

## **Education in Transition and Job Mismatch: Evidence from the Skills Survey in Non-EU Transition Economies <sup>1</sup>**

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**Abstract:** This paper explores vertical education-job mismatch in Armenia, Georgia, Macedonia and Ukraine based on the recent skills surveys of adult population and compares its incidence and characteristics to those observed in advanced economies. Besides, the paper examines the role of transition-related cohorts and skills in determining the probability of overeducation and undereducation in transition economies. The study finds that older workers whose careers have been affected by economic transformations since the early 1990-s have higher incidence of overeducation in Georgia and Armenia and lower incidence of overeducation in Ukraine and Macedonia as compared to younger workers that acquired education in the modern economic environment. However, after controlling for other observed characteristics, age has a significant effect on the multinomial log-odds for being overeducated relative to well-matched only in Armenia. Our empirical analysis finds support for the substitutability hypothesis between formal education and other components of human capital: individuals with less time to proficiency, required experience, actual tenure, and lower intensity of computer use at work have significantly higher probability of being overeducated relative to adequately matched (*ceteris paribus*).

**Keywords:** overeducation; late reformers; substitutability hypothesis; reading proficiency; non-cognitive skills

**JEL Classification Numbers:** I21, J24, J62, P23, P52

### **1. Introduction**

Over the past two and a half decades, transition economies in Europe and Central Asia (ECA) have seen dramatic transformations in virtually all spheres of life, including education and training. Despite multiple transition challenges, most countries in the ECA region continue to have strong achievements in education. Gross enrollment ratios in primary and secondary education remained remarkably high while enrollment ratios to tertiary education have grown rapidly and are quite high relative to the income levels of these countries (Sondergaard et al., 2012). As a result, the stock of human capital – measured as the proportion of population aged 25 and over that had completed at least secondary education – has significantly improved. In spite of these positive achievements in enrollment and attainment rates, many employers in the region face difficulties in finding workers with the adequate level of skills (Koettl et al., 2015; World

Bank, 2014). At the same time, many educated workers are either unemployed or are doing jobs that do not require their level of education.

Some degree of skills and qualification mismatch is inevitable even in countries with well-performing labor markets because the task content of jobs changes over time in response to technological and organizational changes, and there is always an adjustment lag between skill demand and supply (OECD, 2013). However, in late-reforming transition economies skill mismatches can play out differently than in mature market economies and can affect more workers of different age, education and family background.

This paper examines characteristics of vertical education-job mismatch, i.e. the mismatch between the educational credentials of workers (years of education or degree) and those required by their jobs, in four non-EU transition economies, namely Armenia, Georgia, Former Yugoslav Republic of Macedonia (further – Macedonia) and Ukraine. Although a considerable body of literature on overeducation exists, it is mainly focused on the analysis of overeducation and its consequences in developed economies (see review in Leuven and Oosterbeek, 2011; Kucel, 2011; Quintini, 2011). To the best of our knowledge, only several studies have been carried out in transition economies<sup>2</sup>, and only three of them – Galasi (2008), Mojsoska-Blazevski and Ristovska (2012) and Bartlett (2013) – provided limited knowledge on the education-job mismatch in non-EU transition economies. Recent country reports on skills in Armenia and Georgia (World Bank, 2015 a, b) touch on the issue of vertical mismatch without specific details.

This study fills this gap in the literature and explores whether findings on the patterns and determinants of education-job mismatch in mature market economies also hold true for the countries stuck in economic transition (“late reformers”). In order to contribute to the existing mushrooming studies on overeducation, this paper aims at answering several important questions. First, is education-job mismatch a more salient feature in “late reformers” than in the countries with more effectively functioning labor and education markets? Second, are there differences between older workers who obtained education and basic skills during central planning and young new comers to the labor market in terms of the risk of being overeducated or undereducated? Third, do job-relevant and non-cognitive skills differ significantly between overeducated, undereducated and those who are well-matched to their jobs in terms of formal education? Finally, what are the individual-level determinants of education-job mismatch in non-EU transition countries?

To answer these questions, we make use of the newly available data from the World Bank’s Skills Toward Employment and Productivity (STEP) household surveys undertaken in Ukraine in 2012 and in Armenia, Georgia and Macedonia in 2013. For comparison of the incidence of mismatch in these four countries with the OECD countries and Russia, we use the OECD Programme for the International Assessment of Adult Competencies (PIAAC) data. This allows us to obtain comparable estimates of job-education mismatch based on the same measurement

approaches and roughly during the same period (between 2011 and 2013) in 25 countries.

The novelty of this study is not only in the comparative analysis of overeducation and undereducation in transition and developed economies but also in the combination of economic theories with social stratification and intergenerational mobility perspectives to explain the existing overeducation in transition economies.<sup>3</sup> Besides, the paper examines the role of cognitive and non-cognitive skills in determining the probability of overeducation and undereducation.

The rest of this paper is organized as follows. Section 2 provides background information on education and labor markets in Armenia, Georgia, Macedonia and Ukraine. Section 3 describes the data and methods used for the measurement of education-job mismatch in this paper. Section 4 compares the incidence of mismatch in Armenia, Georgia, Macedonia and Ukraine and OECD countries using three mismatch measurement approaches, and then examines the incidence of mismatch (measured with the self-assessment approach) in selected countries by age and transition-related cohorts. Section 5 explores cognitive, job-relevant and non-cognitive skills of workers depending on their match to jobs in terms of formal education. Section 6 discusses the results of our empirical analysis of the determinants of mismatch in non-EU transition economies. Section 7 provides some concluding remarks.

## **2. Education and labor market trends in Armenia, Georgia, Macedonia and Ukraine**

Like the other post-socialist European economies, Armenia, Georgia, Macedonia and Ukraine enjoyed high levels of human capital at the beginning of their economic transition process, with high literacy levels and educational attainment of the adult population by international standards (EBRD, 2013).

Despite the economic downturn and limited public investment in education in the 1990's, these countries experienced an impressive improvement of educational attainment levels of population throughout the economic transition period. For example, according to the Barro and Lee dataset, the share of population aged 25 years and over with tertiary education increased between 1990 and 2010 from 18.9 to 21.4 percent in Armenia and from 20.9 to 39.9 percent in Ukraine (Table 1). Georgia also has a large supply of highly educated workers, with 31 percent of the labor force having completed tertiary education and only 9 percent being without completed secondary education (Rutkowski, 2013). In Macedonia, the percentage of the total working age population (15-79 years) achieving tertiary education is fairly low compared to the other countries, but it has significantly increased since 2001 (from 9.5 to 14.7 percent in 2013).<sup>4</sup> According to Mojsoska-Blazevski and Ristovska (2012), the relatively poor educational achievements of the Macedonian population can be mainly attributed to a long period of input-based educational

policy and underinvestment in education in the past.

**Table 1. Highest educational attainment and average years of total schooling of the population aged 25 and over**

Country/Group	Indicator	1990	1995	2000	2005	2010
<b>Armenia</b>	Secondary total (%)	67.7	69.1	70.7	73.0	73.1
	Tertiary total (%)	18.9	19.5	20.4	19.8	21.4
	Avg. years of total schooling	10.08	10.44	10.81	10.80	10.87
<b>Ukraine</b>	Secondary total (%)	56.7	55.6	48.5	53.5	53.6
	Tertiary total (%)	20.9	28.2	36.7	38.2	39.9
	Avg. years of total schooling	9.14	10.04	10.68	11.16	11.34
<b>ECA (average)</b>	Secondary total (%)	50.6	59.2	64.3	69.3	70.9
	Tertiary total (%)	12.8	14.5	17.2	19.1	22.0
	Avg. years of total schooling	8.98	9.79	10.49	11.01	11.42
<b>Advanced economies (average)</b>	Secondary total (%)	42.1	45.8	48.2	49.9	49.9
	Tertiary total (%)	16.7	19.3	22.4	26.2	30.2
	Avg. years of total schooling	9.12	9.65	10.14	10.76	11.25

Source: Barro and Lee dataset (v. 2.0, 06/14; <http://www.barrolee.com>); author's calculations of the regional unweighted averages.

Notes: "ECA" includes 20 countries; "Advances economies" includes 23 countries (excluding Turkey) according to the Barro & Lee classification. There is no statistics on Georgia and Macedonia in the dataset.

The improvement of educational attainment levels in all countries has been primarily due to the increased participation of young people in tertiary education. For example, gross enrollment ratio to tertiary education in Ukraine grew from 46.8 percent in 1991 to 79.7 percent in 2013.<sup>5</sup> Despite the cross-country differences in enrollment rates in the early 1990's and in their evolution over the transition period, the national systems of tertiary education developed in a similar way: with a struggle of public universities for their survival amid the chronic underfunding by the state and emergence of private universities in the 1990's, and gradual "Europeanization" reforms of higher education associated with the Bologna process in the 2000's (ETF, 2011; Dobbins and Khachatryan, 2014; Shaw, 2013; Stojanov and Angeloska-Galevska, 2006).

