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TööKõrgEEL toimetised nr. 8/2011

IS IT WORTH BECOMING AN ENGINEER IN CENTRAL AND EASTERN EUROPE?

The evidence from Poland and Estonia

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Abstract

The aim of this study is to examine the labour market returns to field of study for tertiary graduates in two countries with post-socialist heritage: Poland and Estonia. So far research focusing on the employment chances of graduates in Western countries has emphasized the benefits of engineering. We would like to revisit this conclusion and find out if the same can be generalized for all other societies, including Central and Eastern Europe.

We use micro-level data, which include detailed information about the type of education gained and early career development. We examine the following outcomes: the chances of finding a job within the first half-year of graduation, the quality of the first job and its salary. Our findings suggest that in Estonia and Poland, the effects of completing engineering courses are quite different to Western Europe. We discuss possible explanations for the lack of advantage for engineering graduates. We pay special attention to the role of licensing, i.e. institutional barriers to entry into the occupation of engineer.

Keywords: fields of study, graduates, Central and Eastern Europe, school to work transition

Introduction

This article aims to contribute to the discussion on the impact of fields of study by providing evidence for two countries with post-socialist legacies: Estonia and Poland. We pay particular attention to the engineering field of study[1], which is believed to be very beneficial for early employment career success (Dronkers, 1993; van der Velden and Wolbers, 2007; Dolton and Vignoles, 2000). We look at the school-to-work transition of tertiary educated graduates by field of study. We investigate the following labour market outcomes: the chances of entry into employment within the first six months of graduation, the chances of having a high status job and salary level. We carry out our analyses separately for men and women, because the outcomes of field of study may differ by gender.

The research evidence, based mainly on the experience of Western Europe, has so far suggested that the success of engineering graduates contrasts with the relative disadvantage of youth from some other fields, such as the humanities and arts or the social sciences (Reimer et al., 2008; van de Werfhorst, 2004). However, both in Estonia and Poland the expansion of tertiary education concerned especially the fields of social sciences, business and law (Tina and Tõnisson, 2006: 21; Sztanderska, 2008). In contrast to this, the growth in the number of students in disciplines such as engineering was more limited.

Estonian and Polish policy makers seem to share the view that increasing the number of engineering graduates will lead to an improvement in the labour market situation for tertiary educated youth. Therefore, they prompted reforms that aim to create direct financial incentives to choose engineering as a field of study (Strategy Plan for Higher Education 2006-2013, 2006; Polish Ministry of Science and Higher Education, 2009).

[1] Hereafter, we define engineering as a group of fields of study encompassing engineering, manufacturing and construction.

Thus, the effects of field of study are an interesting issue both from an academic and policy-making point of view (van de Werfhorst, 2008).
As long as these reforms might in future increase the numbers of engineering graduates in Poland and Estonia, it remains an open question if they change the gender stratification in tertiary systems. In both countries women tend to choose fields such as the humanities and arts, the social sciences, teacher training and education as well as services (see Table 1). Engineering, manufacturing and construction – considered as particularly beneficial for a labour market career – remain a 'typical male' study discipline (in a similar way to other European countries, see Eurydice, 2007). Hence, as long as the common view on the profitability of choosing engineering as a field of study is relevant for Estonia and Poland, the question of whether women from engineering could benefit compared with women from other fields arises.

Table 1 Gender distribution of fields of study in Estonia and Poland in 2006

	Estonia		Poland	
	Men	Women	Men	Women
Teacher training and education	8	92	27	73
Humanities and arts	26	74	30	70
Social sciences, business and law	33	67	38	62
Science, mathematics and computing	61	39	63	37
Engineering, manufacturing and construction	74	26	73	27
Agriculture and veterinary	48	52	47	53
Health and Welfare	12	88	27	73
Services	49	51	51	49
Total	38	62	27	73

Source: Estonian Ministry of Education and Research, Polish Central Statistical Office.

Gender-specific analysis is also important due to differences in gender relations in the two countries. Central and Eastern Europe used to be regarded as region which supports the traditional male breadwinner model (Treas and Widmer, 2000). However, Poland stands out among Central and Eastern European countries as a society with rather unfavorable cultural and institutional conditions for the female career. Compared to Poland, these conditions are much more moderate in Estonia. Specifically, Puur et al. (2008) classify Poland among traditional countries, and Estonia as an intermediate case in terms of attitudes to female employment. Given the conservativeness of Polish society, the field of study might have a different meaning in this country for women and men. Female graduates within 'typical male' fields of study can be at a disadvantage due to persisting beliefs that women do not fit for certain roles or occupations.
The remainder of this paper is structured in the following way: In section 2 we present theoretical ideas behind our research questions and describe the structural and institutional setting in both countries. In section 3 we explain the key features of tertiary education system and its linkages to the labour market. Then, in Section 4, we present data and methods used in order to test our hypotheses. Section 5 presents our main findings and Section 6 provides a conclusion.

Theoretical background

The role of field of study

The expansion of tertiary education increases the importance of horizontal differentiation inside higher education. Field of study is regarded as one of the crucial dimension-shaping stratifications in the modern youth labour market, although the explanation of why this is so, differ. From a human capital perspective, different fields of study provide young people with very different resources (van de Werfhorst and Kraaykamp, 2001). The literature distinguishes the ‘hard’ fields of study, such as engineering, which are more labour-market oriented and provide the student with more specific skills. Employers prefer graduates from these fields as they require less training (Dronkers, 1993; van der Velden and Wolbers, 2007; Davies and Guppy, 1997). From the perspective of indicating a student’s capacity, ‘hard’ fields of study are more challenging and hence may signal better skills and motivation. As a consequence, engineering graduates are assumed to secure higher rewards in the labour market than the ‘soft’ fields of study such as the humanities and arts (Reimer et al., 2008).

