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Policy Brief

Stanford Institute for Economic Policy Research

Growth Policy

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When the actual rate of economic growth falls temporarily below the economy's potential for growth, attention naturally turns to policies that can help it recover: tax cuts, interest rate reductions, temporary investment incentives, extended unemployment benefits, and increases in government spending. Unfortunately, more attention to measures that provide short-run stimulus can mean less attention to long-run policies that might permanently increase the economy's growth potential. History shows us that a small permanent increase in the trend rate of growth can profoundly alter our quality of life. There is much we don't know about the details of policies that can cause this kind of increase, but there is one easy measure that we can implement with confidence. The government should increase incentives for our universities to train more young people in science and engineering.

Why the trend rate of growth matters

In 1870, Britain was the world's most productive economy. Output per person in the United States lagged far behind. Since then, the rate of growth in the United States has been higher by about 0.5% per year. This difference may sound small, but after 130 years, it has a huge cumulative effect. By the beginning of the 20th century, annual output per head in the United States had pulled even with Britain. By the end of the century, it was higher here by $10,000 (in the purchasing power of 1996 US dollars).

By way of comparison, during the recession of the early 1990s, output per head in the United States fell by about $500 in 1991 and returned to its previous level in 1992. This kind of temporary reduction in output is dwarfed by the permanent $10,000 difference created by a faster trend rate of growth.

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The sources of economic growth

Economists cannot say with certainty why growth in the United States has been faster. Given the state of our knowledge, we can only point to a list of candidate factors and steer people away from the most basic pitfalls in thinking about growth.

Three broad factors contribute to growth in output per capita:

1) Increases in physical capital – the buildings, machinery, and infrastructure that we use in daily life.

2) Increases in human capital – the skills and experience of the workforce.

3) Increases in productivity – a catchall category that includes the many large and small discoveries that lead to the introduction of new goods and services or to more efficient production of existing goods and services.

A myriad of national institutions and government policies determine the rate of increase along these three dimensions. For example, legal and financial systems channel capital goods to promising firms. Formal educational and on-the-job training increases skills and experience. Research and development and the pressure created by intense competition spur the discoveries that raise productivity. Excessive rates of taxation or burdensome regulations can slow progress along all three dimensions.

The most common mistake in thinking about growth is to search for a "silver bullet," a single policy that is everywhere and always the key to faster growth. In fact, a whole range of policies and institutions must work together to sustain a high rate of growth. Each is more valuable when it is adopted in conjunction with all the others.

In setting national policy, a better strategy is to look for the "weakest link," where current policy is far from ideal and it would be easy to do better. At different times and in different countries, this weak link may differ.

Training more undergraduate scientists and engineers

There is one clear area in which the United States now lags behind and could make rapid progress. Too few of our young people receive undergraduate degrees in science and engineering. According to data collected by the National Science Foundation (NSF), in 1997, 5.4% of all 24-year-olds in the United States received an undergraduate degree in the natural sciences or engineering. In Japan the comparable figure is 7%. In Germany it is 8% and in South Korea it is 9%.

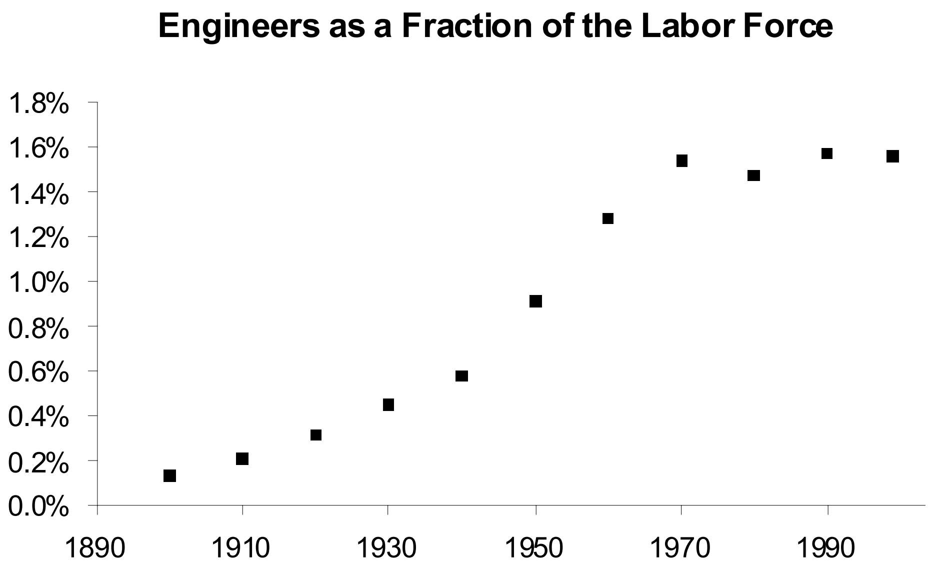
If undergraduate training in science and engineering were the long-sought silver bullet that ensured rapid technological progress, these countries would soon surpass our technological lead. It is not. There are no silver bullets. But these international comparisons do highlight one area where the United States could surely do better.

