European Commission

European **E**xpert **N**etwork on
Economics of **E**ducation **(EENEE)**

State of Research of Foresight Studies in Education and Training

EENEE Ad-hoc Question nº1-2020
Prepared for the European Commission

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March 2020

EUROPEAN COMMISSION

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The state of research of foresight studies in education and training

George Psacharopoulos

Education futures

A caveat is in order at the outset. Attempts to predict education futures have a long history. Based on the earliest ones whose target year has been reached, their record does not look good.

For example, education manpower forecasts by international organizations in many countries in the 1950s showed errors of hundreds of percent by the 1970s (Ahamad and Blaug, 1973). Universal primary education enrollment expected in 1990 to be achieved by 2000 has yet to materialize in 2020 (WCEFA, 1990).

Given the negative evaluations of manpower forecasts, the practice has been abandoned by the World Bank and the ILO. Instead, labor market analysis has been used that led to a dramatic change in the Bank's lending portfolio from tertiary and vocational education that was dictated by manpower forecasts, to primary education based on cost-benefit considerations (Psacharopoulos, 1991; Richards and Amjad, eds. 1994; Psacharopoulos, 2006; World Bank, 2013).

The World Bank's view on the subject

Manpower planning has given way to dynamic skills development

Manpower planning, a technique that used macroeconomic and sector forecasts to derive how many workers with specific technical skills would be needed was popular in the 1960s and 1970s. Manpower planning generally assumed a fixed relationship between labor and outputs, implicitly ruling out technological change. It also emphasized technical skills to the detriment of cognitive and social skills. And it was slow to adapt to rapid changes in the world of work brought by globalization. Gradually the focus shifted from merely ensuring an adequate supply of skills to delivering demand-responsive, quality-skills.

Source: World Bank 2012, Box 5.8.

Yet attempts to predict education futures has continued in other quarters by changing names, e.g., early anticipation of skills needs, foresights and scenarios (CEDEFOP, 2016). This is fine, provided one is aware of the limitations, and remembering that predicting the weather or the stock market is not possible, even a few days ahead.

In reviewing the recent literature on foresight, it should also be noted at the outset that the topic is nebulous and rarely appearing in published refereed academic journals. On the contrary, there are many rigorous papers published in academic journals, some based on experimental evidence, on what education policies work and what not.

In the spirit of this ad hoc question and adopting a broad definition of foresight, below are listed some major trends that are likely to affect education systems in the future, along with credible possible policies to correct anticipated problems.

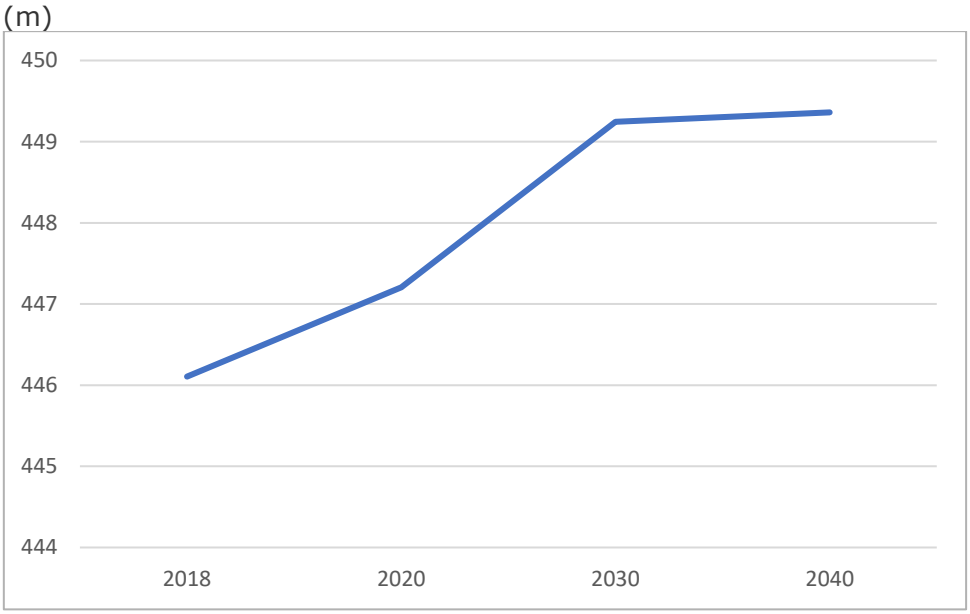
Trends affecting education

Demographic

The methodology of demographic projections is based on a model with inputs a series of assumptions on fertility, mortality and migration. The output of the model is age-specific fertility rates, age-specific and sex-specific mortality rates; and age-specific and sex-specific net migration for each of the years covered by the projection (Eurostat, 2019).

