Journal of Economic Perspectives—Volume 12, Number 3—Summer 1998—Pages 89-110

U.S. Industry Adjustment to Economic Deregulation

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Economic deregulation does not happen overnight. It takes time for lawmakers and regulators to dismantle regulatory regimes, and then it takes more time for the deregulated industries to adjust to their new competitive environment. Federal regulatory agencies and the U.S. Congress began liberalizing pricing, entry, and exit in the transportation, financial, energy, and communications industries during the mid-1970s. But while some smaller industries such as intercity bus transportation and air cargo have been fully deregulated during that time, the only major American industries fully deregulated to date are airlines and motor carriers. As to the pace of industry adjustment, consider airlines. Economic deregulation of the airline industry began in 1974 when the Civil Aeronautics Board first encouraged experiments with discount fares. It was completed in 1983 when all regulations on fares, entry, and exit were eliminated. Yet more than 20 years after the deregulatory process began, the airline industry continues to shed inefficiencies that accumulated over decades of regulation and to find new ways to market their service. Indeed, the airlines' latest marketing innovation—selling discount fares on the Internet—would be illegal if fares were still regulated.

It is not surprising that deregulated (or partially deregulated) industries are slow to achieve maximum efficiency. When regulatory restrictions on pricing, operations, and entry (especially from new firms), have been enforced for decades, managers and employees of regulated firms settle into patterns of inefficient production and missed opportunities for technological advance and entry into new markets. Deregulation frees an industry from the state's control over prices, entry, and exit, although, of course, firms are still subject to antitrust laws and safety regulations. After deregulation, some costs usually fall in short order, but it takes

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firms a long time to tear down decades-old barriers to efficiency and to adopt more efficient production and marketing practices.

Deregulation is a long-term process, from which society will continue to reap benefits as firms continue to adjust to free market competition and as more and more industries are more fully deregulated. Policymakers, however, take a more myopic view—and often place a greater weight on minimizing disruptions to the public than on maximizing economic efficiency.[1] This emphasis may play a useful role in gaining passage of deregulatory legislation. Nonetheless, the concern over disruptions can also lead to counterproductive outcomes. For example, the Essential Air Services program was established in 1978 to assuage congressional fears that airline service to small communities would disappear under deregulation. However, Morrison and Winston (1986) suggest that the subsidies provided under this program were not only unnecessary, but may have been responsible for reducing the potential benefits that could be generated in these markets.

Policymakers are impatient, and when deregulation fails to produce sufficient immediate benefits to their constituents, they face temptation to reregulate or to limit further deregulation. For example, Congress deregulated cable television in 1984 and then reregulated it in 1992, even though the reregulation in all likelihood resulted in a loss in consumers' welfare (Crandall and Furchtgott-Roth, 1996). Similarly, some policymakers were expressing concern early in 1997 that the 1996 Telecommunications Act had not already led to declines in rates—while failing to acknowledge that this legislation still left the telecommunications industry substantially regulated.

Policymakers and the public tend to notice only what deregulation has done for them *lately*, forgetting that society will continue to reap benefits from deregulation as industries continue to adjust to the new competitive order. As a result, they often undervalue the benefits of deregulation. To make sure that policymakers and the public do not sell deregulation short, it is useful to examine how the long-run efficiency benefits of deregulation are achieved. In doing so, it will become clear that the U.S. industries' adjustment to deregulation is marked by many common elements. These same elements will probably govern the evolution of other industries—telecommunications, cable television, and electricity—that are now embarking on substantial deregulation. It appears likely that each will become far more efficient than it was under regulation and in the process generate substantial benefits to consumers.

Although I believe that the academic community has reached a consensus that deregulation's net benefits to consumers are substantial, I recognize that this view may not be compelling to certain policymakers who do not care about the average consumer in the country, but only about their constituents. For example, at a recent hearing on the airline industry in the U.S. House of Representatives, Congressman

[1] Hahn and Hird (1991), Winston (1993), and Joskow and Noll (1994) provide comprehensive overviews of regulatory reform. Peltzman (1989), Noll (1989, 1996), and Winston and Crandall (1994) assess political forces underlying regulatory reform.

Conyers from Detroit, Michigan, ignored estimates of the large nationwide benefits of airline deregulation and questioned the wisdom of the entire policy because he felt fares at Detroit's Wayne airport were "too high." Setting aside the accuracy of Conyers's assessment, his perspective illustrates that public debates about deregulation persist after it has long been in place. It is therefore important to identify the long run benefits of deregulation to respond to policy proposals that may emerge from these debates.

Theoretical and Empirical Considerations

Neoclassical economic theory predicts that both a profit-maximizing monopolist and a perfectly competitive firm will operate on the technologically efficient production frontier; that is, any profit-maximizing firm should always wish to minimize its costs, regardless of how much competition it faces. But a regulated firm is in a different situation. Although regulated firms can choose their technologies and operating practices, these choices are made subject to the state's control over prices, entry, and exit and without the challenges posed by unrestricted competition from incumbent firms and new entrants, hence managers and employees face a rather different set of incentives in searching for greater efficiency. I am not aware of a formal model of industry adjustment to deregulation that provides theoretical guidance on this issue. Predictions of the effects of deregulation were generally guided by static models that assumed technology and operations would not be significantly affected by the change in the regulatory regime (Winston, 1993). Nonetheless, one can draw on some basic theoretical ideas to identify the central factors that will cause an industry to become more efficient as it adjusts to deregulation.

First, an old-fashioned view is that regulation improves welfare because it helps control monopoly. This view has been discredited because it is clear that regulation primarily limits competition among firms, and this lack of competition causes an industry to accumulate substantial managerial slack or "X-inefficiency"; that is, firms do not minimize the cost of producing a given level of output. When an industry is deregulated, unrestricted competition among incumbent firms and from new entrants forces the industry to shed such inefficiencies and to seek out innovations in marketing, operations, and technology. Nickell (1996) presents empirical evidence that shows that increased numbers of competitors are associated with a significantly higher rate of total factor productivity growth.

