

CHAPTER 12

DEVELOPMENTS IN ENERGY AND TRANSPORTATION, 1950 TO THE PRESENT

It would be incorrect to suggest that a few sectors or events have been more significant than any other in the postwar economic history of the United States. If pressed, however, most economists would surely agree that events in the energy sector were among the more important. The energy sector was in the forefront of environmental concerns, and changes in the availability and prices of types of energy played a major role in the economic roller coaster of the 1970s and early 1980s and initiated significant industrial shifts in the American economy.

The transportation sector was among the sectors most directly affected by the energy changes. Riding the wave of declining real gasoline and diesel fuel prices from the Second World War to the early 1970s and the expanding network of high-speed expressways, trucking, automobile, and airline use grew at the expense of urban mass transit, railroad freight and passenger traffic, and intercity buslines. Fueled by the low costs of energy and transportation, cities and their suburbs expanded, and central business districts declined as multiple retail shopping

districts arose in the suburbs.

We begin our examination of these changes with a survey of developments in the postwar American energy industries.

Energy

The energy markets have had a tumultuous history since the Second World War. New energy sources, primarily nuclear power, arose to provide competition for the established sources. Environmental worries added to concerns over energy self-sufficiency in the United States, leading to more and more political control over energy markets.

As Figure 12.1 shows, total energy production grew rapidly from 1950 through 1970 but much more slowly after that. Coal was our primary energy source in 1950, but it rapidly lost markets to petroleum and natural gas through 1970. Since then coal has regained some of its former market share. Petroleum's peak share was in 1955, and it has

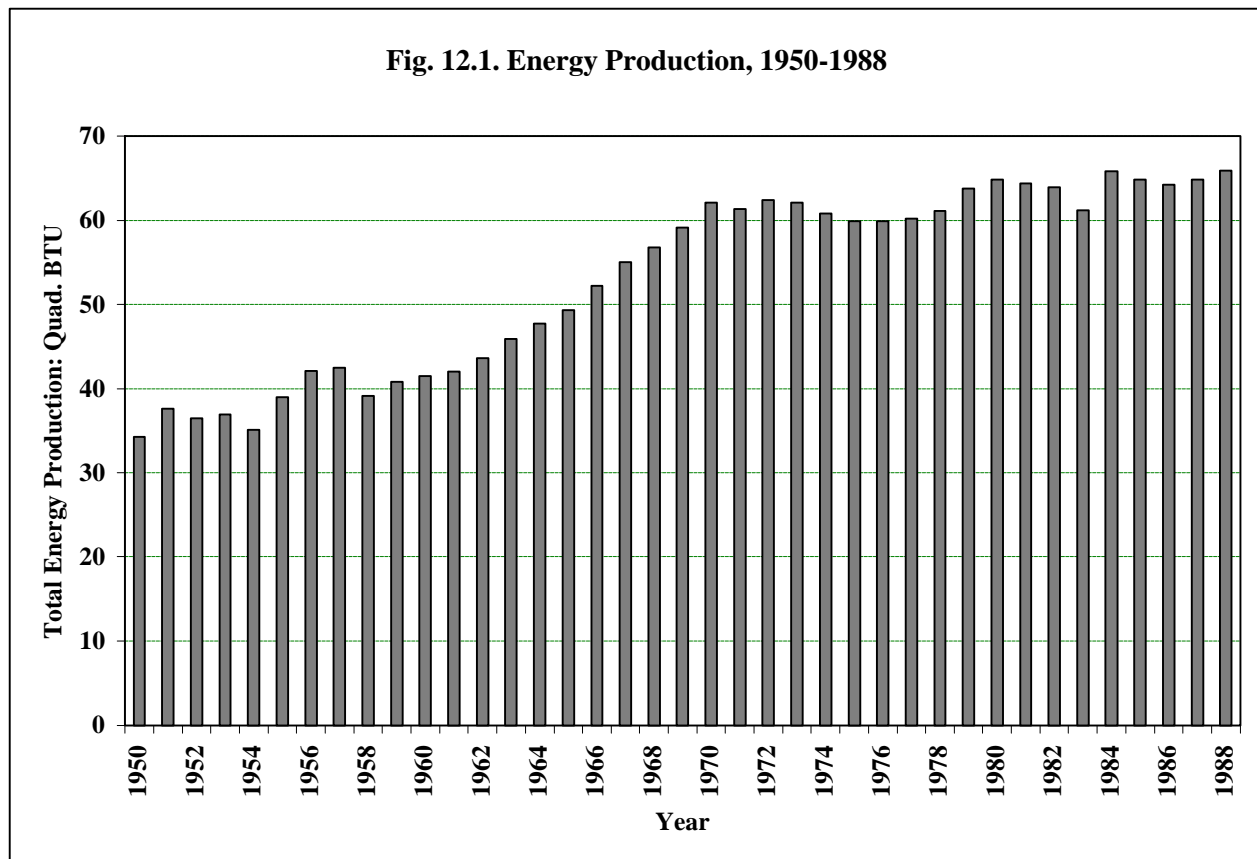
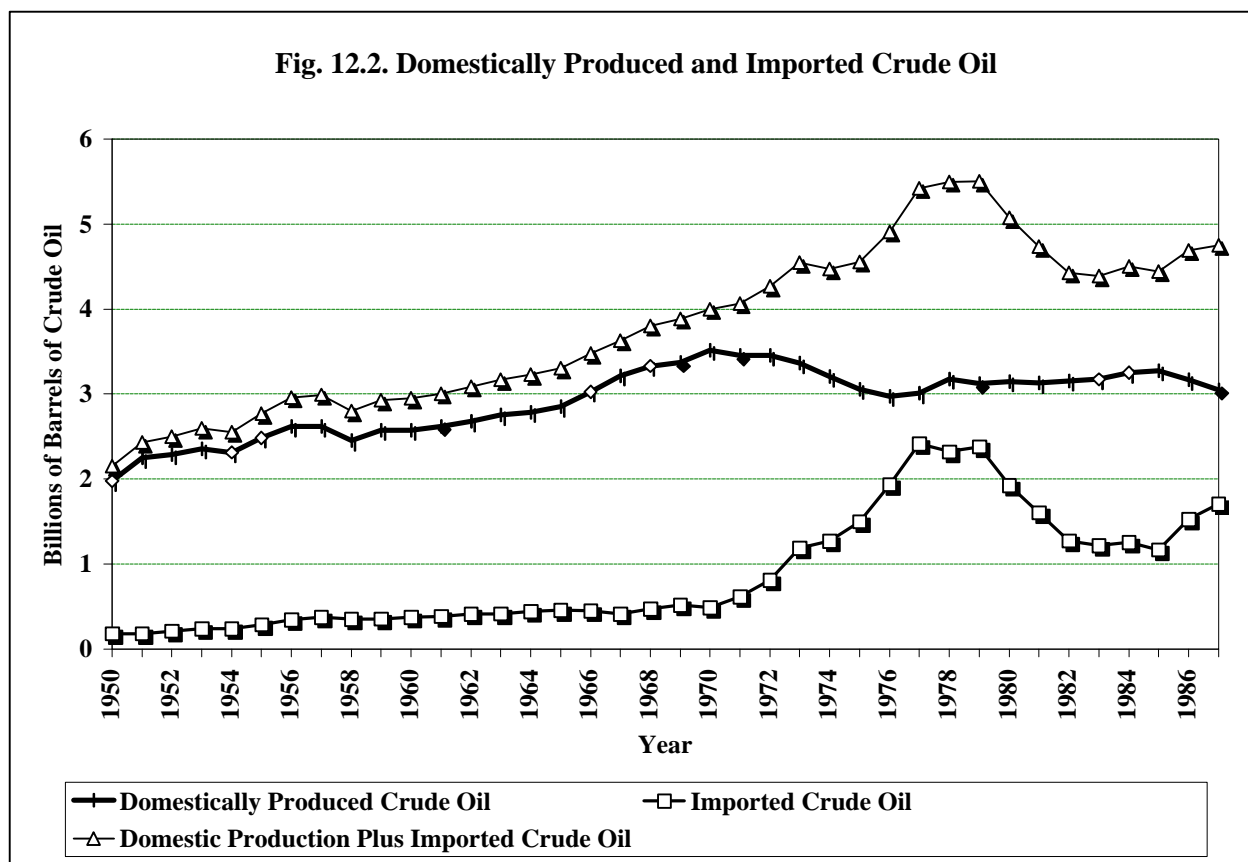


Fig. 12.2. Domestically Produced and Imported Crude Oil



declined to the present time. The share of energy production from natural gas rose rapidly from 1950 to 1970, but with rising real prices and a relatively unreliable supply, its share has fallen.