Eurostat projects a modest increase of the EU population to 2040.

Figure 1: Population projection to 2040, EU27

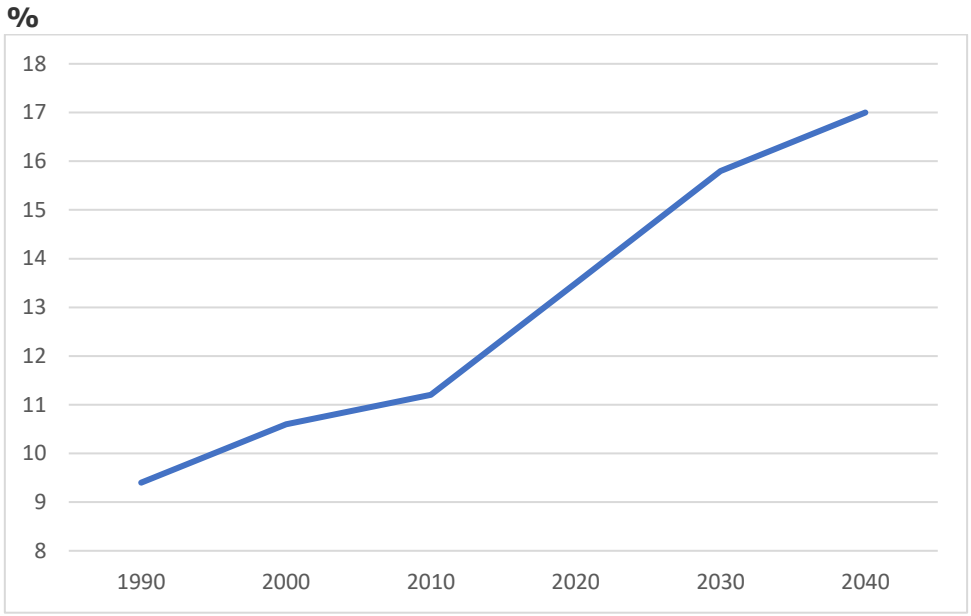


Source: Based on Eurostat (2020c).

At the same time, there will be an ageing of the population. Eurostat (2020d) projects that the share of people aged 80 years or more will more than double by 2100 to reach 14.6 % of the whole population.

The change of the shape of the age pyramid from the younger to the older ages and increased life expectancy means that education and training systems will have to cater for older workers beyond the classic retirement age of 65. The implication for education is increased emphasis on forms of lifelong learning (World Bank, 2003).

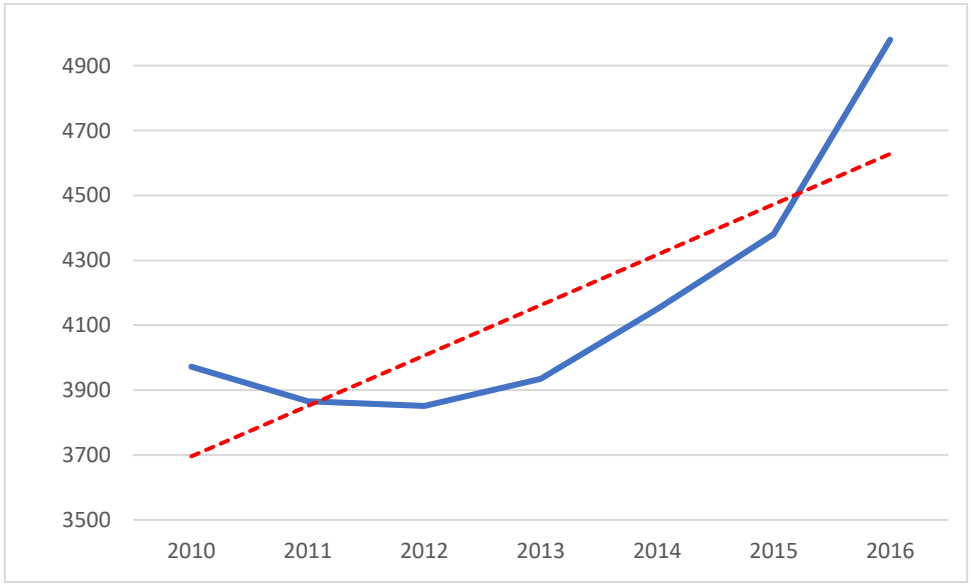
Figure 2: Percent of population aged 65-79 in OECD countries