There are theoretical reasons why the benefits from the engineering field of study may differ by gender. On the one hand, female graduates from within engineering, which is a ‘typical male’ field of study, can be at a disadvantage due to the persistent belief that women do not fit certain roles or occupations (Hultin, 2003; Reskin and Roos, 1990; Whittock, 2002). ‘Feminine’ areas of professional competence are associated with attributes such as ‘serving’ or ‘caring’, whereas male occupations are associated with attributes of ‘strength’ and ‘power’ (Charles, 2005; Bourque and Conway, 1993). Hence, women with diplomas from ‘typical male’ fields of study may face barriers when trying to find a job.

On the other hand, there are also studies indicating a positive result on female labour market integration when choosing ‘typical male’ fields of study. Actually, for both men and women the decision to study in a field dominated by the other gender might indicate exceptionally strong interest and commitment to the chosen field of study, which in turn might positively affect future productivity in the related profession (Katz-Gerro and Yaish, 2003). Hence, employers may interpret the choice of gender-atypical positions as a positive signal of future quality of match between a worker and a job.

The impact of institutional context

Obviously, the above-discussed theoretical ideas need to be interpreted in the countries’ structural and institutional context. We will therefore discuss the importance of occupational licensing and the structure of the labour market. The key argument in theories predicting the advantages from engineering is that they provide very specific skills and lead to clearly defined occupations. However, there are institutions at the intersection of education system and labour market that may restrict access to professions of a certain type. One of the key types of regulation in this respect is occupational licensing (Sørensen, 1996). Despite the idea of the role of occupational licensing being well grounded in the sociological theory of social closure (Weeden, 2002), it has so far attracted little attention in conceptualising the transition from school to work. Occupational licensing can restrict access to particular jobs and thus mediate the labour market chances of graduates from certain fields of study.

Occupational licensing is defined as a process by which entry into an occupation is subject to state control (Kleiner and Krueger, 2008). The state usually appoints a licensing board, which mainly includes the members of the occupation, to oversee the regulated professions. The agency is often supported by fees and registration charges from persons in the licensed occupations. Licensing is commonly applied in occupations of “social trust”, related to medical and legal services, selected financial services (accountants, tax advisers and auditors) as well as technical services (architects and engineers). Licensing aims to assure a high quality of services, but in practice it may be misused in order to allow the incumbents to monopolise occupational advantages by limiting access for labour market entrants (Weeden, 2002).
If occupational licensing is particularly strong in specific groups of occupations, then the fields of study leading to these occupations offer poorer labour market opportunities. Importantly, on the aggregate level, these fields of study may be associated with substantial labour market rewards, which reflects the benefits restricted to the incumbents, who have gained strong occupational positions already. In order to understand how fields of study shape the opportunities of graduates, it is important to focus on this specific group and investigate their employment chances for labour market entry (we adopt such an approach in this article).
Obviously, occupational licensing is not the only factor that moderates the relative labour market chances of graduates. For example, youth returns to education depend not only on institutional factors but also on demand-side factors (Baranowska 2011; Saar 1995; Saar 2010; Saar and Unt, 2011). The expansion of certain sectors in the economy of a specific country promotes the creation of new jobs in these specific labour market segments. Hence, if engineering jobs are created in industry rather than in the services, then the expansion of services and the restructuring of industry (which took place in Poland and Estonia) would diminish the advantages enjoyed by engineering graduates.

Occupational licensing in Estonia and Poland

In Central and Eastern Europe the licensing regulations are rather liberal as compared to Western Europe in most professions, although regulations for engineers limit access to jobs to a considerable extent (Terry, 2009; Patersen et al., 2003). In the following section, we will describe the restrictions of entry into engineering jobs for Poland and Estonia.
In Poland graduate access to many engineering occupations, specifically those concentrated in fields such as construction - is governed by so-called eligibility for “independent technical functions in the construction industry”. This eligibility gives an opportunity to supervise for example construction works and the production of construction elements, as well as technical control of the state of buildings. The legal regulations describe the occupational standards for engineering, referring to specific types of tertiary education diplomas and the fields of study required. Furthermore, access to engineering jobs depends on certification proving adequate professional experience. Finally, graduates need to pass special exams.
Regarding educational requirements, full eligibility for engineering jobs is granted for graduates with Masters degrees, whereas the Bachelor degree gives only limited opportunities. Moreover, if the field of study completed by a graduate does not correspond to the fields mentioned in the regulations, a graduate needs to apply for an individual process of recognition for their qualification(s) by the regional chamber.

Regarding professional experience, graduates need to accumulate about 2-3 years of work experience. Their work needs to be documented and approved by special supervisors employed by the company where the graduates work. The exams are organized by the regional chamber of engineers. If the chamber decides that a graduate's education and professional experience are adequate, they may take exams which are organized at least twice a year and cover many areas, from legal regulations to practical issues related to construction work.

In Estonia, the regulations for construction engineers include 44 occupational standards with requirements referring to educational background and work experience. There are three levels: construction engineer, diploma engineer and chartered engineer. In order to become a construction engineer, one needs to have at least 3 years of field-specific tertiary level education and 3 years of professional experience. A job at the level of diploma engineer requires Master's degree and 2 years of professional experience. The title of chartered engineer can only be given to those who meet the criteria given for diploma engineer and who also have at least 2 years of independent professional experience and recently acquired special training.

From the description of the regulations concerning access to engineering jobs provided above, it seems that these regulations are similar to those in many other European countries, insofar as engineers should have a relevant diploma and experience, and a certificate from an exam that evaluates their theoretical and practical knowledge. However, in Poland and Estonia the organization of the whole system of occupational preparation is different in terms of the timing and provision of on-the-job training as well as the organization of exams. Regarding the timing, both in Poland and Estonia, the two- or three-year practical training in reality starts only after graduation (the soonest possible moment, assuming that graduates have no problems finding a suitable employer). In principle, the law allows graduates to start this type of on-the-job training after the third year of studies. In practice however, engineering study programmes are very demanding and occupational practice, which would count as work experience for licensing regulations, is not part of the study program – it seems it is assumed graduates will obtain it after graduation.