Petroleum

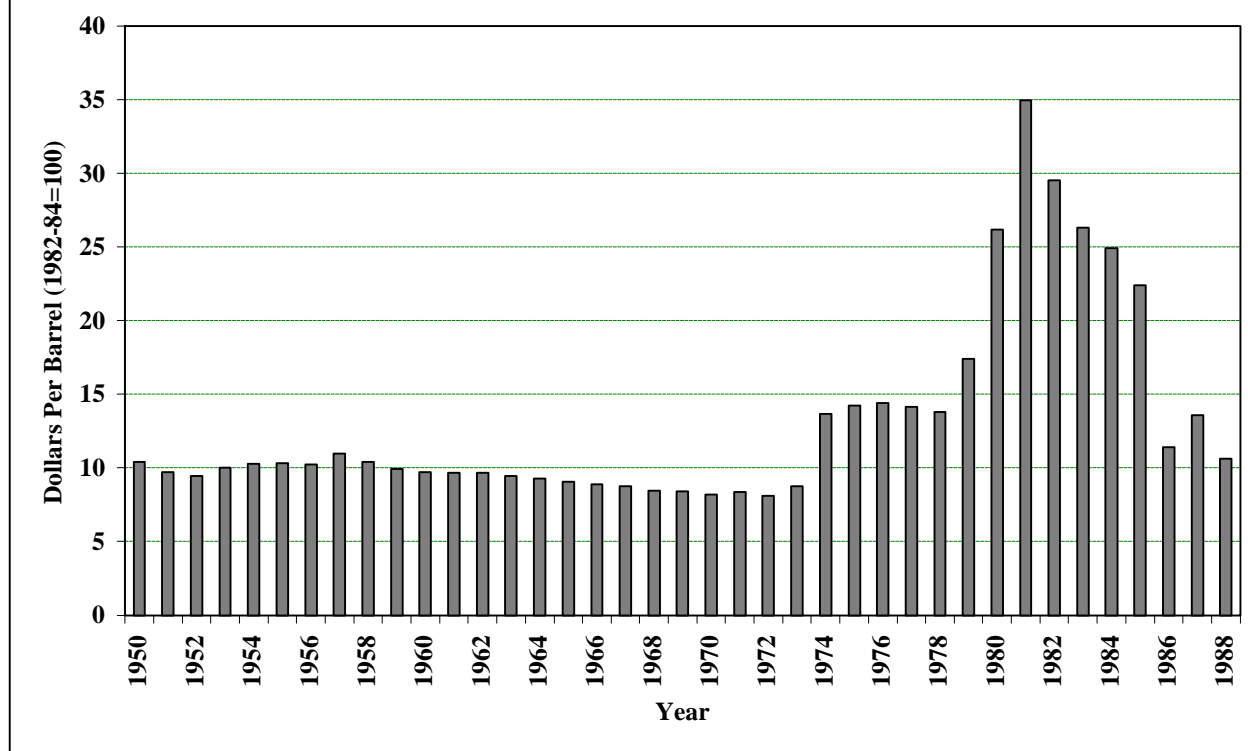
The petroleum industry involves four different levels of operation: production of crude oil, refining, marketing, and transportation.¹ The most important derivative of crude oil is gasoline, which has accounted for an average of 46.5 percent of all refined petroleum products in the postwar period. The share of distillate fuel oil, used primarily for heating, has since fallen slightly since 1960. Residual fuel oil has declined in importance, while jet fuel and petrochemical feedstocks have both become more important.

Crude Oil As Figure 12.2 shows, domestic crude oil production peaked in 1970 at 3.5 billion barrels. Importation of crude oil rose rapidly in the 1970s and peaked in 1977. Domestic consumption of crude oil peaked in 1978 at 5.5 billion barrels. The real average price per barrel of crude oil fell from 1950 through 1972, but under the umbrella of OPEC-led price increases it rose to \$14.26 per barrel in 1975 and \$26.20 in 1980. (See Figure 12.3.) Since then the real price of petroleum has fallen almost as much and as rapidly as it rose.

Though crude oil markets in the United States had initially been quite competitive, the Texas Railroad Commission exercised demand prorationing from the mid-1930s to the late 1940s to prevent excessively rapid extraction of crude oil from commonly held reserves.² Most of the other oil-producing states established similar commissions. Such commissions could limit output from wells transforming demand prorationing into a mechanism to reduce output and raise prices. Because of its dominant position in United States production and before the emergence of the Persian Gulf and Venezuela as major oil suppliers, the Texas Railroad Commission was able to “effectively determine domestic crude oil prices...[and] in effect operated on behalf of Texas oil producers as the first international cartel.”³ The expansion of Persian Gulf crude oil production pushed world prices below domestic prices, and by 1948 the United States had switched from being a net exporter of crude oil to a net importer.

Though the major international oil companies initially dominated Persian Gulf crude oil markets and attempted to limit production to keep prices higher, this strategy failed. Starting with the 1954 Iranian consortium, the entry of independent producers and the demand for additional tax revenues by the Persian Gulf countries and Libya boosted

Fig. 12.3. Real Average Price Per Barrel of Crude Oil (1982-84=100)



production. When combined with increasing production from Venezuela and the Soviet Union, production grew faster than a rapidly expanding demand, and world and domestic crude oil transaction prices began falling, although the posted prices did not. Because the producing countries collected taxes on the posted prices for crude oil, in 1960 Exxon reduced its posted crude oil prices to reflect the extensive declines in transactions prices. Angered by this, in September of 1960 Saudi Arabia, Iraq, Iran, Kuwait, and Venezuela met and agreed to establish OPEC, the Organization of Petroleum Exporting Countries.⁴

With the world price of crude oil below the domestic price and imports growing, the domestic price began falling, and by 1954 domestic oil producers began to call for limits on crude oil imports. Under the pretext that limiting crude oil imports was vital to national security, in 1955 and 1957 voluntary guidelines were established but these failed to stem the growth of imported crude oil.⁵ In 1959 a Mandatory Oil Import Program was instituted with the objective of not allowing imports to exceed 9 percent of domestic demand, a goal that was never achieved.⁶

This program established quotas and required that importers of crude oil and refined products obtain import quota tickets from the

Treasury. Controversy erupted over the allocation of the tickets; finally “a so-called sliding scale awarded proportionately more import quotas to small refiners than to larger ones.”⁷ Many of the smaller refineries were located inland, requiring expensive transportation of the oil. The program allowed refiners to exchange import tickets for oil. Smaller inland refiners generally exchanged their imported oil at coastal receiving ports for domestic crude oil produced near their refineries, thus saving most of the transportation costs. Because imported crude oil had a lower price than domestic crude oil, this amounted to a subsidy to small refiners of about a \$1.25 per barrel, or 38 percent of the domestic price, during most of the 1960s.⁸

Political competition for import quota tickets during the 1960s was intense, and an increasing number of tickets were issued, forcing the real price of domestic crude oil to decline. The oil producers’ unhappiness with this led President Nixon to establish a task force to examine the Mandatory Oil Import Program. They recommended that a simple tariff replace the program; however, because this would no longer benefit the smaller producers that were subsidized under the program, the recommendation was rejected, and nothing was changed.

