

# The NBER Digest

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## How Technology Spreads in the Electric Industry

In the electric utility industry, a firm's size and form of ownership—public or private—help to determine how quickly it adopts new technology. According to a new NBER study by **Nancy Rose** and **Paul Joskow**, "large firms and investor-owned electric utilities historically have adopted new technologies earlier than their smaller and publicly or cooperatively owned counterparts." For the very largest firms in the industry, though, increasing size reduces the probability of quickly trying the industry's innovations.

In **The Diffusion of New Technologies: Evidence from the Electric Utility Industry** (*NBER Working Paper No. 2676*), Rose and Joskow observe that technological advances in fossil-fueled electricity generation from 1950-80 have focused on improving the thermal efficiency of generating units. By increasing steam operating pressures, utilities were able to generate more electricity from a given amount of fuel and reduce their costs. Two new technologies were introduced: high-pressure conventional units (which generate 2400 pounds per square inch, or psi) and very-high-pressure supercritical units (which generate over 3206 psi). By 1980, 93 of the firms in their sample of 144 utilities that built fossil-fired steam turbine generating units between 1950 and 1980 had adopted the 2400-psi technology. Only 39 utilities, or 27 percent, had adopted the supercritical technology. Only 39 utilities, or 27 percent, had adopted the supercritical technology.

When building a new generating unit, investor-owned utilities were more likely to try the new 2400-psi technology than utilities owned by municipalities and cooperatives were, Rose and Joskow learn. That may be because investor-owned utilities are more involved in industry R and D activities and organizations. For example, in 1987, 73 percent of investor-owned utilities belonged to the Electric Power Institute as compared to 37 percent of munis and 32 percent of coops.

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Rose and Joskow caution that "large firms have a higher probability of building a new generating unit of any kind in a given year, other things equal." Taking this into account, estimates of the effect of firm size on adoption of new technology are cut in half and the effects of ownership structure and potential cost savings on adoption of technology increase.

## Unionization, Personnel Practices, and Wages

Successful unionizing drives in the 1980s caused union workers' wages to rise about 4 percent more than the wages of nonunion workers, according to a recent study by NBER Research Associates **Richard Freeman** and **Morris Kleiner**.

In **The Impact of New Unionization on Wages and Working Conditions: A Longitudinal Study of Establishments under NLRB Elections** (*NBER Working Paper No. 2563*), Freeman and Kleiner report that one year before an election, wages at the plants that later became unionized and signed a contract with the new union were about 3 percent lower than wages at nonunion plants not facing an organizing drive. After the union contracts were signed, the unionized plants had wages about 4 percent higher than those at the nonunion plants. Freeman and Kleiner estimate that about four percentage points of this seven-percentage-point change were attributable to unionization.

Freeman and Kleiner's findings differ from those of past studies. Most such studies have found that wages are 15 to 25 percent higher for union workers than for nonunion workers with similar characteristics. One possible reason for the difference, write Freeman and Kleiner, is that studies finding large effects of unions were based on data from before the 1980s. They point out that between 1963 and 1983, compensation of union workers increased by about 16 percent, compared to 20 percent for nonunion workers. Thus, updating the older studies would yield a wage differential of 10 to 20 percent. Still, they caution, this is well above their estimate of 4 percent. Another reason for the differences between their findings and those of earlier studies is that they focus on newly organized firms. These firms do not pay the full union wage premium; instead, wages increase slowly toward the union level.

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Freeman and Kleiner also find that employment at newly unionized firms declined 9 to 13 percent rela-

tive to employment at firms not facing union elections. They caution against attributing this decline to the union, though, noting that the decline is 9 percent for plants with a union contract versus 13 percent for firms with a union but no contract.

Recent union contracts also appear to have important effects on personnel practices. Union contracts significantly increase the prevalence of formal grievance procedures, written seniority systems for promotions or for layoffs and recalls, and written posting of promotions. At the same time, such contracts reduce the prevalence of profit-sharing plans.

Freeman and Kleiner base their conclusions on a comparison between 203 plants that had had union elections in the 1980s and 161 nonunion plants that had not had elections. The 161 nonunion plants were determined to be close competitors of the plants facing a union election. In total, the survey of the 364 establishments covered over 146,000 workers.

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## Developing Countries and the Multifiber Arrangement

The Multifiber Arrangement (MFA), initiated in 1974, restricts imports of textiles and apparel to North American and European countries from a large number of developing countries through a system of quotas. A new study for the NBER finds that elimination of the MFA would benefit the vast majority of developing countries, along with the United States, and the world economy. NBER Research Associate **John Whalley** and **Irene Trela** estimate that the annual global gain from the elimination of MFA quotas and tariffs would be \$17 billion. The developing countries together would receive \$11 billion from increased sales, and the United States and the European Economic Community (EEC) would gain \$3 billion each in lower consumer prices. These gains would far exceed the losses to producers in the developed countries.

In **Do Developing Countries Lose from the MFA?** (*NBER Working Paper No. 2618*), Whalley and Trela find that removing all quotas and tariffs on textiles and apparel would benefit some of the developing

countries proportionately more than others. Without quotas, import prices in developed countries would fall, and the volume of imports would rise. However, even the holders of relatively large quotas—such as Korea, Hong Kong, and Taiwan, who have a protected market niche against lower-cost competition under the MFA—would benefit. In fact, Whalley and Trela estimate that China, Korea, and Taiwan would be the three largest beneficiaries of gains from the elimination of quotas and tariffs on textiles and apparel. Removing quotas would improve their market share in developed country markets, rather than causing a reallocation of the current share among the developing countries. This increased market share would come at the expense of reduced production by the developed countries. Gains to the developing countries from increased sales would offset losses from lower prices by \$11 billion in the aggregate.