Regarding on-the-job training, in Poland and Estonia graduates are on their own when they need to find an employer to provide them with suitable professional experience. This differs from the situation in Anglo-American countries, where professional associations cooperate with universities in negotiation with the state in order to control the licensing, accreditation and practice arrangements. In Poland and Estonia, it was more common, historically, for state bureaucracies to operate the licensing and regulatory processes (Evetts and Buchner-Jeziorska, 2001). Perhaps this is the reason why there are weak links between universities and employers or employer organizations that would enhance the process of matching of graduates and employers who offer internships. All in all, it seems that while in Western Europe graduates from engineering may enter high status jobs at the end of their education and training period, Polish and Estonian counterparts encounter higher entrance barriers and have to start therefore from a lower entry level.

Recently, the European Commission funded a cross-country comparative study that makes an attempt to quantify occupation licensing stringency (Conway and Nicoletti, 2006; Paterson et al., 2003). The key outcome of this study are indicators measuring the stringency of entry and conduct regulations in accountancy, the legal profession and architecture as well as in engineer services. In the following, we will focus on stringency of entry regulations in engineer services. These regulations are regarded as strict if there are many services where the given profession has an exclusive right.

Furthermore, the stringency of entry regulations pertains to education requirements.[2] Table A1 in the Annex presents the values of these indicators in European countries.
According to this comparative study, in Central and Eastern Europe the engineering profession is subject to fairly strict entry regulations (Paterson et al., 2003); this also relates to Poland and Estonia. The sub-indicators measuring stringency of education requirements and the range of licensing reached 6 and 4.3 respectively for Poland, and 6 and 3 for Estonia (with 0 as the minimum and 6 the maximum)[3]. In the ranking of 24 European countries compared by Paterson et al. (2003), Poland takes second and Estonia sixth place when it comes to a combined score for restriction of entry into engineering occupations.

Hypotheses

Based on theoretical ideas, we derive hypotheses about the impact of field of study on the labour market outcomes of tertiary educated graduates. We formulate two competing hypotheses about the effect of completing engineering studies for graduate labour market success. In general, the arguments of Dronkers (1993) imply that completing an engineering course should be especially beneficial (hypothesis 1a). A diploma confirming more specific skills allows graduates to distinguish themselves from the crowd of tertiary educated young people in the two countries within the growing share of the tertiary sector. However, occupational restrictions in the engineering professions in Poland and Estonia may reduce the benefits of obtaining an engineering diploma. Hence, we suppose that the hypothesis about better labour market outcomes from fields of study such as engineering might not hold in these two countries (hypothesis 1b).
Although, the general assumption is that an engineering degree should guarantee smooth labour market entry for these graduates, we can still argue that this advantage may or may not hold for women. In Poland the barriers resulting from the persistent beliefs that women are not appropriate for certain occupations may decrease the advantage of engineering for women. Hence, as compared with female graduates who completed tertiary education in other fields, women who studied engineering may have no advantage in the labour market (hypothesis 2a). As long as attitudes in Estonia are less conservative, we may expect this prejudice to be less prevalent. Hence, we hypothesize that the effect of the commitment, as described by Katz-Gerro and Yaish (2003), will be more relevant for Estonia. Specifically, we expect that unlike Poland, women in Estonia benefit from engineering compared to women choosing other professions (hypothesis 2b).

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[2] The indicator also measures quotas and economic needs tests. However, hardly any country in Europe implements such restrictions.
3 The licencing indicator is based on an evaluation of how many services the profession has, and whether it has an exclusive or shared exclusive right to provide? (ranging from 0-6); education requirements apply only if licencing is not 0. Education requirements consist of weighted sub-themes such as duration of study, duration of compulsory practise, and existance of professional exams (ranging from 0-6).

Data and methods

We use data from various sources: REFLEX data for Estonia, the Polish School Leavers Survey and Polish and Estonian labour force surveys.

The Estonian REFLEX survey was conducted in 2005 targeting tertiary education graduates who attained their degrees in the 1999-2000 academic year (n=960). The Polish School Leavers Survey was carried out in 2006-07. The sample consisted of 20 250 Polish graduates, although we restrict the sample to those who completed tertiary education in 1998-2005 (n=5248). Both surveys include detailed information about the first two outcomes under study: the timing of entry into the first job and the quality of that first job. The chances for entry into the first job after leaving education was defined as entering the first employment period after a job search lasting up to 6 months. First job quality measurement is based on the ISCO-88 occupational classification, which allows definition of the chances of entry into professional and managerial jobs.

In the analysis of salaries we used labour force surveys from the years 2004-2008 for Estonia and 2006 for Poland. Samples in both countries were limited to graduates who obtained higher education between 1998 and 2005. For Estonia, we had an effective sample of n=961 respondents and for Poland n=2677.

The key explanatory variable in all our analyses is to the fields of study. We distinguish the following categories: teacher training and education science (ED); humanities and arts (HU); social sciences, business and law (SBL); science (NAT); computing (COMP); engineering, manufacturing and construction (ENG); agriculture and veterinary (AGR); health and welfare (HW) and services (SER). In our analyses, the focus is on the engineering fields. The social sciences, business studies and law, constitute the reference group. The choice of this reference category is dictated by the fact that it has expanded the most in both countries under study. Consequently, the arguments about the role of the diploma, which distinguishes specific graduates from the crowd of tertiary educated students, are most relevant for comparisons with this field. Furthermore, the group of graduates who completed social sciences, business and law is very large in our samples and hence secures robust estimates.

The explanatory variables that we control for in our analyses comprise: age, type of tertiary education (Diploma, bachelor degree and master's degree), grades, region (NUTS-2), a dummy for rural/urban divide and parental background. Parental background and grades are omitted in analysis based on Labour Force Survey data, because these datasets include neither any information about respondents' social backgrounds nor grades. However, we excluded age and added further controls to wage models, such as tenure and educational cohort.