Source: Based on OECD (2019), projections by United Nations (2018).

Another demographic trend is increased immigration flows. OECD countries received more than 5000 new permanent migrants in 2018, and the trend is on the rise. The implication for education is that school systems must cater for students of diverse backgrounds and languages.

Figure 3: Inflow of permanent immigrants into OECD countries

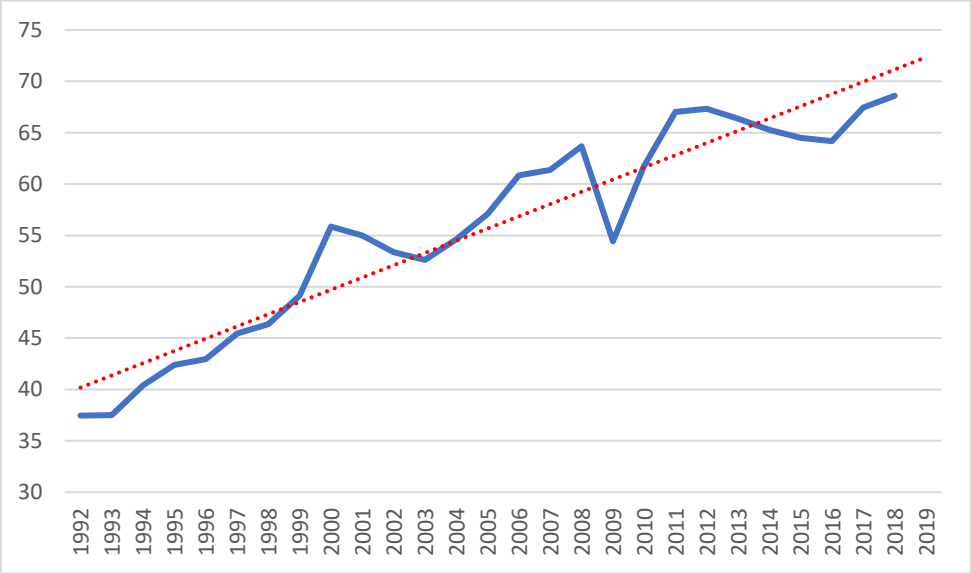


Source: Based on OECD (2018)

Globalization

The world is becoming smaller due to the increased movement of people, goods and capital. The implications for the educational system is that it has to prepare students for interacting in an international environment, not only in terms of foreign languages, but also cultures, transferability of skills and diploma accreditation. Globalization also calls for going beyond Bologna and extending the Credits Transfer and Accumulation System (ECTS) for the mutual recognition of qualifications.

Figure 4: Merchandise trade as % of GDP, European Union

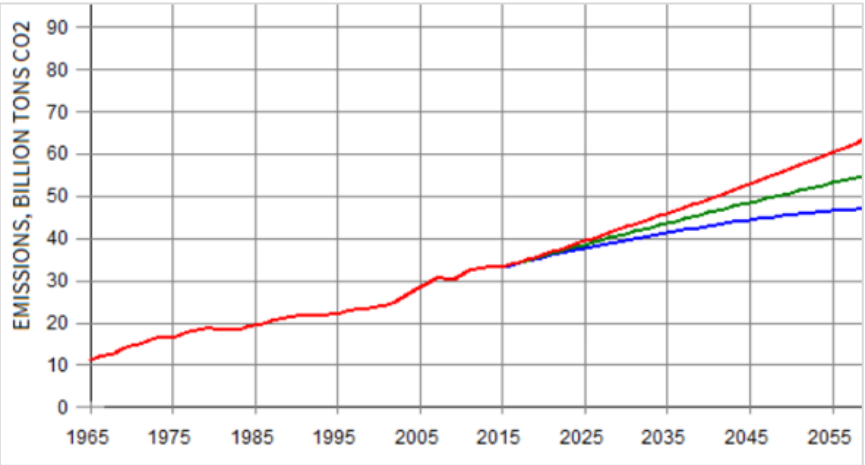


Source: Based on World Bank (2019a).