Beginning with the Libyan revolution of September, 1969, Middle East nations began demanding concessions to raise crude oil prices and taxes and finally a number began nationalizing oil operations within their borders.⁹ World crude oil prices began rising and by early 1973 surpassed domestic prices. The United States froze domestic oil prices in June, 1973. The Cost of Living Council then created an artificial distinction between “old” and “new” oil; old oil came from domestic wells producing prior to 1973; new oil was oil from existing wells in excess of that produced in the corresponding month in 1972 as well as oil from newly drilled wells. Old oil had to be sold at lower, frozen prices, while new oil could be sold at market prices. The restrictions on competition caused growing chaos in petroleum markets, and oil firms increasingly resorted to political competition to gain advantages.¹⁰ The Arab oil embargo dramatically increased world oil prices from \$3.01 to \$5.11 a barrel in October, 1973, and to \$11.65 in January, 1974, creating greater gains from access to “old” domestic crude oil.¹¹

To handle the intense political pressures, the Federal Energy Office created the Buy-Sell Program in February of 1974, which required refiners with above average capacity utilization to sell oil to refiners with below average capacity utilization, at below market prices.¹² However, the program discouraged imports of crude oil and actually resulted in sales from small refiners to major oil companies—the reverse of congressional objectives—and it was revised in May, 1974, so that only the 15 largest refiners would be sellers. The Buy-Sell Program was replaced by the Entitlements Program. Refiners were then required to have a Federal Energy Office entitlement for each barrel of old oil refined, and entitlements were distributed to refineries in proportion to the total amount of oil refined. Like the Mandatory Oil Import Program, it effectively subsidized small refiners.¹³

The Emergency Petroleum Allocation Act, which allowed the federal government to control petroleum prices, was extended to the end of 1975 and then replaced by the Emergency Petroleum Conservation Act, under which the petroleum markets were to be decontrolled on September 30, 1981. Real petroleum prices fell slowly from 1975 to the end of 1978. In January, 1979, a revolution brought down the Shah of Iran and led to a reduction in Iranian crude oil exports. The “aftermath of instability and violence so unsettled world markets that the price of crude oil rose almost continuously from January 1979 to March 1980.”¹⁴ In June of 1979, as President Carter began the gradual decontrol of petroleum prices and allocations, he requested and

Congress approved a Windfall Profits Tax on oil producers, which was simply an additional excise tax on oil production rather than a capture of non-existent windfall profits from decontrol.

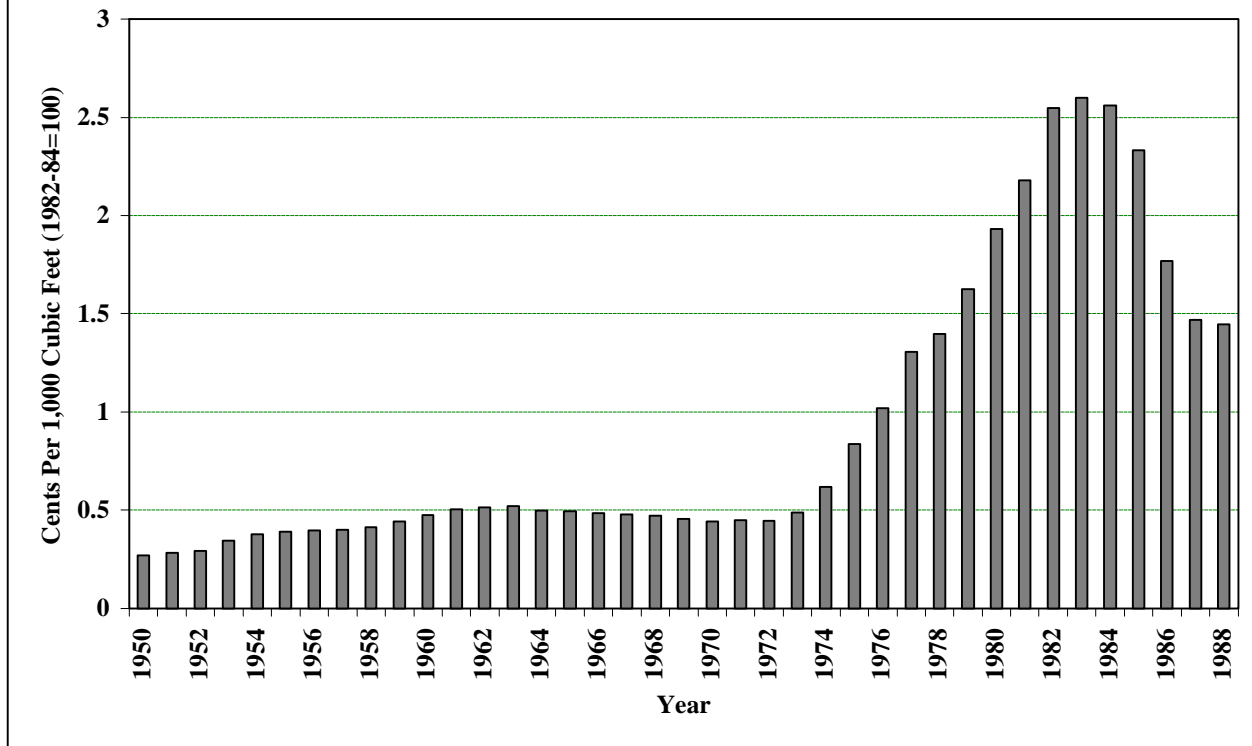
Soon after his inauguration in 1980, President Reagan ordered the immediate decontrol of all petroleum and gasoline markets. Although there were loud protests that decontrol would result in a dramatic increase in crude oil and gasoline prices before they stabilized at a much higher real level, within a short time prices began to fall and continued to do so throughout the 1980s. By 1987 real crude oil prices were only 52 percent of what they had been in 1980.

Gasoline As crude oil prices fell through the 1950s and 1960s, so did gasoline prices. President Nixon’s August 15, 1971, freeze of wages and prices applied price controls to the gasoline market. Gasoline and heating oil prices vary during the year, reflecting seasonal demands. Because of relatively high heating oil stocks and mild temperatures, no serious problems were encountered in the winter of 1971-72. However, the freeze did not allow heating oil and gasoline prices their usual seasonal variation. Gasoline prices were high relative to heating oil prices throughout 1972, and heating oil inventories were not built up as they normally would have been.

When controls ended on January 10, 1973, heating oil prices quickly began to rise relative to gasoline prices. This brought bitter protests from distillate fuel oil users. The Cost of Living Council then issued Special Rule Number One to recontrol heating oil prices for the 23 largest firms in the industry, which effectively reduced crude oil imports and wreaked havoc in product markets.¹⁵ During 1973 prices of crude oil and refined products rose rapidly, while spot shortages of gasoline, heating oil, and propane gas appeared. The Cost of Living Council tried several tactics to reduce the rate of price increases before finally allowing changes in ceiling prices only once a month.

In October, 1973, the Arab countries embargoed crude oil to the United States and Netherlands and sharply raised posted crude oil prices. Within a short time shortages of gasoline became widespread in the United States because the price controls, particularly the once-a-month rule, made it difficult to pass the bulk of the additional costs of crude oil on to the gasoline purchasers. “Facing rapidly rising costs and an excess demand for gasoline, dealers had a powerful incentive to sell supplies early in the month and build up stocks later in the month in anticipation of an imminent price increase.”¹⁶ As shortages spread panic buying commenced, and drivers began to top off their

Fig. 12.4. Real Average Value of Natural Gas at the Wellhead



gasoline tanks to keep them full, effectively increasing the demand for inventories of gasoline.