We estimate probit models for the chance of making the transition into the first job no later than 6 months after graduation. Furthermore, for those graduates who managed to find the first job, we analyze the employment quality of their first post; specifically, we look at whether they entered specialist or managerial positions or if they made the transition into first jobs of lower occupational status. The distinction reflecting the quality of the first job is based in the ISCO classification. Thereafter, we estimate salary returns with a generalized linear model using maximum likelihood.

We run our analysis separately for men and women because the cultural and institutional setting in the two countries may modify the returns to specific fields of study for men and women. Based on the results of our models, we calculate marginal effects corresponding to the effects of field of study. In the linear regression the coefficients can be directly interpreted as marginal effects.

Empirical results

In the first stage, we carry out analysis of the chances of entry into employment within six months of graduation. Our results presented in Figures 1a and 1b indicate that despite rapid tertiary education expansion that took place in the two countries, field of study do not seem to have significance. Neither in Poland nor in Estonia does the field of study provide much variation in the chances of finding a job within 6 months. Focusing on engineering, in neither country does this field bring advantage when it comes to entry to the labour market. Engineering graduates are as likely to find jobs as graduates in the reference group while seeming to fare no better than the graduates from other fields. This contrasts our hypothesis 1a and confirms hypothesis 1b. Unlike in Western Europe, in Poland and Estonia engineering improves quick entry chances of neither young men nor young women.

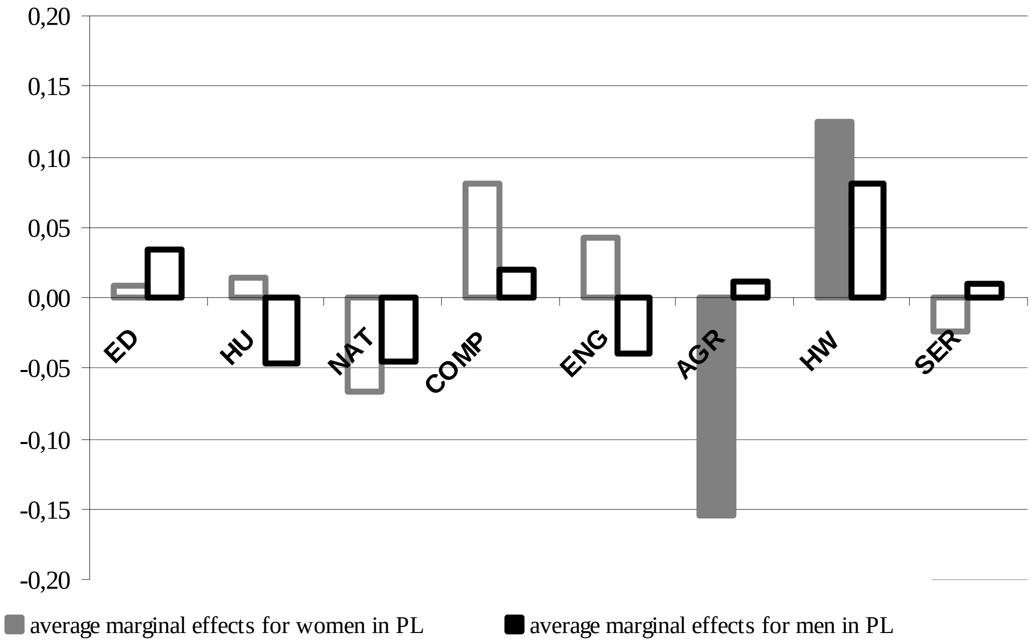

Figure 1a The effects of fields of study on entry into first job in Poland.
Source: Polish School Leaver Survey, own calculations.
Note: the marginal effects are estimated based on probit models, the control variables are: age, grades, the type of tertiary education and parental background.
Empty bars represent effects that are not significant at the level 0.05

In the light of our assumptions, as we expected, female graduates who completed engineering courses in Poland do not seem to fare any better than female graduates from social sciences, business and law (the reference group). At the same time, it does not seem that women who choose the ‘typical male’ subject of engineering are particularly disadvantaged at labour market entry. Although the opposite was expected for Estonia (in that there would be an advantage to being an engineering graduate among women), this also proved to be untrue. In Estonia, graduating from an engineering course gives an advantage to neither men nor women. Perhaps it could be argued that in occupations such as engineering, where access is strongly restricted, genuine and obvious motivation does not influence the chances of obtaining a job, and therefore the effect of commitment described by Katz-Gerro and Yaish (2003) is not observed.