Second, particular regulations can force firms to operate in an inefficient manner. In a seminal paper, Averch and Johnson (1962) showed that a hypothetical form of regulation, rate-of-return regulation, forced regulated firms to choose their inputs in an inefficient manner; because the regulators determined a firm's profits as a percentage of the firm's capital investment (or "rate base"), firms had a strong incentive to overinvest in capital. One could modify this model to characterize

situations where an actual regulation leads to an operating inefficiency. For example, entry barriers prevented firms, such as airlines and motor carriers, from developing their networks optimally; exit barriers prevented firms, such as railroads, from shedding excess capacity; and price regulations prevented firms, such as natural gas pipelines, from efficiently marketing their capacity during peak and off-peak periods.

Finally, regulations also prevent firms from responding effectively to external disturbances, such as a recession or a large unanticipated change in prices or interest rates. An industry subject to regulation may, because of its cartel status, be somewhat insulated from these shocks. For example, if fuel prices rise, regulated electric utility firms could appeal to regulators to raise prices. But if regulators refuse such appeals, regulated firms lack the flexibility to respond to shocks (Joskow, 1974). Deregulated firms gain the ability to respond more effectively to external disturbances.

To sum up: an industry's adjustment to deregulation will, in theory, be shaped by intensified competition and increased operating freedoms that will cause the industry to become more technologically advanced, to adopt more efficient operating and marketing practices, and to respond more effectively to external shocks. Moreover, one must remember that deregulated industries are facing these challenges and opportunities for the first time, often with a burden or legacy of investments, operating practices, and sunk costs that inhibit change and competition. In what follows, I will present empirical evidence from the airline, trucking, railroad, banking, and natural gas industries that illustrates how these factors govern an industry's adjustment to deregulation. Regulatory reform of the former industries began in the mid-1970s, and their current regulatory status is summarized in Table 1. I focus on these industries because they are major industries that have been subject to regulation for decades and have recently experienced substantial regulatory reform. Thus I do not consider the intercity bus industry because it is comparatively very small (its annual revenues are only $900 million), nor do I consider petroleum production, because it was regulated for a short period. The experience drawn from the industries in Table 1 will constitute evidence that I will use to assess the likely adjustment of other industries to deregulation.

Some of the evidence that I report should be qualified at the outset. The appropriate way to measure the effects of deregulating an industry is a counterfactual analysis that estimates the price, cost, and service changes that are solely attributable to deregulation, and thus would not have occurred had an industry still been regulated. But such an analysis can be complicated. It may need to account for the business cycle, for those elements of technological change due to deregulation and those not, and for changes in the characteristics of products, including service quality. Some argue that an appropriate counterfactual should also allow for regulators to learn from past errors and for regulation to have improved as it hypothetically continued, although there is little evidence that regulators learn and change in this way. To sidestep such complications, a simpler approach is to evaluate changes in real costs and prices over time; for example, one can compare real

Table 1
Current Status of Regulatory Reforms

Industry	*Regulatory Status*
Airlines	Pricing, entry, and exit have been fully deregulated.
Motor Carriers	Interstate and intrastate rates, entry, and exit have been fully deregulated.
Railroads	Most rates, including contract rates, have been deregulated, but "tariff" rates for certain commodities are still subject to maximum rate "guidelines."
Banking	Ceilings on interest rates (except for demand deposits) have been eliminated by deregulation, and Congress has authorized interstate banking to take place during the next few years. Thrift institutions have been allowed into consumer and business lending, while affiliates of banks have been permitted some degree of securities underwriting.
Natural Gas	Prices at the wellhead have been fully deregulated. Independent shippers now have access to pipelines at rates regulated by the Federal Energy Regulatory Commission. By obtaining "interruptible" service (i.e., a pipeline owner can stop service to a customer when demand is high under conditions specified by a contract), shippers can obtain discounts from these rates. Shippers can also sell their surplus pipeline capacity to other entities. This competitive re-selling has also led to rates below the tariff rates. Finally, market-based or negotiated rates for pipeline storage service, hub service, and even transportation services are being allowed.

airline costs in 1977 the first year before deregulation with real airline costs for the most recent period during which cost data have been collected. This simpler approach is taken in many studies of deregulation, thus I will draw on these estimates here. Although these analyses do not constitute a rigorous counterfactual, their conclusions are strongly suggestive and qualitatively consistent with the few rigorous counterfactuals that have been performed, typically using less recent data.

Changes in Entry and Exit and the Extent of Competition

As the airline, trucking, railroad, banking, and natural gas industries have been deregulated, competition has intensified, both among incumbent firms and because of new entrants.

Many of the new entrants that have made their presence felt have come to be identified as "low-cost" or "independent."[2] In the airline industry, Southwest Airlines, the premier low-cost carrier, is generally acknowledged to have set the standard for

[2] For more detailed discussion of the material in this section, see Morrison and Winston (1995) for the airline industry; Corsi (1996a) for the "less-than-truckload" trucking industry; Corsi (1996b) for the "truckload" trucking industry; Grimm and Windle (forthcoming) for the railroad industry; Berger, Kashyap, and Scalise (1995) for the banking industry; and DeVany and Walls (1994), Herbert and Kreil (1996), and Energy Information Administration (1995) for the natural gas industry.