Although the Bologna process was seen by policymakers as a great opportunity for bringing higher education in line with the European standards, the real outcomes after a decade of Europeanization efforts are quite disappointing. The national education systems have not changed sufficiently to adapt to the new economic environment, with the type of knowledge and

skills provided by formal education not matched to the real labor market needs (ETF, 2011). Among the main reasons for the lack of positive outcomes of education reforms are organizational path dependence, the mismatch between the Soviet-type state-centered model of university governance and the Western university tradition which maintains significant institutional and individual autonomy, and inadequate or inconsistent implementation of the main Bologna process principles (Dobbins and Khachatryan, 2014; Shaw, 2013).

Tertiary education has expanded rapidly, whereas the labor markets failed to keep pace with such expansion, offering limited numbers of high-skilled job opportunities and using the available stock of human capital ineffectively. As Table 2 shows, the bulk of jobs in Armenia, Georgia, Macedonia and Ukraine are provided either in the traditional low-productivity sectors such as agriculture, trade and repairs, transport, accommodation and food services or in the public sector jobs which often require tertiary education but do not offer adequate returns to it.

**Table 2. Sectoral structure of employment in Armenia, Georgia, Macedonia, Ukraine and Euro area (% of total employment)**

<b>Economic sector</b>	<b>Armenia (2013)</b>	<b>Georgia (2007)</b>	<b>Macedonia (2013)</b>	<b>Ukraine (2013)</b>	<b>Euro area (2013)</b>
Agriculture, hunting, forestry and fishing	36.2	53.4	18.7	17.5	3.4
Industry	11.3	6.3	23.5	16.0	15.6
Construction	5.7	4.2	6.9	4.4	6.2
Trade and repairs; transport; accommodation and food services*	11.6	10.9	22.6	30.1	24.6
Information and communication*	6.2	4.2	1.6	1.5	2.8
Financial intermediation, real estate, renting and business activities	3.8	3.0	5.2	7.6	16.3
Public administration, education, health and social work	20.4	14.5	18.3	19.5	23.7
Other service activities	4.6	3.5	3.1	3.4	7.4

Source: Author's calculations based on the data from the OECD for Euro area 17 countries (Employment by main activity, ISIC Rev. 4, in persons); and the National Statistical offices in Armenia, Georgia, Macedonia and Ukraine.

Notes: The most recent available data are presented. Definitions of employed and age limits for working-age population are those used by the National Statistical offices: Armenia (15-75 years), Georgia and Macedonia (15 years and above), Ukraine (15-70 years). \* Possible classification mismatch should be taken into account: in Armenia and Georgia "Transport and storage" is included in "Information and communication" (in line with NACE Rev.1 classification).

Although some higher-productivity modern sectors such as financial and insurance activities, telecommunications, professional, scientific, technical, administrative and support service activities have seen an increase in the share of employment since the early 1990's, this has not occurred as rapidly as in advanced economies and their shares remained relatively small (ETF, 2011). Moreover, the recent economic and financial crisis has halted positive achievements in the sectoral employment structure.

As a consequence of a limited demand for the highly skilled labor along with the low quality and lack of relevance of education programs in late-reforming transition economies, many young workers encounter difficulties in putting their skills to use and are often forced to take up jobs that require lower level of education. Meanwhile, older workers are also affected by education-job mismatch because rapid structural and technological changes made obsolete their diplomas and qualifications while the system of adult training remains largely underdeveloped (Sondergaard et al., 2012; World Bank, 2014). Hence, education-job mismatch is expected to be profound in late-reforming transition economies; at least until the skill structure of labor demand adjusts to the availability of a highly educated workforce whereas high levels of formal education translate into high levels of up-to-date productive skills.

### **3. Data and measurement issues**

#### **3.1. Data**

For the analysis of education-job mismatch in non-EU transition economies we make use of the World Bank's Skills Towards Employability and Productivity (STEP) household surveys undertaken in Ukraine in 2012 and in Armenia, Georgia and Macedonia in 2013. The target population is the urban population aged from 15 to 64 years, and the original sample varies from 2,389 observations in Ukraine to 4,009 observations in Macedonia. An important advantage of the STEP household surveys is that in addition to a standard background information about a surveyed individual regarding her educational attainment, employment, and family background, the surveys collected information about the different types of skills. These include: (i) job-relevant skills that the respondent uses at work (see Table A.2 in Annex); (ii) non-cognitive skills such as openness to experience, conscientiousness, extraversion, emotional stability, etc. which are also referred in the literature as socio-emotional skills (see Table A.3 in Annex); and (iii) direct assessment of reading proficiency designed to identify levels of competence at accessing, identifying, integrating, interpreting, and evaluating information (see more about the survey in Pierre et al., 2014).

Our sample for the analysis of education-job mismatch includes employed population with information about formal education, current job, job requirements in terms of formal education and experience, and skills used at work. Although the country-level sample size is fairly small,

particularly for Ukraine, we believe that statistics estimated with sample weights and primary sample units using the Stata's facilities for survey data analysis centered around the *svy* prefix command is reliable and valid.

For comparison of the incidence of mismatch in these four countries with the OECD countries and Russia, we use the OECD Programme for the International Assessment of Adult Competencies (PIAAC) data. The survey is targeted at the population aged from 16 to 65 years, with approximately 166,000 adults surveyed in 24 countries and sub-national regions from August 2011 to March 2012. Our sample is limited to employed working-age population in those countries or sub-national regions which are available in public use files<sup>6</sup> and which have information about workers' educational attainment and occupation. Special Stata module "*repest*" has been used to account for the complex survey design in the estimation of sampling variances with jackknife replicate weights.

STEP and PIAAC surveys are based on the similar data collection process in terms of instrumentation, survey operations and time of the fieldwork (Pierre et al., 2014). This provides an opportunity to examine comparable estimates of skills and other relevant measures including the incidence of education-job mismatch. However, there are also some concerns, common for international assessments of educational achievements, such as the limited number of countries with both assessment and other common data, single cross-sectional designs with no ability to track individuals, and unmeasured cultural factors (Hanushek and Woessman, 2011). Moreover, the difference in target populations – urban population in STEP and total (or subnational) population in PIAAC – may lead to the predetermined differences in the incidence of education-job mismatch as the quality of match between education, skills and jobs is expected to be higher in denser urban labor markets.

### 3.2. Measurement of mismatch using STEP and PIAAC surveys

Vertical education-job mismatch refers to a situation in which workers have an educational attainment that is higher or lower than that required by their job (Cedefop, 2010; Quintini, 2011). Therefore, in order to measure mismatch it is necessary to compare workers' education with educational requirements of jobs or occupations. STEP and PIAAC surveys made it possible to construct three different measures of education-job mismatch in non-EU transition economies, selected OECD countries and Russia: one measure is based on the self-assessment approach and two measures are based on the realized match (statistical) approach.<sup>7</sup>

- 1) *Self-assessment*: Information about required education is taken from the question "What minimum level of formal education do you think would be required before someone would be able to carry out this work?" in the STEP dataset and from the question "Still talking about your current job: If applying today, what would be the usual qualifications, if any, that someone would need to get this type of job?" in the PIAAC dataset. Although these

questions differ in important dimension, with the former question asking about the necessary education to carry out work, and the latter asking what is needed to get a similar job, we believe that possible differences in the measured outcome (Leuven and Oosterbeek, 2011) are negligible if we use wider classes of educational attainment.

If a worker's highest educational attainment is the same as that defined by her as required by a given job, she is classified as well-matched. If an educational attainment is higher or lower than that required by a job, she is classified as overeducated or undereducated, respectively.

- 2) *Realized match, mode-based method.* For each 2-digit occupational group<sup>8</sup> coded according to the International standard classification of occupations – 2008 (ISCO), with at least 10 observations per country, we defined the mode of highest educational attainment using the education classification with five levels defined below. This modal educational attainment is taken as required education for all workers of a given occupational group. Classification into well-matched, overeducated and undereducated is done in the same way as in the first method, from comparison of actual and required levels of education.
- 3) *Realized match, mean-based method.* As in the second method, we decide about the required education from the educational attainment of workers per each 2-digit ISCO occupation. But unlike our approach in the mode-based method, we use total years of education and follow Verdugo and Verdugo (1989) by calculating the mean years of education and using the cut-off of one standard deviation from the mean to define well-matched, overeducated and undereducated workers.

It should be noted that the variable containing information about total years of education does not refer to actual years of schooling reported by respondents. Instead, it is derived by the STEP and PIAAC survey teams from the original variable regarding the respondent's highest level of education and refers to adjusted years of schooling. Using actual years of education ignores repeated and inefficient years which do not give significant increments to formal qualifications (Sloane et al., 1999), whereas using adjusted years of schooling ignores the possibility of multiple degrees. Whether actual or adjusted years of education are used, the role of variation in total years of education seems to be overstated as it can emerge simply due to the differences in duration of studies across countries and generations. For this reason and other limitations described in the literature (Leuven and Oosterbeek, 2011), we consider this method inferior to the other two methods.

