

## The Opportunity Costs of STEM Degrees and the Unmet Needs of the Low-Skilled: Two labour market problems explained

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### SUMMARY

There is general consensus that to achieve employment growth, especially for vulnerable groups, it is not enough to kick-start economic growth – skills among both the high- and low-skilled population need to be improved. In particular, we argue that if the lack of graduates in science, technology, engineering, and mathematics (STEM) is a true problem, it needs to be tackled via tangible incentives and not simply by public campaigns: students are not enrolling in ‘hard-science’ subjects because the opportunity cost is very high.

As far as the low-skilled population is concerned, this paper encourages EU and national policy-makers to invest in a more comprehensive view of this phenomenon. The ‘low-skilled’ label can hide a number of different scenarios: labour market detachment, migration, and obsolete skills that are the result of macroeconomic structural changes. For this reason lifelong learning is necessary to keep up with new technology and to shield workers from the risk of skills obsolescence and detachment from the labour market.

**H**igh and increasing unemployment is at the top of the policy agenda, especially with regard to young people. There is general consensus that to achieve employment growth, especially for vulnerable groups, it is not enough to kickstart economic growth, skills among both the high- and low-skilled population also need to be improved.

However, we need to move beyond simplified narratives and generic policies and better understand the phenomena. In this Policy Brief, we focus on two issues that are frequently misunderstood by EU-level institutions.

CEPS Policy Briefs present concise, policy-oriented analyses of topical issues in European affairs, with the aim of interjecting the views of CEPS researchers and associates into the policy-making process in a timely fashion. This paper was initially prepared as Policy Brief No. 4.6 of the NEUJOBS research project, which is financed by the European Commission under the 7th Framework Programme. Its objective is to analyse likely future developments in the European labour market(s), in view of major transitions that will impact employment – particularly certain sectors of the labour force and the economy – and European societies in general

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We believe that academic and policy discussions about low-skilled workers has long been driven by an over-simplified approach that has tended to characterise the low-skilled as a homogeneous group - across as well as within countries. Put simply, the problem with EU policy is that while there are many realities of low skill, there is only one generic policy response.

Regarding the high skilled, company surveys and statistics report a lack of graduates in science, technology, engineering, and mathematics (STEM) that persists despite the expansion of higher education. Policy interventions have been limited to the provision of better information to students via campaigns whose objective is to attract them towards hard sciences. New research shows that the problem might not be one of information, but of incentives. Properly calculated costs and benefits do not favour the study of 'difficult' subjects. To encourage students to major in these subjects, therefore, policies should be geared towards both better information dissemination and the provision of new incentives.

## 1. Science graduates need new incentives

When higher education was an elite pursuit, it did not matter as much what and where one studied as the fact that he (or, in a smaller number of cases, she) participated in tertiary education at all. Since the 1960s, Europe has gradually moved towards mass higher education, with the European Union recently setting itself the goal of having 40% of young people with a higher education degree by 2020 (in the 30-34 year age cohort). It is reasonable to expect that as the group of university graduates grows, within-group heterogeneity will also increase, in that different labour market outcomes can be expected for graduates from different faculties. To what extent has this really happened and what are the policy implications?

European analysts and policy-makers appear to have a clear understanding of the issue. EUROPE 2020, the flagship EU policy strategy document, states: "At national level, Member States will need to ensure a sufficient supply of science, maths and engineering graduates."

This is based on research that shows that "the current supply of STEM skills is considered to be insufficient and when combined with forecast growth in demand for STEM skills, these shortages present a potentially significant constraint on future economic growth in Europe." At the same time, applied research highlights the fact that "those with specific degrees do better than those with more general degrees (arts and humanities)."

There is a gender dimension to the choice of a field of study. While female students are now in the majority in tertiary education, the share of female students in science, technology, engineering and mathematics remains only around one third, with little variation across countries. The European Commission recently stated that it is "a key challenge for Member States and for higher education institutions to attract a broader cross-section of society into higher education" noting that the need to make STEM education more attractive to women is "a well-known... challenge".

