

## Qualification Mismatch And Growth In The Eastern European Region

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**Abstract:** The present study aims at exploring the impact of vertical qualification mismatch of higher education graduates on economic growth by using an extended version of the Mankiw, Romer and Weil's model of growth with human capital. The sample includes the eleven new EU member states from Central and Eastern Europe between 2000 and 2016. The paper tries to bring empirical evidence to the mixed theoretical views on the link between mismatch and growth. The outcome implies that an increase of the share of tertiary education graduates in the active population does not lead to a higher growth rate per se. The impact of human capital becomes positive and statistically significant only if the properly matched graduates i.e. those with occupations requiring tertiary education are included in the model instead of the total country's stock of human capita. On the contrary, the impact of overeducated on per capita growth rate is negative. These results are robust to the changes in the method used to measure the extent of mismatch. In the light of that, the results have important practical implications for the education policy in the developed countries given the increasing average educational attainment of the population accompanied by a rising education mismatch.

**Keywords:** vertical qualification mismatch, higher education, economic growth, Eastern Europe.

### 1. INTRODUCTION

The latest studies in the field of labor market draw attention on the rising qualification mismatch. The mismatch is defined as a difference between one's educational degree and the qualification required by his or her job. It is classified as either horizontal or vertical. Eurostat (2009, p. 131) defines horizontal mismatch as employment position which is not in the same field as the educational qualification of the employee. On its side, vertical qualification mismatch is employment below or above the theoretical skill level being acquired (Eurostat, 2009, p. 131). A worker is said to be over/under-qualified if he or she has a higher/lower educational level than needed for the job performed. This study focuses on the vertical qualification mismatch. According to the estimates, about one-third of workers in the developed world experience qualification mismatch (OECD, 2013) as the vertical one prevails. It appears to be rather a persistent than temporary phenomenon (Mavromaras et al., 2013). The primary reasons for that is the continuously increasing participation in education. As a result, the supply of education by degrees outpaced its demand. Another reason is the accelerating exit rates of older workers who usually possess lower education than younger people entering the active population.

The current study [1] aims at quantifying the impact of overeducation of tertiary education graduates on the growth rate of real GDP across the 11 new EU member states from the region of Central and Eastern Europe, henceforth NMS.

The paper is organized as follows. Section 1 discusses the approaches used to measure the

vertical qualification mismatch and outlines some trends across the NMS. Section 2 describes the study's methodology and presents an analysis of the empirical outcome. Section 3 tests the robustness of regression output by adopting a dynamic approach to education mismatch. The last part of the paper gives some concluding remarks.

### 2. APPROACHES USED TO MEASURES VERTICAL QUALIFICATION MISMATCH

This section summarizes the approaches used to measure qualification mismatch and presents some statistical data on overeducation among university graduates. The measurement methods could be classified into two major groups: statistical data assessment and workers' self-assessments. One popular approach of the first type is based on systematic job analysis. It involves a comparison between the educational degrees according to the International Standard Classification of Education (ISCED) and the required degree according to the International Standard Classification of Occupations (ISCO) of Organization of Economic Cooperation and Development. This study is based on this measure of vertical qualification mismatch due to its objectivity and availability of comparable data for a large panel of European countries.

The main drawback of this approach is its implicit assumption that attainment of a certain educational degree guarantees accomplishment of a set of presumed knowledge, skills and competences. But, the latter is dependent on the quality of education in the country as well as the personal characteristics in case of over- and under-achievers at school (Chevalier, 2003). Therefore, some persons might be wrongly identified as overeducated whilst, in

fact, their real qualification just matches the job they hold since they have not acquired the skills that can be the basis of competence development after hiring. It is worth mentioning another important disadvantage of the method. It assumes fixed mapping over a longer period of time between the educational levels and job categories. But, in case of rapid changes in technologies, organizations and the way of doing business such a time-invariant map would not adequately represent the educational requirements for some occupations. As a result, an individual with a given educational degree who takes a lower-level job would continue to be classified as over-educated few years later while, actually, he or she might possess the right education for that job if the nature or the scope of the occupation has changed over the years without that being considered by the static mapping framework. On its side, that might bias the statistics regarding the extent of the qualification mismatch. One way to correct that is to subtract such workers from the mismatched whereas counting them as properly educated. Such an approach is adopted in section 4 below.