As a starting point for the first two methods, we generated a variable containing information about the highest educational attainment and required education in the same scale. Given different classifications of education used in different countries, surveys and time, we find it most appropriate to use the following classification of educational attainment in line with the International standard classification of education – 1997 (ISCED):



1. Lower secondary education or less (ISCED 0-2);
2. Upper secondary education (ISCED 3, all programmes including vocational);
3. Post-secondary, non-tertiary education (ISCED 4);
4. Tertiary short-cycle education (ISCED 5B);
5. Tertiary long-cycle education (ISCED 5A/6), i.e. a university degree, including bachelor, specialist, master and PhD.

Although we can expect significant differences in group 5, we do not distinguish between holders of bachelor's, specialist's and master's degrees because of the completely different classification used in the Soviet system, with a specialist's degree given to all university graduates. Secondary professional, or specialized, education according to the Soviet and Armenian system is classified as tertiary short-cycle education (ISCED 5B). Post-secondary, non-tertiary education (ISCED 4) does not have any equivalence in Armenian, Georgian and Ukrainian systems of education, and therefore this class is empty in these countries.

#### **4. Incidence and characteristics of education-job mismatch in Armenia, Georgia, Macedonia and Ukraine**

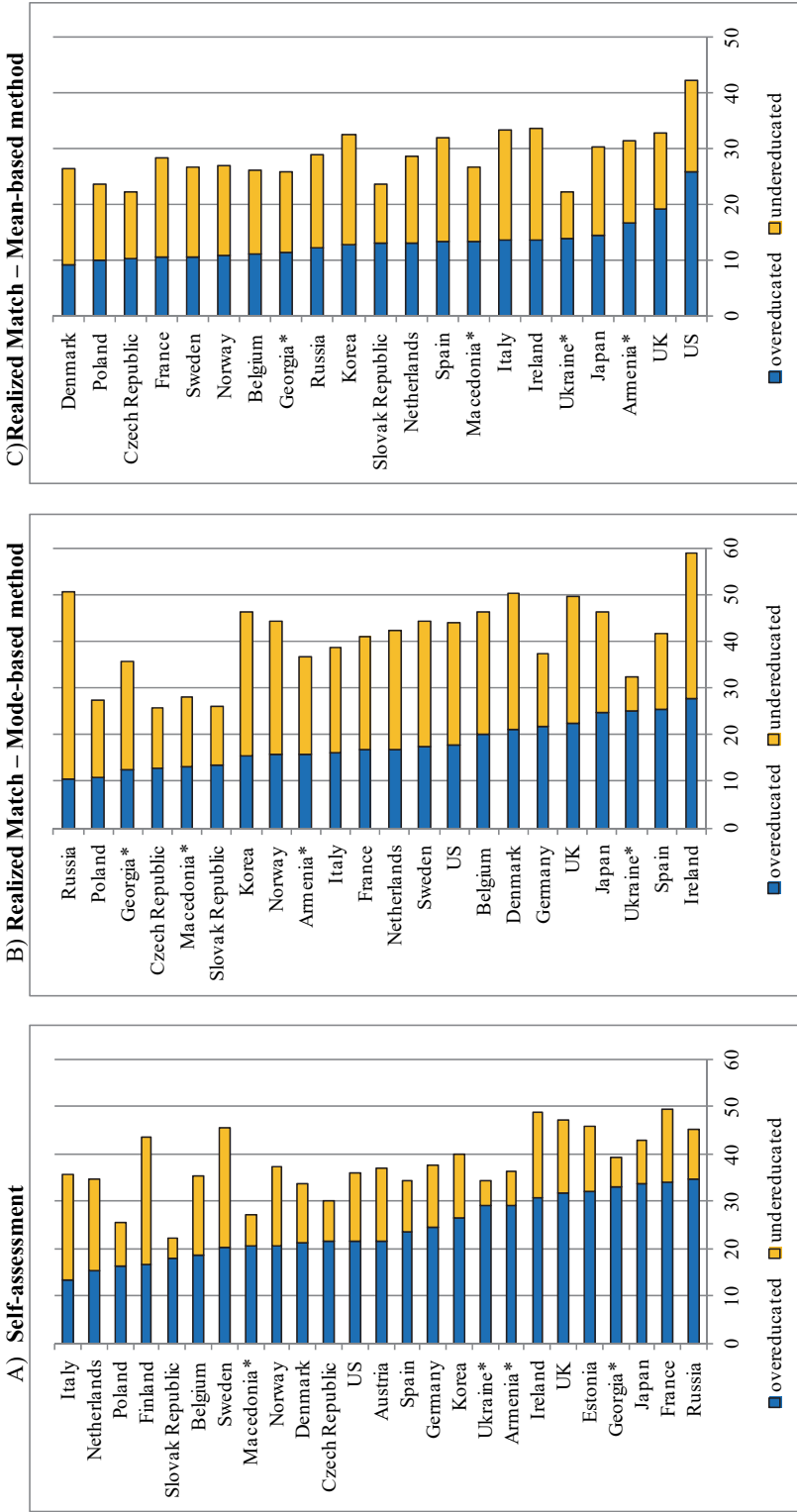
##### **4.1. Education-job mismatch in transition and developed economies**

The comparison of different measures of education-job mismatch between developed and transition economies shows that the phenomenon of overeducation is quite widespread and affects at least 10 percent of the workforce (Figure 1). In most countries, the self-assessment method gives higher estimates of overeducation than the other two methods, whereas the mean-based method gives the lowest estimates. This result is consistent with the literature on overeducation and supports concern over the measurement error in the years or level of required schooling variable according to the realized match methods (see, e.g. Leuven and Oosterbeek, 2011).

According to the self-assessment approach, the incidence of overeducation varies from 13.4 percent in Italy to 33 percent or more in Georgia (only urban population), Japan, France and Russia (excluding the population of the Moscow municipal area). In 19 out of 25 countries, at least each fifth worker has higher level of education than required by her job<sup>9</sup>.

The incidence of overeducation among urban working-age population in Ukraine and Armenia (29.1 percent) is high in absolute terms but it is on a par with many developed countries. Macedonia compares favorably with many other countries in our sample, with the share of overeducated workers at 20.7 percent. However, like many other Western Balkan countries, Macedonia has persistently high rates of total, long-term and youth unemployment (IMF, 2014). Hence, a lower incidence of overeducation in Macedonia should not be seen as the outcome of more effective functioning of the labor market and better match of workers to jobs compared to Armenia, Georgia and Ukraine. It is rather an indication of the general scarcity of jobs,

**Figure 1. Incidence of education-job mismatch in developed and transition economies (% of total employment)**



Source: Author's calculations based on PIAAC Survey of Adult Skills for OECD countries and Russian Federation (2011–2012); STEP Skills Measurement Surveys for Ukraine (2012), Armenia (2013), Georgia (2013), and Macedonia (2013). The PIAAC Survey was conducted subnationally in Belgium (Flanders) and in the UK (England and Northern Ireland). The sample for Russia does not include the population of the Moscow municipal area.

Notes: Countries are ranked in ascending order of the share of overeducated workers. \*Statistics based on the STEP survey is representative of employed population aged 15–64, urban population only. The PIAAC survey used for the other countries provides statistics representative of employed population aged 16–65, both rural and urban population.

regardless of the required level of education and skills.

At the same time, Armenia, Georgia, Ukraine and Macedonia have considerably lower incidence of undereducation and the overall education-job mismatch than in developed countries (Figure 1 and Table 3). However, it should be taken into account that we compare urban population in these four countries to the entire population in the OECD countries. Analysis of undereducation and its relationship with skills mismatch in literacy in the OECD countries (OECD, 2013; Quintini, 2014) suggests that the overwhelming majority of undereducated workers have the literacy skills required to carry out their jobs or higher levels, even though they do not have the corresponding level of education. The authors argue that undereducation can be linked to credential inflation as employers tend to raise job requirements without upgrading the content of jobs. It can also be a sign of widespread informal learning in the workplace when workers acquire the necessary skills on the job, but these skills are not certified by an official educational qualification.

**Table 3. Average incidence of education-job mismatch by country group (% of total employment)**

Group	Countries	Overeducated	Undereducated	Well-matched
Developed	Austria, Belgium (Flanders), Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, Norway Spain, Sweden, UK (England and Northern Ireland), US	23.4	16.5	60.0
Transition, EU	Czech Republic, Estonia, Poland, Slovak Republic	22.0	8.9	69.1
Transition, non-EU*	Armenia, Georgia, Macedonia, Ukraine	28.0	6.4	65.7

Source: Author's calculations, simple averages of country-level estimates shown in Figure 1, panel A (self-assessment method).