This points to a conundrum - if studying 'difficult' subjects such as STEM leads to better employment and pay prospects, why is students' motivation "insufficient"? It is interesting to observe that in the five countries considered, the number of graduates in STEM subjects increased, consistently with the more general educational expansion, but the share of STEM graduates in the total remained constant in Slovenia, increased in Poland and slightly decrease in France, Italy and Hungary. On average they amount to one-quarter of new graduates each year. Either this is irrational decision-making on the part of students or a lack of relevant information or, in case of women and STEM, it can be explained by an unfortunate historical legacy of a past in which majors like engineering and physics were 100% male-dominated.

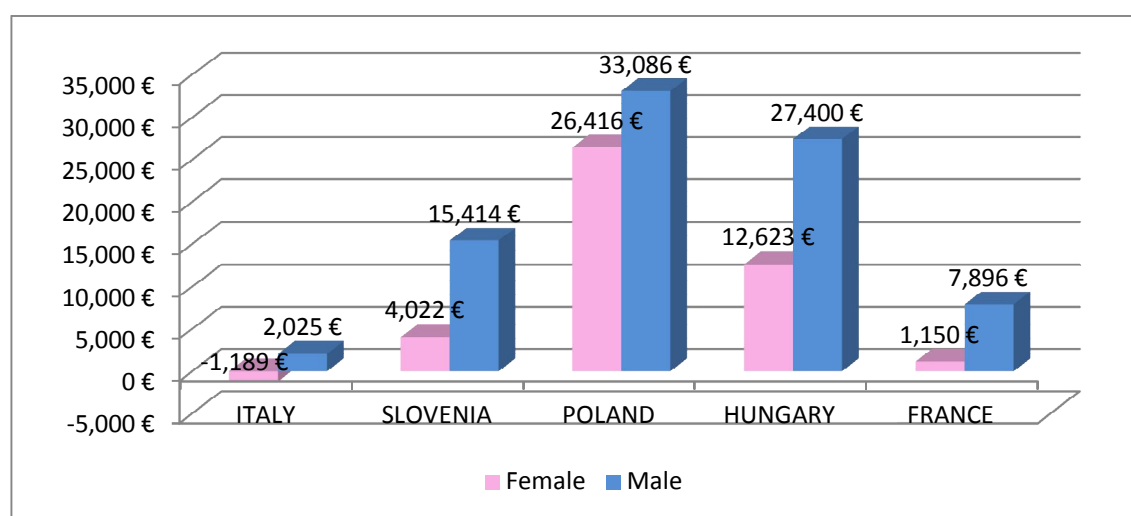
Recent research from the NEUJOBS project sheds some light on this dilemma by analysing the net present value (NPV) of university education by field of study in five countries (France, Italy, Hungary, Poland and Slovenia). We contend that the current research examines only part of the equation because it tends to look at only SOME of the benefits (employment prospects and salaries of graduates). Private returns to education should include a broader set of variables. The main one is the higher cost of study to students

in terms of time, which significantly influences their opportunities to work while studying or to complete their education in a relatively short time.

Once both costs and benefits of tertiary education are considered, studying STEM is often not the best deal for students. Data indicate good labour market outcomes in terms of salaries and employment opportunities: in most cases graduates from STEM score better than their peers in other sectors, which is a signal that the market values and demands their skills. But the system fails on two major points: costs, especially opportunity costs, associated to the degree and a strong gender bias.

As far as the latter is concerned, we should underline that better labour market outcomes only pertain to male graduates. When a female student leaves university with a STEM degree she has far lower chances of success: in terms of salaries and the likelihood of employment in the first five years after graduation, female students are much better off studying medicine or social sciences in all five countries. As a result, the net present value of education presents a wide gap for STEM when male and female graduates are compared, which explains why so few female students study in *écoles polytechniques*.