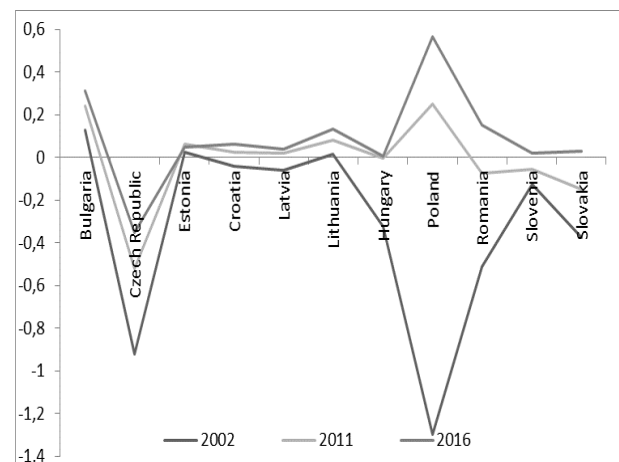
The second method for approximating the extend of qualification mismatch assumes a comparison between one's education and the average educational level of workers in the job the person holds (Groot and van den Brink, 2000; Mendes de Oliveira, Santos and Kiker, 2000; Ramos et al., 2009). People whose level of education exceeds the mean, median or mode by, for example, one standard deviation are considered to be over-educated. This method results in an objective assessment since the proper education-occupation mapping is defined by the market. But, its important disadvantage is related to the quality of country's educational system. If school does not provide relevant skills and knowledge there would be a downward bias in the evaluation of overeducation. The reason is that some people with higher educational degrees might take jobs located down the occupational ladder instead of jobs corresponding to their degree due to lack of presumed theoretical knowledge or skills. That might bias upward the mean educational level for some occupations. As a results, some of over-educated would misleadingly be counted as properly educated. An example is a woman with a bachelor degree who works as an office assistant. If a prevailing number of employees having completed tertiary education take such jobs, that woman would not be counted as over-educated while, in fact, her job does not require a university degree.

As it was mentioned above, the second group of methods is based on subjective self-assessments. Mismatch is recorded in case of a difference between the educational degree (or skills) required for the specific job taken by an employee and his or her actual educational level (or skills) (Frei and Sousa-Poza, 2005). Alternatively, one might report his or her opinion regarding the minimum level of education necessary to perform his or her job.

The study utilizes the first approach for measuring the degree of vertical qualification mismatch. Taking into account the mapping matrix being proposed by the International Standard Classification of Occupations (ISCO-08), the over-educated comprise the university graduates taking any job position different from Managers, Professionals, Technicians and Associate professionals. Utilizing that definition, figure 1 shows the rate of overeducation among the active population having completed university education across the eleven new EU member states. It compares the incidence of mismatch in 2000, 2011, and 2016.

Figure 1: Supply and demand of tertiary education across the new member countries\*

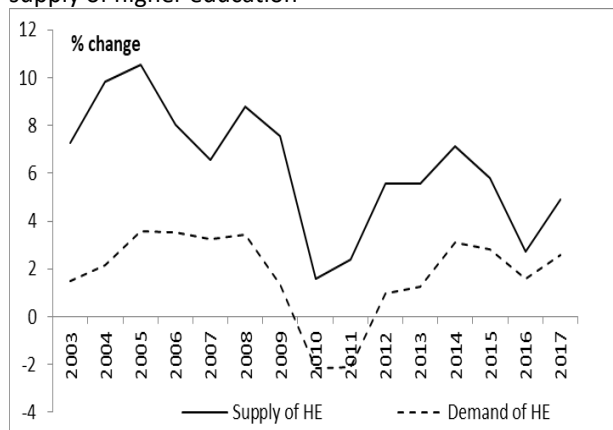
(a) Supply minus demand of higher education



\*Difference between the number of tertiary education graduates representing the supply of higher education and the number of properly matched tertiary education graduates representing the demand of higher education. The values are expressed in thousands.