The gasoline crisis led the federal government to further intervene in the market. Fearing another shortage of heating oil in the winter of 1973-1974, the Federal Energy Office allowed heating oil prices to rise more than gasoline prices between September, 1973 and June, 1974, provided that the refiners increased the production and inventories of heating oil. Because this came at the expense of gasoline, it further exacerbated the gasoline crisis. In addition to controlling prices, the Federal Energy Office began to direct the allocation of gasoline supplies to various users and to regions based on historical consumption patterns. This resulted in more severe shortages in some regions. "To avoid being cut off from supplies far from home, motorists curtailed long-distance driving. This meant that gasoline became plentiful in most rural and resort areas, while shortages became increasingly concentrated in urban areas."¹⁷

By April of 1974, gasoline price ceilings had been increased sufficiently to eliminate most of the gasoline shortages. From the summer of 1974 through the end of 1978, the real price of crude oil and gasoline fell slowly as consumption demands began to adjust to the higher real prices of gasoline. The 1979 revolution in Iran disrupted markets, and

gasoline prices again began rising. Although prices were still controlled, refiners drew upon "banked costs" to raise gasoline prices and initially shortages were limited.¹⁸ By May serious shortages were occurring, particularly in California; from there they spread to other parts of the United States and continued through July of 1979.

When President Reagan finished the decontrol of petroleum markets shortly after he assumed office in 1981, there were dire predictions of gasoline prices reaching \$2.00 a gallon or higher within a few years. Gasoline prices on December 30, 1980, averaged \$1.234 for regular gasoline; rose to \$1.387 a gallon in March 1981; and then began to fall reaching, \$1.224 per gallon in May 1982.¹⁹ Gasoline prices continued to fall throughout the 1980s. In 1990, in spite of a 59 percent increase in the consumer price index during the 1980s, prices were lower in nominal terms than in 1980.²⁰ The inescapable conclusion is that the 1970s gasoline crises stemmed from the creation of federal government price and allocation controls.

Natural Gas

At the end of the 1980s there were some 5,000 producers connected to 1,443 local utilities through a two-million-mile network of pipelines operated by 45 independent companies. Natural gas use expanded

rapidly from 1950 to 1970, but fell from 1970 through 1985.²¹ Prices, which had fallen from 1963 to 1972, rose sharply. (See Figure 12.4.) Industry has been the largest consumer of natural gas, and its use grew rapidly to 1970 but has since fallen 28 percent. Residential consumption peaked in 1975 and has fallen 10.2 percent since then, and, though at a lower level, commercial consumption has a similar pattern.

Federal regulation in the natural gas market began with the Natural Gas Act of 1938.²² An attempt to eliminate the Federal Power Commission's (FPC) regulation of producers was vetoed by President Truman in 1949. In 1954 the Supreme Court ruled that producers of natural gas were to be regulated under the 1938 act. Another bill to eliminate the FPC's regulation of producers was vetoed by President Eisenhower in 1956.²³ In 1959 the Supreme Court required that the FPC review the prices in all new contracts to be sure they were in line with existing prices under similar conditions. This effectively froze prices in new contracts because it simply could not handle such a load of price evaluations; by 1960 only 10 of 2,900 submitted applications for increased rates had been acted upon.²⁴ To get out of the logjam, the FPC decided to determine prices by area and divided the United States into five producing areas, however, by the early 1970s price ceilings had been determined for only two areas, so the prices were effectively frozen at the 1959-60 levels.

Natural gas prices in new contracts apparently remained below FPC ceiling levels during the early 1960s.²⁵ One indication was that prices for new contracts for natural gas sold only in intrastate markets, which the FPC did not regulate, first rose above the interstate price in 1966. Following that the price gap between intrastate and interstate natural gas prices grew to 6 cents per million cubic feet in 1969, 18 cents in 1971, and 83 cents in 1975.²⁶

Natural gas contracts with most industrial users and utilities were written to be interruptible in case of shortages. In the winter of 1972-73, natural gas deliveries even to noninterruptible customers were at times curtailed. The Federal Power Commission then began to raise ceiling prices at a more rapid rate, but the gap between intrastate and interstate prices for natural gas continued to grow, and each winter through 1978-79 there were widespread shortages and service interruptions. In the severe winter of 1977, interruptions were widespread, and in areas of the midwest, especially Ohio, schools and businesses had to be closed down due to the temporary loss of natural gas deliveries.

Congress responded by passing the Natural Gas Policy Act of 1978. The FPC's regulatory power was extended to the intrastate markets, however,

prices were increased, and the legislation provided for the gradual decontrol of prices between 1978 and January 1, 1985 or 1987, depending on the category of natural gas. By 1985 natural gas prices had been largely decontrolled, and, in fact, prices peaked in 1983. Natural gas consumption declined in the 1980s reflecting both the rapid increase in prices between 1975 and 1983 and the remembrance of the severe shortages and cutoffs, particularly to industrial and institutional users, in the winter of 1977. As recently as 1991, natural gas sellers found it difficult to sell natural gas to industrial and institutional consumers.²⁷

Coal

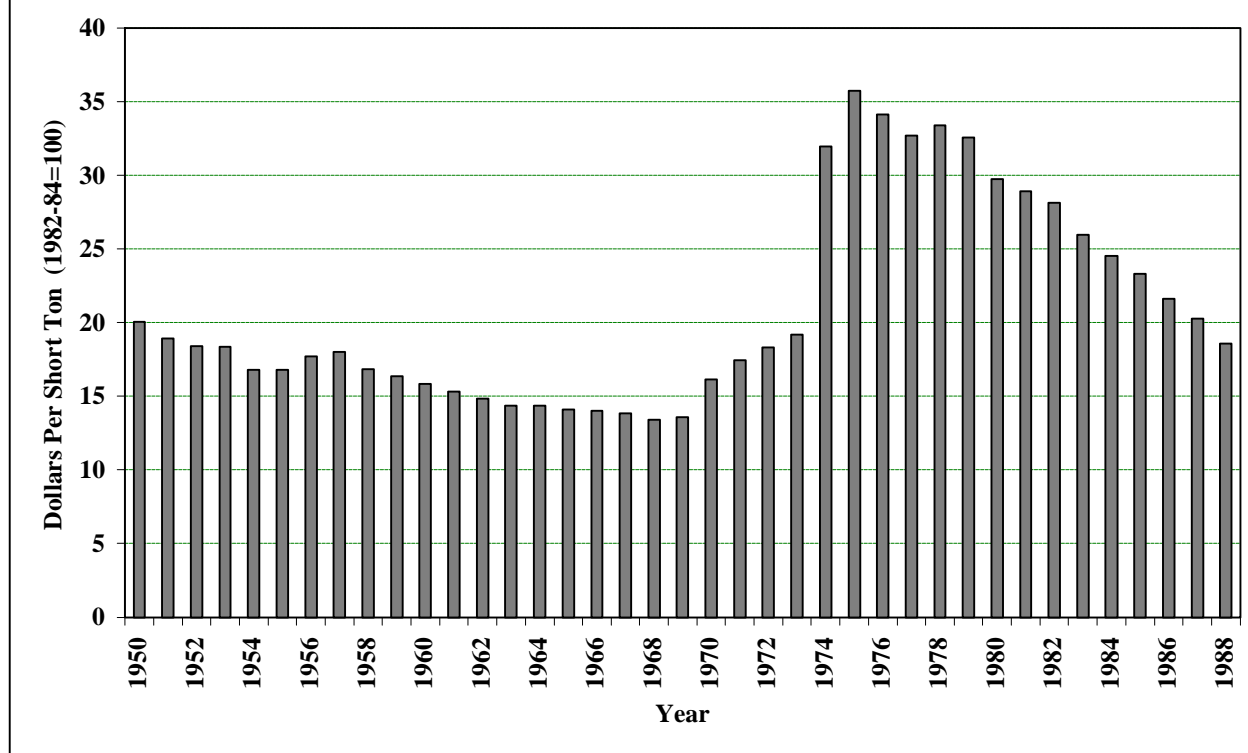
Coal's contribution to total energy production declined from 50.0 percent in 1945 to 23.5 percent in 1970. Since then its use has risen and it provided 31.8 percent of all energy production in 1988.²⁸ The production of anthracite (hard) coal fell nearly 90.7 percent between 1950 and 1987, while the production of bituminous coal rose 85.9 percent over the same period. The price of coal fell until 1968 and then began to rise, especially from 1973 to 1975. By 1988 the real price of coal had fallen to about its level in 1973. (See Figure 12.5.)

