

LABOUR MARKET TIGHTNESS AND MATCHING EFFICIENCY IN DIFFERENT LABOUR MARKET SEGMENTS – DO DIFFERENCES IN EDUCATION MATTER?

Alka Obadić, Viktor Viljevac

Abstract

This paper analyses the existing educational structures of selected EU member countries and their alignment with the labour market (LM) needs. This study aims to identify potential structural mismatches between the skills taught in schools and universities and the skills and knowledge required in the workplace. To evaluate this educational mismatch, the paper explores the matching needs of employers and unemployed job seekers by using disaggregated national employment office data. The paper examines the selected group of EU countries (AT, HR, EE, SI, ES) from 2010 to 2022, using the Beveridge curves and estimating LM tightness and matching efficiency for different education groups. The results show that differences in education levels result in relatively small deviations from aggregate trends in the LM. Aggregate LM trends strongly impact all education groups in the labour market.

Keywords: structural unemployment, Beveridge curve, matching efficiency, labour market tightness, EU countries

JEL classification: J21, J22, J23, J63

1. Introduction

The existing educational structure in the EU member states may not always correspond to the labour market needs. A mismatch between the existing educational structure, skills that are acquired in schools and universities, and the skills needed in the workplace presents a serious problem. Such incompatibility is increasingly difficult to keep pace with (in the context of) the rapid technological progress and it is a key threat to economic growth and development considering that, in the long term, such a situation can result in the increase of structural unemployment. It should not be forgotten that the effectiveness of the matching process also depends on the business cycle. The main approach in such research concentrates on the matching process, which relates to matching the needs of employers and unemployed job seekers to fill vacancies. The aggregate matching efficiency moves

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over the cycle because of variations in the average characteristics of the labour market. An important feature of the labour market is its matching efficiency, i.e., the market's ability to match unemployed workers to jobs (Barnichon and Figura 2015, p. 222).

The correlation between education and better employability is indisputable and has been proven countless times in numerous social and economic research studies. The relationship between educational attainment and labour market compatibility has become particularly important during the COVID-19 pandemic. Namely, individuals with high education could keep their jobs much easier in significant unexpected situations in the labour market, such as the social distancing and "lock-down" measures in spring 2020. According to IMF research (2022), the main reason why employment remains restrained, particularly compared to the pre-crisis trend, is that disadvantaged groups – including the low-skilled, older workers, or women with young children – have yet to fully return to the labour market. The decline in immigration also seems to have amplified labour shortages among low-skilled jobs (Duval et al. 2022, p. 5). The abovementioned warrants attention and therefore in this paper, the research concentrates on the labour market matching model estimated for groups of different education levels, focusing on the interaction between unemployment and new job posts (vacancies).

As the job matching process changes over time in relation to business cycles, the best way to graphically show the matching process in the labour market is by using the Beveridge curve², which shows the empirical relationship between job vacancies and unemployment. The Beveridge curve is thought to be an indicator of the efficiency of the labour market functioning. A negative slope of the Beveridge curve indicates that vacancy and unemployment rates tend to move in opposite directions over the business cycle. Movements in the vacancy-unemployment space are usually related to labour market tightness and labour market efficiency (Consolo and da Silva 2019). In order to empirically evaluate the process of demand and supply matching, (the) labour market tightness and matching efficiency are estimated using the traditional aggregate matching function. The matching function relates the flow of new hires to the stock of vacancies and unemployment which are typically modelled with a Cobb-Douglas matching function.

Most of the existing research focuses on general labour market trends or the aggregate data for a specific country. Instead of focusing on general trends in the labour market, this research represents a step forward because it analyses disaggregated data. To the

best of our knowledge, this selected group of countries has not been analysed using registered data disaggregated by education level groups. The research focuses on how different levels of education among workers respond to general trends in the labour market. For example, economic downturns, which lead to increases in unemployment, might be felt more severely by those groups of workers with lower education levels. Therefore, this paper seeks to answer the following research question - Do worker groups with different levels of education experience the impact of aggregate labour market trends in different ways?

In this respect, this research contributes to the existing literature by using national employment office data for five selected EU member countries (Austria, Croatia, Estonia, Slovenia, and Spain), disaggregated according to the levels of education. Due to the differences in the data collection processes, the educational levels are not uniform among the countries, since different employment offices use different methodologies. Previous research mainly used Labour Force Survey data which is not disaggregated according to all nine ISCED¹ levels of education. It is important to emphasize that this paper does not deal with the analysis of the mismatch between qualification characteristics and skills of currently employed workers. The aim of analysing the efficiency of the matching process at the aggregate level is to point out the potential existence of the problem of structural unemployment, and according to the economic theory this is accomplished by putting into a relationship the existing needs of employers, i.e. vacancies and job seekers.

