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A Three-Country Analysis of R and D and Productivity

New econometric research, by **Pierre A. Mohnen**, **M. Ishaq Nadiri**, and **Ingmar R. Prucha**, into the evolution of the production process of the manufacturing sector in different economies indicates that they respond differently to changes in output, technology, and relative prices. Moreover, some striking differences separate the manufacturing sectors in the United States and Japan. For instance, the capital stock and the stock of R and D in Japan respond much more quickly to such changes. These results are reported in *NBER Working Paper No. 1264, R and D, Production Structure, and Productivity Growth in the U.S., Japanese, and German Manufacturing Sectors*.

Considerable work has been done on the contribution of R and D to growth and productivity in various U.S. industries. The role of energy in the structure of the U.S. economy has also been debated for a considerable time. However, few econometric studies have explored the role of R and D in other industrialized economies, and most of the studies that do exist were based on models that do not adequately explore the intertemporal nature of some of the issues.

Mohnen, Nadiri, and Prucha studied the evolution of the production process in the manufacturing sectors in the United States, Japan, and Germany. They developed a dynamic model that takes explicit account of the adjustment costs inherent in the investment process. To estimate their model, they used two variable factors—labor and energy—and two quasi-fixed factors—the stock of R and D and plant and equipment. (R and D and plant and equipment were treated as quasi-fixed because adjust-

ment costs prevent them from adjusting instantaneously to their optimal level.) Data used to estimate factor demand and the production structure in the three countries covered 1965 through 1977.

The results indicate that the capital stock adjusts more than twice as fast as the stock of R and D to changes in relative prices and output. Moreover, both capital and R and D adjust much more slowly in the United States than in Japan and Germany. The adjustment times for capital and R and D in the United States are about 2 years and 5.5 years, respectively, versus adjustment lags of about 1 year and 3 years in both Japan and Germany. Another interesting finding is that adjustment costs appear to be much lower in Japan than in either Germany or the United States. This is especially true in the case of R and D.

“Some striking differences separate the manufacturing sectors in the United States and Japan.”

The Japanese economy exhibits several other significant differences. Consistent with its lower adjustment costs, Japanese manufacturing responds much more strongly than manufacturing in the other two countries to changes in prices and output. The contrast between Japan and the United States is particularly sharp. The long-run price elasticity of

labor is very high in Japan while it is low in the United States and Germany. The short-run output elasticity of energy also is higher in Japan than in the other countries. The contrast is interesting in light of Japan's high dependence on imported energy.

In the years under study, manufacturing output grew at rates of 9.5 percent in Japan, 4 percent in Germany, and just over 3 percent in the United States. The contributions of various inputs to the growth rates also varied across countries. Technical change was the most significant contributor to growth in all three countries. The next most important contributor was capital accumulation, which accounted for about 20 to 25 percent of the growth in the United States and Germany and a dramatic 42 percent in Japan. Labor was a very high contributor to growth in the United States but very low in Japan and highly negative in Germany. Declines in both employment and hours worked in Germany accounted for labor's negative contribution there. Had it not been for technological progress and capital accumulation, German manufacturing growth would have been low or even negative over the period.

The contribution of R and D to the growth of output was highest in the United States (about 11 percent) followed by Germany (9 percent) and Japan (5 percent). Given that R and D's share is small, the differences in these rates are fairly significant. Finally, the effect of adjustment costs for capital and R and D is generally small in the Japanese and German manufacturing sectors and fairly large in the United States. The inference is that the growth of output would have been larger, especially in the United States, if adjustment costs had been lower. AE

Effects of Taxing Unemployment Benefits

In 1979, Congress decided to begin taxing the unemployment insurance benefits of persons in higher-income families. Some economists had argued that the previous policy of taxing earned income but not unemployment benefits encouraged some of the jobless to prolong their unemployment. In *NBER Working Paper No. 1260, Work Incentive Effects of Taxing Unemployment Benefits*, Faculty Research Fellow **Gary Solon** finds that the economists were right: taxing benefits did reduce the duration of unemployment.

In 1979, Congress made unemployment insurance benefits taxable on joint tax returns reporting at least \$25,000 of adjusted gross income (counting

the benefits) and on single returns reporting at least \$20,000. In 1982, these income thresholds were lowered to \$18,000 and \$12,000, respectively. To drop the thresholds even further might prompt the unemployed to find work faster.

Previous research examined the impact on unemployment duration of changes in the weekly unemployment benefit level, not changes in benefit taxation. The typical finding, that duration went up along with benefit levels, agreed with predictions of economic theories that paying people more to be unemployed would increase the length of their joblessness.

"Taxing benefits did reduce the duration of unemployment."

In his study, Solon examines data on a sample of persons who filed for unemployment insurance in 1978 or 1979 to see whether high-income claimants collected benefits for shorter periods after the tax change than did claimants before benefits became taxable. The data were collected as part of the Continuous Wage and Benefit History program, a joint effort by the U.S. Department of Labor and several state employment security agencies to develop data banks on samples of workers covered by the unemployment insurance program. This project used the sampled individuals' claims records to obtain data on prior earnings, benefit entitlements, and how long they collected benefits. It also administered a questionnaire that obtained, among other things, sufficient income data to impute which claimants had high enough income to be subject to benefit taxation. Only Georgia data were used because Georgia was the only state with extensive questionnaire data from as early as the beginning of 1978.

