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The Effect of Compulsory Schooling Laws on Teenage Births

Teenage motherhood has been associated with an array of negative outcomes, such as lower educational attainment, lower lifetime income, higher welfare dependence, and higher rates of crime among both mothers and their children. However, the determinants of teenage motherhood are poorly understood; as a result, it is not clear that government policies can have an effect on teenage childbearing.

In **Fast Times at Ridgemont High? The Effect of Compulsory Schooling Laws on Teenage Births** (NBER Working Paper No. 10911), authors **Sandra Black**, **Paul Devereux**, and **Kjell Salvanes** use data on the Norwegian population collected by Statistics Norway and samples from the decennial U.S. Census to examine whether changes in compulsory schooling laws affect the incidence of teenage childbearing. The authors find that compelling a girl to stay in school until age 16 reduces the probability of a birth before age 20 by 0.008 in the United States and 0.006 in Norway. In each country, 17 percent of the women in the sample had a child as a teenager, implying that compulsory schooling until age 16 reduces

the probability of a birth before age 20 by 4.7 percent in the United States and by about 3.5 percent in Norway.

Close examination of the data suggests that the U.S. laws affected whites most strongly, and that the laws in both countries had a stronger impact in urban areas. Evidence on the timing of the births in the sample suggest that the incarceration effect, "the fact that educational attendance reduces time available to engage in risky behavior," is at best weakly associated with

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birth outcomes. The authors conclude that other mechanisms likely influence fertility behavior and that "policy interventions to increase female education at the lower tail of the educational distribution may be an effective means of reducing rates of teenage childbearing."

Compulsory schooling requirements in the United States vary by state; between 1924 and 1974, the

years relevant to the authors' sample data, states changed the minimum dropout age, the minimum number of years of required schooling, the age at which children must be enrolled in school, the minimum age for a work permit, and the number of years of schooling required before a work permit would be issued.

In Norway, municipalities were required to adopt a nationwide educational reform between 1959 and 1973, and different municipalities implemented the reform at different times during this period. In schools operating under the old system students could drop out at age 14. The new system required nine years of education beginning at age 7, had a minimum dropout age of 16, and increased education by 0.12 of a year on average.

— Linda Gorman

Fighting Deflation in the U.S. and Japan

During the late 1980s, Japan's economic system — its innovative management methods, efficient manufacturing processes, and bold investments in new technologies — was widely seen as a model to be emulated. Little more than a decade later, America again turned to Japan for a lesson in economics, but for a different reason: this time the issue was not how to replicate Japan's success, but how to avoid its failure.

In **Lost Decade in Translation: Did the U.S. Learn from Japan's Post-Bubble Mistakes?** (NBER Working Paper No. 10938), NBER researchers **James Harrigan** and **Kenneth Kuttner** identify what went wrong in Japan in the 1990s, and the lessons the United States could — and perhaps did — learn from Japan's experience. Focusing on the critical role of monetary policy, their analysis reveals how U.S. policymakers successfully avoided the monetary missteps that are partly to blame for Japan's "lost decade."

In 1991, after years as the economic envy of the world, Japan entered a period of stagnation from which it has yet to fully emerge. Ten years later, in 2001, America's own record expansion came to a halt. And some of the same problems that have caused so much pain in Japan — chiefly, falling prices or "deflation" — began to loom as threats to the U.S. recovery. Yet the United States avoided Japan's fate and may have Japan to thank.

Harrigan and Kuttner document a number of worrying parallels between the situations in Japan and the United States as the two countries fell into recession. Both economies' expansions were powered by extraordinary investment growth, and both countries experienced asset price bubbles. And the U.S. government's fiscal situation, like that of Japan's, deteriorated

sharply as the economy collapsed. There were also some important differences, however: Japan's asset price bubble was significantly larger, and its financial system more fragile than that of the United States.

Harrigan and Kuttner note that the U.S. Federal Reserve and the Bank of Japan both responded to the recessions in their countries by cutting interest rates. But a more detailed analysis of monetary policy reveals that, as the U.S. "boom turned to bust," the monetary policy pursued by the Federal Reserve was "far more aggressive" than that

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Harrigan and Kuttner suggest that, with Japan's sobering lesson in mind, Fed policymakers were sensitive to the threat of deflation, and acted accordingly. "Perhaps because it had learned from Japan's experience, the Fed was prepared to implement a vigorous anti-deflation policy... much more quickly than the Bank of Japan," they write. "Moreover, this intention was consistently backed up by statements and speeches by Fed officials emphasizing the seriousness of the deflation threat, however small, and pledging to do whatever was necessary to prevent it."