efficiency and consistent service that other carriers are striving to reach. ValuJet, another low-cost carrier, also played an important competitive role until its license was suspended in June 1996 because of safety concerns (it has subsequently returned and is now known as AirTran); its presence in Atlanta influenced Delta to lower its costs and prices. The trucking industry is composed of two sectors: "less-than-truckload" (LTL), which uses a network of terminals to consolidate shipments of more than one shipper's goods on a truck, and "truckload" trucking, which provides point-to-point service for one shipper's goods that fill an entire truck. In the LTL segment, low-cost non-union regional carriers, such as Con-Way Transportation Services, have become an important competitive force. In response to this challenge, the national LTL carriers, such as Roadway, have pursued an aggressive policy of purchasing regional (non-union) carriers and operating them as independent business units. The dominant force in "truckload" trucking has become the "Advanced Truckload" or "High Service" mega-carrier, such as Schneider National. These carriers have become so efficient that they are capturing substantial traffic from firms that historically, in response to high regulated truck rates and poor service, provided their own trucking services. For-hire trucking operations are now roughly 25 percent less expensive than private carriage, which relies primarily on (more costly) unionized labor, according to estimates from DRI/McGraw-Hill (cited in Corsi, 1996b). In the rail industry, no large carrier has entered for several decades, because of the huge capital requirements to start a railroad and the ubiquitous coverage of existing networks. But since deregulation there has been a substantial increase in the number of smaller low-cost (non-union) railroads such as Montana Rail Link, which have formed a small system from track that they purchased from large railroads. And competition among incumbent railroads is much more intense. Darius Gaskins has frequently pointed out that when he was a Berkeley economics professor, he taught theories that predicted that duopolists had considerable ability to maintain high prices. But as the CEO of Burlington Northern railroad, he learned that duopolists' prices often reflected fierce competition. In banking, new competition has arisen from interstate bank expansions and from non-bank intermediaries like mutual funds, insurance and financial companies, and corporations issuing debt. Finally, in the natural gas industry, independent producers have increased their share of gas production since deregulation, and independent shippers now have competitive access to pipelines.

Substantial merger activity has generally occurred within a decade of an industry's deregulation. As in any industry, whether recently deregulated or not, the contribution of these mergers to social welfare has been subject to controversy. For example, end-to-end mergers have helped railroads become more efficient, but parallel mergers may have reduced competition between railroads while producing few efficiency gains. Similarly, some airline mergers have been found to enhance social welfare, while others have not.[3] Major mergers often continue as firms adjust

[3] Winston, Corsi, Grimm, and Evans (1990) discuss railroad mergers in the deregulated environment, while Morrison and Winston (1989) and Werden, Joskow, and Johnson (1991) estimate the effects of airline mergers since deregulation.

to deregulation. In the airline industry, American and U.S. Airways, Northwest and Continental, and United and Delta have all recently proposed alliances. In the railroad industry, the imminent absorption of Conrail by Norfolk Southern and CSX may lead to other merger proposals. In the trucking industry, national carriers continue to acquire regional carriers, and in the wake of the UPS strike, Federal Express has acquired RPS to compete more effectively for small freight shipments. The growth of nationwide banking has already led to a great deal of merger activity in the banking industry and as indicated by the recent Norwest and Wells Fargo mega-merger, seems likely to lead to more.

In some cases, incumbent firms, particularly in the airline, banking, and railroad industries, have seen mergers as the way to enter new markets. Conversely, because regulation enabled many inefficient firms to stay in business, it is not surprising that mergers have also facilitated large-scale exit, especially in the LTL trucking industry and in the banking industry, as weaker firms that were unable to compete effectively in a deregulated environment sought a merger partner to remain in business.

Following deregulation, the net result of entry, exit, and mergers has generally been that competition in actual *markets* becomes more intense, although the total number of firms in an industry nationwide may either rise or fall. That is, travelers can choose among more airlines when taking a trip; consumers can choose among more lending institutions when seeking a loan; shippers can choose among UPS, Federal Express, or revitalized rail, truck, or intermodal (truck-rail) carriers to ship their goods; and companies can choose among more utilities or an array of marketers to purchase their natural gas.

After deregulation, competition has even developed in markets once thought to have "natural" entry barriers. In other words, experience rather than theory is more instructive about which parts of an industry are competitive and which parts are subject to natural monopoly. Some rail shippers that may appear to be captive to one major railroad have the option of using railroads that have formed a small system or using another major railroad with trackage rights over the "monopoly" carrier's track. In addition, firms contemplating a new plant location or expansion can sign long-term railroad rate contracts before committing to new investment, thus exploiting competitive alternatives before making a decision. Thousands of natural gas end users now contract with pipelines to ship and store their gas and they can release (sell) their unused capacity to other entities. Natural gas end users and rail shippers can benefit from source competition—for example, Alabama utilities that face rate increases on coal shipped from Colorado can switch to coal from Kentucky if they can access a different railroad—and from product competition—for example, utilities that face rate increases on natural gas can shift to coal or oil if their technology permits such substitution.

Innovations in Marketing, Operations, and Technology

The intensified competition resulting from deregulation causes firms to make innovations in marketing, operations, technology, and governance that enable

them to become more efficient, improve their service quality, introduce new products and services, and become more responsive to consumers' preferences.[4] One might suspect that regulation could foster innovations because firms were more profitable in this environment and thus had the resources to devote to innovative activity. I point out, however, that regulation generally did not significantly increase industry profitability.

One way that deregulated firms have marketed their services more effectively is by offering an array of price-service packages to potential customers. Airlines now offer travelers a wide range of fares from discount fares with various travel restrictions—some of the lowest discount fares are exclusively available on the Internet—to much higher fares with no travel restrictions. This has contributed to planes flying with a higher percentage of seats filled—a rise in the so-called "load factor." Railroads and motor carriers now often negotiate price-service packages with shippers directly. During regulation, railroad traffic was effectively prevented from moving under contract rates. Today, more than half of all rail traffic moves at a negotiated contract rate, which has facilitated more efficient use of capacity and services that are tailored to shippers' production and inventory policies. Banks have greatly expanded the scope of financial services they offer customers and provided new tools, such as derivative securities and financial guarantees, to help their customers diversify risk. In the natural gas industry, the development of market centers and hubs has enabled marketers to help business consumers contract for rates and service that match their specific requirements.