These changes reflect the interaction of changes in the demand for and supply of coal. The demand for coal declined from the end of the Second World War to the early 1970s. At the end of the war, coal was a common heating source in residences and businesses. Most railroads used coal-fired steam locomotives. Steel, rolling, and cement mills as well as other manufacturing industries used significant amounts of coal, and many electric generating plants were coal powered. With the exception of electric power utilities—which now consume nearly 75 percent of all coal production—these demands declined in the postwar period and virtually disappeared in some instances.

As production shifted from the east and midwest to the west, where large surface mines could produce coal at a much lower cost the supply of coal increased. Older, less efficient underground mines in the east were closed down and labor productivity in coal mining rose overall. The dramatic rise in petroleum prices associated with the Arab oil embargo caused a substitution toward other energy sources such as coal, and the increased demand caused coal prices to rise 62 percent between 1973 and 1975. Older, less efficient mines were reopened. The 65 percent fall in real coal prices between 1975 and 1988 caused the closing of those older, less efficient underground mines and the continued shift to surface mines.²⁹

The transportation of coal has always been a major factor because these costs were often almost as

Fig. 12.5. Real Average Price Per Short Ton of Bituminous Coal



large as the price of coal at the mines. The percentage of coal being shipped by rail has been rising over the postwar period as it became feasible to use unit trains (trains dedicated only to coal shipments) to run directly from mines to electric utilities.³⁰ This lowered transportation costs and particularly helped western coal.

Electricity

In addition to the energy sources discussed previously, electricity, as a means of distributing power, can be generated by waterpower and by nuclear energy. Coal has always been the most important of these generating sources. Hydroelectric power has steadily declined, while residual fuel oil and natural gas's shares have dropped since the early 1970s. Nuclear power's share of electric energy production was negligible until the late 1960s and rose from 1.4 percent in 1970 to 19.5 percent in 1988.

A declining rate of growth in the production and consumption of electricity is partly explained by the changes in real rates for electricity. From 1950 to 1970, real rates per kilowatt hour fell. (See Figure 12.6.) After that the rise in the prices of energy sources, led by increases in crude oil prices in the early 1970s, caused real rates to rise into the early 1980s, though they have since begun falling.

The rapid growth of electricity production and consumption during the 1950s and 1960s reflects the combination of rapidly expanding generating capacity and technological advances. The management of the utilities adopted what has been called a "grow and build strategy," a strategy that had been developed early in the century.³¹ The utilities also counted on steady advances in the technology of generating electricity to continue to lower costs. Technological advances led to huge increases in the maximum capacity of the largest steam-turbine generator units between 1950 and 1970, which sparked extensive campaigns by utilities to promote the use of electricity.³² Residential use grew rapidly as new electrical appliances became much more common.³³

By the 1950s a new source of energy, nuclear power, to drive the steam turbines of generating plants had been developed, but utilities were concerned that the possibility of an accident presented such a huge liability problem that no insurers would consider coverage for a nuclear generating plant. In 1957 Congress passed the Price-Anderson Act, which limited the liabilities of utilities in case of a nuclear accident.³⁴ With limits to their liability in place, the utilities began to develop nuclear plants. From then through 1974, there was a rapid expansion in the demand for nuclear plants.

Fig. 12.6. Real Electricity Rates`



In November, 1965, there was an extensive electrical blackout in the northeast. Richard F. Hirsch reports that, "the blackout led to the creation of regional power pool arrangements through the new North American Electric Reliability Council."³⁵ A total of nine regional pools were created, and this integrated smaller utilities into the larger systems. The increased size of the customer base in the regional pools meant that utilities could invest in larger generating units, because a common rule of thumb limited the size of new generating units to 7 to 10 percent of capacity. The pools, therefore, led to demands for considerably larger generating units, particularly nuclear plants, even at small utilities.

The 1970s were something of a shock to the managers of the nation's electric utilities. By the late 1960s an apparent limit seemed to have been reached in thermal-efficiency improvements. In 1947 power plants transformed only 21.8 percent of a fuel's energy content into electricity, but by 1965 this had increased to 32.9 percent and then stopped. "Fluctuating within a narrow range after the mid-1960s, the average efficiency for all plants in 1980 registered only 32.5%, a figure slightly lower than the 1965 rate."³⁶ The growth in size of individual power units also ceased. The average size of nuclear units in 1975 was about 1,000 megawatts, but by 1980 the average size was only 1,100 megawatts.³⁷

The technological progress that had allowed greater growth and lower costs appeared to have ended.

The onset of more rapidly rising real fuel prices, varying rates of inflation, and a slowing in the growth of the demand for electricity made calculations and forecasts increasingly difficult. By the mid-1970s environmental concerns had led various groups to oppose both additional nuclear and steam-powered generating plants. The last order for a new nuclear plant was placed in 1974, though given the long construction time, they continued to be built well into the 1980s. The public's concern about the safety of nuclear generating plants was sharply increased after an accident at the Three Mile Island nuclear generating plant in Pennsylvania in March of 1979.³⁸

By 1980 electric utility companies across the United States were pushing conservation in order to avoid the costs and difficulties of constructing new generating plants.³⁹ Many argued against the construction of new coal-fired plants because of environmental problems, especially acid rain; the real costs of reducing emissions were also rising rapidly as increasingly tougher standards were imposed. By the end of the 1980s, no permanent depository for spent nuclear fuel had yet been designated, and storage was becoming an increasingly serious problem.

Energy in the Postwar American Economy

Energy sources are, within limits, substitutes. This means that to understand changes in one market, we also have to consider changes in other markets due to these interdependencies. For example, at the end of the Second World War, coal was an important source of energy for heating homes and businesses. However, as the prices of electricity, fuel oil, and natural and liquefied petroleum gas (LP) fell over the next 25 years, businesses and homeowners began switching from coal heat to cleaner, more convenient alternative fuels.

The disruptions in crude oil imports and rising prices of imported crude oil induced substitutions toward domestic crude oil, coal, and natural gas, and all of these prices also rose sharply. The federal government's attempts to control the prices of natural gas and crude oil (and its derivatives, gasoline and fuel oil) and to direct the allocation of crude oil and its derivatives exacerbated the problems. The rising prices of these energy sources brought on increases in the prices of electricity. In the 1980s, when government controls on prices and allocations were relaxed or removed, energy prices fell.

The turbulence in the energy markets in the 1970s and early 1980s also affected other sectors. The competition that American automobile manufacturers faced from imported small cars made in Japan and western Europe was magnified by the sharp increases in fuel prices. These increases also made it difficult for the regulatory authorities to modify rates in a timely and appropriate fashion for trucking, railroads, and air transportation. This helped propel changes in American passenger and freight transportation—a topic we now turn to.

Transportation

With the exception of Amtrak, the federally owned national passenger train service, passenger and freight transportation are privately provided in the United States. However, much of the transportation infrastructure has been publicly provided. Private automobiles, trucks, and buses use the publicly provided roads. Barges use the inland waterways, which are maintained by the Army Corps of Engineers. The federal government has maintained the electronic highways in the air, which commercial aviation has used, as well as provided a considerable portion of the funds to construct airports.

At the end of the Second World War congress appropriated funds to rebuild the existing surfaced roads and establish a system of federal highways not to exceed 40,000 miles in length. The

rising volume of traffic led to increasing congestion and traffic jams, and a National Highway Users Conference was created to lobby for more and better roads.⁴⁰ In 1956 Congress authorized the National Defense Highway System, or, as more commonly known, the Interstate Highway System. It was initially designed to provide about 41,000 miles of highway and was to be completed in 1969; by 1971, however, over 10,000 additional miles had been scheduled, and the completion date had been moved back to 1977.