Environment

Carbon emissions are projected to increase in the coming decades. The educational system has a role to play in sustaining the environment. This can be done not only by instilling recycling behaviour and consumption habits early in the school cycle, but also by facilitating the development of ecological technologies.

Figure 5: Carbon emissions - low, medium and high forecasts

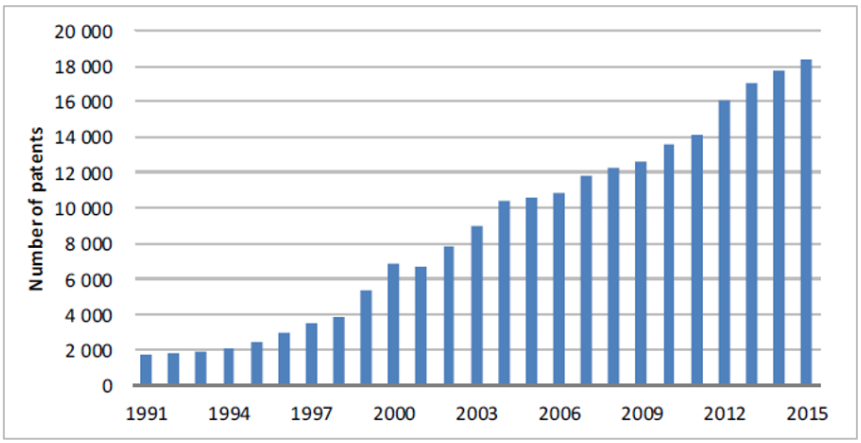


Source: Energy matters (2018)

Technological

New technologies, already in place and expected to rise in the future, come under different names such as automation, robotics, ICT (information and communication technology, AI (artificial intelligence), digitization and the internet of things. These technologies are already in place and are expected to have an impact in the future on the kind of skills used in the labor market, along with what and how learning takes place in schools, training centers and universities (Joint Research Center, 2018). An indicator for such trend is the rise in the number of artificial intelligence patents.

Figure 6: Artificial intelligence technology patents

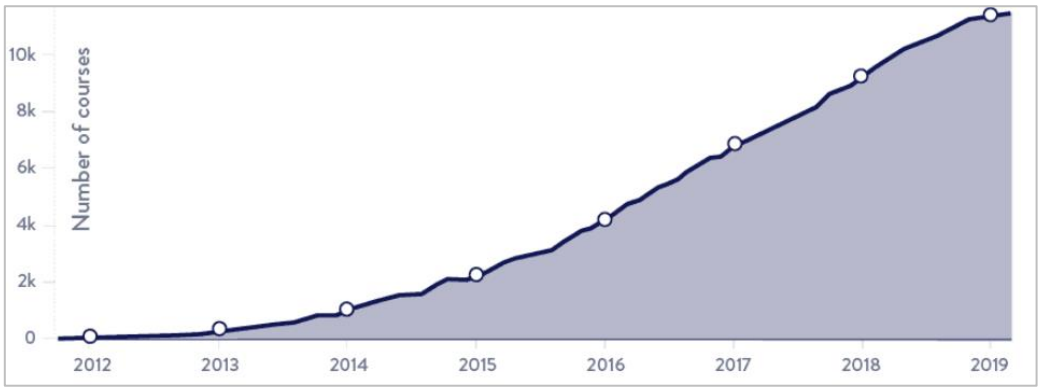


Source: OECD (2019)

Using the new technology, teachers can become coaches and mentors focusing on individual student instruction. Digitization has facilitated virtual classrooms and massive open online courses (MOOCs). In less than 10 years since their inception, MOOCs are growing fast and now offer about 12,000 courses to 100 million students in 1000 universities (Class Central, 2020).

Blockchain can have an impact on education, e.g. regarding the validation of credits and qualifications.