Notes: \* See notes to Figure 1.

The major conclusion stemming from the comparative analysis of education-job mismatch in non-EU transition economies and developed countries is that the share of overeducated workers is fairly high in Armenia, Georgia and Ukraine but it is on a par with many developed countries. However, overeducation can be seen as a more serious and long-term problem in late-reforming transition economies, because production is not redesigned and jobs are not upgraded enough to account for the growing supply of workers with tertiary education. A dramatic shortage of

high-skilled jobs and a rapidly growing competition for these jobs push many highly educated workers into jobs for which they are genuinely overqualified, and the longer individuals remain in these jobs, the lower chances they have to move upward due to a state dependence (Kiersztyn, 2013). Lack of the necessary knowledge and skills to perform more complex tasks and more demanding jobs may also contribute to the problem of widespread overeducation.

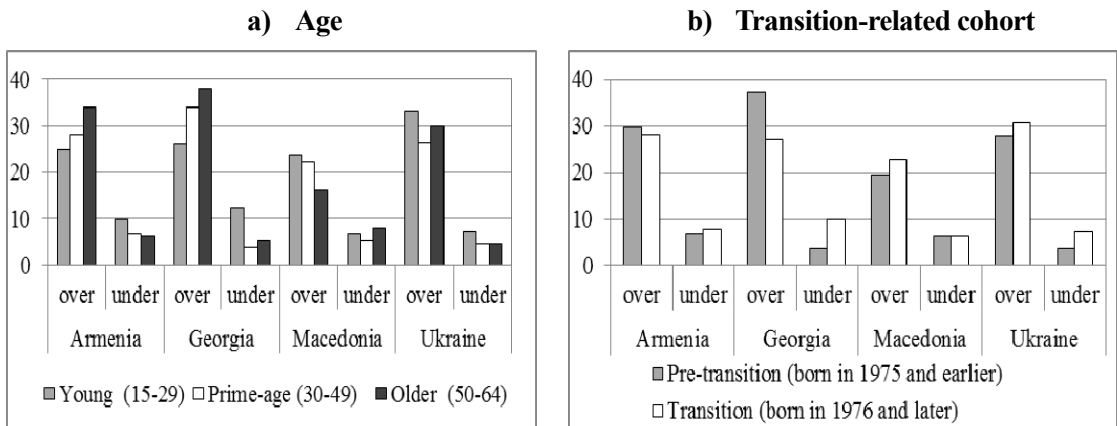
#### **4.2. Education-job mismatch in Armenia, Georgia, Macedonia and Ukraine by age and transition-related cohorts**

This section examines briefly whether the incidence of overeducation and undereducation in Armenia, Georgia, Macedonia and Ukraine (estimated with the self-assessment approach) systematically differs between workers from different age groups and transition-related generations.<sup>10</sup> The existing labor market theories and empirical evidence in developed countries (Leuven and Oosterbeek, 2011; Quintini, 2014) suggest that older workers are less likely to be overeducated because they have more experience, better relevant skill sets and more opportunities for upward mobility. On the other hand, the study of overeducation in post-Soviet Estonia (Lamo and Messina, 2010) reveals that the incidence of overeducation and the wage penalty associated with it increases with age, partly due to the obsolescence of diplomas and qualifications obtained under central planning.

As Figure 2 a) shows, the extent of overeducation varies considerably by age group but the pattern is not uniform: overeducation is relatively more prevalent among younger workers in Macedonia and Ukraine; the completely opposite pattern is observed in Armenia and Georgia, where the incidence of overeducation increases with age and at least each third worker aged 50+ years is overeducated. In Ukraine, the incidence of overeducation among older workers (29.8 percent) is above the average for the entire urban employed population and is higher than among prime-age workers (30-49 years). Therefore, the observed relationship between age and the incidence of overeducation in Armenia and Georgia and partly in Ukraine is closer to that found in Estonia, as one could expect, than in developed market economies.

In order to examine this relationship further, we also look at the difference between two transition-related cohorts. We followed EBRD (2013) and defined cohorts on the basis of respondents' year of birth so that the older cohort (born in 1975 or earlier) – so-called pre-transition cohort – would have reached working age by 1991 when the Soviet Union was dissolved. Analysis of the incidence of overeducation by two transition-related cohorts shows that the patterns are roughly the same as for the age groups: workers from the pre-transition cohort have relatively higher chances of holding jobs that require lower levels of education in Georgia and Armenia, whereas in Ukraine and Macedonia they are in a relative advantage compared to younger workers from the transition cohort (Figure 2 b).

**Figure 2. Incidence of over- and undereducation in non-EU transition economies by age and transition-related cohort (% of total employment)**



Source: Author's calculations based on STEP Skills Measurement Surveys (2012 in Ukraine; 2013 in Armenia, Georgia) targeted at urban residents only.

Notes: Self-assessment approach is used for the definition of education-job mismatch.

At the same time, in all countries except for Macedonia, younger workers tend to have a higher incidence of undereducation. This might indicate that some employers put low value to formal education credentials of young people because of low educational standards, preferring to test skills directly or to use other information than formal qualifications for selecting the right candidates. Alternatively, it can be explained by credential inflation: employers raised requirements for the minimum level of education as their better-off competitors did, but in the long run they tend to hire workers with the level of education that corresponds to the job content.

## 5. Skills use and education-job mismatch

An emerging trend in the literature argues that cognitive and non-cognitive skills affect a wide range of labor market and behavioral outcomes, including educational achievement, wages, work experience, occupational choice, participation in illegal activities, health, etc. (Heckman et al. 2006; Kautz et al. 2014). But only a few studies examined the role of cognitive and non-cognitive skills in education-job mismatch so far. Sohn (2010) found that US workers with higher non-cognitive skills are more likely to be undereducated, and that cognitive and non-cognitive skills seem to be substitutable for education in the case of undereducation. Quintini (2014) found that in most OECD countries covered by the PIAAC survey, undereducated individuals have, on average, higher scores in literacy and numeracy proficiency

than their well-matched counterparts, while overeducated workers have lower scores. Furthermore, overeducated workers are found to use numeracy, writing, reading, ICT and problem-solving skills less intensely than well-matched peers with the same level of proficiency.

This section focuses on the analysis of differences in cognitive and non-cognitive skills between over- and undereducated and well-matched workers in Armenia, Georgia, Macedonia and Ukraine without control for socio-demographic and job characteristics. It is expected that when actual skills do matter, individuals with a better bundle of skills in a given education category are more likely to get jobs requiring higher or same formal qualifications and therefore to be undereducated or well-matched. At the same time, workers that lack key skills are more likely to get jobs that require lower formal qualifications, despite having the same degrees and diplomas as the former group (Quntini, 2014).

Analysis of the mean reading proficiency scores in Armenia, Georgia and Ukraine partially confirms this expectation: the average reading proficiency among undereducated workers is generally higher than that among well-matched workers with the same formal education, while overeducated individuals have lower average scores than their well-matched and undereducated peers (Table 4). However, the differences in proficiency scores are fairly small, with only two cases of statistically significant differences in Georgia.

Besides, this pattern does not always hold true when we distinguish between those born in 1975 and earlier (pre-transition cohort) and their younger counterparts (transition cohort). Overall, in nearly all education groups and countries the mean score falls into the interval 226 to 275 corresponding to the literacy level 2 out of five levels. Hence, to the extent that adults' reading proficiency can be used as a proxy for a more comprehensive set of competencies and skills, we find only partial support for the argument that overeducation or undereducation is strongly associated with the differences in key skills and competencies within education levels. This finding might also suggest that the direct assessment of reading proficiency is an imperfect proxy for worker's skills, and that overeducated (undereducated) workers can have relatively lower (higher) capacities in other important dimensions than formal education and literacy.

To test differences in the use of job-relevant cognitive and technical skills as well as in non-cognitive (socio-emotional) skills defined in Tables A.2 and A.3, we estimated the mean scores for the three types of workers by their (mis)match status and then calculated the differences between overeducated/ undereducated and well-matched.<sup>11</sup> In all four countries, important cognitive and technical skills such as reading, writing, numeracy, computer and interpersonal skills, learning and thinking, making presentations and supervising others appear to be used at work less intensely by overeducated individuals compared to those who are well-matched to their jobs. At the same time, both overeducated and undereducated workers tend to have more physically demanding tasks at work than their well-matched peers.