Source: Eurostat, author's calculations

(b) Percentage change in the demand and supply of higher education\*



\*Average values for the new member states are presented.

Source: Eurostat, author's calculations

The first graph illustrates the difference between the supply of university graduates in the active population (in thousands) and the demand calculated as the number of employees taking jobs requiring at least a bachelor degree (in thousands). It indicates an existence of surplus of workers with higher education. That is clearly expressed since the year 2011 onwards. In 2016, all countries but the Czech Republic report a larger supply than the demand of university graduates. However, the second picture showing the rate of change of the respective supply and demand implies that recently (2016-17) the supply of tertiary education approaches its demand thus shrinking the recorded surplus. In view of these figures, the next section draws attention on the impact of overeducation on GDP per capita growth rate.

### 3. Impact of vertical mismatch on the rate of economic growth ACROSS THE NEW EU MEMBER STATES: METHODOLOGY AND STUDY RESULTS

The model of economic growth with human capital developed by Mankiw, Romer and Weil (1992),

$$d \log y_t = a_0 + a_1 \log(y_0) + a_2(\log(s_k) - \log(n + g + \delta)) + a_3 \log(HKSTOCK) + a_4 \log(VQM) + \varepsilon$$

(1a)

$$d \log y_t = a_0 + a_1 \log(y_0) + a_2(\log(s_k) - \log(n + g + \delta)) + a_3 \log(HKSTOCK) + a_4 \log(VQMIS) + \varepsilon$$

(1b).

The dependent variable ( $d \log y_t$ ) is the first difference of real Gross Domestic Product (GDP) per

henceforth MRW model, is a widely used instrument for exploring economic growth and its underlining determinants. An overview of its modifications could be found in Neycheva (2019). This study also utilizes the MRW model but, in order to examine the effect of overeducation of tertiary education graduates on long-run growth rate the model has been extended by differentiating between the stock of human capital and the vertically (mis)matched employees (see, eq. 1 below).

In this section the rate of vertical qualification mismatch is measured by applying a static approach. It assumes a fixed mapping between one's educational degree completed according to ISCED (International Standard Classification of Education) framework and occupations based on International Standard Classification of Occupations (ISCO). Following the descriptive analysis of mismatch of higher education graduates given above, the next section introduces a revised dynamic approached of estimating the rate of (mis)match. The annual data are supplied by the Labor Force Survey of the European Statistical Office (EUROSTAT). The survey presents the distribution of the graduates by a range of occupations following ISCO-08 (OECD, 2013). The investigated time period is 2000-2016. The sample comprises Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia, and Croatia. The next lines present a mathematical description of the MRW model, the regression equations and the variables as well as the econometric output.

The regression models are presented by eq. (1). The total economy's stock of human capital is denoted by  $HKSTOCK$ . The rate of vertical qualification match ( $VQM$ ) is included in equation (1a) while the rate of vertical qualification mismatch ( $VQMIS$ ) is in equation (1b) below:

unit of active population calculated in logs. The output per unit at the beginning of each time period

is presented by  $\log y_0$ . The rate of investments in physical capital ( $s_k$ ) is approximated by the fixed capital formation in both public and private institutions expressed as a share of GDP.

The rate of qualification mismatch ( $\log VQMIS$ ) comprises the active population with tertiary education (ISCED 5-8) holding jobs different from Managers, Professionals, Technicians and Associate professionals expressed as percentage of all tertiary education graduates in the labor force. It is also calculated in logs. Alternatively, the share of matched higher education graduates expressed in logs is denoted by  $\log VQM$  in (1a). The overall stock of human capital ( $HKSTOCK$ ) comprises the active population (15-74 years of age) having completed at least upper secondary education (ISCED 3-8). The construction of the variables in this way solves the problem of potential correlation between  $HKSTOCK$  on the one side and the variables  $VQMIS$  or  $VQM$  on the other side which would adversely affect the econometric outcome. Thus, the correlation coefficient turns to be small (0.15) and insignificant.

