

THE RETURNS TO EDUCATION: LINKS BETWEEN EDUCATION, ECONOMIC GROWTH AND SOCIAL OUTCOMES

This indicator focuses on the role of human capital as a determinant of the level and rate of growth of output per capita within countries. The indicator complements Indicator A9, which examines the relationship between human capital and economic returns at the individual and public levels. While Indicator A9 depicts what happens to the earnings of an individual as his or her level of schooling rises, Indicator A10 seeks to capture the effects of changes in a country's overall stock of human capital on labour productivity and health status.

Key results

- The estimated long-term effect on economic output of one additional year of education in the OECD area is generally between 3 and 6%. Analyses of human capital across 14 OECD economies – based on literacy scores – also suggest significant positive effects on growth.
- An analysis by the OECD secretariat of the causes of economic growth shows that rising labour productivity accounted for at least half of GDP per capita growth in most OECD countries from 1994 to 2004.
- Many national analyses indicate a positive causal relationship between higher educational attainment and better mental and physical health.

Policy context

Since the mid-1980s, economic growth has occupied centre-stage in macroeconomic research. Research has gained impetus from new theoretical insights – in particular new-growth theory – and new approaches to the empirics of growth. Human capital – the knowledge and skills embodied in workers – has been critical to this question. Significant differences among OECD member countries in their recent macroeconomic performance have also spurred interest in the causes of economic growth.

Comparisons of micro-level estimates of returns to education for individuals (such as those portrayed in Indicator A9) and macro-econometric estimates as reflected in this indicator, are potentially of great policy relevance. Discrepancies between the two approaches can point to differences in the private and public returns on schooling that may call for corrective policy action. For instance, following a rise in school attainment, if productivity at the aggregate level of the economy is raised in ways additional to the increases in productivity of each worker, then this will generate a tendency for underinvestment in education, because individuals will fail to take into account the wider economic benefits that could arise from their schooling choices. In this context, micro-econometric estimates of wage equations with individual cross-section data for a given country only pick up the effects on individuals of schooling, whereas macro-econometric estimates with cross-country data should also capture the wider economic impacts.

This year, Indicator A10 also reviews linkages between educational attainment and physical and mental health. Interest in this relationship is likely to grow in light of a range of challenges to social cohesion associated with globalisation and immigration. Though much is already known about a variety of positive associations between educational attainment and physical and mental well-being, definitive evidence is lacking on the forms, magnitudes and causal nature of these benefits. Further evidence on these relationships could have significant policy implications. This is especially so given that in many countries, the overall cost of health care is rising faster than the rate of economic growth.

Evidence and explanations

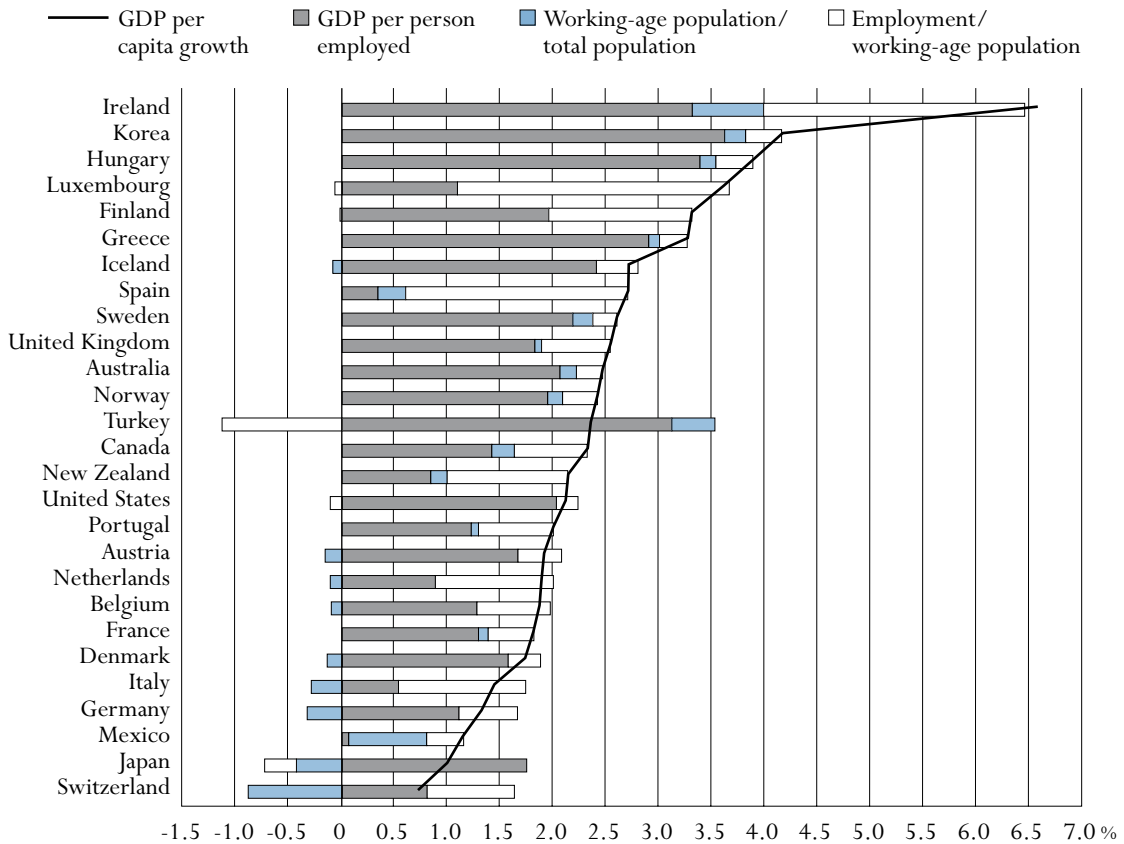
The critical roles of labour productivity and human capital