Figure 1. NPV of tertiary education for STEM graduates, 5 years from graduation, male and female compared



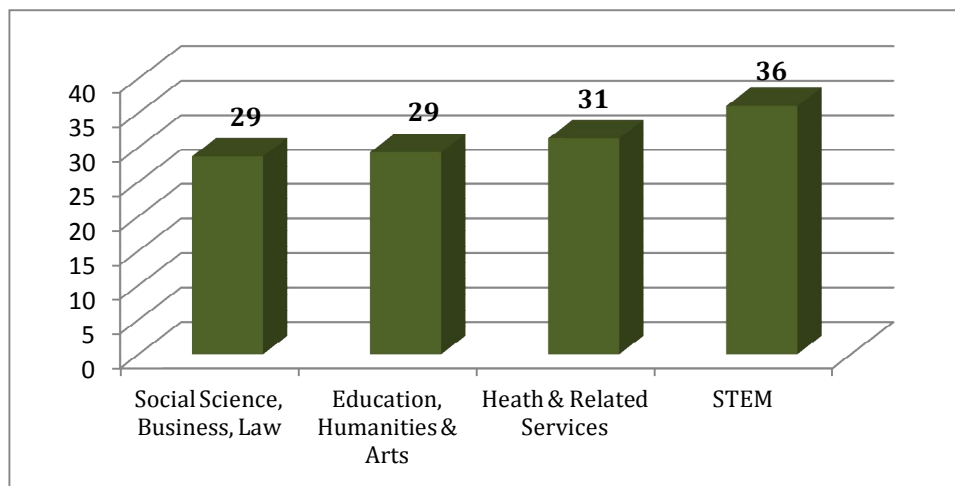
Source: Authors' elaboration based on HEGESCO/REFLEX datasets.

This underperformance has been the subject of debate: according to some authors (Hall, 2007 and Hewlett et al., 2008) it is due to long working hours, a 'macho' culture and lack of transparency in career paths. Hunt (2012) argues that it is because of dissatisfaction with pay and promotion opportunities. Our data indicate that there is a clear wage gap, which supports the latter hypothesis.

The second main failure concerns costs. Statistics show that before obtaining a degree, STEM students face higher costs than their peers from other faculties. These costs are not necessarily linked to fees<sup>1</sup> but rather to the time spent in universities: both in terms of hours spent on study (which translates into fewer hours available for part-time jobs) or in terms of the years needed to complete the courses. This makes the opportunity cost of graduating from STEM higher than for social and human sciences.

<sup>1</sup> Which are equalised across subjects in each country in the analysis.

Figure 2. Hours studied (classes plus personal work) by field in the five countries



Source: Authors' elaboration based on HEGESCO/REFLEX datasets.

As a consequence, those that still decide to enrol in STEM (in particular female students) despite the high costs, are either very bright and expect to take less time than the average to complete the course, or have the means to afford more years or hours in education (or both).

The important lesson to take from this analysis is that students decide rationally or, at least, that their decisions make economic sense. This creates a comfortable margin of manoeuvre for policy-makers. Policy action should therefore switch from launching useless campaigns to providing incentives for students, especially women, to compensate for the high opportunity costs associated with a STEM degree.

## 2. N worlds of low-skilled, but only one generic policy

The low-skilled are often mentioned in European policy documents because having low skills is associated with negative labour market outcomes (lower employment rate and salaries, higher unemployment, higher inactivity, etc). Nevertheless, 'the low-skilled' are lumped together in a rather indistinct category that tends to be linked solely to initial formal education (in the EU2020 strategy, the specific target is to reduce the share of early school leavers to below 10%).