The parameter  $n$  equals the percentage change of the active population between 15 and 74 years of age. In the relevant studies the rate of capital depreciation ( $\delta$ ) is usually set at 3% annually while  $g$  is supposed to equal 2% per year. Therefore, for the sum ( $g+\delta$ ) the annual value of 5% is used most often. In order to get estimates as close as possible to the real-life data, here  $g$  is approximated by annual productivity growth across the countries under investigation. The average value over the examined period for the sample as a whole is 3% per

year. Therefore, with an annual depreciation rate of 3%, the value of ( $g+\delta$ ) is fixed to 6% since it seems more realistic.

In the regression models the variables  $d\log y_t$ ,  $\log y_0$ ,  $s_k$ ,  $VQM$ ,  $VQMIS$  and  $n+g+\delta$  are introduced as five-year averages over the examined period i.e. 2000-2004, 2001-2006, and so on. That helps for the the cyclical fluctuations in the economic activity to be flattened and the tendencies in the growth path to be examined.

With regard to that, it should be pointed out that as it is usual for panel data the econometric output sheds light on the link between education (mis)match and real GDP per capita growth for the sample as a whole. It does not give a rationale for conclusions and implications on a country basis. In order to tackle the potential problem of heteroscedasticity or general correlation of observations within a cross-section, we use the Panel Estimated General Least Squares (EGLS) method with SUR (Seemingly Unrelated Regressions) weights (Beck and Katz, 1995).

As it is reasonable, the variable  $\log y_0$  has a negative slope thus proving the cohesion across the new EU members. The countries with a lower initial income per capita are expected to grow faster. The results also imply that the higher percentage of graduates whose education just matches the educational standards for their occupations accelerates the GDP per capita rate of change (table 1, model 1). This is evident by the positive and statistically significant slope of the variable  $VQM$ .

Table 1: Estimation of the restricted MRW model<sup>a</sup> extended by the rate of vertical qualification (mis)match

	Model 1 <sup>b</sup>	Model 2
Dependent variable: first difference of log GDP per a unit of active population ( $d\log y_t$ )		
const	-0.015 (0.242)	1.153*** (0.315)
$\log y_0$	-0.167*** (0.006)	-0.164** (0.012)
$\log s_k - \log (n+g+\delta)$	0.095*** (0.009)	0.084*** (0.014)
$\log HKSTOCK$	0.170*** (0.039)	0.123* (0.074)
$\log VQM^c$	0.200*** (0.031)	
$\log VQMIS^c$		-0.034*** (0.007)
N of obs.	99	99
adj. R sqr.	0.913	0.734
Normality of residual (p-value)	0.205	0.233
Pesaran CD test (p-value) <sup>e</sup>	0.744	0.495

<sup>a</sup>The abbreviation MRW refers to the neoclassical growth model with human capital developed by Mankiw, Romer and Weil (1992)

<sup>b</sup>Panel EGLS estimates using period SUR weights are presented. Standard errors are in parentheses.

<sup>c</sup>Percentage of active population with higher education working as Managers, Professionals, Technicians and Associate professionals.

<sup>d</sup>Percentage of active population with higher education with any occupation different from Managers, Professionals, Technicians and Associate professionals.

<sup>e</sup>Pesaran's cross-section dependence test. Null hypothesis: No cross-section dependence in residuals.

On the contrary, qualification mismatch does not positively contribute to the rate of GDP growth (table 1, model 2). Though small (-0.034), the regression coefficient for *log VQMIS* is negative and statistically significant at the 5% level (see table 1, model 2). Taking into account that this is a "log-log" relation, the result shows that if the share of the vertically mismatched holding at least a bachelor degree increases by one percentage point, the growth rate of aggregate output might decrease by 0.03%. The larger absolute value of the slope coefficient for the properly educated (0.2) implies that the impact of the qualification match on growth is stronger.