Solon notes that after the 1979 change in the law, income taxes were not deducted from the benefit checks but claimants were formally notified of the tax change. This was apparently sufficient to change their job-seeking behavior. Among the sampled low-income claimants whose benefits were not taxable in either 1978 or 1979, the mean unemployment duration was 8.7 weeks in both years. Among the high-income claimants, however, mean duration fell from 10.8 weeks in 1978, when their benefits were not taxable, to 8.4 weeks in 1979, when their benefits were taxable. This simple comparison, states Solon, "suggests the possibility that the introduction of benefit taxation did indeed affect unemployment duration."

Solon goes on to use more elaborate means of examining the same question. Although the results

vary somewhat, they all come to the same basic conclusion—that the tax change did trim unemployment among the high-income claimants by about one week. As a result, the government pays out less in unemployment insurance benefits and collects more in income taxes. The Georgia sample indicates that benefits paid to high-income claimants dropped \$115 on average, an 11 percent reduction from the \$1030 average benefit income they would have collected in the absence of taxation of benefits.

Finally, the author cautions that, although the tax change may speed the return of the unemployed to work and may reduce government costs, it may also undercut the key objective of the program—to maintain the income of individuals who are out of work.

DF

Reflections on Aging, Health, and Medical Care

The elderly are living longer but are working less and spending more on health care than they did fifteen years ago, according to a recent study by NBER Research Associate **Victor R. Fuchs**. In *Working Paper No. 1269, "Though Much Is Taken"—Reflections on Aging, Health, and Medical Care* (Milbank Memorial Fund Quarterly/Health and Society, Vol. 62, No. 2, 1984), Fuchs uncovers these and other facts that have a bearing on the potential funding problems of the Medicare system.

How one defines and measures the elderly population is, of course, crucial to measuring their current and future needs. Between 1950 and 1980, the number of people aged 65 and over rose from 8.2 to 11.3 percent of the total population. Of that group, those who were no longer in the labor force, and thus had to support themselves by other means, rose from 6.2 to 10 percent of the total population.

Fuchs suggests, though, that the needs of the elderly may be less related to age and more to proximity to death. Using a statistical technique to estimate the number of elderly who are within five years of death, Fuchs calculates that their share of the total population has risen only one-half of one percentage point between 1950 and 1980 (from 2.6 to 3.1 percent).

This is not very surprising, since Fuchs observes a large increase since 1965 in life expectancy at age 65. In 1950 at age 65, average life expectancy was less than 14 years; in 1965 it was 14.6 years, and in 1980, over 16 years.

Nearly all of this improvement can be explained by a decreasing proportion of deaths from heart and cerebrovascular disease. Between 1965 and 1980, the death rate from those diseases fell 2.4 percent per year among 65–74-year-olds. Deaths from other causes fell only 0.3 percent per year.

Coincident with these increases in life expectancy were large increases in (real) per capita expenditures by the elderly on health care relative to similar expenditures by those under 65. From 1965 to 1981, the elderly's share of total expenditures on health rose from under 24 to nearly 33 percent.

In part, this is because the proportion of elderly people grew more rapidly than the rest of the population (at a differential rate of 1.3 percent per year). But there was also a differential of 2.7 percent per year in the growth rate of per capita expenditures on health care between the elderly and the nonelderly.

Utilization of health care, as measured by Medicare reimbursements, is known to rise steadily with age. Fuchs observes that the age distribution among those 65 and over is shifting toward the older ages. His analysis suggests that increases in per capita expenditures on health as one ages are primarily attributable to large expenditures in one's last year of life.

Fuchs goes on to consider three nonhealth areas that may have a bearing on the future status of Medicare: the labor force behavior, income, and living arrangements of the elderly. For example, he observes a sharp decrease in labor force participation of the elderly in the last 15 to 30 years. Among men aged 65 and over, the participation rate fell from 46 to 19 percent between 1950 and 1980. Even among men aged 55 to 64, the rate fell from 83 to 72 percent between 1965 and 1980.

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At the same time, the relative income of the elderly has increased sharply. In fact, "the *aftertax* income per *household member* of the elderly is almost equal to that of the 45–64 age group," Fuchs notes.

The elderly tend to be females living alone, Fuchs finds, many of whom will spend their later years in nursing homes. Also, as of 1982, 62 percent of deaths among those 65 and over occurred in hospitals and medical centers, "often at great cost." These facts obviously are relevant to any analysis of the Medicare system and its future.

Fuchs concludes his overview with three infer-

ences. First, he writes, we need to periodically revise our definition of who is old, focusing on changes in life expectancy. Second, we need to consider more flexible labor market arrangements "to facilitate the

continued labor force participation of older men and women." And third, we need to reach a social consensus concerning what is appropriate care for the dying.

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