Our recent performance also falls short of what we accomplished in the past. Figure 1, which is based on census data, shows that in the first seven decades of the 20th century, the United States steadily increased the fraction of the labor force trained as engineers. But since 1970, this fraction has remained roughly constant, despite the fact that these last three decades were, by all indications, a time when technological change steadily increased the demand for skilled problem solvers and knowledge workers.

All observers agree that the university system in the United States is the best in the world. Even if the elementary and secondary school system leaves many children poorly prepared for advanced study, surely the top 8% or 10% of the students educated in this system could profitably pursue studies in science and engineering.

Students themselves are interested in science and engineering. Data from the NSF show that for every two undergraduates who receive a degree in these fields, there is a third who expressed an intention to major in them but became discouraged along the way. It's not hard to see why. The grades assigned in science courses are systematically lower than grades

Figure 1



the fraction of their students who receive undergraduate education in science and engineering. Performance along this dimension is easy to measure and can be closely linked to an easily stated national policy goal. The United States should lead the world in the fraction of 24-year-olds who receive science and engineering degrees.

Because human capital is one of the three key drivers of growth, we know that output per capita will be higher if we have more of the kind of human capital that education in science and engineering creates – the ability to state and solve problems, to quantify what's at stake, to reason abstractly about causality and counterfactuals.

More important, there is good reason to expect that more of this kind of human capital will lead to more rapid growth in productivity, the most important of the three factors that drive growth. Whatever the private-sector challenge, be it increasing the speed of the next generation of computer chips or refining the logistical systems that move goods from factories to retail outlets, productivity growth will be faster if the people working on solutions have training in science and engineering.

in other disciplines, and students rely heavily on grades as signals about the fields for which they are best suited. The introductory science courses are also large, impersonal, and threatening. Students know them for what they are. They call them "weed out" or "weeder" courses.

The key to solving the problem is to recognize that incentives matter on university campuses, just as they do in every other part of life. Since World War II, the federal government has substantially increased the incentives for university professors to do research, with dramatic results. Before the war, we were not a world leader in basic research. Now we are. But in contrast to the practice in many other countries, our government does not give university professors or administrators a financial incentive to train more undergraduate scientists and engineers. Universities have responded by devoting more effort to research and less to teaching.

Without taking any resources away from its support for research, the federal government could create a new arena in which universities and colleges compete for funds. The Tech Talent Bill recently introduced by Senators Bond, Domenici, Frist, Lieberman, and Mikulski and Representatives Boehlert and Larson shows how this could be done. Institutions would compete for grants on the basis of their success in increasing

About the author

Paul M. Romer is the STANCO 25 Professor of Economics in the Graduate School of Business at Stanford University and the Ralph Landau Senior Fellow at the Stanford Institute for Economic Policy Research (SIEPR).

Romer was the lead developer of "new growth theory." This body of work emphasized the lasting effect that institutions and policies could have on the trend rate of economic growth. It moved scientific discovery, technological change, innovation, and productivity growth back to the center of macroeconomic analysis.

In 1997, Time Magazine named Romer one of America's 25 most influential people. He is a fellow of the American Academy of Arts and Sciences, the Econometric Society, and a research associate of the National Bureau of Economic Research, and holds a Ph.D. in economics from the University of Chicago.

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