showing that tickets were less expensive on the less heavily regulated intrastate routes of Texas and California.

Policy implication: *Choice for* **all** *customers for all competitive services will provide the most benefits.*

The best way to let all customers reap the benefits of competitive electric service is to let all customers choose their electricity suppliers. Policy proposals that deregulate only the wholesale electricity market, or allow only large customers to choose their suppliers, are thus inferior from a consumer perspective. For similar reasons, states that refuse to allow competition from out-of-state suppliers do their own citizens a disservice.

- **Finding: Competitive markets continue to evolve in response to consumer needs.**

Although prices fell noticeably in response to deregulation, adjustment to the new, deregulated environment was far from immediate for incumbent firms. Regulation affects not just the structure of incentives facing a firm, but also its corporate culture—the shared assumptions about what types of activities generate business success. Regulation can change relatively quickly, but corporate culture often changes slowly, and so corporate strategies may also adjust slowly to the deregulated environment. For the five industries in this study, significant changes and adjustments are occurring even after 10 years. Benefits of regulatory reform continued to accrue long after the market was first opened.

Even if some firms adjust quickly to the deregulated environment, that environment changes much more quickly than the regulated environment. The industries in this study did not move from a "monopoly equilibrium" to a new "competitive equilibrium." Rather, they moved from a fairly stable regulated environment to an evolutionary environment in which competitive rivalry continually forces producers to improve their performance. Since it is unlikely that firms will ever stop learning, and consumers are never satisfied with the status quo, a stable equilibrium is extremely unlikely.

The five industries in this study present a plethora of examples of innovations that were not foreseen or planned beforehand. These include natural gas hubs, airline hub-and-spoke systems, and a multitude of types of new services and customer-premises equipment in telecommunications. Such developments should give pause to anyone who claims to be able to predict either the likely or the optimal market structure.

Policy implication: *Open and competitive markets should be allowed to evolve.*

Legislators and regulators should resist the temptation to elaborately plan either the structure of markets or the transition process. The temptation to overplan takes many forms, including mandates that power must be bought and sold through a central "POOLCO" and proposals that would restrict the range of contracts that generators can make with customers.

In any move toward greater reliance on markets, transition problems must be addressed. But the significant ones where government must play a role, such as those dealing with transition costs, involve the assignment or reassignment of property rights to various market participants. The proper role of policy is not to "design market mechanisms" but to create and protect a framework of property rights that allows market institutions to evolve on their own.

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APPENDIX

Natural Gas Data

Gas Prices, in $1995

Year	Wellhead	Residential	Commercial	Industrial	Elec. Util.	Citygate
1984	3.91	8.99	8.14	6.19	5.43	5.79
1985	3.56	8.67	7.79	5.59	5.03	5.31
1986	2.70	8.11	7.06	4.49	3.38	4.48
1987	2.24	7.43	6.40	3.94	3.11	3.85
1988	2.18	7.05	5.96	3.80	3.00	3.76
1989	2.08	6.93	5.83	3.64	2.99	3.70
1990	1.99	6.76	5.63	3.42	2.78	3.53
1991	1.84	6.51	5.38	3.01	2.44	3.24
1992	1.89	6.40	5.30	3.08	2.56	3.27
1993	2.15	6.50	5.62	3.24	2.75	3.39
1994	1.93	6.59	5.59	3.14	2.34	3.16
1995	1.59	6.06	5.01	2.66	2.02	2.78

Margins (in $1995); Gas Consumption and Production (in mmcf)

Year	Distribution Margin	Transport. Margin	US Gas Consumption	US Gas Production
1984	3.19	1.89	17,950,524	18,304,339
1985	3.36	1.76	17,280,943	17,270,227
1986	3.63	1.78	16,221,296	16,858,675
1987	3.58	1.61	17,210,809	17,432,901
1988	3.29	1.58	18,029,588	17,918,465
1989	3.23	1.62	18,800,826	18,095,147
1990	3.23	1.54	18,715,090	18,593,792
1991	3.27	1.41	19,035,156	18,532,439
1992	3.13	1.38	19,544,364	18,711,808
1993	3.11	1.23	20,279,095	18,981,915
1994	3.43	1.22	20,755,471	19,635,495
1995	3.28	1.19	21,655,000	19,826,000

Source: Energy Information Administration, *Natural Gas Annual, Natural Gas Monthly*, various issues.