Chart A10.1 illustrates the relative importance of the key drivers of growth in GDP per capita over the years 1994 to 2004. For each country, changes in GDP per capita are broken down into three effects: demographic, labour utilisation and labour productivity. The demographic effect refers to the ratio of the working age population to total population. In most countries, this effect accounted for only a minor part of per capita output growth over time, with the exceptions of Ireland, Mexico and Turkey. However, in some OECD countries (such as Austria, Belgium, Denmark, Germany, Iceland, Italy, Japan, Luxembourg, the Netherlands and Switzerland) demographic trends have begun (in this accounting sense) to act as a slight drag on growth in GDP per capita. This tendency is set to strengthen in the future as the total population ages more rapidly.

In most countries, improvements in the utilisation of available labour (*i.e.* an increase in the share of the working age population that is in employment) had a much larger impact on change in per capita output. Improved labour utilisation accounted for from 2 to approximately 2.5% per annum increases in GDP per capita in countries such as Ireland, Luxembourg and Spain.

Chart A10.1. The driving forces of GDP per capita growth (1994-2004)

Trend series, average annual percentage change



Countries are ranked in descending order of GDP per capita growth.

Source: OECD.

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Chart A10.1 shows that rising labour productivity (GDP per person employed) accounted for at least half of GDP per capita growth in most OECD countries over the period 1994 to 2004. Indeed, in a number of countries, growth in labour productivity produced almost all of the increase in GDP per capita (this includes Austria, Denmark, Greece, Hungary, Japan, Korea, Turkey and the United States).

Labour productivity can be increased in several ways: by improving the quality of labour used in the production process, by increasing the use of capital per worker, or by attaining greater overall efficiency in how these factors of production are used together: what economists call multi-factor productivity. Multi-factor productivity itself reflects many types of efficiency improvements, such as improved managerial practices and organisational changes, and innovations leading to more valuable output being produced with a given combination of capital and labour. The skills and competencies embodied in workers – or human capital – play a fundamental role in raising labour productivity. Rising levels of educational attainment among workers is only one sign of this role. Increases in the level of post-educational skills may be even more important, although few hard measures of this are available. The OECD Growth Project estimated that in the OECD area, the long-term effect on output of one additional year of education in the adult population generally falls between 3 and 6%.

Box A10.1. Literacy and growth in 14 OECD member countries

Recent research has sought to estimate the relationship between human capital and economic growth using internationally comparable literacy scores. This approach helps avoid the problem of the imperfect comparability of measures of educational attainment across different national education systems. The literacy measures were obtained from the 1994 International Adult Literacy Survey (IALS), which tested the skills of 16-to-64-year-olds in prose, quantitative and document literacy. The data cover 14 OECD countries. Using these survey findings, a synthetic time series was constructed for 1960-1995. The literacy results of 17-to-25-year-olds in a given period were then used as proxies for investment in human capital during the previous period.