The investment in the inland waterways has been undertaken by the Army Corps of Engineers as they have dredged rivers to provide shipping channels, built and operated dams and locks to control water levels, and generally undertaken most harbor investment.⁴¹ Since water shippers generally pay neither user fees nor license fees, they have been heavily subsidized.

The capital investment for the airways has also received varying amounts of federal government subsidy. Through the FAA the federal government has undertaken to provide the capital to create the electronic highways in the sky, extensive weather reporting, and, for safety purposes, control of traffic in the air and traffic landing and takeoffs at major airports. Though obviously benefiting the users of the airways, no attempts were made to impose user costs for these services. After 1960 government subsidies for airport construction began to decrease, and as traffic increased, user fees began to cover operating costs and finally, at larger airports, the capital costs.

Freight Traffic

There has been a pronounced shift in freight traffic from railroads to trucks and oil pipelines in the postwar period. A major factor in this decline has been the rate-setting policies of the ICC. When the ICC was given control over interstate trucking in 1935, similar rate structures were imposed on trucks and railroads to “maintain competition.” With similar tariffs for long distance shipment of the same goods—rather than incremental cost-pricing—it is usually more desirable to ship compact, higher valued goods by truck than by rail. As a result, in the postwar period trucks increasingly took over these shipments, even though studies continued to indicate that at longer distances railroads are more efficient carriers than trucks. Trucks' advantages lie in shorter distance hauls because of their lower fixed costs relative to higher variable costs. The ICC's reluctance to allow lines to abandon very low use branch and spur lines required that profits from trunk line traffic be used to cover losses on branch and spur line service, further harming railroads.⁴²

The competitive position of the railroads was worsened by railway labor unions that resisted the installation of most labor saving devices and insisted upon work rules relevant to the technology of 50 to 100 years earlier.⁴³ For example, firemen were required on diesel locomotives where there were no coal cars nor steam engines, and a one-hundred-mile trip was a “day’s work.”

The railroad industry also argued that trucks received an implicit subsidy from the federal and state governments in the form of the highways, while railroads had to maintain and pay property taxes on their own roadbeds. The argument has not been particularly persuasive. Highways were largely constructed on a pay-as-you-go basis, using revenues from fuel taxes and license fees. There also is evidence that, though trucks do not pay the full cost of the roadbed, they have pretty much paid their share as fuel taxes and license fees roughly correspond to incremental costs.⁴⁴ Because the roadway is used both by commercial trucks and by private automobiles, efficiency requires that the user costs are shared between the two according to the incremental costs of the type of vehicle.

In 1976 Congress initiated regulatory reform to provide more freedom for railroads. By 1978, in response to increasing criticism, the ICC changed its policy to encourage more consolidations to preserve “essential services” rather than trying to preserve intact the entire system of financially weak lines. In early 1980, partly under pressure from the general movement for deregulation, the ICC began to give railroads more freedom to set their own rates for “demand sensitive” commodities,⁴⁵ and on October 14, 1980, the Staggers Rail Act was signed.⁴⁶ The act reversed existing policies by its premise that the railroad industry was no longer a monopoly. The goal was to assist the railroad industry in its rehabilitation under private ownership and to reform federal regulatory policy to achieve a more efficient and stable system while balancing the needs of carriers, shippers, and the public. To do this, the act proposed that unprofitable services be eliminated, and that railroads be free to set rates according to market conditions as well as entering into contracts with individual carriers.

By 1980 the move for transportation deregulation had spread to trucking, and the ICC took steps toward de facto deregulation. Deregulation was more difficult in this area because of the size and political power of the opponents of trucking deregulation—the large common carrier trucking firms and the powerful Teamsters Union—even though nearly all studies suggest that there are no economies of scale in trucking and that industry entry

and exit would be very easy in the absence of regulation.⁴⁷

The share of intercity ton-miles of truck freight carried by ICC-regulated carriers, common and contract, dropped from the early 1960s through the beginning of the 1980s. ICC regulations on common carriers also effectively stopped the entry of new firms unless they purchased ICC certificates of operating authority from existing firms.⁴⁸ Rates and entry were controlled so as to protect the profits of the existing carriers, and, as a result, the certificates of operating authority were very valuable, generally 15 to 20 percent of the gross revenue earned on an operating route in a year. The rates were set by associations of common carriers called “rate bureaus” and sanctioned by the ICC. In this way the regulated common carriers operated as a cartel, with no price competition allowed.

ICC regulations contributed to inefficiency and higher trucking costs. As more trucking shifted to private carriers, “deadheading,” or empty backhauls, increased. The ICC regularly disallowed route changes that might have provided for fuel and time savings if there was any potential to harm the competitive position of another carrier. Circuitous routes resulting from the arbitrary travel restrictions imposed by the ICC added to shipping times, requiring firms to carry more inventory and provide more warehouse and storage space. Shipper dissatisfaction with the existing carriers was generally dismissed as a reason to allow new competitors to enter. In the “yak fat” case, a trucking firm facetiously requested a rate for a nonmarketed product, yak fat, and found that the existing firms, through the rate bureaus, immediately protested this rate without knowing or finding out what it was for. The ICC subsequently disallowed the yak fat rate.

Congress finally passed the Motor Carrier Act of 1980, designed to deregulate interstate trucking. Like the airline deregulation bill, deregulation of trucking was to be phased in gradually. Entry and route restrictions were eased, and rules on private carriers were relaxed.⁴⁹ As an indication of the effectiveness of the deregulation, the aggregate value of the certificates of operating authority, which were valued at an average of \$5.1 billion in the years prior to 1979, quickly fell.⁵⁰ However, the markets did not completely disappear, and the values did not fall to zero because deregulation under the Motor Carrier Act of 1980 was considerably less complete than for, say, the Staggers Rail Act of 1980.⁵¹

Competition quickly appeared in the trucking industry. During the expansion from 1983-85 20 percent of the largest 100 carriers from the pre-1980 era failed. By 1985 nearly 15,000 new carriers

had entered, the majority of which were small truckload operators. With excess capacity from the new competition, truckload rates fell, and this spilled over into the less-than-truckload (LTL) carrier market.⁵² The LTL carriers did not face the same entry but found themselves facing new competitors as routes were opened, reorganized, and rationalized, and these rates also dropped and became simply the starting point for negotiated discounts.⁵³ By the middle of the 1980s, concentration among the LTL carriers had increased. The share of the largest 4 LTL carriers had risen from 20 to 35 percent between 1978 and 1985, while the share of the largest 20 LTL carriers had risen from 43 to 67 percent during that same period, though it is not clear that this had lessened the intense competition among the carriers.⁵⁴

Passenger Traffic

After the Second World War passenger traffic was quickly diverted to automobiles (and later to airlines) from trains and buslines. There appears to be nothing that could have altered this shift. The advantages of passenger travel by private automobile and plane are such that it seems likely that the direct costs and prices of car and air travel would have to be several times higher than the current direct costs and prices of train or bus travel to divert significant numbers of passengers back to trains and buses.

By the mid-1950s two of the three national intercity buslines—Trailways and Continental—had merged into Continental Trailways to survive. Greyhound remained the dominant carrier in a declining market, and in the 1980s Continental Trailways went out of business. In 1990 Greyhound's precarious financial position led it to demand wage cuts and other concessions from its drivers, and it declared bankruptcy to protect its assets while giving it time to reorganize. Smaller regional intercity buslines continued to do business in some areas of the United States. However, by 1988 all intercity buslines carried only 1.2 percent of passenger traffic.