Telecommunications Data

Prices of Consumer Equipment, in $1994

Year	Answering Machines	Std. Corded Telephones
1984	106	43
1985	105	39
1986	108	37
1987	96	33
1988	91	30
1989	85	26
1990	73	26
1991	75	24
1992	72	28
1993	79	14
1994	79	15

Source: Multimedia Telecommunications Association, *Telecommunications Market Review and Forecast*, 1990 and 1996 editions.

Billions of Minutes of Long-Distance Calls

Year	Total	Intrastate	Interstate
1980	1733	141	133
1994	2898	331	424
% change	67	135	219

Source: Federal Communications Commission (1996).

Prices and Revenues

Year	Intrastate LD Price Index ($1977)	Interstate LD Price Index ($1977)	Interstate LD Revs./ minute	Access Costs/ minute	LD Revs-Access Costs/minute	Monthly Local Rate ($1995)
1984	61.8	57.9				
1985	60.1	53.4	30.4	16.6	13.8	19.58
1986	59.0	48.9	25.0	14.6	10.4	20.59
1987	55.8	40.2	20.5	12.0	8.5	22.43
1988	52.0	37.0	19.5	10.5	9.0	22.35
1989	47.4	34.2	18.0	9.2	8.8	21.35
1990	44.1	31.6	15.6	7.6	8	21.54
1991	41.4	30.1	14.6	7.1	7.5	20.74
1992	39.5	29.4	14.3	6.9	7.4	20.88
1993	38.0	29.2	14.2	6.7	7.5	20.31
1994	36.9	30.7				19.85
1995	34.5	29.9				19.54

Sources

Price Indexes: Bureau of Labor Statistics
Long-distance revenues and access costs: Crandall and Waverman (1996).
Local telephone rates: Federal Communications Commission, Common Carrier Bureau, *Trends in Telephone Service* (1996).

Airline Data

Average Yield (cents/RPM, $1995) by Number of Competitors on Route

Year	1	2	3	4+
1979	25.82	22.25	19.31	20.78
1984	29.19	22.88	19.51	18.92
1988	25.25	18.94	18.16	13.53
1995	18.80	16.40	14.30	11.70

Average Yield (cents/RPM, $1995) by Market Density (passengers/day)

Year	< 50	50-100	101-200
1979	22.67	23.72	11.10
1984	23.03	23.91	15.90
1988	17.91	18.16	14.50
1995	14.40	15.80	16.10

Average Yield (cents/RPM, $1995) by Trip Distance (miles)

Year	0-250	251-500	501-750
1979	43.45	32.33	27.29
1984	39.60	31.54	30.51
1988	48.31	32.59	26.67
1995	45.70	26.50	20.30

Average Yield (cents/RPM, $1995) at Single-Carrier Hubs

Year	Yield
1979	23.1
1984	26.0
1988	21.0
1994	18.7

Source for preceding 4 tables: DOT Data Bank 4.

Average Number of Departures and Destinations

	Departures, Sm. Cities	Departures, Med. Cities	Destinations, Sm. Cities, Nonstop	Destinations, Sm. Cities, One-Stop	Destinations, Med. Cities, Nonstop	Destinations, Med. Cities, One-Stop
5/78	32,744	40,561	9	9	11.7	11.9
5/95	48,960	63,854	8.4	9.8	11.5	15

Source: General Accounting Office, *Airline Deregulation: Changes in Airfares, Service, and Safety* (April 1996).

Airline Yield (cents/RPM, $1995) and Quantity Measures

Year	Yield	Passengers (Millions)	Rev. Passenger Miles (billions)
1977	21.65	222	157
1978	19.84	253	183
1979	18.80	287	205
1980	21.25	271	198
1981	21.36	259	194
1982	18.98	271	205
1983	18.44	294	223
1984	18.77	316	238
1985	17.29	353	266
1986	15.40	388	299
1987	15.32	417	324
1988	15.86	419	329
1989	16.05	416	330
1990	15.66	423	340
1991	14.83	411	331
1992	13.89	429	347
1993	14.45	441	353
1994	13.58		
1995	13.57		

Source: DOT, Office of Aviation and International Economics, and Air Transport Association Web Site.