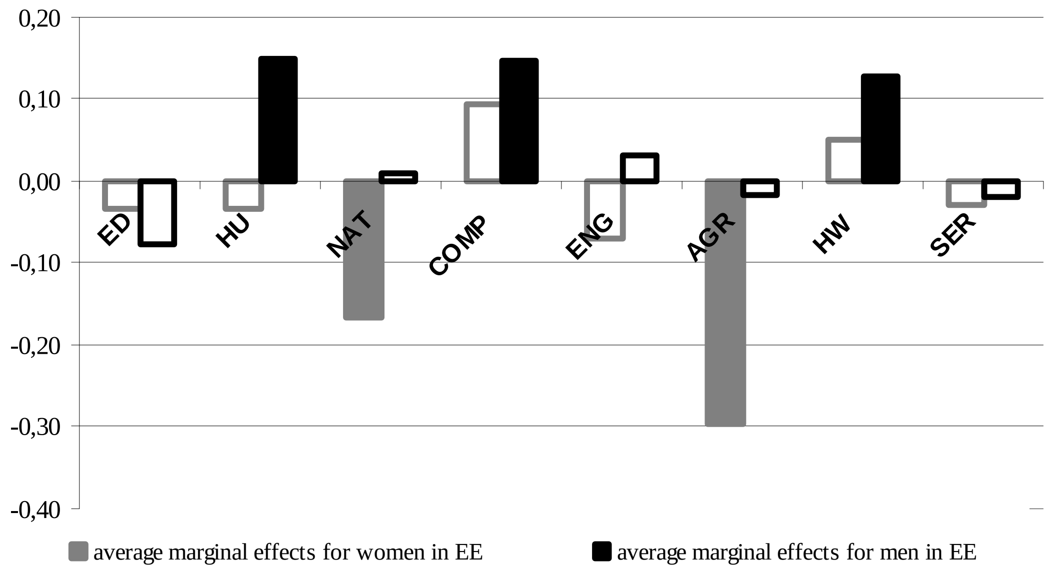

Figure 1b The effects of fields of study on entry into first job in Estonia
Source: REFLEX data, own calculations.
Note: the marginal effects are estimated based on probit models, the control variables are: age, grades, the type of tertiary education and parental background.
Empty bars represent effects that are not significant at the level 0.05

Regarding the quality of jobs, as presented on Figures 2a and 2b, variation in labour market performance is more differentiated across fields of study. Although in Poland the graduates who complete engineering courses are more likely to find jobs of high occupational status than the reference group, still they do not have an advantage over all other fields of study. Specifically, graduates with a diploma in education and training, or in humanities and the arts, actually have better chances. In Estonia, engineers turn out to have no advantage in finding professional jobs. Again, the findings from our study suggest a completely different pattern of advantage when it comes to labour market entry for young people with specific qualifications compared to Western Europe.

Regarding gender-specific effects, in Poland, female engineering graduates fare better than females from social sciences. However, women who completed degree from other fields of study, such as teacher training and education, or humanities and the arts, have even better chances for high-status jobs. The same pattern can be observed among male graduates. Therefore, consistently with hypothesis 2a, we observe no advantage of female engineers, but it does not seem to be the effect of negative stereotypes related to gender roles. In Estonia, engineering brings neither strong advantage nor disadvantage for women. Hence, again, we do not find the benefits from engineering among female Estonian graduates predicted in hypothesis 2b.

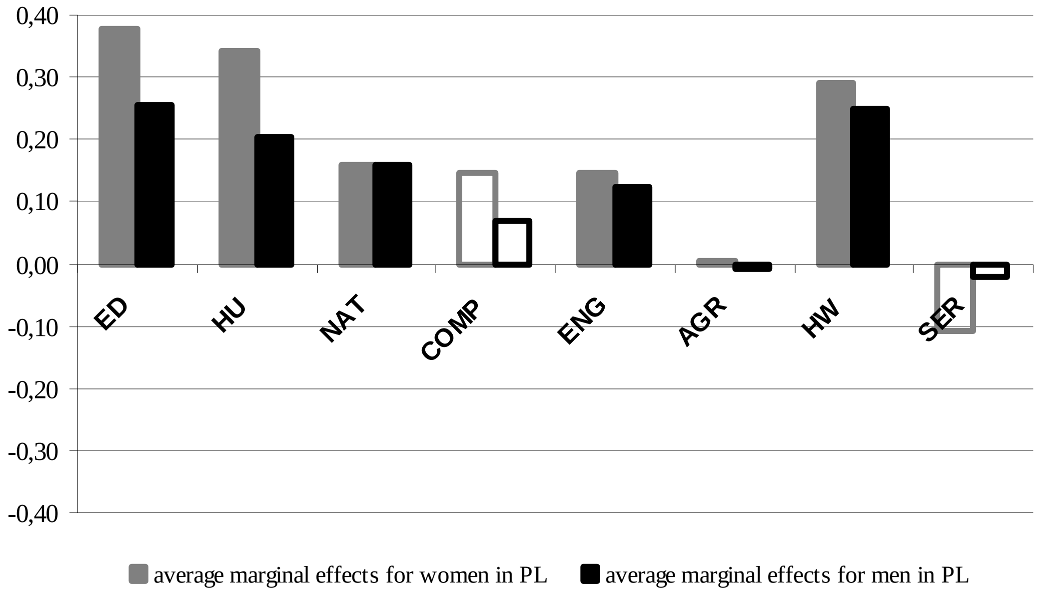

Figure 2a The effects of field of study on the quality of first job in Poland
Source: Polish School Leaver Survey, own calculations.
Note: the marginal effects are estimated based on probit models, the control variables are: age, grades, the type of tertiary education and parental background.
Empty bars represent effects that are not significant at the level 0.05