Deregulated firms have made a number of innovations in their operations and technology. Among these innovations to date are the airlines' accelerated development of hub-and-spoke networks that have enabled carriers to increase their load factors. Also, the hub-and-spoke system has brought much greater service frequency, which was a dramatic surprise to many. When fares were regulated, airlines competed excessively in flight frequency. It was thus expected that flight frequency would fall when airlines were deregulated. But with the connections made possible by hub-and-spoke networks, one additional aircraft departure from a spoke airport to a hub airport provides many alternatives on connecting flights, so that service frequency has actually risen. Airlines' development of computer reservation systems has also facilitated improvements in scheduling and handling flight reservations. In the trucking and railroad industries, improvements in network design, the expanded use of intermodal operations, double stack rail cars, and increased use of computer systems have enabled faster, more reliable service. For example, Norfolk Southern once tracked its cars and locomotives by posting a video camera at the entrance to each rail yard; now, an electronic scanner automatically tracks each car's arrival. Truck drivers for Schneider National used to have scheduled check-in

[4] For more detailed discussion of the material in this section, see Morrison and Winston (1995) for the airline industry; Corsi (1996a, 1996b) for the trucking industry; Winston, Corsi, Grimm, and Evans (1990) for the railroad industry; Berger, Kashyap, and Scalise (1995) for the banking industry; and Henning, Tucker, and Liu (1995) and Herbert (1996) for the natural gas industry.

phone calls to headquarters; now, they roam the highways with small satellite dishes attached to their cabs, and use the data transmitted by technicians in the company's headquarters to track maintenance needs and the location of shipments. Banks have applied advances in information processing and communications to lower consumers' and their own transactions costs. Natural gas companies have used computer technology to lower their operating and maintenance expenses, and have improved their service to customers by unbundling production, transportation, and distribution.

It could be argued that many of the innovations by deregulated firms have been the direct result of advances in information technology, and thus would have occurred regardless of whether their industries were deregulated. The argument, of course, is not that deregulation was a primary force in the information technology revolution. But the benefits from these advances were realized only because firms had the incentive and operating freedom to design new production systems and write computer programs to optimize operations. Under regulation, these firms had little incentive or competitive pressure to do so, and regulators did not design regulations to stimulate innovative activity.

Deregulated firms have also been spurred by external shocks to improve the efficiency of their operations, and in particular to match their capacity with consumer demand. The airline industry, for example, has traditionally made capacity commitments roughly two years in advance because of the lead times to acquire aircraft. However, the high income elasticity of demand for air travel—together with a dose of unpredictability—created overcapacity in the early 1990s, which led to intense fare wars and huge industry losses (Morrison and Winston, 1996). Carriers have subsequently adjusted their operations by expanding their capacity more slowly in the face of growing demand. In addition, American and Delta Airlines have made long-term purchasing commitments to Boeing Aircraft, in return for expedited delivery of planes, which puts American and Delta in a better position to tailor their capacity to demand.[5] Railroads have used contracts to align their cars and equipment with shippers' demand and reduced their vulnerability to problems caused by overcapacity. Contracting for natural gas pipeline storage and capacity, and the development of spot and futures markets have helped the gas industry respond effectively to the business cycle.

The experience of the banking industry with external shocks differs from that of other deregulated industries, because deregulation was followed by a crisis for the savings and loan industry and for many banks, culminating in substantial costs for taxpayers to bail out the savings and loan (S&L) deposit insurance fund. But deregulation—which in this industry meant freeing up the interest rates that savings and loans could pay, and allowing interstate banking and new financial instruments—can be held responsible for only a fraction of the savings and loan

[5] Boeing has agreed not to enforce these commitments as a condition for obtaining the European Commission's approval of its merger with McDonnell-Douglas. American and Delta, however, are unlikely to change their commitments.

debacle. The earlier regulations, under which S&L's were limited in the interest they could pay and the loans they could make, could have literally meant the annihilation of the S&L industry when market interest rates climbed sharply in the late 1970s. The S&L disaster was caused by a sequence of events: the legacy of previous regulation, unfavorable interest rate movements, partial deregulation, lax regulatory supervision, moral hazard problems created by federal deposit insurance, and unwarranted optimism over real estate prices in certain areas. The lesson here is not to fear deregulation itself; indeed, the deregulated banking and S&L industries are today vibrant and healthy. However, deregulation can be undermined if it is not supplemented with appropriate policies. In the case of a deregulated banking industry, a vigilant safety-and-soundness regulatory regime was essential, given federal deposit insurance. In other industries, the appropriate supplemental policies mean that deregulated industries continue to be subject to antitrust laws, safety regulations, and so on.

Finally, deregulation has also led to improvements in corporate governance that contribute to innovative activity. Winston, Corsi, Grimm, and Evans (1990) report that under deregulation, railroad managers are younger, better educated, and have fewer years of company service than under regulation, and Kole and Lehn (1996) and Meyer and Oster (1984) argue that airline managers have become much more entrepreneurial in the deregulated environment.

Improvements in Industry Efficiency and Consumer Welfare

By stimulating competition and giving firms greater incentives and freedom to seek out efficiency, deregulation has generated substantial improvements in consumer welfare that will continue over time. Because firms will continue to innovate in ways that they would not have under regulation, it is important to bear in mind that any current summary of the gains from deregulation is likely to be a lower bound.

Industry Efficiency

The evidence to date suggests that since deregulation, each industry has substantially improved its productivity and reduced its real operating costs from 25 percent to 75 percent. Table 2 gives some examples of what has happened in the main industries considered here. Of course, deregulation should not be given total credit for all of the decline in each industry's real operating costs. For example, some of the decline in rail operating costs can be attributed to the long run trend in railroads' traffic mix to include a greater proportion of low-cost bulk traffic. Some of the decline in truckload carriers' operating costs can be attributed to these carriers largely eliminating the more costly less-than-truckload traffic from their traffic mix. Nonetheless, deregulation does deserve credit for most of the fall in costs. In general, these cost savings have not significantly increased industry profitability. Rather, the intensity of competition under deregulation has forced much of the