**Table 4. Mean reading proficiency scores by the highest educational attainment, education-job mismatch and transition-related cohort**

Education	Mismatch status	Armenia			Georgia			Ukraine		
		Total	Born in 1975 and earlier	Born in 1976 and later	Total	Born in 1975 and earlier	Born in 1976 and later	Total	Born in 1975 and earlier	Born in 1976 and later
Upper secondary and less (ISCED 0-3)	Overeducated	244.0	240.6	250.2	225.7	220.2	232.2	263.0	258.4	271.1
	Undereducated	251.6	257.3	246.1	<b>254.2</b>	230.9	262.5	270.5	273.6	267.9
	Well-matched	247.8	246.5	249.2	234.9	227.5	240.8	265.6	262.5	271.0
Post-secondary or tertiary short-cycle (ISCED 4/5B)	Overeducated	252.4	250.4	257.2	233.3	234.6	227.0	261.8	260.9	262.9
	Undereducated	266.7	269.3	261.1	236.5	239.0	230.0	279.2	277.7	279.7
	Well-matched	252.3	251.2	255.0	235.0	232.2	256.3	262.1	270.5	248.4
Tertiary long-cycle (ISCED 5A/6)	Overeducated	262.7	268.5	258.5	254.4	253.4	256.0	278.3	281.2	275.9
	Well-matched	265.0	261.4	269.5	259.4	258.1	261.3	285.2	290.5	279.1
Total	Overeducated	255.2	254.4	256.3	<b>243.6</b>	242.3	246.4	269.0	267.5	270.6
	Undereducated	254.1	259.6	247.6	250.5	234.3	259.6	272.9	274.4	271.9
	Well-matched	258.5	255.7	262.2	251.8	249.6	254.7	272.5	274.2	269.9

Source: Author's calculations based on STEP Skills Measurement Surveys (2012 in Ukraine; 2013 in Armenia, Georgia) targeted at urban residents only. Direct reading assessment has not been conducted in Macedonia.

Notes: Self-assessment approach is used for the definition of education-job mismatch. Reading proficiency score is based on the direct reading assessment and ranges from 0 to 500. The score from 226 to 275 corresponds to the Reading proficiency level 2 (out of 5 levels). Statistically significant difference in the mean proficiency score with well-matched workers at 5 % level is boldface.

However, the observed differences do not necessarily mean that overeducated workers lack the basic skills expected for their qualification level and subsequently select jobs that require lower formal qualifications. It may be the case that workers had the necessary skills corresponding to their level of education, but they were not able to win in a strong competition for scarce high-skill jobs and were pushed to lower-level and less demanding jobs in which these skills atrophied and became obsolete over time.

Another interesting finding that is worth noting is that undereducated workers in Macedonia and Ukraine report about relatively higher frequency of learning new things at work and undertaking tasks that require more thinking than their well-matched peers. This result is in line with the idea that undereducated workers might be willing to challenge themselves and accept more demanding jobs (Sohn, 2010).

The differences in the average scores of non-cognitive skills between overeducated/undereducated and well-matched workers are fairly small, often insignificant and not systematic across countries. For instance, in Armenia overeducated workers on average have significantly lower scores in conscientiousness, openness, emotional stability, and grit than well-matched workers. Georgian overeducated workers significantly differ from their well-matched counterparts in terms of extraversion, openness, agreeableness, and decision making. In Macedonia, the difference is statistically different and positive only for grit (in favor of well-matched as opposed to overeducated) and for extraversion and openness (in favor of undereducated as opposed to well-matched). Finally, Ukrainian overeducated workers appear to have significantly higher scores in agreeableness whereas undereducated individuals tend to be relatively more emotionally stable than their well-matched peers.

Hence, overeducated individuals seem to have a relatively worse set of skills and abilities than well-matched workers while undereducated individuals often perform better or at the same level as their peers who are adequate for their jobs in terms of formal education. But the differences are not always significant. The next section explores whether differences in the observed abilities and skills have a significant impact on the probability of being overeducated or undereducated when other important factors are taken into account.

## **6. Determinants of overeducation and undereducation in Armenia, Georgia, Macedonia and Ukraine**

Following the common approach in the literature (e.g. Kiker et al., 1997; Sloane et al., 1996 and 1999), the determinants of over- and undereducation are estimated by using a multinomial logit model.<sup>12</sup> The base outcome in the model is being well-matched in terms of formal education, while the other two outcomes represent, respectively, over- and undereducation. The literature reports that young, female, unmarried workers, racial/ethnic minorities, individuals with low quantitative skills are more likely to be overeducated (Leuven and Oosterbeek, 2011). Sloane et al. (1999) and Kiker et al. (1997) show that human capital characteristics (such as tenure, time to proficiency, experience) and job characteristics (including part-time vs. full-time work, previous employment experience, location, firm size, sector of activity, occupation, and public vs. private ownership) might also be important determinants of overeducation and undereducation. Based on the findings from empirical studies in developed countries and taking into account available



data, we model the likelihood of being overeducated/ undereducated as a function of:

- personal characteristics (age group, gender, marital status, resident of the capital city vs. other city/ town; also tested: age and age squared, transition-related cohort based on the year of birth, chronic disease, attitude towards risk);
- job-related human capital (required experience in other related work, tenure, time to proficiency, i.e. time needed to do work well; also tested: tenure squared);
- employment characteristics (employment status, establishment size, economic sector);
- skills and ability-related indicators (number of languages spoken by respondent<sup>13</sup>, computer use at work, and non-cognitive skills; also tested: field of studies in Armenia, Georgia and Macedonia, and reading proficiency score in Armenia, Georgia and Ukraine).

According to the studies on the impact of non-cognitive skills on labor market outcomes and job performance (Kautz et al., 2014), conscientiousness has the largest predictive power across a variety of outcomes. Moreover, the importance of conscientiousness does not change a lot with job complexity, suggesting that this personality trait is an important determinant of successful results for a wide spectrum of jobs. Duckworth et al. (2007) found that grittier individuals made fewer career changes than their less gritty counterparts of the same age and that grit may be as essential as intellectual talent to high accomplishment in every field. Following this line of thought, we include an individual's scores in conscientiousness and grit to the vector of explanatory variables to test whether the differences in these personality traits contribute to variance in the probability of being overeducated/ undereducated. We expect that grittier and more conscientious workers have a more successful education outcome and perform better at jobs. Hence, they are less likely to be overeducated as their actual skills – acquired during formal education and on the job – are expected to match better to the skills needed for a job corresponding to their education level.

Besides, to test the validity of social stratification and intergenerational mobility perspectives in explaining the likelihood of overeducation (see Table A.1 in Annex), we include two variables for the family background. The first variable is the maximum educational attainment of parents. Tertiary education no longer acts as a social elevator in post-socialist economies due to a widespread credential inflation and limited social mobility, but young people and their parents value university diplomas despite their decreasing signaling power. Hence, it is expected that college and university graduates with parents having lower educational attainment are more likely to be overeducated than their peers with highly educated parents. Another argument in favor of this expectation is that highly educated parents can provide their children with better information regarding the choice of educational institution, field of studies, job opportunities, etc. and with more relevant networks necessary for a favorable job match (Verhaest and Omey, 2010). The second variable is the self-reported socio-economic status of respondent's family when she was

15 years old, which is expected to be negatively correlated with the likelihood of overeducation.

The estimates of the multinomial logit model in four countries separately and in the pooled sample are shown in Table 5. OE/WM is the multinomial log-odds of being overeducated relative to well-matched, and UE/WM is the multinomial log-odds of being undereducated relative to well-matched. The estimated coefficients are robust to specification changes, when we run wider models with explanatory variables not available in all four countries, use transition-related generation or the direct measure of age instead of the age group dummies.

The patterns regarding the relationship between age group (or transition-related cohort) and education-job mismatch observed in Section 4.2 are not fully confirmed by the regression analysis. After controlling for observed characteristics, particularly skills and experience requirements, age remains a significant determinant of mismatch only in Armenia and Georgia: the probability of being overeducated relative to well-matched increases with age in Armenia, and the probability of being undereducated relative to well-matched decreases with age in Georgia.

Regression results partially support our bivariate findings in the previous section that workers with better skills tend to get adequately matched jobs, while their less talented counterparts are more likely to get jobs for which they are overqualified in terms of formal education. The only skill-related variable which has a significant effect on education-job mismatch in all four countries is the intensity of computer use at work: after controlling for economic activity and other observed characteristics, using computer at work more intensely reduces the probability of overeducation in Armenia, Georgia and Ukraine and raises the probability of undereducation in Macedonia. This evidence is in line with the argument of Autor et al. (2003) and their followers that the adoption of computer-based technologies altered job skill demands favoring workers who hold a comparative advantage in computer skills. Number of languages spoken used as a proxy for innate ability has a significant effect on the likelihood of overeducation in Georgia and Macedonia. But the positive sign in Macedonia is quite unexpected implying that individuals able to speak more languages well enough to work in a job that requires those languages tend to be overeducated more often than less able workers. One of the possible explanations for this result is that fluency in Macedonian together with some of the officially recognized minority languages (Albanian, Turkish, Serbian, Romani, and Bosnian) may be a sign of belonging to minority groups which are at a disadvantage in the Macedonian labor market, whereas fluency in English or some other foreign language does not bring expected benefits in terms of a more favorable education-job match due to a limited demand from foreign companies and extremely high competition for these jobs. Scores in conscientiousness and grit appear to be insignificant in most cases or have unexpected signs, e.g. the positive sign of the coefficient on conscientiousness in Ukraine and the total sample of countries with respect to the probability of overeducation and the negative sign of the coefficient on grit in Macedonia with respect to the probability of undereducation.