Figure 7: Growth of MOOCs



Source: Class Central (2020)

Labor market relevance

CEDEFOP makes skills forecasts for Europe.

The methodology consists in making projections of the demand and supply of skills using the Cambridge Econometrics (2020) E3ME and European Commission (2020b) DG ECFIN macroeconomic models. Data come from Eurostat's EUROPOP on demographics, along with country national account statistics and labor force surveys. The models are supplemented by expert peer reviewing in individual countries for validation (CEDEFOP, 2012).

New technologies are a double-edge knife regarding employment. Automation will certainly displace some workers, but at the same time it will increase productivity and the demand for workers employed in the new technologies. It has been estimated that in the United States one additional robot reduces employment by six jobs (Acemoglu and Restrepo, 2017), and in Germany two jobs (Dauth et al., 2017).

New types of skills will be needed (World Bank, 2010; World Bank, 2019b; Almeida et al., 2012). Many occupations of the future do not appear in the current dictionaries of occupational titles (Cognizant, 2017), e.g.:

- Data Detective
- Fitness Commitment Counselor
- AI-Assisted Healthcare Technician
- Genomic Portfolio Director
- Financial Wellness Coach
- Digital Tailor
- Trust Officer
- Quantum Machine Learning Analyst

The skill requirements of the misplaced and new type of workers are different, and to acquire the new skills will need time, perhaps one generation long. There is bound to be a period of discontent, hopefully not as bad as workers destroying looms during the industrial revolution.

In employer surveys, 40 percent of employers said that lack of skills was the main reason for entry-level vacancies (McKinsey, 2018a) and among new hires, only 55 percent got a job related to their field of study (McKinsey, undated).

Table 1: Projected change in the use of skills

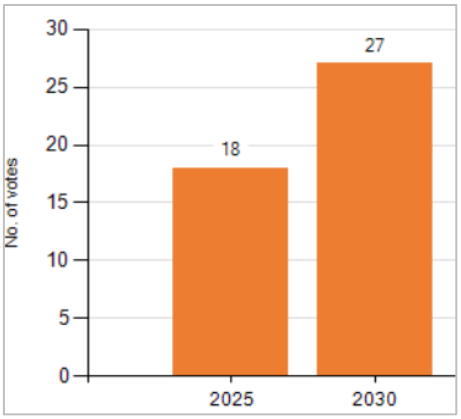
Skill type	2016-2030 change (%)
Manual	-14
Basic cognitive	-15
Higher cognitive	+8
Social and emotional	+24
Technological	+ 55

Source: Based on McKinsey (2018c)

Curriculum

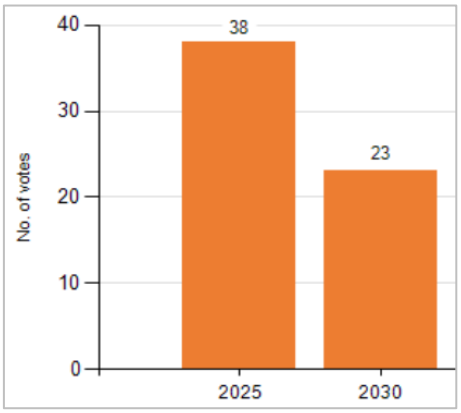
The anticipated changes described above call for drastic changes in the curriculum away from rote learning to science, technology, engineering, and mathematics subjects (STEM). But it also calls for teaching creativity, problem solving and critical thinking. Yet, in a Delphi survey, experts gave a rather pessimistic opinion as to when they predict problem solving would be introduced in the curriculum.

Figure 9: Experts' opinion on the timing of curriculum change towards problem-solving



Source: European Commission (2018).

The same experts also predicted a reduction of free online courses in European universities.



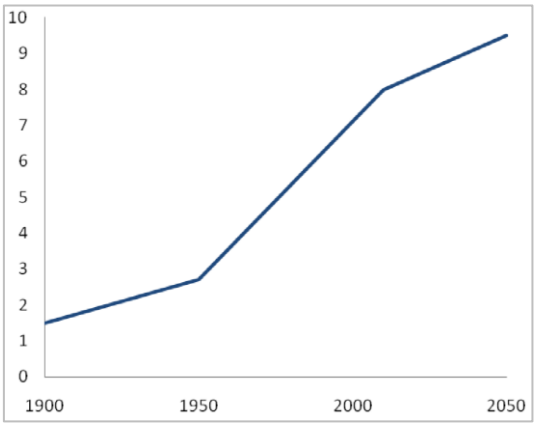
Source: European Commission (2018).