Table 2
Improvements in Industry Efficiency

Industry	*Improvements*
Airlines	Average industry load factors have increased from roughly 52 percent the decade preceding deregulation to roughly 62 percent since deregulation. Real costs per revenue ton-mile have declined at least 25 percent since deregulation. Industry profits have been very volatile during deregulation, although higher, on average, than they would have been under regulation.
Less-Than-Truckload Trucking	Carriers have substantially reduced their empty miles since deregulation. Real operating costs per vehicle mile have fallen 35 percent, but operating profits are slightly lower than they would have been under regulation.
Truckload Trucking	Carriers have substantially reduced their empty miles since deregulation. Real operating costs per vehicle mile have fallen at least 75 percent, but operating profits are slightly lower than they would have been under regulation.
Railroads	Railroads have abandoned one third of their track miles since deregulation. Real operating costs per ton-mile have fallen 60 percent, and rail profits are much higher than they would have been under regulation.
Banking	The real cost of an electronic deposit has fallen 80 percent since deregulation. Operating costs have declined 8 percent in the long run because of branch deregulation. Recent industry returns on equity exceed those just before deregulation.
Natural Gas	Pipeline capacity has been much more efficiently utilized during peak and off-peak periods since deregulation. Real operating and maintenance expenses in transmission and distribution have fallen roughly 35 percent.

Sources: For airlines, Morrison and Winston (1998); for less-than-truckload trucking, Corsi (1996a); for truckload trucking, Corsi (1996b); for railroads, Winston, Corsi, Grimm, and Evans (1990) and Association of American Railroads (1996); for banking, Berger, Kashyap, and Scalise (1995) and Jayaratne and Strahan (1998); and for natural gas, Henning, Tucker, and Liu (1995) and Herbert (1996).

savings to be passed on to consumers in lower prices. The one industry where profitability *has* increased substantially is the railroad industry, which had earned low profits under regulation and experienced many bankruptcies. As hoped for by the architects of the 1980 Staggers Act deregulating the railroads, rail has profited greatly from deregulation. During 1971–80, the industry's return on equity was less than 3 percent, which along with widespread bankruptcies in the northeast and midwest heightened concerns about whether this industry could be financially viable in the private sector; during the mid-1990s, the industry return on equity has been more than 8 percent.

The intertwined pattern created by deregulation—more competition, restructuring, opportunities for new markets, and further cost reductions—seems likely to continue. The deregulation of international airline markets, which is slowly proceeding through bilateral negotiations between the United States and other countries, will bring new competition to U.S. carriers, along with new possibilities for route networks and marketing. Airlines are currently exploring a number of options to raise labor productivity such as having (lower cost) pilots who work for their

affiliates fly smaller (regional) jets that have been recently introduced on short-haul routes. The trucking industry has experienced a serious shortage of long-distance drivers, but the increasing use of intermodal operations has helped to alleviate this problem. Of course, intermodal operations also bring more competition in freight markets. Although truckers have significantly reduced their empty mileage, more progress can be made through further load consolidations, and by for-hire motor carriers making further inroads into private trucking operations (Corsi, 1996b). Although railroads have abandoned a lot of track already, they will continue that process. Railroads can also improve their fleet by taking advantage of technological innovations that have made locomotives more powerful and enabled rail cars to carry heavier loads without wearing out track. The spread of smaller low-cost rail carriers should spur the industry to continue to reduce its labor costs. Finally, it is possible that rail mergers will continue to the point where only two large transcontinental railroads, both highly efficient, would remain in the industry. But even this restructuring (if it comes to pass) would still leave two large railroads in the east and two in the west, and thus have little effect on the current level of rail competition between any two given destinations. The growth of nationwide banks and securitization will lead to more consolidations in the banking industry, but also to more competition in local banking markets. The recent development of electronic banking is opening up a new set of markets where banks are likely to compete with computer and phone companies, according to the American Bankers Association. Finally, continued unbundling of natural gas production, transportation, and distribution will increase competition in this industry, particularly at the distribution level.

Innovations in marketing, operations, and technology are often difficult to anticipate, so the path of any particular industry as it adjusts to deregulation will be unpredictable. Nonetheless, it is striking that nearly 20 years after deregulation began, even industries with low sunk costs and a simple technology, like truckload trucking, are continuing to adjust to deregulation in much the same way as industries with large sunk costs and a more complicated technology, like railroads.

Consumer Welfare

Consumers have turned out to be the primary beneficiaries of deregulation. The evidence to date suggests that since deregulation, each industry has significantly improved its service quality and reduced its real average prices from 30 to 75 percent, as summarized in Table 3. As in the case of the decline in operating costs, one can attribute most but not all of the decline in prices to deregulation. Some alternate reasons for lower costs in rail and trucking, which also apply to prices, were given earlier. Certain critics of airline deregulation have argued that fares were already declining before deregulation and that the decline in real fares since deregulation would have occurred anyway. However, Morrison and Winston (1995) show that deregulation has accelerated the de-

Table 3
Improvements in Consumer Welfare

Industry	*Improvements*
Airlines	Average fares are roughly 33 percent lower in real terms since deregulation, and service frequency has improved significantly.
Less-Than-Truckload Trucking	Average rates per vehicle mile have declined at least 35 percent in real terms since deregulation, and service times have improved significantly.
Truckload Trucking	Average rates per vehicle mile have declined at least 75 percent in real terms since deregulation, and, because of the emergence of "Advanced Truckload" carriers, service times have also improved significantly.
Railroads	Average rates per ton mile have declined more than 50 percent in real terms since deregulation, average transit time has fallen at least 20 percent, and the standard deviation of transit time has fallen even more than 20 percent.
Banking	Consumers have benefitted from higher interest rates, from better opportunities to manage risk, and from more banking offices and automated teller machines.
Natural Gas	Average prices for residential customers have declined at least 30 percent in real terms since deregulation, and average prices for commercial and industrial customers have declined even more than 30 percent. In addition, service has been more reliable as shortages have been almost completely eliminated.

Sources: For airlines, Morrison and Winston (1998); for less-than-truckload trucking, Corsi (1996a); for truckload trucking, Corsi (1996b); for railroads, Winston, Corsi, Grimm, and Evans (1990) and Association of American Railroads (1996); for banking, Berger, Kashyap, and Scalise (1995) and Jayaratne and Strahan (1998); and for natural gas, Costello and Duann (1996) and Crandall and Ellig (1997).

cline in real fares, and that the decline would have been much less had fares still been regulated.