**Table 5. Determinants of education-job mismatch: multinomial logit estimates**

Variable	Armenia		Georgia		Macedonia		Ukraine		Total sample	
	OE/W/M	UE/W/M	OE/W/M	UE/W/M	OE/W/M	UE/W/M	OE/W/M	UE/W/M	OE/W/M	UE/W/M
<b>Personal characteristics and family background</b>										
Prime-age (30-49 years)	0.613* (0.340)	-0.049 (0.427)	0.134 (0.323)	-1.350*** (0.392)	0.042 (0.248)	-0.364 (0.394)	-0.333 (0.297)	0.301 (0.584)	-0.285 (0.269)	0.066 (0.493)
Older (50-64 years)	0.855** (0.383)	-0.522 (0.671)	0.524 (0.380)	-1.669** (0.688)	-0.013 (0.330)	-0.309 (0.483)	0.317 (0.372)	0.401 (0.688)	0.329 (0.331)	0.187 (0.619)
Middle-educated parents (ISCED 2-3)	1.009* (0.538)	1.056 (0.825)	-0.846 (0.688)	-1.433 (1.207)	-0.007 (0.179)	-0.966*** (0.259)	-0.222 (0.383)	0.278 (1.200)	-0.139 (0.327)	0.055 (0.660)
Highly educated parents (ISCED 4-6)	0.969* (0.558)	1.029 (0.914)	-0.480 (0.681)	-1.342 (1.213)	-0.271 (0.251)	-1.370*** (0.341)	0.397 (0.437)	0.587 (1.224)	0.408 (0.377)	0.366 (0.718)
Middle economic status at age 15	-0.511 (0.311)	0.066 (0.508)	-0.001 (0.454)	2.645** (1.116)	-0.024 (0.286)	-0.418 (0.377)	-0.050 (0.242)	0.268 (0.551)	-0.044 (0.226)	0.296 (0.495)
High economic status at age 15	-0.424 (0.328)	-0.222 (0.563)	-0.244 (0.457)	1.673 (1.117)	0.130 (0.297)	-0.683** (0.396)	-0.590* (0.329)	0.031 (0.758)	-0.489* (0.284)	0.007 (0.622)
<b>Skills</b>										
Number of languages spoken	-0.123 (0.110)	-0.086 (0.202)	-0.302** (0.145)	-0.509* (0.290)	0.171*** (0.056)	0.049 (0.099)	0.198 (0.180)	-0.570 (0.439)	0.136 (0.129)	-0.365 (0.270)
Intensity of computer use at work (score)	-0.247*** (0.082)	-0.249** (0.118)	-0.308*** (0.100)	-0.102 (0.139)	-0.094 (0.062)	0.152* (0.090)	-0.322*** (0.092)	-0.175 (0.157)	-0.310*** (0.080)	-0.169 (0.125)
Conscientiousness (score)	-0.296 (0.233)	0.168 (0.312)	0.038 (0.217)	0.356 (0.426)	-0.036 (0.164)	0.276 (0.262)	0.389* (0.205)	0.249 (0.562)	0.360** (0.181)	0.287 (0.433)
Gift (score)	-0.262 (0.168)	-0.044 (0.249)	0.157 (0.191)	0.230 (0.371)	-0.218 (0.133)	-0.511*** (0.208)	-0.039 (0.169)	0.230 (0.408)	-0.031 (0.150)	0.221 (0.337)
<b>Job-related human capital</b>										
Tenure (years)	-0.038*** (0.014)	0.024 (0.021)	-0.019 (0.015)	0.008 (0.024)	-0.030*** (0.010)	-0.000 (0.014)	-0.052*** (0.016)	-0.042 (0.030)	-0.050*** (0.014)	-0.030 (0.023)
Experience of at least 1 year needed	-0.879*** (0.199)	-0.532 (0.367)	-0.830*** (0.238)	-0.194 (0.565)	-0.475** (0.197)	0.803*** (0.307)	-0.751*** (0.273)	0.251 (0.600)	-0.747*** (0.239)	0.197 (0.491)
Time to proficiency (1-6 months)	-0.205 (0.240)	0.561 (0.388)	-0.225 (0.275)	-0.390 (0.506)	-0.605*** (0.208)	0.345 (0.356)	-0.216 (0.250)	1.420* (0.794)	-0.228 (0.218)	0.988** (0.481)
Time to proficiency (over 6 months)	-0.437 (0.268)	-0.050 (0.434)	-0.425 (0.282)	-0.074 (0.582)	-0.538*** (0.191)	-0.072 (0.407)	-0.287 (0.318)	1.678** (0.812)	-0.304 (0.273)	1.219** (0.538)
N	912	821	1711	841	4285					

Source: Author's calculations based on STEP Skills Measurement Surveys (2012 in Ukraine; 2013 in Armenia, Georgia and Macedonia) targeted at urban residents only.

Notes: Self-assessment approach is used for the definition of education-job mismatch. OE/W/M is the multinomial log-odds of being overeducated relative to well-matched, and UE/W/M is the multinomial log-odds of being undereducated relative to well-matched. Regressions also include the intercept, gender dummy, marital status (2 dummies), capital city dummy, dummy for wage and salaried workers, firm size (2 dummies), economic sector of employment (4 dummies), 3 country dummies (in the last 2 columns). The reference categories for the reported dummy variables are: Young workers (15-29 years), Low-educated parents (ISCED 0-1), Low economic status at age 15, Experience of less than 1 year needed, Time to proficiency (up to 1 month).

Sampling weights and clusters (primary sample units) are applied with the use of svy: mlogit command in Stata. Linearized standard errors are in parenthesis. \* significant at the 10% level; \*\* 5% level; \*\*\* 1% level.

Meanwhile, job-related human capital measured by tenure, necessary experience at related work and time to proficiency, is an important determinant of the likelihood of overeducation in all four countries (Table 5). With the exception of Georgia, more years of tenure decrease the log-odds of being overeducated relative to adequately matched.<sup>14</sup> Besides, workers holding relatively more demanding jobs in terms of the necessary experience at related work and time to become fully proficient in these jobs are less likely to be overeducated (in all countries) and more likely to be undereducated (in Macedonia and Ukraine). These results can be interpreted in a way that job-education mismatch may result from a trade-off between formal education credentials and the other forms of human capital: deficit in formal education among undereducated can be remedied by relevant work experience and on-the-job training, while higher than required education among the overeducated can give them additional skills compensating for the lack of specific training (Kiker et al., 1997; Sloane et al., 1999). Thus, the hypothesis about the substitutability between different components of human capital, including formal education, relevant work experience and on the-job-training observed in developed countries holds true in non-EU transition economies as well. There is also some evidence in favor of the Thurow's (1975) job competition theory of overeducation as employers in poorer countries are not willing to invest a lot in their workforce and therefore may be interested in hiring overeducated workers for which less on-the-job training is required than in the case of adequately matched workers.

Contrary to our expectations consistent with social stratification and intergenerational mobility perspectives, there is no empirical evidence for a systematic impact of family background variables on the likelihood of overeducation or undereducation.<sup>15</sup> Relatively higher educational attainment of parents has marginally significant positive impact on the probability of overeducation in Armenia and significant negative impact on the probability of undereducation in Macedonia. Workers who lived in the households with a high socioeconomic status at the age of 15 in Ukraine and in the total sample are less likely to be overeducated than workers originating from the households with low socioeconomic status. In Georgia there is a statistically significant difference between workers originating from the households with middle and low socioeconomic status with respect to the probability of undereducation relative to adequate match.

For the sake of brevity, Table 5 does not report the estimates for the intercept, gender, marital status, residence in the capital city, and employment characteristics, which are also included in the model. Gender and marital status is a marginally significant determinant of the probability of overeducation only in Macedonia, with a higher likelihood of overeducation among women and divorced or widowed individuals compared to men and single ones. Higher likelihood of overeducation among Macedonian women may reflect the need of extra schooling to compensate for the lack of experience and specific skills due to long child- and household-related career breaks. Besides, many highly educated women may choose jobs which require lower level of education if these jobs provide better opportunities for reconciling work and family life. In

Ukraine and in the total sample of four countries, residents of the capital city are in a relative advantage as they are less likely to be mismatched (both overeducated and undereducated) than their counterparts living in the other cities and towns where labor markets are smaller and less efficient.