The impact of their action, if judged by the state of the economy, appears to have been positive. By the summer of 2004, three and a

half years after the onset of recession in the U.S., its economic recovery had become self-sustaining, and deflation had receded as a threat. The contrast with Japan's experience is stark. At the same point in its own post-peak period, the Japanese economy remained stagnant, and deflation was emerging as a chronic problem.

While it's easy to understand why the Fed would want to do what it could to avoid with the corrosive effects of deflation, Harrigan and Kuttner said it has remained puzzling why Japanese responded "so slowly and so erratically in the face of deteriorating economic conditions." The insufficient response early in the crisis, they said, could be attributed to the simple fact that few anticipated how rapidly disinflation would assert itself. But even when it was apparent to all that it was well established, Japan's response remained weak.

In fact, in 2000, the Bank of Japan actually raised interest rates and a senior bank official publicly stated that deflation was beneficial. Harrigan and Kuttner note that some economists compare this decision to the Federal Reserve's move in 1937 to effectively restrict bank lending, which is widely blamed for extinguishing the incipient post-Depression recovery underway at the time.

Harrigan and Kuttner suggest that the reluctance to act consistently and forcefully against deflation could be partly attributable to

bureaucratic turf wars between the Bank of Japan and the country's Ministry of Finance, with the lack of cooperation producing weak policy. They also note that others view the long-term effort by the Bank of Japan to seek independence from the Ministry of Finance, which was formalized in 1998, as producing what is known as an "independence trap." Bank leaders may have feared that if a bold initiative against deflation backfired, they might lose their new autonomy.

Harrigan and Kuttner also note that Japan's inaction may have been the result of a simple, rigid adherence to "certain economic doctrines," such as those that stress caution in doing anything that could cause inflation. These doctrines might work well in normal conditions, they observe, but can be obstacles to effective action in other times.

The authors offer one cautionary note in an otherwise favorable view of U.S. response to its postboom period. One difference between the two countries that does not bode well for the United States is a comparatively high level of government debt, which stood at 43 percent of GDP prior to the recession, compared to 13 percent for Japan. There also is the even more troubling fact that U.S. foreign indebtedness has "soared in recent years" while Japan continues to run surpluses in this area. Harrigan and Kuttner view foreign indebtedness as a serious issue that remains unresolved, despite the recovery. "Such a large U.S. current account is not sustainable and adjustment is likely to be a substantial policy challenge in the coming decade," they conclude.

— Matthew Davis

The Effect of Newer Drugs on Survival

In **The Effect of Drug Vintage On Survival: Micro Evidence from Puerto Rico's Medicaid Program** (NBER Working Paper No.10884), NBER Research Associate **Frank Lichtenberg** finds that patients suffering from serious illnesses such as heart disease, diabetes, and cancer who use newer drugs are likely to live longer than patients using drugs approved by the Food and Drug Administration in earlier years.

Lichtenberg's data mainly come from information recorded by Puerto Rico's Health Insurance Administration (ASES), which contracts with private managed care organizations to provide services to Medicaid patients, which account for 40 percent of Puerto Rico's population. His sample includes data on over 500,000 Medicaid patients. To qualify for Medicaid in 2002 a family of four could not have an annual income larger than $16,440.

Lichtenberg analyzes the impact of the vintage of drugs used to treat patients on their probability of survival, conditional on demographic characteristics (age, sex, and region), their use of medical services, and the nature and complexity of their illness. Because each pharmacy claim includes the National Drug Code, Lichtenberg can determine the earliest date of the FDA's approval for each prescription's active ingredients. He calculates values for drugs introduced post-1970, post-1980, and post-1990. He further organizes his data by disease group, and examines mortality data provided by Puerto Rico's Department of Health during the period 2000-2. Lichtenberg factors into his models such variables as the

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number of medical, pharmacy, and hospital claims, 15 different diagnosis categories, and dummy variables for region and for single-year-of-age-by-sex.