It is difficult to itemize the sources of the price declines in each industry according to changes in competition supplied by incumbent firms and new entrants and by improvements in efficiency. Morrison and Winston (1998) are able to provide such a decomposition for the airline industry. They report that competition supplied by incumbent carriers accounts for 18 percent of the savings from lower real fares since deregulation, competition supplied by Southwest Airlines accounts for 31 percent of the savings, competition supplied by other new entrants accounts for 10 percent of the savings, and improvements in carriers' operating efficiencies account for 41 percent of the savings.

Deregulation's considerable success has surprised the economics profession in at least some respects. The profession correctly predicted that consumers would gain from lower airline, motor carrier, and natural gas prices, and from higher interest rates on bank deposits, but the profession expected rail rates to rise (or at least not to fall very much), and failed to predict the large gains from improved service quality in all industries (Winston, 1993). Accounting for changes in prices and service quality, a conservative estimate of the annual net benefits that consum-

ers have received just from deregulation of intercity transportation—airlines, railroads, and motor carriers—amounts to roughly $50 billion in 1996 dollars (Morrison and Winston, 1998). These benefits have been achieved without compromising safety.[6]

To be sure, consumers have not shared equally in the gains from deregulation. Long-distance air travelers on high density routes have benefitted more than short-distance travelers on low density routes; large rail and truck shippers have benefitted more than small rail and truck shippers; large savers have benefitted more than small savers; and commercial and industrial natural gas customers have benefitted more than residential natural gas customers. But this distribution of benefits has generally had a rational economic basis. Because one objective of economic regulation is commonly to "equalize" prices and services across all consumer groups and geographical areas, it is not surprising that the transition from regulation to market forces has not "equalized" deregulated prices and services for all customers. In any industry, buyers who make large purchases or reside in markets with many competitors or lower costs will generally receive lower prices and better service than buyers who make small purchases or reside in markets with few competitors or higher costs. In the airline industry, for example, Morrison and Winston (1997) show that roughly 90 percent of the difference in the gains to travelers on high traffic density routes and low traffic density routes can be explained by the higher costs of serving travelers on low density routes, which are attributable to the lesser economies of scale of smaller planes and lower load factors on such routes.

As in other industries, institutions are evolving to maintain competitive forces in many deregulated markets. In shipping, third-party logistics firms have sprung up to analyze shipper distribution patterns and logistics costs and to determine, with the aid of sophisticated software, the lowest-cost routes and the carriers with the lowest rates. These firms are also able to achieve cost savings for shippers by leveraging the volumes of all of their clients to obtain discounts from carriers. Travel agents and large firms can obtain lower fares for travelers who can be organized into a bargaining unit. Recently, GM and Chrysler set up an agreement with Pro Air, a start-up carrier, to pay a monthly fee for five years in exchange for unlimited passage on the carrier for their employees. Marketers can obtain lower natural gas prices for an aggregate of residential users, and so on. Many of these institutions are just developing. In the future, they are likely to become more prominent in deregulated markets and enable more consumers to share in the ongoing efficiency gains from deregulation.

[6] The effects of deregulation on wages and employment vary by industry. For example, truckers have experienced significant losses in wages but railroad workers have not, while railroad employment has been cut but airline employment has risen. In general, the losses to labor from deregulation represent at most a modest fraction of consumers' gains, see Winston (1993) and the accompanying article by James Peoples in this issue.

Implications for Other Industries

The evidence suggests that deregulation has been and continues to be a success, and further, that this success is the result of an adjustment process that is common to all major industries that have been completely or partially deregulated. Is this conclusion likely to apply to the major industries—telecommunications, electricity, and cable television—that are currently facing substantial regulatory reform?[7]

Deregulation in these areas is barely underway and moving very slowly. In telecommunications, prices for interstate long-distance service have been deregulated for incumbent carriers—subject to various restrictions on geographic conformity of rates and interconnection charges that are kept above costs by state and federal regulators to cross-subsidize local service. The prices of intrastate long-distance and local service are still regulated by state regulatory commissions. The 1996 Telecommunications Act envisioned widespread entry by the many players in telecommunications and cable TV into each other's markets, but also left in place a number of existing regulations, including those at the state level, and set up some new preconditions and restrictions on such competition. In electricity, states are exploring deregulation of generation, and allowing access to transmission and eventually to distribution. Cable television rates were deregulated in 1984 and then reregulated in 1992, but, in accordance with the 1996 telecommunications legislation, rates for smaller systems have now been deregulated again. Remaining cable television regulations are to be phased out by 1999. Some in the policy-making community and the press are attempting to assess the overall benefits of deregulation by looking at the short-term effects of these partial steps toward deregulation. I will take a long-run perspective, which begins by assessing whether the greater operating freedoms afforded by deregulation will be accompanied by intensified competition in these industries, and then considers both the likely problems of transition and the possible innovations that may benefit the public.

Competition and Potential New Entry

Until recently, many economists would have said that telecommunications, electricity, and cable TV industries were natural monopolies on the grounds that they have substantial economies of scale, making entry difficult. But recent technological advances have changed the rules of competition in these industries. In telecommunications and cable TV, digital transmission technologies over fiber optics or the electromagnetic spectrum are creating new opportunities for competition in parts of these industries. In electricity, the advent of small scale combined cycle gas turbine (CCGT)

[7] For more detailed discussion of the material in this section, see Crandall and Waverman (1995) and Harris and Kraft (1997) for the telecommunications industry; Crandall and Furchgott-Roth (1996) for the cable television industry; and Smith (1996), White (1996), Joskow (1997), and Kwoka (1997) for the electricity industry.

technology is doing the same. In all three industries, both incumbents and potential entrants are providing a potentially large source of competitors.