Aircraft Miles, Departures, and Passenger Fatalities
(Part 121 Airlines, Scheduled Service)

Year	Aircraft Miles (000)	Departures (000)	Passenger Fatalities
1960	997,976	3856	336
1961	969,556	3750	124
1962	1,009,784	3660	158
1963	1,095,058	3788	121
1964	1,189,135	3954	200
1965	1,353,503	4197	226
1966	1,482,486	4373	59
1967	1,833,563	4946	226
1968	2,123,993	5300	305
1969	2,359,745	5377	132
1970	2,394,313	5100	2
1971	2,343,578	4999	174
1972	2,336,922	5044	160
1973	2,368, 550	5102	197
1974	2,177,253	4694	420
1975	2,240,506	4704	113
1976	2,319,997	4833	36
1977	2,418,645	4937	69
1978	2,520,165	5015	150
1979	2,791,120	5399	348
1980	2,816,303	5353	0
1981	2,703,219	5212	2
1982	2,698,928	4964	222
1983	2,808,566	5034	14
1984	3,113,604	5448	4
1985	3,319,955	5835	196
1986	3,728,429	6427	4
1987	3,988,105	6581	229
1988	4,140,911	6700	274
1989	4,192,820	6622	130
1990	4,490,793	6924	12
1991	4,414,087	6783	49
1992	4,619,177	7051	31
1993	4,846,458	7245	0
1994	5,026,894	7511	228

Source: Air Transport Association Web Site.

Trucking Data

Real Operating Cost per Mile ($1987)

Year	LTL carriers	TL carriers
1977	4.10	4.07
1987	3.01	1.80
1993	2.66	1.00

Source: Corsi (1994, 1996, and 1996a)

Small Shipment Revenues ($1995, billions)

Year	Total	LTL	UPS	Air	Other
1980	33.11	19.60	7.40	4.25	1.85
1981	32.36	18.11	7.88	4.53	1.84
1982	30.32	16.74	7.74	4.26	1.57
1983	31.98	17.29	8.57	4.90	1.38
1984	35.93	19.95	9.09	5.72	1.17
1985	37.82	20.96	9.63	6.37	0.99
1986	39.63	21.55	10.29	7.09	0.70
1987	41.59	22.14	10.73	8.05	0.54
1988	43.93	22.42	11.72	9.28	0.39
1989	44.86	22.25	12.41	9.83	0.49
1990	46.64	22.97	12.71	10.61	0.35
1991	47.11	22.49	13.87	10.52	0.34
1992	47.91	23.25	13.80	10.65	0.33
1993	50.31	24.47	14.45	11.07	0.32
1994	48.02	20.67	15.12	11.83	0.41
1995	49.80	17.60	15.30	12.50	0.40

Source: Eno Foundation (1996).

Railroad Data

Rail Revenue per Ton-Mile ($1985)

Year	All Freight	Farm Products	Coal
1980	3.78	3.51	2.84
1981	3.85	3.38	2.98
1982	3.63	2.87	2.81
1983	3.38	2.66	2.61
1984	3.21	2.40	2.59
1985	3.04	2.25	2.24
1986	2.85	2.06	2.18
1987	2.59	1.85	2.07
1988	2.48	1.86	1.97
1989	2.34	1.77	1.89
1990	2.23	1.76	1.75
1991	2.10	1.70	1.68
1992	2.03	1.67	1.60
1993	1.93	1.72	1.49
1994	1.87	1.81	1.37

Source: Association of American Railroads.

Rail Productivity Index

1969	37.9	1981	55.1
1970	36.2	1982	58.3
1971	38.6	1983	72.0
1972	42.1	1984	78.0
1973	46.5	1985	81.5
1974	45.5	1986	89.2
1975	43.3	1987	100
1976	46.9	1988	108.4
1977	49.1	1989	114.6
1978	51.6	1990	118.5
1979	54.3	1991	127.8
1980	54.6	1992	139.6

Source: Bureau of Labor Statistics.

Electricity Data

Electricity Revenues and Fuel Costs, cents/kwh ($1995)

Year	Residential	Commercial	All	Industrial	Fuel cost
1980	9.98	10.17	8.69	6.84	3.83
1981	10.39	10.56	9.22	7.20	4.05
1982	10.89	10.89	9.63	7.89	3.88
1983	11.01	10.70	9.63	7.65	3.65
1984	10.99	10.70	9.53	7.33	3.53
1985	11.04	10.62	9.48	7.36	3.21
1986	10.28	9.87	8.89	6.81	2.67
1987	9.92	9.38	8.45	6.30	2.47
1988	9.66	9.14	8.11	5.92	2.27
1989	9.33	8.84	7.86	5.77	2.20
1990	9.09	8.51	7.69	5.59	2.10
1991	8.95	8.39	7.60	5.37	1.96
1992	8.93	8.28	7.41	5.25	1.87
1993	8.79	8.14	7.29	5.12	1.81
1994	8.64	7.96	7.11	4.85	1.63
1995	8.42	7.70	6.90	4.69	

Source: Energy Information Administration, *Electric Power Monthly*, and Edison Electric Institute, *Statistical Yearbook of the Electric Utility Industry*, various issues.