The data reveal that ASES beneficiaries using newer drugs during January-June 2000 were less likely to die by the end of 2002, conditional on the covariates. The estimated mortality rates strictly decline with respect to drug vintage. For pre-1970 drugs, the estimated mortality rate was 4.4 percent. The mortality rates for users of the 1970s, 1980s, and 1990s drugs were 3.6 percent, 3.0 percent, and 2.5 percent respectively. These differences in mortality rates are highly significant statistically, Lichtenberg concludes.

Moreover, he notes that people who used more medical services during January-June 2000 were more likely to die by the end of 2002. For example, one additional medical claim (physician visit) is associated with a .0031 (about 8 percent) increase in the probability of death. Although use of medical services presumably reduces mortality, given initial (pre-treatment)

health status, people in the worst initial health group use the most medical services.

Medicaid patients in Puerto Rico receive older medications than U.S. Medicaid patients. Lichtenberg believes this is so at least in part because in Puerto Rico, physicians bear the costs of the drugs they prescribe, with those costs deducted from the physician's health fund reimbursements. The estimates suggest that if the ASES vintage distribution were the same as U.S. Medicaid's, the ASES mortality rates would have been 5.3 percent lower (3.5 percent versus 3.7 percent).

In addition to estimating the model for the entire ASES population, Lichtenberg estimates the model separately for patients with diseases of the circulatory system, patients with endocrine, nutritional, and metabolic diseases and immunity disorders (primarily diabetes), and patients with neoplasms. With only one exception, within each group the coefficients of all three drug-vintage variables were negative and highly significant.

"In this study," Lichtenberg cautions, "we did not control for the effect of the vintage of medical products and services other than drugs on survival, and this may have affected our estimates of the effect of drug vintage. We plan to address this issue in future research."

— Matt Nesvisky

The Productivity Slowdown of the 1970s

In a study described as "economic archeology," NBER Research Associate **William Nordhaus** analyzes the slow productivity growth that hit the U.S. economy during the 1970s. His paper, **Retrospective on the 1970s Productivity Slowdown** (NBER Working Paper No. 10950), asks two main questions: First, was the slowdown in productivity growth during this period unusual by historical standards? Second, what were the industry sources of slowing productivity growth in the American economy?

In order to answer the first question, Nordhaus studies long-term data on U.S. productivity growth, focusing on productivity per hour for the nonfarm sector. He considers slowdown periods differing in length from five to twenty years and determines how many productivity slowdowns occurred from 1889 (as far back as the data go) through 2004. Nordhaus finds that the slowdown during the 1970s is not unique during this period; indeed, the productivity slowdown that began in the early 1900s was larger. However, the 1970s slowdown is much larger than any slowdown since the end of World War II.

The central section of the paper examines productivity growth by detailed industry. Nordhaus notes that comprehensive data on output and inputs are available from the U.S. Bureau of Economic Analysis (BEA) only since 1977. Working with the SIC industrial classification, Nordhaus and Alexandra Miltner have developed a comprehensive continuous set (available on the Internet) of data on real and nominal output, prices, and productivity from 1947 to 2001 for all industries. This new dataset allows Nordhaus to examine productivity trends prior to the 1970s slowdown as well as to break down the productivity slowdown by industry.

Nordhaus uses different methods for decomposing the changes in productivity growth, including a measure he calls "well-measured output" (WMO) that includes only those sectors with adequate defla-

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tion and price procedures. WMO shows a consistently higher rate of productivity than other measures. For total productivity from 1948 to 2001, WMO displays productivity growth of 2.59 percent as compared to 2.06 percent per year for the business sector. The traditional measure of productivity growth (defining productivity growth as the difference between the growth rate of output and the growth rate of inputs) shows a larger slowdown than other measures. The "welfare theoretic measure" — defined as the productivity growth weighted by industry shares of nominal output — shows an annual productivity slowdown of 0.69 percent, some 0.17 percent per year less than the rate of total productivity growth.

Nordhaus also investigates the sources of the productivity slowdown by detailed industry, examining which industries had the largest

productivity slowdowns, comparing the 1959-73 period to the 1973-95 period. The largest slowdowns were in pipelines, auto repair, and oil and gas extraction — industries heavily affected by the energy crises of the 1970s. These industries also showed large declines in output growth over the same period.