The research indicates that literacy scores, as a direct measure of human capital, perform better in growth regressions than indicators of schooling. A country able to attain literacy scores 1% higher than the international average will achieve levels of labour productivity and GDP per capita that are 2.5 and 1.5% higher, respectively, than those of other countries. IALS offers two explanations as to why literacy data should contain more information on the relative well-being of nations than data on years of schooling: that literacy might be a superior measure of some key driver of growth, such as social infrastructure; and that data on literacy skills might be more comparable across countries than data on years of schooling. To assess these interpretations, the study proposes future research using both indicators to compare growth effects across regions within a given country. This could help to surmount problems of imperfect international comparability, as the relative performance of the two would reveal which performed best as a measure of human capital and which was most closely associated with economic growth.

Measures based on average literacy scores across all individuals were shown to serve as much better indicators of aggregate human capital than measures based on the share of individuals attaining high levels of literacy. This finding is in line with the idea that the principal impact of education on growth is to raise the productivity of the whole workforce, rather than to increase the number of individuals able to bring about radical innovations. Strikingly, increases in literacy skills among women have a much larger effect on growth than increases in literacy among men. Various explanations are possible: investment in the education of women may have been provided to particularly high-ability individuals who were previously held back by social barriers; the rate of return to education among women may have been high owing to low initial levels of literacy; increased education might allow a reallocation of male and female labour across occupations, allowing more men and women to subsequently work in occupations for which they have a comparative advantage; if male and female labour is not perfectly substitutable, increased education of women might be associated with a period of rapid growth, rebalancing of the stock of human and physical capital prior to achieving a new steady state level; possible statistical effects stemming from greater variation in women's literacy scores across countries; and the possible association of women's literacy with omitted variables that affect growth, such as a country's level of social development.

Source: Coulombe *et al.* (2004).

Estimating the macroeconomic returns to education: challenges and outstanding questions

A large body of empirical research has confirmed a positive link between education and productivity. Better educated employees are generally more productive, and may also raise the productivity of co-workers. Higher stocks of human capital facilitate investments in physical capital and enhance the development and diffusion of new technologies, which in turn affects output per worker. A range of indirect benefits from education are also likely to have positive economic consequences. For instance, greater education is associated with superior health status and increases in some aspects of social cohesion and political participation.

Studies of the macroeconomic returns to education are methodologically diverse and based on two broad theoretical approaches. The first, a neo-classical approach, models the relationship between the stock of education and the long-run level of GDP. Most studies follow this tradition. A second approach derives from new-growth theory and models the relationship between the stock of education and the rate of growth of GDP. Whether increases in the stock of education primarily affect the level of output or its growth rate is still unclear. Concerning the magnitude of the returns, the available studies indicate that in the neo-classical models a one-year increase in average education raises the level of output per capita by between 3 to 6%. Studies of the new-growth variety find that the same increase in average education raises the rate of growth of output by around 1%. The two theoretical approaches yield results that differ significantly in magnitude over the medium-to-long term. This is because the absolute effect on output of a cumulative one percentage point increase in the rate of growth soon exceeds a once-only increment to the level of output of even 6 percentage points (the upper boundary). However, over a period of a few years the absolute size of the predicted effects on output is comparable in both theoretical frameworks.

Various conceptual and methodological hurdles have hindered the estimation of education's impact on growth. A central issue relates to the direction of causality in the growth relationship: does education spur growth, or does growth cause individuals to consume more education? In practice, it is likely that causality operates in both directions. In a related manner, efficiency in producing educational outputs may simply be positively associated with efficiency in other areas of the economy. The results of many studies have also been weakened by data deficiencies. For instance, low correlations have been observed between measures of education from some key sources of educational data. Furthermore, growth studies have relied on a variety of proxies for human capital, such as average years of education, adult literacy rates and school enrolment ratios, and different studies have used a variety of dependent variables. Such proxies pose a number of difficulties. For instance, they include formal education only, omitting the skills acquired through on-the-job training, experience and other channels, as well as the loss of skills caused, for example, by disuse. Similarly, adult literacy rates capture only one dimension of human capital, omitting such competencies as numeracy and technical knowledge. Indeed, different specifications of human capital lead to major divergences in estimates of the stock of human capital across countries. And variations in the quality of education systems mean that indicators of educational attainment are often not fully comparable across countries. Different types of education can also be expected to have different impacts on growth: a cohort of graduates in engineering disciplines is likely to affect productivity in different ways than a similar-sized cohort of graduates in the arts. But this differential effect is not captured in the usual aggregated proxies of human capital. However,