Employment characteristics also have a different impact, depending on the country. For instance, in Armenia and Macedonia workers of larger companies (20 employees and above) are significantly less likely to be overqualified for their jobs than employees of micro firms. This suggests that larger firms utilize skills of their employees better than smaller ones for two reasons. First, larger firms are more likely to use effective human-resource policies to screen candidates at hiring and they have more opportunities to move workers to more suitable jobs within the internal labor market (Quintini, 2014). Second, such firms tend to offer jobs with higher skills content (e.g. white-collar positions in education, health care, public administration, culture and art, industry, construction, and the financial sector), and therefore they are more interested in hiring the most skilled workers. Economic sector is a significant factor only in Georgia and Macedonia: as expected, individuals working in trade, accommodation and food service activities, transport and communication, individual services, industry and construction have significantly higher probability of being overeducated relative to well-matched compared to workers in the reference sector of public services (education, health care and public administration). Georgian workers employed in trade, accommodation and food service activities are also more likely to be undereducated. Finally, neither of employment characteristics is a significant determinant of education-job mismatch in Ukraine.

## **7. Conclusions**

The main goal of this paper was to explore vertical education-job mismatch in Armenia, Georgia, Macedonia and Ukraine and compare its incidence and characteristics to those observed in more advanced economies. To do so, we analyzed data from the recent adult skill surveys, using several measures of required education and, consequently, of education-job mismatch.

The labor markets in three post-Soviet countries are characterized by highly imperfect job matching and significant skill underutilization, as indicated by the fact that over 33 percent of the urban workforce in Georgia and about 30 percent in Armenia and Ukraine are in jobs for which they are overeducated, and from 5 to 7 percent are classified as undereducated (according to the self-assessment approach). Overeducation in Macedonia affects relatively less urban workers (20.7 percent) than in post-Soviet countries but this is partly because of a trade-off between work at lower-level jobs (overeducation) and no work at all (unemployment).

Four non-EU transition economies have roughly the same incidence of overeducation as in many developed countries but lower incidence of undereducation and overall education-job

mismatch. Hence, we cannot conclude that education-job mismatch is a more salient feature in non-EU transition economies than in the countries with a longer history of the market economy.

However, unlike the developed countries where discrepancy between actual educational attainment and that required for the job largely represents a temporary mismatch, mainly at the beginning of working life, it seems to be a more permanent phenomenon in Armenia, Georgia, Macedonia and Ukraine, affecting both young and older workers. On the one hand, rapid deindustrialization after the collapse of the socialist system together with expansion of subsistence farming, retail trade, personal services and other less-knowledge intensive services caused an increase in the relative demand for low-skilled workers. These jobs constrained the ability of workers to fully utilize the skills and knowledge they acquired during formal education. On the other hand, there are large cohorts of older workers with formal education credentials acquired under the previous economic system who often lack basic skills relevant for the new economic environment and therefore are not able to find an adequate employment. At the same time, young people are at high risk of overeducation and undereducation because their education no longer carries the same signal to employers about abilities and skills as before, and because they tend to get diplomas and degrees without taking into account employment opportunities. Our bivariate analysis reveals that older workers (aged 50-64 years) have higher incidence of overeducation in Georgia and Armenia and lower incidence of overeducation in Ukraine and Macedonia than young workers (15-29 years), and that young workers in Armenia, Georgia and Ukraine have higher incidence of undereducation than older individuals. But after controlling for other observed characteristics, age has a significant effect on the probability of overeducation relative to well-matched only in Armenia and on the probability of undereducation relative to well-matched only in Georgia.

Answering our third research question about the differences between overeducated, undereducated and well-matched workers with respect to job-relevant and non-cognitive skills, we find that overeducated individuals tend to use basic skills at work (reading, writing, numeracy, computer and interpersonal skills, learning and thinking, making presentations and supervising others) less intensely than their well-matched colleagues. At the same time, both overeducated and undereducated workers tend to have more physically demanding tasks at work than their well-matched peers. The differences in the average scores of non-cognitive skills between overeducated/ undereducated and well-matched workers are often insignificant and not systematic across countries. Moreover, the effects of tested skill variables on the probability of overeducation and undereducation are often insignificant when other important variables such as economic sector, required experience, time to proficiency and tenure are taken into account. The significant negative effect of the intensity of computer use at work on the probability of overeducation in three countries and in the total sample implies that workers with better computer skills may be less likely to be overeducated in the modern environment. From this finding

follows an important policy implication that teaching computer skills (along with other up-to-date technical and soft skills) to adults with outdated diplomas and qualifications can be one of the most important measures to deal with overeducation in transition economies.

Finally, our multivariate analysis provides support for the substitutability hypothesis between different components of human capital, including formal education, relevant work experience and on-the-job-training as there is a significant relationship between tenure, required experience, time to proficiency and the probability of overeducation found in all countries. This finding together with the previous ones indicates that workers who are classified as overeducated in terms of formal education tend to possess lower human capital measured by innate abilities, skills, relevant work experience, etc. than well-matched workers. And this is true not only for young people who start their careers but also for many older workers who were displaced from their jobs because of economic restructuring and job reallocation triggered by transition to a market economy and global trends.

Qualification and skill mismatches are likely to affect more and more workers regardless of their age and formal educational credentials, as long as high levels of formal education do not translate into high levels of up-to-date knowledge and practical skills, and local firms do not adjust their labor demand to make more effective use of the skills of highly educated workers. Given this, policymakers in Armenia, Georgia, Macedonia and Ukraine should be concerned not so much with increasing or maintaining quantitative indicators of formal education, as with enhancing the quality of existing human capital and allocating it efficiently.

## Notes

- <sup>1</sup> This paper is a revised and shorter version of Kupets (2015).
- <sup>2</sup> These are: Bartlett (2013) in EU Neighbourhood Policy Countries, Kiersztyn (2013) in Poland, Lamo and Messina (2010) in Estonia, Morgado et al. (2014) in 30 European countries, including 10 transition countries which joined the EU in 2004 and 2007, Mojsoska-Blazevski and Ristovska (2012) in Macedonia, Kucel et al. (2011) in six Central and Eastern European countries, and Galasi (2008) in 25 European countries, including six transition countries.
- <sup>3</sup> Main theories which offer explanations for the existence of education-job mismatch from the economic viewpoint and the social mobility perspectives are summarized in Table A.1 in Annex.
- <sup>4</sup> Author's calculations based on the annual data on working age population by economic activity, gender and educational attainment downloaded from the statistical database of the Statistical office of the Republic of Macedonia.
- <sup>5</sup> See UNESCO Institute for Statistics dataset (<http://data.uis.unesco.org>), series "Gross enrolment ratio by level of education, both sexes".
- <sup>6</sup> See more about PIAAC at <http://www.oecd.org/site/piaac/publicdataandanalysis.htm> and in

OECD (2013).

- <sup>7</sup> Main approaches to the measurement of required education and vertical mismatch are described in Quintini (2011) and Leuven and Oosterbeek (2011).
- <sup>8</sup> Relatively small samples of workers in STEP and PIAAC surveys make impossible using more disaggregated information about occupation (e.g. at 3 or 4-digit levels).
- <sup>9</sup> Our estimates of the incidence of overeducation in developed countries are somewhat lower than those found in the other studies (see review in Leuven and Oosterbeek, 2011; Quintini, 2011; and Kucel, 2011), probably due to our aggregation of levels of the highest educational attainment into five larger groups for the sake of comparison with post-socialist countries (see Section 3.2).
- <sup>10</sup> For a detailed discussion of the incidence of overeducation and undereducation by many other socio-demographic and job characteristics not presented here for brevity, see Kupets (2015).
- <sup>11</sup> For the sake of brevity, we do not provide any tables or graphs with the estimated scores. They can be provided by the author upon request.
- <sup>12</sup> Sohn (2010) used multinomial probit model not explaining the reason for choosing multinomial probit rather than logit model. Although a multinomial probit model is more flexible in a way that it does not require the assumption of independence of irrelevant alternatives, which is not always empirically justified, we prefer using a multinomial logit model which is more computationally tractable with survey data (using “svy” prefix) than a multinomial probit model. Some of the studies (e.g. Verhaest and Omey, 2010; Lamo and Messina, 2010) use binary probit or logit models to define the determinants of overeducation only, and therefore they omit important information about characteristics of undereducated workers.
- <sup>13</sup> This variables is derived from the question “In which languages do you speak well enough to work in a job that requires that language?” as a sum of positive answers, including the official language of the country and mother tongue.
- <sup>14</sup> Sloane et al. (1996) argue that overeducated workers are expected to minimize tenure in their current jobs and to avoid jobs that require a long time to proficiency in view of potential losses from a bad match. This raises the issue of potential endogeneity as tenure and time to proficiency may depend on the mismatch status of workers. In our sample many overeducated workers have a fairly long tenure at their current jobs: 19 percent of all overeducated workers in Armenia, Georgia and Ukraine and 28 percent in Macedonia have been working at their current jobs for 10 years and more. Therefore, qualified workers are found to be stuck in their current jobs with little chance of moving to more adequate jobs and escaping overeducation as the skills and competences acquired through formal education, if any, became obsolete and irrelevant. In this situation tenure and time to proficiency tend to be less dependent on the mismatch status.
- <sup>15</sup> There is evidence based on the STEP survey in Armenia and Georgia suggesting that parents’ educational attainment and family socioeconomic factors affect educational outcomes and skill



development of their children and that some of the early skills gaps in the childhood translate into current skills gaps (World Bank 2015 a, b).