Nordhaus then assesses the extent to which individual industries contributed to the overall productivity slowdown. Again, industries affected by the 1970s energy crises — such as pipelines, oil extraction, electric and other utilities, motor vehicles, and air transportation — make up some two-thirds of the slowdown. He concludes, switching from archeologist to geologist, that "the energy shocks were the earthquake, and the industries with the largest slowdown were nearest the epicenter of the tectonic shifts in the economy."

However, "past is not prologue," Nordhaus explains. The productivity slowdown originating in the 1970s eventually gave way to a rebound in productivity growth in the new-economy sectors of the late 1990s. "As the economy made the transition from the oil age to the electronic age, the aftershocks of the energy crisis have died off and productivity growth has attained a rate close to its historical norm."

— Carlos Lozada

The Measurement and Evolution of Health Inequality

Has U.S. health care become more equitable for the elderly during the past several decades? If equality is measured by Medicare expenditures, the answer is yes. During 1987-2001, low-income households experienced an increase of 78 percent ($2624) in per capita expenditures on healthcare, double the increase for the highest income group of 34 percent ($1214). However, if equality is measured by life expectancy, the answer is no. Survival for the lowest income group during the 1990s grew by 0.2 years, compared to 0.8 years for the highest income group. The fact that the two measures deliver such discordant messages may reflect their intrinsic shortcomings: expenditures depend on preferences, health status, and prices, while outcomes are strongly affected by health behavior and past illness.

In **The Measurement and Evolution of Health Inequality: Evidence from the U.S. Medicare Population** (NBER Working Paper No. 10842), authors **Jonathan Skinner** and **Weiping Zhou** — using U.S. data from the elderly Medicare population over age 65 —

consider an alternative approach to measuring inequality. The authors suggest comparing quality of care across income groups — as measured by the use of effective treatments with proven effects on health outcomes — to capture the degree of inequality in the health care system. This approach avoids complications encountered in other measures of inequality such as differ-

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ences in underlying health status or preferences. The efficacy of these treatments is so well proven that nearly everyone in the relevant population, regardless of health or preferences, should be receiving these treatments.

Using Medicare claims data matched to zip code and income, the authors find greater use of mammography screening, diabetic eye exams, and alpha-blockers and reperfusion following heart attacks among the higher income households. These differences in care appear to be stable or growing slowly over time. The rapid relative growth in health care expenditures among low-income elderly people has not translated into relative improvement in either survival rates or rates of effective care.

The authors caution, though, that the magnitudes of the differences in effective care observed in the data would not be expected to have a large impact on overall mortality rates. Ensuring that low income households are as likely to receive beta-blockers as are high income households would increase

survival among heart attack patients by only about 0.2 percentage points. (The impact on population health would be even smaller, since heart attack patients make up a small fraction of the total elderly population.) The fact that these measures of effective care account for a small fraction of overall expenditures, and a small fraction of the overall variation in health outcomes, motivates the authors' interest in whether other measures of quality are correlated with mammography rates or beta-blocker use.

The authors also note some important limitations of their study. For example, using outcome data, they focus only on survival and not on quality-adjusted or "healthy life years." To capture a fuller measure of health, it would be necessary to include income-based differentials in treatments with proven effectiveness in improving functioning rather than survival per se. Some examples include hip or knee replacements for the treatment of osteoarthritis or the use of angioplasty for patients with ischemic heart disease. Another limitation is that this study is confined to the over-65 population. Focusing just on income-based differences in mammography rates within the Medicare program ignores the fact that Medicare itself contributes to a substantial increase in mammography rates at age 65 among those previously uncovered by insurance or in lower educational groups.

The authors point out that a singular advantage of focusing on equality in effective care (or quality of care) is that there are reasonable approaches to fixing the problem. Monitoring claims data in real time with the objective of raising rates to ideal levels of near 100 percent among appropriate candidates is one sure way to at least reduce income-based inequality in health outcomes. Inequality in outcomes may continue for many years, but at least such differences would not be exacerbated by inequality in health care. Indeed, one could imagine "non-discrimination" rules like those developed for 401(k) pension plans in which hospitals or health care systems would experience a partial loss in Medicare funding if effective care measures for their low income patients fell too far below those for their high income patients, or too far below those for all patients at high quality hospitals.

— Les Picker

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