

## Introduction

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Looking back into Sweden's and many other countries' histories, it is astonishing to see how a century of historically high economic growth revolutionised the lives of ordinary people. It is not far-fetched to argue that the way to achieve long-run growth is the most important of all economic policy issues. On an abstract level, the recipe for growth is straightforward; an economy can only increase its productive potential by increasing its stock of factors of production, i.e., physical and human capital, where the latter is understood to encompass knowledge, ideas, technology, and institutions. But the step from this almost tautological statement to practical policy prescriptions is long. The purpose of this issue of the *Swedish Economic Policy Review* is to take some steps in a practical direction. The focus is on human capital accumulation, partly because it has been emphasised as an engine for growth in the new theory of growth, and also because this is an area where government intervention is prevalent. The papers in this edition were first presented on November 23, 1998 in Stockholm, at a conference organised by the Economic Council of Sweden.

**Robert J. Barro's** article takes a broad look at the macroeconomic evidence: do countries that have devoted more resources to education tend to grow faster? Using about 100 observed countries over the 1960-1995 period, Barro comes to a clear conclusion: the quantity and quality of education have significant and economically large effects on growth. Controlling for various factors that affect growth, countries that start the sample period with higher levels of human capital tend to grow faster. An interpretation of this is that high levels of human capital facilitate technology adoption and increase the rate of physical capital accumulation. The effect is quite strong; countries that start the period with an education system that provides an extra year of education have subsequent growth rates that are about 0.7% higher. More surprisingly, female school attain-

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ment appears to have a much lower impact on growth. This may reflect that many countries fail to adequately exploit the potential of its educated female labour force. Another important finding is that the education quality, as measured by international test scores, has a strong impact on growth.

Barro also uses his estimates to produce growth forecasts for the 1996-2006 decade. Unfortunately, growth prospects for Sweden and other northern European countries look relatively dim, reflecting large government sectors and less investments in human capital accumulation than in, for example, the US.

**Alan B. Krueger** and **Mikael Lindahl** take the opposite perspective and start with micro data. It is well established that the level of individual education has a strong impact on lifetime earnings. Many studies have shown that this is a causal relationship; more education increases individual productivity and is not simply a signal of inherent qualities that are independent of education. Then, if an economy increases its aggregate stock of educated people, its aggregate income should increase. In other words, *changes* in the aggregate level of education should positively affect growth. But the strong microeconomic findings have not been matched in the empirical macroeconomic literature. Typically, the disconcerting finding in the latter has been that changes in education are unrelated to economic growth. Krueger and Lindahl help resolve this puzzle. They argue that previous macroeconomic results are due to a failure to account for measurement problems in international data on educational attainment. Measurement errors are common in available data on average education, and these errors are particularly serious when *changes* in the education level are examined. Taking these problems seriously, they show that micro- and macroeconomic evidence is mutually consistent: education increases individual productivity, and an increase in a country's average education level positively affects aggregate output.

As shown by Barro in this issue, school quality appears to affect growth. **John Bishop** provides important evidence to the debate about how to construct an educational system of good quality. In particular, Bishop discusses the question: are external exit examinations in high schools an effective way to increase educational quality? Bishop argues that there are several theoretical reasons for the answer to be *yes*. External examinations tend to reduce negative peer pressure against studying hard, which tends to arise when grades are based on relative performance in class. External exams may also in-

crease the incentive for teachers and schools to focus more on academic achievements, as well as increasing parental demand for educational quality. But external exams may also reduce quality by inducing too much devotion of time and resources to learning facts and definitions rather than to deeper understanding and critical analysis. Using a variety of data, Bishop concludes that positive effects are likely to dominate. He also finds evidence of a negative impact after abolishing exit examinations in Sweden in the 1970s.

How does Sweden's educational system rank in an international comparison? To answer this question, **Åsa Sohlman** gives a detailed account of the stock and accumulation of human capital in Sweden and other countries. Sohlman finds that in many dimensions, Sweden has a relatively well-educated population. But there are indications that Sweden's relative position is deteriorating. For example, the expected number of tertiary (higher) education years for a person age 17 is lower in Sweden than in almost all compared countries. The proportion of science graduates in the young labour force is also low compared to other countries. Nevertheless, Swedish education costs appear to be among the highest, despite a modest number of teaching hours and quite low teacher salaries. Sohlman concludes that if Sweden intends to remain a leading knowledge-based society, it may have to increase the participation of young people in tertiary education, especially in science and technology. Some signs of such an increase may already be visible in the data.

For various reasons one should not expect the benefits of education to society and to the individual to coincide. Subsidies to education may increase the private return, while progressive taxation would reduce it. Because learning generically requires active and voluntary individual participation, such a divergence can distort incentives and lead to inefficient levels and compositions of human capital. The purpose of the article by **Erik Mellander** and **Per Skedinger** is to increase our understanding of these incentives by estimating the increase in the income an individual can expect after completing an academic degree. Previous international comparisons of such educational wage premia have suffered from limited comparability of data. Mellander and Skedinger circumvent this problem by using a unique data set that contains observations on wages, individuals, and job characteristics—specified in the same way in all surveyed countries. Watson Wyatt, an international consulting firm that specialises in cross-country analyses of wage and employment conditions, collected

the data. Mellander and Skedinger use this data to calculate the wage premium associated with a job that typically requires higher education relative to a job that does not. An important finding is that the wage premia for engineers are strikingly similar among all countries. For business administrators, the international variation in the wage premia is larger. In both cases, the computed wage premia for Sweden is close to the international average.

In sum, the articles in this issue strengthen the case for education being an important ingredient in the recipe for growth. A more transparent and individually based evaluation system for students, as well as for teachers and schools also appears to be a way of increasing educational quality and efficiency. After reading the articles, the picture of Sweden as a country with an outstanding educational system vanishes. Human capital of average level and quality may be sufficient to achieve average growth rates, but not for a country that wants to be in the economic forefront.