Passenger rail traffic fell from 382 million passenger miles in 1949 to 108 million in 1969.⁵⁵ Losses from passenger service absorbed about 25 percent of the freight-generated profits.⁵⁶ The ICC slowed down reductions in passenger service and in 1970 to maintain some rail passenger service, the federal government created a quasi-national agency, the National Railroad Passenger Corporation, or Amtrak, to take over rail passenger service. In 1981, after continuous government subsidies to keep Amtrak going, it was made a fully government-owned corporation.⁵⁷

Airline traffic grew as rail and bus passenger traffic declined. Interstate airlines were regulated by the Civil Aeronautics Board (CAB) the counterpart of

the ICC. In the 1950s the CAB regularized the process of setting airfares to achieve rates of return of 10.5 percent for large airlines and 12.0 percent for small airlines. To maintain the local service and regional airlines, the CAB provided subsidies to them from 1940 to 1978. Subsidies to the trunk airlines generally ended in 1959. Doing all of this and ensuring safety taxed the CAB, and in 1958 the Civil Aeronautics Act of 1938 was amended to create the Federal Aviation Administration to regulate safety by setting standards for aircraft, taking over air traffic control, and investigating accidents. The CAB was then freed to concentrate on economic regulation.⁵⁸

Passenger traffic on the airlines was spurred by the introduction in 1954 of the Boeing 707, the first successful commercial jet. It was much faster and quieter than propeller planes and was commonly said to have shrunk the world in half due to its faster speed.⁵⁹ Another shot in the arm for air passenger traffic came in the late 1960s with the introduction of the Boeing 747 and other jumbo jets.

From its creation until deregulation in the late 1970s, the CAB did not allow any new trunk, or national, airlines. Local and regional lines' routes were kept limited, to reduce competition for the trunk carriers. The CAB, acting as a cartel manager, allocated routes, especially new routes, so as to limit competition. It rarely approved fare decreases and required that all airlines flying the same route have the same rates. From 1969 to 1973, the average airline fare increased 52 percent, well in excess of the general rise in prices, but these fare increases did not increase the rates of return earned by airlines. Airlines continued to compete in terms of such amenities as in-flight meals, drinks, movies, and other personal services, and in terms of the number of flights originating at airports, particularly the largest ones. The increased costs arising from quality competition dissipated the monopoly rents. Costs were high because the prices, or fares set by the CAB, were high, not the reverse.⁶⁰

As the merits and demerits of deregulation were being discussed in 1977, the CAB, under Alfred Kahn's direction, began moving toward a policy of freer rate changes and easier entry into new routes. In 1978 Congress passed the Airline Deregulation Act, which provided that by January 1, 1982, CAB route restrictions would end and by January 1, 1983, all regulation of passenger fares would end. With an elastic demand for discretionary air travel, as fares dropped profits rose and in 1978 the airlines generated a 24.8 percent return on equity, while their five-year average had only been 10.5 percent.

As routes were quickly opened up, new strategies were developed, and new airlines, offering no-frills, discount-priced service between limited

routes, appeared. Service to the smaller communities was maintained through the development of commuter airlines using small propeller-driven aircraft rather than jets. There was a rapid move of some airlines into international markets. Other airlines expanded rapidly—but not always successfully. Some lines quickly initiated mergers to grow more rapidly and thereby gain a competitive advantage.

To handle complex route expansions airlines, developed the hub-and-spoke strategy, whereby a few airports served as hubs. Originating flights would then go to the hub airports to transfer passengers to other flights to continue on to their final destinations. This allowed airlines to serve more cities, but tight schedules meant that delays in one or two flights could lead to often lengthy delays for most of the flights out of a hub and throw off schedules for most of a day. Pricing strategies began to change quickly, especially under the pressure of the new discount airlines. Discounts were available for advanced booking and for booking with no refunds, and bonus mileage programs (frequent flyer programs) encouraged flyers to use only one airline. Price discrimination became common as late-booking business flyers paid substantially higher fares than the discretionary flyer traveling for personal reasons. Fares became much more demand-sensitive rather than based on costs.⁶¹

In the 1979-82 period, severe problems affected the entire industry. Rapidly rising fuel costs in 1979-80 forced fare increases and reduced profits. The rising fares combined with the severe economic contraction in 1981-82 to sharply reduce passenger travel. The labor unions (pilots, attendants, maintenance personnel, and so on) had shared in the monopoly rents created under CAB regulation. The new carriers entering after deregulation used nonunion personnel, and wages were lower. As fares began to drop and monopoly rents began to decline, the existing airlines came under great pressure to reduce the wages of the unionized personnel.

It has been estimated that by the mid-1980s ticket prices were about 30 percent lower than they otherwise would have been. Airline load factors, the percentage of available seats filled with fare paying passengers, rose from 56 percent in 1977 to 62 percent in the mid-1980s.⁶² However, most assessments argue that service deteriorated as the hub and spoke arrangement began to lead to frequent and lengthy delays. The quality of the meals and the number of flight attendants per passenger declined, and seating became more crowded. Entry was not as open as many had envisioned. The bottleneck of boarding gates and time slots at major airports increased and limited competitive entry.

Transportation in the Postwar American Economy

At the beginning of the postwar period, the transportation sector was one of the most heavily regulated sectors in the American economy. For over two and a half decades these regulations slowed down but did not stop improvements in transportation. In the late 1970s Congress began experimenting with deregulating some sectors of the economy, and the first wave of deregulation took place in transportation. As price controls and entry barriers were removed, real prices fell, new firms entered, and existing firms found themselves free to choose routes, schedules, and rates. The smaller and leaner railroads generally became profitable again. Monopoly rents for trucking and airline carriers fell. Deregulation in the United States contributed to the breakup of the transatlantic airline cartel, the International Air Transport Association, in 1978.⁶³

There were some costs to the deregulation. Without the protection of regulation, some airlines—such as Eastern and Pan American—failed. Others—such as Braniff and Continental—expanded unwisely and also failed. With a broad range of volatile prices, consumers found that they had to undertake more extensive searches when purchasing tickets. There were frequent complaints of delayed flights, more crowded planes, and poorer service in general. There were a few calls for some reregulation to improve service. However, overall it appeared that deregulation in the transportation sector was a success.

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Notes

1. This section primarily draws upon David Glasner, *Politics, Prices, and Petroleum: The Political Economy of Energy* (Cambridge, MA: Ballinger Publishing Co., 1985), chapters 4-7. Other sources include Morris Adelman, *The World Petroleum Market* (Baltimore, MD: Johns Hopkins University Press, 1972); Fred C. Allvine and James C. Patterson, *Highway Robbery: An Analysis of the Gasoline Crisis* (Bloomington, IN: University of Indiana Press, 1974); Yoram Barzel and Christopher D. Hall, *The Political Economy of the Oil Import Quota* (Stanford CA: Hoover Institution Press, 1977); Stephen Martin, “The Petroleum Industry,” chapter 2 in Walter Adams, ed., *The Structure of American Industry*, 8th ed., (New York: Macmillan Publishing Company, 1990).
2. Under demand prorationing, the state commission would develop demand projections for the next month and compare this to the state’s oil producing capacity. To avoid “overproduction” and keep the price higher each producing well was allowed to produce an amount of crude oil equal to its productive capacity times the “market-demand factor” which was the ratio of the projected demand to the state’s productive capacity. As Glasner says, “Thus each well had a prorata share, based on the well’s productive capacity, of the state’s total demand.” For a more complete explanation of this see, Glasner, *Politics, Prices, and Petroleum*, pp. 143-144.
3. Ibid., 144.
4. Martin, “The Petroleum Industry,” 42-46.
5. Glasner, *Politics, Prices, and Petroleum*, 144.-145. Four presidents, Eisenhower, Kennedy, Johnson, and Nixon, all used this rationale. Glasner reports that it was said that the mere mention of the national