international surveys, such as the Adult Literacy and Life Skills survey or the Programme for the International Assessment of Adult Competencies (PIAAC), which the OECD is currently developing, can provide internationally comparable multidimensional skills assessments.

Cross-country growth regressions usually assume that the impact of education is linear and constant across countries. However, research suggests that the assumption of constant growth effects of education across countries is unfounded. There is also evidence of diminishing effects on growth above an average of 7.5 years of education (see the Definitions and methodologies section). This is well below the OECD average of 11.8 years in formal education (see Indicator A1).

Much remains uncertain in education-growth research. As noted above, it is still unclear whether education and increases in the stock of human capital affect the level of GDP or its growth rate. Policy-relevant questions that could be addressed by further research include:

- How is growth affected by investment in different stages of education (from pre-school to advanced tertiary education and work-related training)?
- After how many years, and at which levels of education, do diminishing growth returns become important?
- How is growth affected by investment in different types of education, such as engineering disciplines or the arts?
- How is growth affected by the quality of education?
- How, if at all, are growth effects from the expansion of one stage of education affected by the level of attainment achieved at an earlier stage?

Education and health: an overview of the connections

More education and higher levels of qualification are associated with a lower incidence of a variety of physical and mental health disorders. Such relationships have been observed across countries, as well as across income, age and ethnic groups. The interactions involved are both direct and indirect, and in some instances vary over the lifecycle (an ongoing OECD project, entitled the Social Outcomes of Learning, examines a range of outcomes from education, including those in health). Better identification of the full range and magnitude of the effects of education on health could provide a new calculus for public investment decisions in education.

A large number of studies suggest that education has a positive causal impact on good health. However, the methodological challenges to establishing causality are significant. For instance, physical and mental ability, as well as the characteristics of parents, may bring about both higher educational attainment and better health status. Similarly, individuals' time preferences – whether they are more oriented to the present or future – may partly determine their investments in both education and health. From the other direction, health status itself is positively associated with educational attainment, although the effect of health on educational achievement may be small for adults. Research suggests three key routes through which higher levels of education can affect health status:

- *Effects on incomes and employment* Education lowers probabilities of unemployment and economic inactivity: states associated with low physical and mental health. People with higher levels of educational attainment are also more likely to work in occupations that they find fulfilling, and in which physical hazards are less serious. The better educated also generally have higher wages and occupational status. Higher incomes can facilitate access to health care (depending

on the terms of health care provision in each country) and help to avoid stresses resulting from financial insecurity. Higher wages brought about by higher educational attainment also raise the opportunity cost of behaviours likely to impair health. In the United States, it is estimated that economic factors are responsible for around half of the impact of education on physical health in adults over the age of 60.

- *Effects on health-related behaviours* Health-related behavioural change may have many causes, including increased awareness of health issues and superior access to and comprehension of relevant information (although some studies show schooling to have a positive effect on health even when health knowledge is held constant). Education may also make individuals more future oriented, thus raising their incentives to make longer-term investments in health. The impact of behavioural change stemming from more education varies across health conditions. Research has found positive associations between higher levels of education and healthier dietary practices, a lower incidence of smoking and excessive alcohol consumption, increased levels of exercise, and even the more frequent use of seat belts.

Education is also associated in positive ways with the use of health-related services. For instance, evidence from the United States indicates that more literate men tend to present for prostate cancer at an earlier stage of the disease. Similarly, lower reading ability in women is associated with lower utilisation of mammography. Research on women in the United Kingdom has shown adult learning to have an important impact on the use of preventative screening, independently of income, occupation or social class. Better educated individuals may even exercise influence on the design of health services, for instance through lobbying activities.