It must also be pointed out that in all cases the variable measuring the country's overall human capital stock (*log HKSTOCK*) is also positively related to the growth rate in the long run. But its impact is lower than that for properly educated employees (*log VQM*) due to the counter-effect of overeducation on the real GDP increments. Thus, the empirical outcome suggests that not only the overall quantity of human capital matters for the growth dynamics but also its distribution among just-, over-, and undereducated population.

#### 4. Robustness of the regression output: a modified approach to vertical mismatch

The previous section relies on the static approach assuming fixed mapping over a long period of time between educational attainment and jobs (Sparreboom and Tarvid, 2016, p. 23). As it was mentioned earlier, a major drawback of such an approach is that it does not take into account the impact of technological changes on workers' qualification, knowledge and skills. It is likely that employers respond to these new challenges to the labor market by increasing the qualification requirements for some jobs down the ladder which having been traditionally occupied by people with lower educational background. In this vein, the abovementioned negative result about the link between overeducation and growth might be affected by this disadvantage of the static approach. In response to that in the current section a revised

"dynamic" view to vertical qualification mismatch is adopted.

Since 2011 onwards, the number of vertically mismatched employees are reduced by clerical support workers with higher education. The occupations include secretaries, office clerks and administrative assistants, receptionists, human resources specialists, labor relations specialists, bookkeeper assistant, etc. The reason is that individuals in these jobs intensively employ digital technologies to a greater of lesser extent. In the new member countries their share changed almost three times since 2002 onwards – from 11.5% to 30.4% as a larger jump has been recorded after the year 2011.

A summary of descriptive statistics for the newly constructed variables *log VQMnew* and *log VQMISnew* is presented in Appendix 2. In all cases the vertical mismatch diminishes after subtraction of clerical support workers. However, the biggest percentage decrease has been recorded for the Czech Republic (10.5%), Romania, Croatia, and Slovakia (5.6%). These numbers indicate that in these economies a significant part of higher education graduates have been employed at positions of support workers requiring upper secondary education.

The regression model is estimated using that newly calculated indicator of qualification (mis)match. The variable denoted *VQMISnew* (table 2, model 1) presents the percentage of active population with higher education with any occupation different from Managers, Professionals, Technicians and Associate professionals up to 2010. Since 2011 clerical support workers have also been excluded from the group of mismatched. The dummy variable equals 0 up to 2010, and 1 afterwards (table 2). The model contains also an interaction term *log VQMISnew\*dummy* which equals 0 up to 2010 and has the same value as *log VQMIS* from then onwards. That would allow for a better evaluation of the impact of the newly adopted dynamic framework on the regression results. In the second modification (table 2, model 2) the properly matched individuals according to the new



measurement method (*log VQMnew*) have been introduced. In addition, an interaction term with the dummy variable is also defined (*log VQMnew\*dummy*). The estimation method is the same as that in the previous section. That allows for the comparison of the results and ascertains the robustness of the regression output as well.

The results once again confirm that an increase of the overall stock of human capital (*log HKSTOCK*) is positively related to the real GDP per head increments. If the former grows by 1%, the latter would rise by 0.17-0.18%. Yet, the negative impact of vertical qualification mismatch remains despite the newly adopted method for measuring it. This is evident by the regression coefficient for the interaction term (*log VQMISnew\*dummy*) which measures the impact of oversupply of higher education after the year 2011. The output presented in table 2 also proves the robustness of the results discussed in the previous section.

At first glance, the addition of clerical support workers to the vertically matched graduates leads to a counter-intuitive outcome since the regression coefficient of the variable *log VQMnew* (table 2, model 2) is below zero and statistically significant. But, the interaction with the dummy regressor gives evidence that the result might be explained by the

structural change in the data. Probably, the negative slope of *log VQMnew\*dummy* is affected by the growing share of employees with tertiary education holding clerical jobs after the year 2011. The results also show that a rise of the jobs down the ladder occupied by college or university graduates does not contribute to growth successfully. Thus, the second econometric output once again provides support for the hypothesis that the rising rate of vertical qualification mismatch is always negatively associated to the income per capita changes.