The current incumbent players in telecommunications include both local service companies, like the regional Bell operating companies, several independent companies, and a number of small rural companies; and long-distance telephone service, like AT&T, MCI, Sprint, and some smaller carriers. They are potential entrants into each other's markets. Other potential entrants into both the local and long-distance markets include cellular and other wireless companies, cable TV companies, and electric utilities, who often own fiber optic cable networks that could carry phone calls. Even Internet services now offer long-distance and international voice calls. Similarly, cable TV companies could face competition from telephone companies, electric utilities, and cellular systems, as well as from direct broadcast satellite systems and multichannel microwave distribution services.

Competition arises in electricity when services are unbundled, so that a single company no longer provides power generation, transmission, and retail distribution services. Independent power producers are potential entrants in generation; retail power merchants and generation companies are potential entrants in transmission; and municipalities could become potential entrants in distribution. An additional source of competition will arise if customers can negotiate with generation companies for power and arrange their own transmission, as has occurred in natural gas.

As in the case of other deregulated industries, the strongest competitive forces could be provided by new low-cost competitors, who are already starting to emerge. For example, "dial around" long-distance firms, which can be accessed by dialing a five-digit code, are offering lower long-distance rates than larger carriers because they have much lower marketing and promotional expenses. In electricity, pilot experiments in certain states will enable consumers to obtain lower electricity prices from independent start-up companies, which use the latest technologies and have much lower costs than older incumbent utilities. The incumbent utilities have enormous sunk costs of plant already installed and contractual commitments to buy independently generated power at very high rates. Free entry may even create markets for a generic service, such as communications or energy, which could eventually enable consumers to choose among several firms to supply all their energy and communications services. The Potomac Electric Power Company has recently announced a new venture with RCN Corporation of Princeton, New Jersey, to offer alternative local telephone service, high-speed Internet connections, and cable television to consumers in the Washington, D.C., area.

The rapid pace of merger activity in the communications and energy industries suggests that firms in these industries are positioning themselves for deregulated competition. Long-distance and local telephone companies, regional Bell operating companies, and cable and telephone companies are proposing mergers. The value of mergers between electric utilities and between electric and natural gas utilities rose from $2 billion in 1982 to nearly $20 billion in 1996. Antitrust authorities will again be required to mediate between the private interests of firms and the efficiency objectives of society. However, most of the proposed restructuring is likely

to help industries shed inefficiencies developed over decades of regulation. The probable pattern is that the number of competitors may fall over time, but the intensity of competition in communications and electricity markets should become much greater than it was under regulation.

Potential Problems of the Transition

It is clear that intense competition can develop in communications and electricity markets. But the legacy of sunk costs created by regulation presents problems for the transition from regulation to deregulation of these industries. Meyer and Tye (1988) argue that the transition should encourage suppliers to sign the same kind of contracts with each other and with customers that they would have signed had there been no sunk cost legacy of regulation, thereby causing regulatory institutions to wither away. In practice, the competing interests of incumbent firms, new entrants, and consumers—as mediated through the existing regulatory and legislative structure—is likely to inhibit prompt or fully efficient solutions. The major problems to be addressed include competitive access, stranded assets, and universal service.

The competitive access issue begins with the observation that to facilitate competition in telecommunications and electricity, competitors must have the option of interconnecting with existing phone networks and electricity transmission lines. As one can imagine, incumbent carriers and new entrants often disagree as to what charge is reasonable; the new entrants argue that they should be charged only at marginal cost, while the incumbent carriers argue for higher charges that would allow them to recover their earlier capital costs. Parties have been able to agree on access charges in the railroad, natural gas, and airline industries, and market mechanisms have also developed to promote access. In Canada, railroads have engaged in "reciprocal switching," thus enabling shippers to have access to more than one railroad. In natural gas, re-selling of capacity has facilitated access to pipelines. To facilitate entry at airports, airlines are now able to buy or lease slots and gates from each other. The Federal Communications Commission has been trying to issue legally binding guidelines, without much success, on how the regional Bell operating companies and other local exchange companies must open their markets to competition and under what conditions the regional Bell companies can enter long-distance markets. AT&T's recently proposed acquisition of TCI, a cable television company, should sharply expand its ability to provide local service and could result in entry of local phone companies into long-distance markets. Congressional legislation has been introduced that would require the federal government to phase in competition in electricity at the consumer level in any state that has not done so by the year 2000.[8]

The "stranded assets" problem arises because incumbent firms are concerned that with deregulation, they will be stuck with uneconomic capital investments

[8] In the case of communications, regulatory authorities can also enhance social welfare by continuing to reallocate spectrum capacity to facilitate competition in cellular service (Kwerel and Williams, 1992).

urged upon them by regulators in the past, while having to compete against firms that are using more efficient technologies. The appropriate compensation, if any, for these stranded assets has emerged as a controversial issue in electricity and telecommunications; Kahn (1997) provides a balanced perspective on this issue in the electricity industry. But the issue is not new. In the natural gas industry, deregulation forced pipeline owners to accept from producers contractually priced gas supplies that they were unable to sell to utilities, because the utilities could find lower-cost sources of natural gas. Pipelines were allowed to recover, through a temporary fixed charge on consumers, as much as half the cost of "buying out" existing commitments to producers. In fact, based on data furnished by pipelines, transition costs predicted by the Federal Energy Regulatory Commission to be $44 billion turned out to be only $13 billion (Crandall and Ellig, 1997). After the break-up of AT&T, the depreciation rates for the obsolete capital caused by the break-up were generally allowed to increase (Costello and Graniere, 1996). When competition accelerated the obsolescence of existing investments, regulators resorted to price caps, but these prices caps were not explicitly set to allow the further recovery of stranded assets. Instead, telecommunications firms were responsible for recovering the undepreciated portion of obsolete capital through the increased profitability allowed by price cap regulation. The stranded cost stakes in electricity are huge, because incumbent utilities have been prodded by regulators to make suboptimal investments and sign long-term contracts that involve costly technologies, like nuclear power and some alternative energy sources, so that their costs will be much higher than new entrants' costs. But several states have already proposed ways to help utilities pay off their construction debts, usually through some fixed charge on consumers' monthly bills, thus enabling deregulation to move forward. Indeed, regulators in California have approved a plan to allow all utility customers to buy electricity from any supplier of their choosing in 1998.