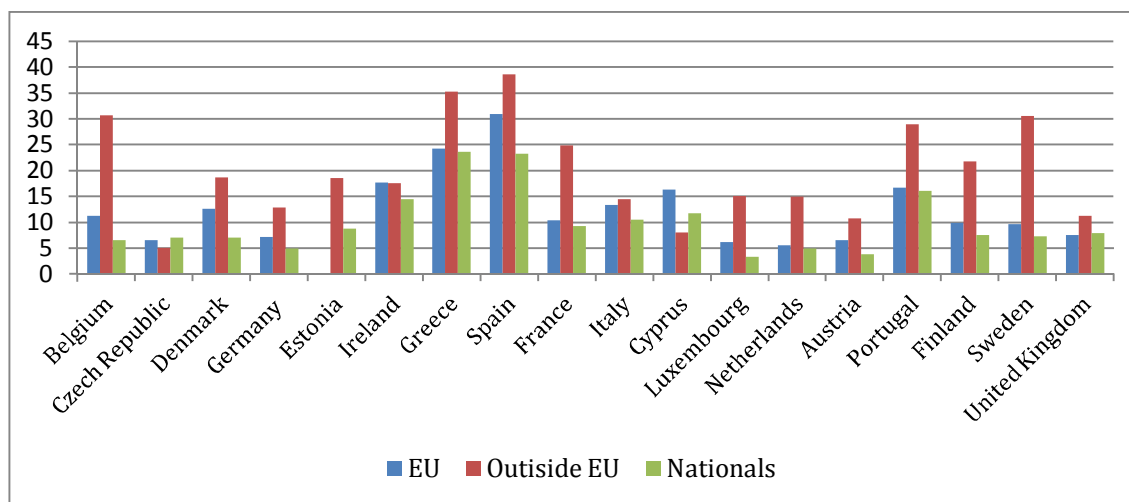
Research from the NEUJOBS research project shows that such a one-size-fits-all approach does not produce the expected outcome of creating more and better jobs for the low-skilled. People who are labelled as low-skilled happen to be so for a number of reasons. The simplest reason is that they leave school without any formal qualification. These are the low-skilled in a strict sense since they only completed up to lower secondary school. Today they make up 29% of the working age population. The share of low-educated people has significantly decreased in recent decades due to continuing educational expansion, but this process has occurred to differing degrees across the EU. If fewer and fewer people leave school without a diploma, the effect of educational expansion is that the increase in the supply of workers with secondary and tertiary education will further undermine the position of the non-educated, especially the younger ones, who are in the worst position among their cohorts and are more easily stigmatised. This also happens because educational expansion goes hand in hand with an upward shift in the overall skill-set required by employers. This is not limited to diplomas but also concerns experience and non-cognitive skills.

Yet, a low level of education is not the only cause of being low-skilled. Workers can have a higher level of education and yet end up unemployed or in a low-skilled job for two main types of reason: both individual-level and macroeconomic/structural. The latter includes the polarisation of labour demand: during the past decade the demand for middle-skilled occupations remained, at best, stagnant, while in most European countries the demand increased for high-paid occupations (managers and professionals) or very low-profile ones (such as cleaners, helpers in the construction and manufacturing sectors). More specifically, it has been observed that despite the greater misfortune of low-qualified workers on the

labour market, in many countries their employment increased significantly, on average by 18.4% in Europe between 2000 and 2010. The figure can be explained by the fact that the demand for jobs like cleaners and street-sellers is not affected by either technology or offshoring: a labourer in the construction sector or a cleaning person cannot be hired in a developing country to perform their task, nor they can be replaced by a robot because their work requires interaction with people and/or the environment. Despite the greater demand for low-qualified tasks, polarisation may not solve the low-skilled unemployment problem on its own: workers that completed secondary education to work as technicians or as administrative assistants, and are made redundant because of globalisation of production or technological change, may have started to compete for lower-skilled professions and poorer working conditions compared to their previous position which, especially for those that worked in the manufacturing sector, entailed better contracts protected by collective agreements. The main driver for such change is technology, which increasingly makes certain skills outdated and creates demand for new ones.