### List of abbreviations

EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia (according to the World Bank's classification of regions)
ISCED	International Standard Classification of Education – 1997
ISCO	International Standard Classification of Occupations – 2008
NACE	Statistical Classification of Economic Activities in the European Community
OECD	Organisation for Economic Co-operation and Development
PIAAC	Programme for the International Assessment of Adult Competencies (OECD's Survey of Adult Skills)
STEP	Skills toward Employment and Productivity (World Bank's Skills Measurement Program)
UNESCO	The United Nations Organization for Education, Science and Culture

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## Annex

Table A.1. Theoretical explanations for education-job mismatch and overeducation

Theoretical approach/ explanation	Author(s)	Key ideas
<b>Labor market (economic) theories</b>		
Human capital theory	Becker (1964)	The basic human capital model does not allow for the existence of an overeducated workforce. Over-education is seen as a temporary phenomenon that can arise in the short run while firms adjust their production processes in order to fully utilize the individuals' human capital.  Adapted versions of the human capital model add that overschooling may substitute for other components in a person's stock of human capital, such as training, experience, and innate ability.
Matching theory	Pissarides (2000)	Temporary mismatch may occur because the job search and matching is costly for both employees and employers. This mismatch is eventually corrected, as mismatched workers change jobs in order to improve their match and obtain a higher salary.
Signaling/screening theory	Spence (1973)	Workers may overinvest in education because it serves as a signal, particularly if signaling costs are negatively correlated with the individual's unknown productivity.
Job competition theory	Thurow (1975)	Individuals compete for jobs based on their position in the order of trainability, with the more highly qualified seen as more able and therefore requiring less training by the firm.
Career mobility theory	Sicherman and Galor (1990)	A worker with a given innate ability may prefer to start in a job below his ability level if this is compensated by a higher probability to be promoted.
Assignment model	Sattinger (1993)	Productivity is maximized when workers are allocated top-down according to their skills, i.e. the most skilled are assigned to the most complex jobs and the least skilled to the simplest jobs. Overeducation is explained then by the difference in the shares of complex jobs and skilled workers.
Differences in individual preferences	Gottschalk and Hansen (2003)	Workers may voluntarily choose occupations on the basis of their heterogeneous preferences and the education-specific

	Leuven and Oosterbeek (2011)	wages in each occupation. People may also differ in their taste for schooling, some will overinvest more than others. Workers may also differ in the degree to which they value leisure on the job and other characteristics of jobs (e.g. autonomy, flexibility, compatibility with personal or family life).
Signaling of relative position in matching tournaments	Hopkins (2012)	Under flexible wages, the signaling effect of education is stronger and investment is everywhere too high; increased labor market competition leads to lower and more efficient investment. In contrast, when wages are not flexible, low-ability workers tend to invest below the social optimum whereas high-ability workers can overinvest; greater competition leads to even lower investment among low-ability workers and even higher investment of high achievers.
<b>Social stratification and intergenerational mobility perspective</b>		
Relative risk aversion theory Rational action theory	Boudon (1974), Van de Werfhorst and Andersen (2005)	The main goal of children is to avoid downward social class mobility. If certain education credentials decrease in value from one generation to the next (credential inflation), children will need more education than their parents to achieve the same social class.
Hysteresis of habitus	Bourdieu (1984)	Hysteresis of habitus is a structural lag between aspirations and changing opportunities. <i>“Holders of devalued diplomas become, in a sense, accomplices in their own mystification, since, by a typical effect of allodoxia (misapprehension), they bestow a value on their devalued diplomas which is not objectively acknowledged”</i> .
Reproduction hypothesis	Breen (2004)	The social origins of persons play an important role in their both educational and occupational attainments; individuals from lower social classes often may not achieve adequate occupational position despite attaining high levels of education and consequently end up overeducated.

Source: Author’s compilation based on Leuven and Oosterbeek (2011), Quintini (2011), Kucel (2010, 2011) and own literature review.

**Table A.2. Definition of job-relevant skills in STEP Skills Measurement Survey**

<b>Job-relevant skill</b>	<b>Questions in the background questionnaire</b>
Reading at work	Among the things that you normally read at this work, what is the size of the longest document that you read?
Writing at work	Thinking about all the things you normally write (wrote) at work, what is the longest document that you write (wrote)?
Numeracy at work	As a normal part of this work, do you (did you) do any of the following: Measure or estimate sizes, weights, distances; calculate prices or costs; perform any other multiplication or division; use or calculate fractions, decimals or percentages; use more advanced math, such as algebra, geometry, trigonometry, etc. ?
Use of computer at work	As a part of your work do you (did you) use a computer? How often do you (did you) use a computer at work?
Interpersonal skills	As part of this work, do you (did you) have any contact with people other than co-workers, for example with customers, clients, students, or the public? Using any number from 1 to 10, where 1 is little involvement or short routine involvements, and 10 means much of the work involves meeting or interacting for at least 10-15 minutes at a time with a customer, client, student or the public, what number would you use to rate this work?
Thinking	Some tasks are pretty easy and can be done right away or after getting a little help from others. Other tasks require more thinking to figure out how they should be done. As part of this work, how often do you have to undertake tasks that require at least 30 minutes of thinking?
Learning	How often does (did) this work involve learning new things?
Autonomy	How much freedom do you (did you) have to decide how to do your work in your own way, rather than following a fixed procedure or a supervisor's instructions? Use any number from 1 to 10 where 1 is no freedom and 10 is complete freedom.
Repetitiveness	How often does (did) this work involve carrying out short, repetitive tasks?
Physical tasks	Using any number from 1 to 10 where 1 is not at all physically demanding (such as sitting at a desk answering a telephone) and 10 is extremely physically demanding (such as carrying heavy loads, construction worker, etc.), what number would you use to rate how physically demanding your work is?
Making presentations*	As part of this work, do you (did you) have to make formal presentations to clients or colleagues to provide information or persuade them of your point of view?
Supervising others*	As a normal part of this work do you direct and check the work of other workers (supervise)?
Driving a vehicle*	As part of this work, do you drive a car, truck or three-wheeler?



<b>Job-relevant skill</b>	<b>Questions in the background questionnaire</b>
Repairing equipment*	As part of this work, do you (did you) repair/maintain electronic equipment (for example, cell phones, computers, printers, other electronic equipment)?
Operating heavy machinery*	As part of this work, do you (did you) operate or work with any heavy machines or industrial equipment (for example, machines/equipment in factories, construction sites, warehouses, repair shops or machine)?

Source: Author’s compilation from the STEP background questionnaire.

Notes: Skills marked by “\*” are measured by an index having two values: 0 (No) and 1 (Yes). The other skills are measured by an index ranging from 0 (almost no use of a given skill) to 3 (high intensity/complexity of use of a given skill).

**Table A.3. Definition of non-cognitive skills in STEP Skills Measurement Survey**

Non-cognitive skill	Questions in the background questionnaire
Openness to experience	Do you come up with ideas other people haven't thought of before? Are you very interested in learning new things? Do you enjoy beautiful things, like nature, art and music?
Conscientiousness	When doing a task, are you very careful? Do you prefer relaxation more than hard work?*
Extraversion	Do you work very well and quickly? Are you talkative? Do you like to keep your opinions to yourself? Do you prefer to keep quiet when you have an opinion?*
Agreeableness	Are you outgoing and sociable, for example, do you make friends very easily? Do you forgive other people easily? Are you very polite to other people? Are you generous to other people with your time or money?
Emotional Stability (Neuroticism)	Are you relaxed during stressful situations? Do you tend to worry?*
Grit	Do you get nervous easily?*
Hostile Bias	Do you finish whatever you begin? Do you work very hard? For example, do you keep working when others stop to take a break? Do you enjoy working on things that take a very long time (at least several months) to complete?
Decision-making	Do people take advantage of you? Are people mean/not nice to you? Do you think about how the things you do will affect you in the future? Do you think carefully before you make an important decision? Do you ask for help when you don't understand something?

Source: Pierre et al. (2014).

Notes: Response categories range from 1 “almost never” to 4 “almost always”. The aggregation process was based on a simple average across items. Negatively scored items marked by “\*” were recoded with a score of 4 assigned for “almost never” and so on, prior to the aggregation.