The provision of universal service is not only important to policymakers, but to many supporters of deregulation as well. But if the goal is to provide reasonable prices and service to an area on an ongoing basis, firms need to have incentives to do that, and universal service requirements tend to reduce those incentives. For example, in airline and railroad deregulation, efforts were made to "protect" air travelers in rural areas by subsidizing carriers to serve these small communities and to "protect" shippers of certain bulk commodities like coal by instituting maximum rate guidelines. In fact, the airline subsidy program reduced carriers' incentives to provide high-quality, low-cost service to small communities (Morrison and Winston, 1986), while maximum rail rate guidelines have had little effect on prices because only a handful of rates have ever been successfully challenged. Another way of providing universal service is to require that large companies cross-subsidize certain users. Such cross-subsidies are difficult to sustain in a competitive market, where services can often be unbundled. Moreover, the gains to the community may not be as large as expected. In telecommunications, for example, Crandall (1997) finds that the inefficient cross-subsidization of local service through supra-compet-

itive long-distance rates has provided very small benefits to low-income consumers, because many of these consumers are heavy users of long-distance service. In these ways, policies to preserve universal service have a tendency to undermine the competitive forces that can enable consumers to obtain reasonable prices and service.

Opportunities for Innovations

Deregulation should not receive credit for the technological changes that have opened the possibility of intense competition in the communications and energy industries. But deregulation should allow and encourage more rapid application of these innovations, and by providing greater operating freedom and a more competitive environment it should stimulate new innovations. For example, communications regulation has cost consumers by delaying the introduction of new services, such as voice messaging and cellular telephone (Hausman, 1997). But after just partial deregulation, the demand of communications firms for fiber-optic cable to provide an array of services at lower cost has already exceeded expectations. There is also evidence that countries with several competitive telecommunications firms have much greater penetration of cellular phone service than countries with state-run monopolies, and that state regulatory reforms, such as using rate caps rather than rate-of-return regulation, have had a beneficial impact on companies' deployment of new technologies that allow much higher speed service, such as high-speed Internet connections (Blustein, 1997; Taylor, Zakardas, and Zona, 1992; Greenstein, McMaster, and Spiller, 1994). Low orbiting satellites represent another technology that could lead to lower costs, and new and improved services. Unbundling electricity production and emerging third parties could lead to various innovations; for example, consider a power marketing firm that also offers a bundled service of optimal climate control and conservation, together with the sale of power.

So what can we expect from deregulating communications and electricity? As with other deregulated industries, the adjustment process will be long and difficult, but the potential benefits to consumers appear to be huge. Remember, real operating costs in other industries fell roughly 25–75 percent following deregulation. Costs should also fall substantially in deregulated communications and electricity industries, as firms are free to shed inefficient technologies and are stimulated by new competition to develop and implement cost-reducing innovations, which should bring prices much closer to marginal costs. In telecommunications, the annual benefits from optimal pricing alone have been estimated to be as high as $30 billion (Crandall and Waverman, 1995). Deregulation of cable television is likely to lead to a more rapid expansion of viewing options (Crandall and Furchtgott-Roth, 1996). The electricity industry will come to be characterized by a competitive generation market, access to the transmission network for all transactions, and a high degree of service unbundling. Although incumbent utilities are likely to suffer losses, new entrants are likely to be profitable, and residential and commercial consumers of electricity are likely to gain considerably more than $10 billion an-

nually from price and entry deregulation (White, 1996). Some gains are already taking place as public transit companies are negotiating contracts with alternative suppliers of electricity or renegotiating contracts with current suppliers that substantially lower their electricity costs.

Conclusion

Some policymakers and economists appear reluctant to draw generalizations from the U.S. experience with deregulation over the last two decades. Industries, it is said, are different: they have different technologies, entry requirements, and so on. That deregulation works in one industry does not imply it will work in others.

This paper suggests, however, that industries are likely to behave quite similarly when it comes to adjusting to deregulation, and that their adjustment, while time-consuming, will raise consumer welfare—significantly even at first, and increasingly over time. Markets will become more competitive. Firms will develop innovations to become more efficient and more responsive to consumers. The benefits to society will grow as the adjustment continues. Indeed, the success of the U.S. deregulation experiment has gained attention throughout the world as evidenced by countries such as Japan and members of the European Union embarking on policies to liberalize competition in transportation, communications, and banking.

In the absence of any real, accumulating evidence about the impact of regulatory reform, the ideological overtones in the past debate over deregulation have been understandable. But we now have some 20 years of evidence. It is time to refocus the debate directly on that evidence and broaden our vision of where markets can replace governments in determining the most efficient way to create and sell products and services. This process is taking place in telecommunications, electricity, and cable TV. Looking ahead, government control over prices, entry, and exit in ocean transportation clearly warrants the deregulatory reforms proposed by the Clinton administration. Similar proposals are also warranted at the state and local level for taxis, limousines, and occupational licensure. It may be even more important to question the extent of the government's quasi-monopolist role in providing and regulating urban transportation (Lave, 1985; Winston and Shirley, 1998) and education (Chubb and Moe, 1990). These are big steps. But most of the theoretical arguments for greater competition in these activities parallel the arguments for deregulation. The empirical evidence may also turn out to be the same.

■ *This paper was originally presented at the Conference of Economists at Australia National University. I am grateful to W. McKibbin for commissioning the paper and to S. King and J. Quiggan for discussing it. Ongoing guidance and encouragement have been provided by A. Kahn, J. Meyer, and T. Taylor. I have also benefitted from discussions with M. Baily, A. Berger, T. Corsi, K. Costello, R. Crandall, S. Dennis, C. Grimm, R. Hahn, J. Herbert, E. Kwerel, J. Kwoka, R. Litan, S. Morrison, P. Nivola, J. Ratner, P. Viton, and M. White. Finally, B. De Long, A. Krueger, and B. Szittya improved the presentation of the paper.*

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