Among individual-level explanations, migration needs to be taken into account. Data clearly indicate that in all countries (with the exception of the Czech Republic) migrant workers face a much higher risk of unemployment than local workers and EU nationals; a condition that is not necessarily due to the migrants being less qualified than the natives. Possible explanations for the higher unemployment, underemployment and especially downskilling, as documented in the literature, are the recognition of their qualification credentials in the host country, language barriers, the lack of contacts in the labour market, etc.

Figure 3. Unemployment rates by origin in 2012



Source: Eurostat, European Labour Force Survey.

Last but not least, labour market detachment: long-term unemployment can significantly erode the skills of a worker - resulting in ever-decreasing employment opportunities. In troubled times for labour markets it is worth remembering that at the aggregate level, long spells of unemployment can translate into a permanent loss of potential for the economy.

The important lessons are that:

- Due to fuzzy conceptualisation, we hardly know how to measure the magnitude of the low-skilled phenomenon in Europe;
- The 'low-skilled' label can hide a number of different situations: labour market detachment, migration, obsolete skills but also macroeconomic structural changes;
- One can be low-skilled after leaving school, but can also become so during working life. For this reason, the amount of low-skilled people in the labour force should not be considered solely as a stock variable but also as a flow.

Moreover, a recent and innovative analysis of job advertisements in three countries, Czech Republic, Denmark and Ireland, reveals that the set of skills demanded for low and medium-skilled occupations is

very diverse by country. For example, Danish employers focus on non-cognitive skills such as customer approach, precision, loyalty, flexibility, empathy and the ability to communicate, whereas in Czech Republic, employers seem to prioritise formal qualifications and diplomas.

Since not only the size, but also the structure and other characteristics of low-skilled unemployment differ in Bratislava and Copenhagen, we suggest that EU recommendations and national policies do not just take a differentiated view but also a holistic and sophisticated view of this phenomenon. For instance, if in one country high-skilled unemployment is due to the high presence of migrants, while at the same time what an employer values is formal diplomas, then rather than promoting lifelong learning in general, measures and learning opportunities to facilitate diploma recognition would be more effective. Or, if being low-skilled is the result of technological change and the workforce is aged and poorly educated, then additional learning opportunities would be valuable for displaced workers.

We therefore urge policy-makers to obtain a clear understanding of national (*and local?*) specificities and also promote lifelong learning and keeping up with new technology to shield workers from the risk of detachment from the labour market and skills obsolescence.

### 3. Concluding remarks

The current economic crisis put the issues of skills and the labour market very high on the policy agenda. In addressing them, it is important to move beyond simplified narratives and generic policies and better understand actual phenomena. In this policy brief, we focused on two issues in order to explain how they tend to be misunderstood by EU-level institutions.

The first concerns the perception of graduate unemployment and the oft-lamented lack of graduates in science, technology, engineering, and mathematics. A new approach to the study of returns from education reveals that the insufficient supply of STEM graduates is, at least in part, attributable to the fact that the opportunity cost of such education is significantly higher compared to other major degree subjects. As a consequence, the problem cannot be solved by campaigns but needs to be tackled via incentives, such as special scholarships or fee-breaks. This is even truer for women, whose apparent limited interest in pure science is consistent with the fact that other studies constitute a much better investment in human capital. Yet, the issue is more complex in this case, because an enduring gender-prejudice also needs to be fought.

As far as the low-skilled population is concerned, we invite EU and national policy makers to invest in a better understanding of the complexities of phenomena in a holistic way. The 'low-skilled' label hides a number of different situations: labour market detachment, migration, obsolete skills and structural macroeconomic changes. Moreover, one can be low-skilled after leaving school but can also take on this label during working life. For this reason, the proportion of low-skilled people in the labour force should not be considered solely as a stock variable, but also as a flow.

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