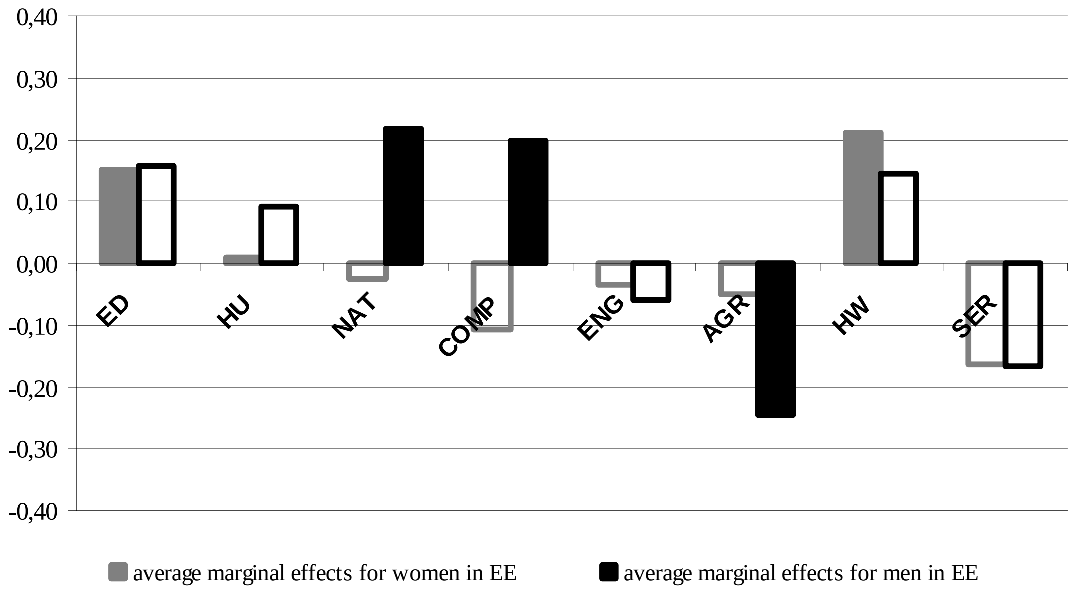

Figure 2b The effects of field of study on the quality of first job in Estonia
Source: REFLEX data, own calculations.
Note: the marginal effects are estimated based on probit models, the control variables are: age, grades, the type of tertiary education and parental background.
Empty bars represent effects that are not significant at the level 0.05

Finally, we move to the question of salary premium. Our results, presented in Figures 3a and 3b, demonstrate that field of study of tertiary educated graduates matters for earnings in both countries. In Poland, graduates of both gender who complete engineering courses do not earn on average more than male graduates from the social sciences, business and law. Similarly in Estonia, graduating as an engineer offers a salary premium for neither men nor women compared to the reference group. Further, men with an engineering background earn significantly less on average than men who graduated from the social sciences, business and law.

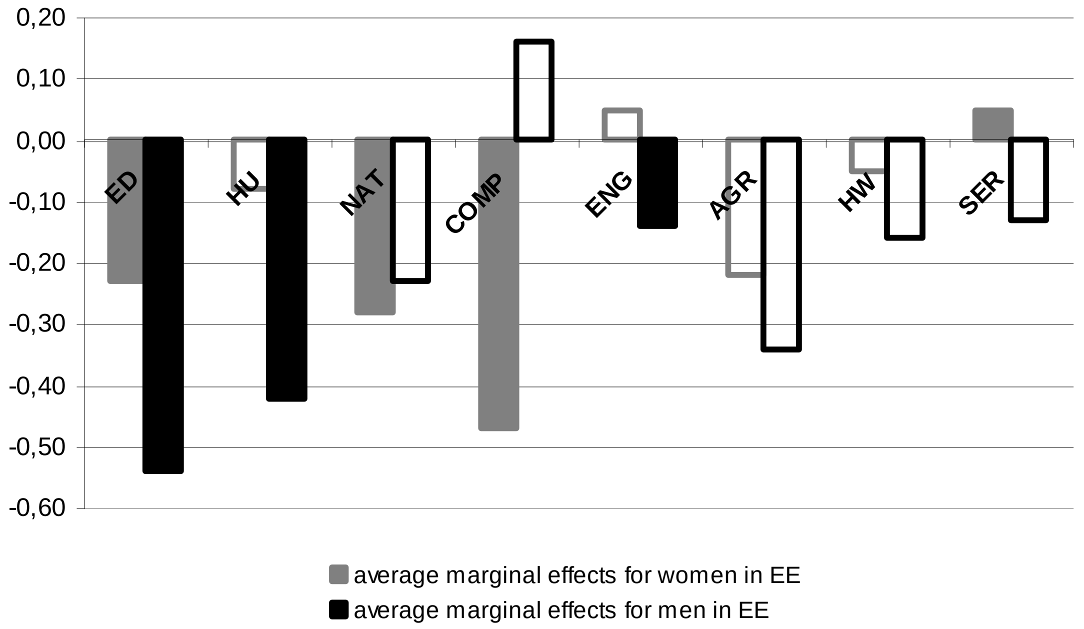

Figure 3a The effects of field of study on wages of graduates in Estonia
Source: Estonian Labour Force Survey, own calculations.
Note: The marginal effects are estimated based on generalized linear models, the control variables are: the type of tertiary education, tenure, educational cohort.
Empty bars represent effects that are not significant at the level of 0.05.

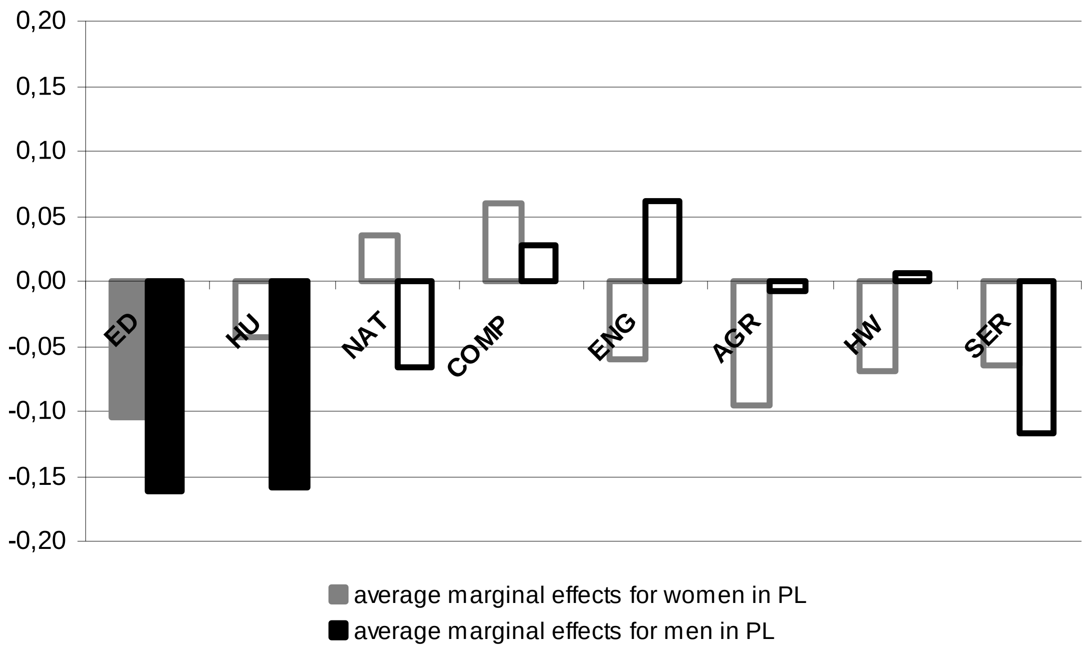

Figure 3b The effects of field of study on wages of graduates on Poland
Source: Polish Labour Force Survey, own calculations.
Note: The marginal effects are estimated based on generalized models, the control variables are: the type of tertiary education, region (NUTS-2) and place of residence (rural/urban), tenure, educational cohort.
Empty bars represent effects that are not significant at the level of 0.05.