Future scenarios

Access to a desired level and type of education would be easier, as students will have more options regarding the mode of instruction. The quality of education is bound to improve because there would be digital monitoring of student progress and evaluation.

Educational attainment will continue to rise unabated in the coming decades, especially at the upper secondary and tertiary levels (Clemens, 2004; Roser and Nagdy, 2020). This means not only that more schools and universities will be needed, but as dictated by other developments above, a drastic change will take in what and how it is taught.

Figure 10: Mean years of schooling of world population



Source: Psacharopoulos (2018)

In spite of the tremendous educational expansion, the returns to investment in education have stayed more-or-less the same over decades. In a review of 700 country estimates, the rate of return was about 9% in the period before 2000 and after 2000.

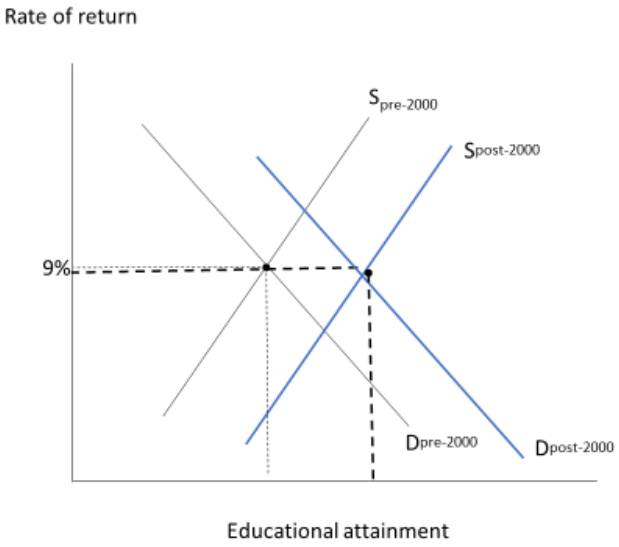
Table 2: Mean years of schooling and private returns, pre-2000 and post-2000

Period	Years of schooling	Rate of return (%)
Pre-2000	7.8	8.7
Post-2000	8.6	9.1

Source: Psacharopoulos and Patrinos (2018)

The maintenance of the same returns is due to what Nobel Laureate Jan Tinbergen (1975) described as the race between education and technology - the increased supply of educated labor was matched by increased demand for higher level skills thus keeping the returns near constant over a long time period (Autor et al., 2020).

Figure 11: Tinbergen's race between education and technology



Source: Based on Psacharopoulos and Patrinos (2018)

Beyond technical skills, there will be increased emphasis in the curriculum for the instillation of soft sills, such as communications, social and emotional and citizenship. The reason is that recent research has shown that soft skills also have great monetary value (Oreopoulos, and Salvanes, 2011; Heckman and Kautz, 2012; Heckman et al., 2018; Psacharopoulos, 2018b).

Table 3: Additional returns to skills in less digitally intensive industries (%)

Skill	Additional returns
ICT	9.8
Numeracy	5.2
Management and communication	4.8
STEM	3.3

Source: OECD (2017a).

Finance

To fulfill its role catering for new teaching requirements, more resources will be needed. Public education systems are typically underfinanced relative to their importance. One way to bring additional resources to the education system is the so-called public-private partnerships (PPPs) that allow private provision of traditionally public services. Many countries, with the assistance of international organizations such as the World Bank, have successfully tapped this new source of finance (LaRocque, 2008; Patrinos et al., 2009; Verger and Moschetti, 2016).

Impact evaluations of PPPs have shown that private schools under the PPP scheme exhibit lower dropout rates and higher student achievement relative to public schools (Barrera-Osorio, 2007).