In this context, analytical and policy interest has recently focused on ‘health literacy’ – the capacities of individuals to “obtain, process, and understand basic health information and services needed to make appropriate health decisions” (Rudd *et al.*, 1999). Large numbers of adults possess a level of literacy below the reading requirements of health-related documentation, especially among at-risk population subgroups. Research on 958 English-speaking patients presenting for non-urgent care at a walk-in clinic in Atlanta, Georgia (United States), showed that almost half of those studied were unable or limited in their ability to understand directions for medication or hospital documents (Rudd *et al.*, 1999). When health literacy is inadequate, access to care can be curtailed and the efficacy of treatment impaired. Lower functional health literacy may also be associated with higher overall costs in health care. Furthermore, deficient literacy skills give rise to ethical considerations in the context of procedures that require informed consent from patients. Indeed, the full impact of inadequate health literacy has not yet been measured.

- *Psychosocial effects* In a variety of ways, education affects how people cope with a range of stresses encountered in daily life. Education can augment individuals’ self-esteem, problem-solving and social skills, personal control, and social engagement, all of which can increase the capacity to respond positively to adversity. Evidence from the United Kingdom has shown that among both men and women a low level of basic skills more than doubles the likelihood of experiencing depressive symptoms.

A positive relationship between education and better health does not hold across all conditions (and in some instances, the relationship only exists for lower levels of education). For example, more education is not linked to lower rates of anxiety disorders. And higher levels of education are associated with a higher incidence of eating disorders and complaints such as allergies and

chronic fatigue syndrome (a relationship that may reflect diagnostic biases). Research indicating a decline in mental health among adolescents and young adults in a number of OECD countries has also raised concern about the possible damaging effects of academic stress and competitive and/or unsupportive learning environments.

The educational attainment of parents also affects the health of their children in a variety of ways. Greater parental schooling has been found to have a positive effect on childhood and adolescent health, even accounting for such variables as birth-weight, the age at which a woman becomes a mother, family income and congenital abnormalities. And more educated mothers are less likely to engage in a range of behaviours damaging to the foetus or young child.

The existing evidence suggests that the magnitude of education's effects on health is sizeable. As the average age of OECD populations rises, and as the costs of providing health care increases more rapidly than GDP growth in many countries, policy makers may need to pay increased attention to the implications of such evidence: the better educated are more likely to invest in preventative care, more likely to use a range of medical services in effective and efficient ways, and more likely to be in better health.

Still, more research is required on the ways in which education affects health. For instance, the precise role of education and instructional modalities in the mental health of young adults is unclear, and merits further research, as does the complex issue of how education affects the ability to cope with different kinds of stress. Research might also help to elucidate how specific interventions in education affect health outcomes. For instance, due in part to the difficulty of directly measuring time preference, evidence on the relationship between schooling and time preference is incomplete. Confirmation that schooling and parental practices cause time preferences to change could be of direct policy relevance. For example, such evidence might lead to a conclusion that general interventions focused on increasing students' future orientation could be more beneficial than specific health campaigns (in this regard, it is noteworthy that in many countries information on the dangers of smoking is readily available, and yet more educated individuals still smoke less than others. This fact might reflect greater future orientation stemming from greater educational attainment).

Definitions and methodologies

In connection with the sub-section "Estimating the macroeconomic returns to education: challenges and outstanding questions", an assessment of how different specifications of human capital affect international comparative estimates of stocks of human capital is provided in Wösmann (2003). Evidence that the growth effects of education are not constant across countries and diminish above an average of 7.5 years of education is provided in Krueger and Lindhal (2001). This section has also drawn heavily on Sianesi and Van Reenan (2003) and on De la Fuente and Ciccone (2003).

With reference to the Evidence and explanations section, see *The Sources of Economic Growth in OECD Countries* (OECD, 2003b) and *The New Economy: Beyond the Hype* (OECD, 2001a).

The sub-section "Education and health: an overview of the connections" has drawn on Grossman and Kaestner (1997), Hammond (2002), Groot and van den Brink (2004), The Nuffield Foundation (2004), Rudd *et al.* (1999) and Feinstein *et al.* (2005).

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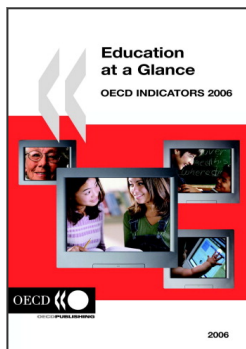
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