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Whalley and Trela consider three developed country importers (United States, Canada, and the EEC) and 34 developing country suppliers. They use 1986 data from the U.S. Department of Commerce, the Canadian Department of External Affairs, the European Commission, and the United Nations and analyze MFA III, the Multifiber Arrangement that existed in the mid-1980s.

## Sources of Business Cycle Fluctuations

For decades, most economists have believed that business cycles were caused by fluctuations in aggregate demand, resulting from sudden shifts in monetary or fiscal policies, for example. More recently, some researchers have emphasized the role played by supply shocks, particularly shocks to technology, in explaining business cycles. In a new NBER study, **Matthew Shapiro** and **Mark Watson** include shocks to oil prices and labor supply in their analysis and find that shifts in aggregate demand and oil prices are the key to postwar recessions, while permanent changes in technology and the labor force explain most fluctuations in output.

In **Sources of Business Cycle Fluctuations** (*NBER Working Paper No. 2589*), Shapiro and Watson observe that aggregate demand played a major role in the recessions of 1957–8, 1960, and the 1980s. Oil price shocks contributed to the 1974–5 recession, had a negative effect on output throughout the early 1980s but were a positive factor in the recovery of the mid-1980s. In contrast, adverse technological shocks have not been an important factor in recessions, except for the one in 1970. However, favorable shifts in technology help to explain the strong growth of the 1960s. Finally, permanent shifts in labor input were the most important factors in the recessions of 1954, 1958, and 1975.

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Shapiro and Watson also examine the sources of fluctuations from one year to the next. They find that changes in aggregate demand explain about 40 percent of the annual variability in hours worked and 30 percent of the annual variability in output. Shifts in technology account for about 20 percent of the variability in output but explain little of the variation in hours worked. Permanent changes in labor supply explain about one-half of the variability in output.

As the horizon increases from one year to five years, the effect of aggregate demand on output falls by more than half; that is, variation in aggregate demand explains only about 12 percent of the variation in output over the longer period. On the other hand, the effect of technology increases.

Oil price shocks have important long-run effects on output, but only in episodes related to the rise and fall of OPEC. Shifts in technology account for about 30 percent, and changes in labor account for about 60 percent, of the ultimate variability in output.

Shapiro and Watson use quarterly data for 1951–85 on total hours worked, output, inflation, nominal interest rates, and real oil prices.

## Inflation and the EMS

A new study by NBER economist **Susan Collins** questions whether the European Monetary System (EMS) really brought about a major reduction in the inflation rates of member countries. The available data do not support this viewpoint.

In **Inflation and the EMS** (*NBER Working Paper No.*

2599) Collins observes that there is strong circumstantial support for the notion that the EMS led to the reduction and convergence of inflation among members. (The members that participate in the Exchange Rate Mechanism are Belgium, Denmark, France, Germany, Italy, Ireland, Luxembourg, and the Netherlands.) In 1978, the year before the EMS began, inflation averaged 7.2 percent among the soon-to-be members. The rates ranged from 2.7 percent in Germany to 12 percent in Italy. By the end of 1986, average EMS inflation had dropped to 2.4 percent, and the range had narrowed considerably—from -0.2 percent in Germany to 5.9 percent in Italy.

The apparent success of the EMS is usually explained in terms of the added "discipline" it provides to monetary authorities in inflation-prone countries. The logic is that membership increases the costs of expansionary policies since the quasi-fixed nature of exchange rates causes the real exchange rate to rise when inflation increases. When real exchange rates rise, imports increase, exports fall, unemployment tends to rise, and foreign exchange reserves are depleted. This may put pressure on monetary authorities to avoid inflation and the resulting rise in real exchange rates. Membership in the EMS thus is assumed to make the announcement of a deflationary policy credible and to alter the behavior of domestic price setters.

However, Collins points out that there are a number of difficulties in applying this argument to the EMS experience. In particular, it is misleading to think of the high-inflation EMS members (for example, France and Italy) as small countries maintaining fixed exchange rates vis-à-vis a large low-inflation country (Germany). During 1979-86 the EMS had nine exchange rate realignments. These realignments prevented real exchange rates from rising in countries with high inflation, thus offsetting whatever

discipline the EMS may have imposed. Second, most EMS members participated in another multilateral exchange arrangement, "the Snake," during the late 1970s. While the EMS may provide discipline relative to a floating exchange rate, it is not clear that the EMS provides more discipline than the Snake did.

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Collins also points out that the beginning of the EMS coincided with a reduction in inflation in most industrial countries—not just in the EMS. Furthermore, it was only after the fourth year of the EMS that inflation in member countries fell relative to inflation of nonmembers. In France, for example, expectations of deflation emerged after domestic policies turned restrictive in 1982-3, not with the new exchange rate regime adopted in 1979.

During 1974-8, inflation of the future EMS members averaged 10.5 percent, compared to 14.2 percent in non-EMS industrial countries. From 1979-82, average inflation rose slightly, to 10.9 percent in the EMS and 14.3 percent in other industrial countries. However, by 1983-6, inflation fell to 5.4 percent and 10.2 percent within and outside of the EMS, respectively. Collins concludes that there is little or no evidence supporting the view that the EMS reduced inflation rates of member countries relative to nonmembers. Deflationary effects that have been attributed to the EMS are explained partially by the widespread post-1979 deflation. AE

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