Resource allocation

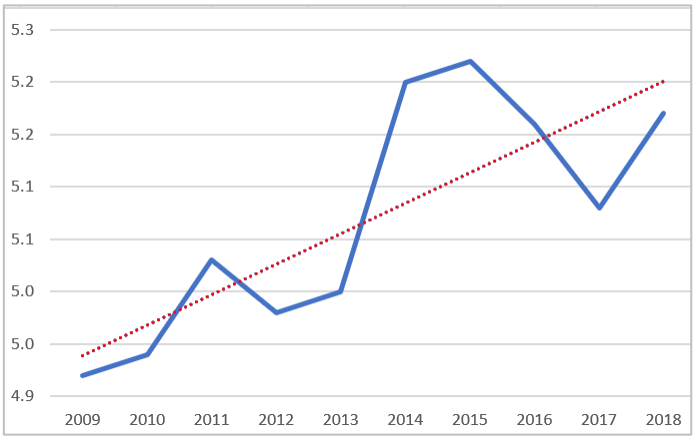
Typically, a public education budget is allocated between different levels and types of education based on inertia, i.e., annual allocations follow past trends adjusted for inflation. Following the human capital revolution in economic thought in the 1960s, resources should be allocated to education activities that exhibit the highest social returns. Based on cost-benefit evidence, priority should be given to pre-school, reducing early school leaving, promoting general rather than technical curricula and improving quality (Psacharopoulos and Patrinos, 2018; Hanushek and Woessmann, 2019; Brown et al., 2019). Early school leaving remains a problem even in advanced countries, with nearly 20% of 18-24 years-old not completing upper secondary education in Spain (Eurostat, 2020a).

Equity

Income inequality is rising. The anticipated continued educational expansion has unclear effects on future equity in society depending on the level of education the expansion takes place, and the way education is financed. The reason is that there are two forces working in opposite direction. For example, preventing early school leaving is bound to increase the earnings of the lower-paid and move them towards the mean of the income distribution. On the other hand, expanding free higher education will move earnings above the mean and worsen income distribution (Marin and Psacharopoulos, 1976).

Figure 12: Rising income inequality

Quintile ratio*



Source: Based on Eurostat (2020b). "Inequality of income distribution". Eurostat [TESPM151].

School system will increasingly care for children coming from a low socioeconomic background, such as the "Exchange education for housing program" in Germany where young people act as education sponsors for children in disadvantaged districts in exchange for rent-free living (European Commission, 2020; Tauschebildung, 2020).

Policy hints

In arriving at policy hints, one should separate what we are confident about from what we are not so confident about. As evident in the vast foresight material reviewed in answering this question, it is very hard to assign numerical values to the anticipated future changes, let alone the year in which a change will take place. What is more credible relative to numerical values, is the anticipated direction and nature of change.

A distinction must also be made between what is likely to happen, and what evidence dictates it should happen for the education system to serve efficiency and equity objectives. Assessment of progress on a particular indicator, rather than benchmarks to be reached by a given date, is a more valid and credible criterion to judge the effect of a policy change.

Past experience tells us that education policy change is difficult and slow to be implemented. In the age of digital transformation, we are still using chalk and blackboard. Education for All and Lifelong Learning, advocated for decades by international organizations, remain a midsummer's dream. United Nations development goals keep been postponed because they are unrealistic.

* Income received by the population 20% with the highest income, to that received by the 20% with the lowest income

Below is a set of policy directions we are confident will take place in the near future:

- There will be increased scrutiny on whether education funds are used in the most efficient and equitable way and equitable way.
- Cost-benefit and cost-effectiveness analysis will be increasingly used to establish education spending priorities.
- There will be increased use of incentives for students and teachers to promote education goals.
- Increased teacher pay will be linked to accountability and evaluation.
- There will be increased use of loans and selective fees in higher education, combined with subsidies to those from low-income families.
- Vouchers will be used as an incentive for students in low-performing public schools to move to a better private school.
- Training will gradually be taken out of the main school system and moved closer to the firm.
- There will be increased decentralization of education systems, combined with evaluation and accountability.
- There would an increased split between the financing and provision of education, where the government finances schools but letting the money flow in an indirect way through the hands of students.

The hardest part in adopting evidence-based education policies, as those outlined above, is persuading politicians who have the ultimate say. Human capital takes years to build and several decades to realize its full benefits. Such long horizon is at odds with the short life span of an Education Minister. Perhaps it would be for the electorate to make politicians realize that education is not an expedient investment.

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