To summarise, in Poland engineers have no benefit when looking for their first job, but those who do manage to find work have relatively high chances of working as specialists or managers. The combination of these results – difficulty of entry into employment and limited rewards once a job is found suggest that in Poland the lack of advantages of completing engineering fields of study might be related to the effect of occupational licensing.
In Estonia, graduates from engineering fields of study search spend less time looking for their first job, although they do not receive jobs with higher status and higher pay. These findings hold in Estonia for both men and women. This might be connected not only with occupational licensing but also with the overall economic situation. Perhaps the economic upswing experienced by the Estonian economy provided enough job possibilities for all graduates and therefore field of study has only limited differential power in graduates' labour market prospects.

Summary

The aim of this article is to revisit the evidence on the benefits of field of study on the early labour market career of tertiary education graduates. It has become common wisdom that young people with diplomas from engineering fields are relatively more successful in entering the labour market. While the evidence for Western Europe seems unambiguous in this respect, there are quite few studies investigating this issue for Central and Eastern Europe. At the same time, the patterns of advantage and disadvantage related to the field of study might differ across European societies (Reimer et al., 2008). We argue that European countries differ with respect to the level of restrictions to entry into the given occupation, which is regulated by means of licensing. In Central and Eastern European countries, licensing in the engineering occupations is particularly strict. Hence, while graduates from engineering fare very well in other countries, this might not necessarily be the case in Central and Eastern Europe.
Our results demonstrate that in Poland and Estonia, young people derive limited or no benefits from having a diploma in engineering as compared to the reference category of the most popular field, which is social sciences, business and law. It might be that in Poland, due to institutional barriers to entry into engineering occupations, graduates who studied fields that should lead to such occupations do not have an advantage in finding their first jobs. Also their benefits after they enter the world of work are rather limited. Similarly, in Estonia, graduates from engineering fields of study do not enjoy neither quicker entry to the first job, nor do they receive jobs with higher status and higher pay.
Our results are worth discussing especially in the context of recent policy efforts to promote engineering fields of study, which have been implemented in Poland and Estonia and elsewhere in Europe. The implementation of policies encouraging young people to choose engineering as a field of study should include relaxation of the institutional barriers to entry into occupations that are targeted by engineering graduates. Our findings stress also the importance of looking more closely at the role of complex entry regulations to specific occupations. In this study, we analysed the short-term perspective; one of the next steps would be to expand the time horizon and see how valued engineers are in the long run and how vulnerable are they towards business cycles in comparison to other graduates.

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ANNEX 1.

Table A1.1 Indicators of strictness of entry regulations regarding licensing and of education requirements for engineering occupations

	Licensing	Education requirements
Slovak Republic	6.0	5.2
Poland	6.0	4.3
Austria	6.0	4.0
Portugal	6.0	3.2
Czech Republic	6.0	3.2
Greece	6.0	3.0
Italy	6.0	3.0
Estonia	6.0	3.0
Spain	6.0	2.0
Hungary	6.0	1.3
Germany	4.5	2.2
Slovenia	3.0	5.6
Australia	3.0	0.0
Sweden	1.5	1.5
Finland	1.5	1.0
Belgium	0.0	0.0
Denmark	0.0	0.0
France	0.0	0.0
Ireland	0.0	0.0
Netherlands	0.0	0.0
Norway	0.0	0.0
Switzerland	0.0	0.0
United Kingdom	0.0	0.0

Source: Conway and Nicoletti (2006).

ANNEX 2.

Table A2.1a. Probability of entry into employment within 6 months from graduation in Poland.

	Women		men	
	Coef.	t-stat	Coef.	t-stat
Type of diploma (ref=BA)				
Msc	0.17**	(2.75)	-0.11	(-1.24)
Field of study (ref. social scie., business, law)				
teacher training & education science	0.02	(0.36)	0.11	(0.77)
humanities & arts	0.04	(0.46)	-0.14	(-0.99)
science	-0.17	(-1.95)	-0.13	(-1.01)
computing	0.23	(1.09)	0.06	(0.52)
engineering, manufacturing	0.12	(0.83)	-0.12	(-1.05)
agriculture & veterinary	-0.40*	(-2.31)	0.03	(0.14)
health & welfare	0.36**	(2.79)	0.27	(1.20)
services	-0.06	(-0.25)	0.03	(0.10)
Parental education (ref. primary)				
basic vocational	0.05	(0.37)	0.04	(0.14)
general secondary	0.07	(0.45)	-0.29	(-1.04)
upper sec. vocational	0.16	(1.15)	0.05	(0.19)
postsecondary	0.20	(1.24)	0.02	(0.08)
tertiary	0.07	(0.50)	-0.04	(-0.14)
Constant	-2.12**	(-3.01)	-2.93**	(-3.03)
LL	-1810.77		-829.86	
N	2891		1500	

* p < .10; ** p < .05; *** p < .01. Note: control variables include: age, GPA, cohorts and place of residence and regional dummies.

Table A2.1b. Probability of entry into employment within 6 months from graduation in Estonia.