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- security argument for limiting oil imports “would elicit uproarious laughter at the Petroleum Club.”
6. This discussion follows Glasner, chapter 7.
 7. Glasner, *Prices, Politics, and Petroleum*, 151.
 8. *Ibid.*, 152. During much of the 1960s domestic crude oil was priced around \$3.25 a barrel, while imported crude oil carried a price of about \$2.00 a barrel so that the subsidy amounted to \$1.25 a barrel of crude oil.
 9. Martin, “The Petroleum Industry,” 46-47.
 10. Glasner, *Politics, Prices, and Petroleum*, 156.
 11. The crude oil prices are those for Saudi Arabian Light Crude Oil. Cyrus Bina, *The Economics of the Oil Crisis: Theories of Oil Crisis, Oil Rent, and Internationalization of Capital in the Oil Industry* (New York: St. Martin’s Press, 1985), 15.
 12. Glasner, *Politics, Prices, and Petroleum*, 157-58.
 13. *Ibid.*, 159.
 14. *Ibid.*, 130.
 15. *Ibid.*, 98.
 16. *Ibid.*, 104.
 17. *Ibid.*, 108.
 18. When refiners did not increase product prices, say gasoline and heating oil prices, as much as their costs had increased, primarily the cost of crude oil, they were allowed to “bank” the costs that they had not passed on to consumers and use these later on if they so chose. Refiners were not, of course, being socially responsible. Using a market analogy, the increased costs shift the marginal cost curves upward, so the market supply curve decreases (or moves upward). Because there was no demand shift, consumers were not willing to purchase as much refined petroleum products when the prices increased and moved up their demand curves. Refiners, therefore, were able to only pass along a portion of their increased costs due to the increased prices of crude oil, and the government allowed the portion of the costs not passed on to the consumers to be “banked.” The analysis is similar to the analysis of the effects of an excise tax in competitive markets.
 19. Glasner, *Prices, Politics, and Petroleum*, 180-81 and 189.
 20. As an illustration, taking the December, 1980, price as \$1.234 per gallon and the average price in 1990 as \$1.00 per gallon and deflating by the all-items consumer price index (1982-84 = 100), the real price in 1980 was \$1.49 per gallon, while the real price in 1990 was \$0.77 per gallon.
 21. This section draws primarily upon Glasner, *Politics, Prices, and Petroleum*, chapter 9, pp. 193-248; and Edmund W. Kitch, “Regulation of the Field Market for Natural Gas by the Federal Power Commission,” *Journal of Law and Economics* 11 (October 1968): 243-80.
 22. Kitch, “Regulation of the Field Market for Natural Gas,” 254.
 23. *Ibid.*, 256.
 24. Glasner, *Politics, Prices, and Petroleum*, 224.
 25. *Ibid.*, 229.
 26. *Ibid.*, 231.
 27. Robert Johnson, “Pipe Dream: Glut and a Poor Image Dash the Grand Hopes Held for Natural Gas: Its Price Has Been Dropping, But Many Customers Say Deliveries are Unreliable,” *The Wall Street Journal*, 1 August, 1991.
 28. Richard L. Gordon, *Coal in the U.S. Energy Market: History and Prospects* (Lexington, MA: Lexington Books, 1978), table 2-1, p. 22.
 29. Gordon, *Coal in the U.S. Energy Market*, 5. For an extensive discussion of this act see Harris, *Coal Firms Under the New Social Regulation*.
 30. Gordon, *Coal in the U.S. Energy Market*, 95.
 31. Richard F. Hirsh, *Technology and Transformation in the American Utility Industry* (New York: Cambridge University Press, 1989), 47.
 32. *Ibid.*, figure 2, p. 5. In general, see chapters 4-6.
 33. *Ibid.*, 50. The role of electricity as an agent of technological progress in the American economy in manufacturing, commercial, agricultural, and residential uses is discussed in considerable detail in, Sam H. Schurr, Calvin C. Burwell, Warren D. Devine, Jr., and Sidney Sonenblum, *Electricity in the American Economy: Agent of Technological Progress* (Westport, CT: Greenwood Press, 1990).

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34. Hirsh, *Technology and Transformation in the American Electric Utility Industry*, 116.
35. *Ibid.*, 57.
36. *Ibid.*, 90.
37. *Ibid.*, 94-95.
38. For example, see the following: David L. Sills, C. P. Wolf, and Vivien B. Shelanski, eds., *Accident at Three Mile Island: The Human Dimensions* (Boulder, CO: Westview Press, 1982); Edward J. Walsh, *Democracy in the Shadows: Citizen Mobilization in the Wake of the Accident at Three Mile Island* (New York: Greenwood Press, 1988).
39. Bill Paul, "Current Trend: Big Electric Utilities and Consumers Push Conservation Strategy: Producers Gladly Avoid Costs of Constructing Plants, and Users Get Innovative," *The Wall Street Journal*, 8 December, 1987.
40. Mark H. Rose, "PAR—Project Adequate Roads: Traffic Jams, Business, and Government, 1945-56," *Business and Economic History*, 2d series, 4 (1975): 120-36. See also Mark H. Rose, *Interstate Express Highway Politics, 1941-1956* (Lawrence, KA: The Regents Press of Kansas, 1979).
41. The Army Corps of Engineers had also undertaken some investment on the Great Lakes in improving connecting channels and on the coasts for harbor work and deep-water channels, but the bulk of all of their work has been in river systems and the intracoastal canals of the Atlantic Coast and Gulf Coast areas.
42. Theodore E. Keeler, *Railroads, Freight, and Public Policy* (Washington, D.C.: The Brookings Institution, 1983), 38-39.
43. *Ibid.*, 40-41.
44. John B. Lansing, *Transportation and Public Policy* (New York: The Free Press, 1966). The largest trucks failed to pay their incremental costs largely because of the relatively greater fuel efficiency of the diesel engines over gasoline engines.
45. "ICC Proposes More Freedom for Roads to Set Some Rates," *The Wall Street Journal*, 20 February, 1980.
46. Keeler, *Railroads, Freight, and Public Policy*, 98-103.
47. See Dennis A. Breen, "The Monopoly Value of Household-Goods Carrier Operating Certificates." *The Journal of Law and Economics* 20 (April 1977): 153-86.
48. The Motor Carrier Act of 1935 and trucking regulation between 1935 and 1980 are discussed in some detail in John Richard Felton and Dale G. Anderson, eds., *Regulation and Deregulation of the Motor Carrier Industry* (Ames, IA: The Iowa State University Press, 1989). The certificates of operating authority held by the existing firms either came originally from a firm grandfathered in 1935 or the firm was one of the firms grandfathered in 1935.
49. John Richard Felton, "Motor Carrier Act of 1980: An Assessment," chapter 11 in Felton and Anderson, *Regulation and Deregulation of the Motor Carrier Industry*, 145.
50. *Ibid.*, 158.
51. *Ibid.*, 161.
52. Nicholas A. Glaskowsky, *Effects of Deregulation on Motor Carriers* (Westport, CT: Eno Foundation for Transportation, Inc., 1986), 8.
53. *Ibid.*, 10.
54. *Ibid.*, 26.
55. The following discussion of Amtrak is drawn from Weaver, *The Politics of Industrial Change*, 88-97.
56. *Ibid.*, 89.
57. *Ibid.*, 97.
58. Ivor P. Morgan, "Government and the Industry's Early Development," chapter 2 in John R. Meyer and Clinton V. Oster, Jr., eds., *Airline Deregulation: The Early Experience* (Boston, MA: Auburn House Publishing Company, 1981), 19.
59. Rick Wartzman, "Boeing Deep-Sixes the 707, a Pioneer of Passenger Jets: Chapter in Aerospace History Inspired by British Rivalry Ends with a British Order," *The Wall Street Journal*, 3 September, 1991.
60. George W. Douglas and James C. Miller III, "Quality Competition, Industry Equilibrium, and Efficiency in the Price-Constrained Airline Market," *American Economic Review* 64 (September 1974): 657-69. These and other characteristics of the airline industry are also discussed in William G. Shepherd, "The Airline Industry," chapter 8 in Walter Adams,

ed., *The Structure of American Industry*, 8th ed. (New York: Macmillan Publishing Company, 1990).

61. Fare for flights to and from cities with little competition from other airlines began to rise, while fares for flights to and from cities with more competing airlines fell.
62. Shepherd, "The Airline Industry," 234.
63. "British Air Says It Will Leave IATA Unless Low Fares Set," *The Wall Street Journal*, 9 June, 1978. "IATA Moves to Loosen Membership Rules by Paring Its Power Over Airline Rates," *The Wall Street Journal*, 5 July, 1978.