The following explanations might be given for the negative link between qualification mismatch and economic growth. First, overeducated workers receive lower wages than their just-educated peers which exhibits a downward pressure on per capita income growth. Second, higher education graduates might possess theoretical knowledge but at the same time might lack necessary practical skills and competences for the positions down the occupational ladder which they occupy. Yet, they are employed due to the lack of adequate labor supply. Third, overeducation might lead to lower job satisfaction which affects productivity and hence growth adversely.

Table 2: Panel estimates of the restricted MRW with a dynamic view of vertical (mis)match

	Model 1 <sup>a</sup>	Model 2
Dependent variable: first difference of log GDP per a unit of active population (dlog yt)		
const	0.283 (0.418)	1.195** (0.594)
log y <sub>0</sub>	-0.115*** (0.016)	-0.124*** (0.014)
log s <sub>k</sub> -log (n+g+δ)	0.083*** (0.015)	0.079*** (0.014)
log HKSTOCK	0.169* (0.098)	0.184* (0.099)
log VQMnew <sup>b</sup>		-0.168** (0.077)
log VQMnew*dummy		-0.024*** (0.002)
log VQMISnew <sup>c</sup>	0.060*** (0.017)	
log VQMISnew*dummy	-0.041*** (0.004)	
N of obs.	99	99
adj. R sqr.	0.817	0.821
Normality of residual (p-value)	0.554	0.503
Pesaran CD test (p-value) <sup>e</sup>	0.245	0.244

<sup>a</sup>Panel EGLS estimates using period SUR weights are presented. Standard errors are in parentheses.

<sup>b</sup>Percentage of active population with higher education who work as Managers, Professionals, Technicians and Associate professionals up to 2010, clerical support workers have been added since 2011 onwards.

<sup>c</sup>Percentage of active population with higher education with any occupation different from Managers, Professionals, Technicians and Associate professionals up to 2010; since 2011 clerical support workers have been excluded.

<sup>d</sup>Dummy equals 0 over the period 2000-2010 and 1 over the period 2011-2016.

<sup>e</sup>Pesaran's cross-section dependence test. Null hypothesis: No cross-section dependence in residuals.

## 5. Conclusion

This paper draws attention on the link between vertical qualification mismatch and the rate of growth in the long run. It utilizes the extended neoclassical model of growth in order to find empirical evidence on that relation. The regression outputs confirm the positive growth impact of the overall human capital stock and the contribution of the properly matched university graduates taking positions such as Managers, Professionals, Technicians and Associate professionals. On the other hand, the increasing percentage of people whose education is above the requirements for the job positions they hold, affect growth negatively. The inclusion of clerical support workers to the properly educated graduates leads to a negative result regarding the link between university education and growth.

From a policy perspective the study implies that investments in human capital and the broader access to education benefit the long-run economic development. But, the attention should be drawn not only to graduation rate per se but also on the distribution of the country's human capital by educational degrees or fields of study. Higher educational attainment of the population does not go hand in hand with adequate skills which affects negatively technology adoption and firm performance at a micro level and resource misallocation at a macro level. Improved quality of education, life-long learning and career guidance are among the measures for mismatch reduction. In light of the study outcome, a better match between educational attainment of the labor force and the specific economic structure might solve the problem of rising qualification mismatch across the European countries and enhance their long-run prospects for growth. From a policy perspective the study implies that investments in human capital and the broader access to education benefit the long-run economic development. But, the attention should be drawn not only to graduation rate per se but also on the distribution of the country's human capital by educational degrees or fields of study. Higher educational attainment of the population does not go hand in hand with adequate skills which affects negatively technology adoption and firm performance at a micro level and resource

misallocation at a macro level. Improved quality of education, life-long learning and career guidance are among the measures for mismatch reduction. In light of the study outcome, a better match between educational attainment of the labor force and the specific economic structure might solve the problem of rising qualification mismatch across the European countries and enhance their long-run prospects for growth. As the current study is one of the first ones exploring the direct relationship between (mis)match and economic growth further evidence is needed in this regard.

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