	Women		Men	
	Coef.	t-stat	Coef.	t-stat
Type of diploma (ref=BA)				
Msc	0.58*	(1.64)	0.04	(0.83)
Field of study (ref. social scie., business, law)				
teacher training & education science	-0.13	(-0.82)	-0.28	(-0.81)
humanities & arts	-0.13	(-0.69)	1.02	(1.60)
science	-0.54**	(-2.30)	0.04	(0.11)
computing	0.48	(0.64)	0.89***	(2.41)
engineering, manufacturing	-0.25	(-1.10)	0.14	(0.59)
agriculture & veterinary	-0.88**	(-2.36)	-0.07	(-0.20)
health & welfare	0.22	(0.89)	0.78	(1.51)
services	-0.11	(-0.44)	-0.08	(-0.23)
Parental education (ref. primary)				
secondary	0.03	(0.80)	0.15	(0.74)
tertiary	0.32	(0.86)	0.37	(-1.02)
Constant	0.37	(0.42)	1.86***	(3.06)
LL	-314.84	(0.81)	-156.90	
N	808		408	

* p < .10; ** p < .05; *** p < .01. Note: control variables include: age, GPA, and place of residence.

Table A2.2a. Probability of having a professional job in Poland.

	Women		Men	
Type of diploma (ref=BA)	Coef.	t-stat	Coef.	t-stat
Msc	0.50***	(6.67)	0.44***	(4.91)
Field of study (ref. social scie., business, law)				
teacher training & education science	0.99***	(13.03)	0.65***	(4.68)
humanities & arts	0.89***	(10.22)	0.52***	(3.58)
science	0.40***	(3.90)	0.41**	(2.91)
computing	0.37	(1.59)	0.18	(1.40)
engineering, manufacturing	0.37*	(2.54)	0.32**	(2.74)
agriculture & veterinary	0.01	(0.05)	-0.02	(-0.09)
health & welfare	0.75***	(5.69)	0.63**	(2.96)
services	-0.29	(-0.84)	-0.06	(-0.16)
Parental education (ref. primary)				
basic vocational	-0.30	(-1.74)	-0.19	(-0.62)
general secondary	0.00	(0.02)	-0.30	(-0.95)
upper sec. vocational	-0.11	(-0.63)	-0.25	(-0.83)
postsecondary	0.16	(0.83)	0.05	(0.14)
tertiary	0.11	(0.62)	0.06	(0.20)
Constant	-0.63	(-0.80)	1.11	(1.09)
LL	-1414.09		-776.85	
N	2423.00		1279.00	

* p < .10; ** p < .05; *** p < .01. Note: control variables include: age, GPA, cohorts and place of residence and regional dummies.

Table A2.2b. Probability of having a professional job in Estonia.

	Women		Men	
	Coef.	t-stat	Coef.	t-stat
Type of diploma (ref=BA)				
Msc	0.50*	(1.85)	0.03	(0.09)
Field of study (ref. social scie., business, law)				
Teacher training & education science	0.45***	(3.32)	0.49	(1.49)
Humanities & arts	0.03	(0.17)	0.27	(0.73)
Science	-0.07	(-0.31)	0.72**	(2.12)
Computing	-0.28	(-0.50)	0.64**	(2.21)
Engineering, manufacturing	-0.09	(-0.45)	-0.17	(-0.85)
Agriculture & veterinary	-0.14	(-0.41)	-0.64**	(-2.02)
Health & welfare	0.69***	(3.13)	0.45	(1.11)
Services	-0.42*	(-1.91)	-0.43*	(-1.50)
Parental education (ref. primary)				
Secondary	0.03	(0.25)	0.17	(0.55)
Tertiary	0.35	(1.11)	-0.18	(-1.03)
Constant				
LL	-460.54		-221.54	
N	793		426	

* p < .10; ** p < .05; *** p < .01. Note: control variables include: age, GPA, and place of residence.

Table A2.3a. Salary returns in Poland.

	Women		Men	
	Coef.	t-stat	Coef.	t-stat
Field of study (ref. social scie., business, law)				
teacher training & education science	-0.16***	(-3.19)	-0.10***	(-3.91)
humanities & arts	-0.16***	(-2.93)	-0.04	(-1.48)
science	0.03	(0.54)	0.06*	(1.79)
computing	-0.07	(-1.44)	0.04	(0.44)
engineering, manufacturing	0.06*	(1.78)	-0.06	(-1.16)
agriculture & veterinary	-0.01	(-0.11)	-0.09	(-1.26)
health & welfare	0.01	(0.08)	-0.07	(-1.35)
services	-0.12	(-1.30)	-0.06	(-0.82)
Tenure	0.03***	(7.31)	0.03***	(9.03)
Constant	7.37***	(97.19)	7.19***	(126.03)
Adjusted R Squared	0.18		0.24	
N	1010		1667	

* p < .10; ** p < .05; *** p < .01. Note: control variables include: educational cohort and place of residence.

Table A2.3b. Salary returns in Estonia.

	Women		Men	
Type of diploma (ref=BA)	Coef.	t-stat	Coef.	t-stat
Msc	0.23***	(3.52)	0.09	(1.07)
Field of study (ref. social scie., business, law)				
teacher training & education science	-0.23***	(-4.11)	-0.54***	(-2.73)
humanities & arts	-0.08	(-1.31)	-0.42***	(-4.24)
science	-0.28***	(-2.57)	-0.23*	(-1.66)
computing	-0.47***	(-3.23)	0.16*	(1.58)
engineering, manufacturing	0.05	(0.61)	-0.14*	(-2.05)
agriculture & veterinary	-0.22*	(-1.50)	-0.34*	(-1.50)
health & welfare	-0.05	(-0.80)	-0.16	(-1.14)
services	0.05	(0.76)	-0.13*	(-1.47)
Tenure	0.02***	(3.90)	0.03**	(3.58)
intercept	-11.49	(-0.58)	56,26*	(1.89)
adjusted r squared	0.09		0.12	
N	587		374	

Note: control variables include: educational cohort and place of residence.