The methodological approach consists of two steps. First, the Beveridge curves are constructed for the aggregate labour markets of each of the five countries in the sample – Austria, Croatia, Estonia, Slovenia, and Spain – and then for different education groups. Then, the estimates of the labour market tightness and matching efficiency for different education groups for each country are presented. The paper is structured in the following way: The first chapter provides a theoretical background regarding the different aspects of the labour market and the relationship between education and labour market outcomes, as well as focusing on both historical and recent empirical evidence of labour market developments in different countries. The second chapter focuses on the data and methodology. The third chapter presents the results, including aggregate and disaggregated Beveridge curves and the estimates of the labour market tightness and matching efficiency. The fourth chapter includes the discussion of the results and explains the main limitations of the findings, while the fifth and final chapter concludes the paper.

2. Theoretical and empirical literature review

2.1. Theoretical Background

Education forms young people's human capital by providing them with the necessary skills and knowledge to prepare them for entering the labour market. To be able to help students achieve a favourable skills match, education programmes need to both know and meet the requirements of the labour market (Bolli *et al.* 2012, p. 324). The research done by Kabát, Bojnc and Stávková (2013) shows that less educated workers benefit less from economic growth and suffer more in recessions, while workers with higher levels of education benefit more from positive economic developments. The requirements of the labour market are achieved by establishing a successful matching that focuses on the interaction between unemployment and job creation. Higher productivity increases the return to job creation and thereby increases the rate of job creation. In turn, a higher rate of job creation makes it easier for unemployed workers to find jobs and thereby reduces unemployment. This explains the observed counter-cyclical (pro-cyclical) behaviour of unemployment (job creation) (Hornstein, Krusell, and Violante 2005, p. 19).

The trade-off between unemployment and vacancies can vary depending on the strength of the labour market needs: When the labour market is strong, with low unemployment and high vacancies, unemployment is likely to be relatively unaffected by increases in job openings. This will be reflected in the Beveridge curve being quite steep. Intuitively, when lots of employers are looking to hire workers but few active job seekers are available, the process of filling job openings is slowed down by the relative scarcity of available workers and the efficiency of the functioning of the labour market decreases (Bok *et al.* 2022, p. 2).

Beyond its slope, the shifts of the Beveridge curve (when vacancies rise and unemployment does not fall or falls too slowly) may signal structural changes in the labour market (Obadić 2016, p. 235) that determine how quickly job matches occur and how long they last. The simplicity of forming job matches represents the efficiency of matching. Reduced matching between the unemployed and vacant positions i.e., reduced efficiency of the mentioned process, where there exists a simultaneous increase in the number of unemployed and vacant jobs, leads to an outward movement of the Beveridge curve. On the contrary, an inward shift of the Beveridge curve indicates improved matching efficiency. Movements along the curve, when unemployment and vacancies move in opposite directions, indicate cyclical fluctuations in

economic activity (Obadić 2005, p. 91). It should be noted that heterogeneities across workers and labour markets are key aspects of unemployment fluctuations and therefore it is important to segment the labour market into diverse submarkets (Barnichon and Figura 2015).

2.2. Empirical Evidence

The Beveridge curve tends to shift over time. For example, outward shifts of the Beveridge curve can be observed almost everywhere in Europe in the early 1970s. One of the reasons for this is the increase of unemployment, with the unchanged number of vacancies due to the beginning of a recession (reduced aggregate demand), and the other resulted in reduced efficiency of the adjustment process due to structural factors, such as the existence of a more rigid labour market (Obadić 2016, p. 235). In most of the new EU member states, during the transition period, the Beveridge curve shifted outwards, which means that the number of unemployed persons increased in relation to the number of vacancies, although in some cases there was an increase in vacancies. For example, in Croatia, this trend has existed continuously since 1997, with the curve being moved the farthest from the origin in 2001 and 2002, when Croatia faced the highest number of unemployed persons in history (Obadić 2016, p. 236). Shifts of the Beveridge curve outwards indicate a reduced matching efficiency, i.e., an increase in structural unemployment or may be indicative of problems of a structural mismatch in the labour market. In their analysis of the United States between January 2001 and December 2017, Lange *et al.* (2020) find that the Beveridge curve shifted outwards during the Great Recession and this shift was also quantified by the estimated decline in matching efficiency (Lange *et al.*, 2020, p. 19).

Barrero *et al.* (2021) have investigated the outbreak of the COVID-19 pandemic. They argue that the COVID-19 recession and recovery created a reallocation shock that has necessitated unusually large movements of jobs and workers across industries. These movements are driven by persistent changes in demand patterns, such as shifts away from in-person services toward delivered goods, as well as shifts towards industries and occupations that support remote work. The pandemic has persistently pushed low-skilled and older workers out of employment but has transformed labour markets less than was generally envisaged after the first wave (Duval *et al.* 2022, p. 3). Labour markets have become tight, as indicated by a sharp rise in unfilled job vacancies (Duval *et al.* 2002,

p. 3) which create challenges for employers and workers that impede the job-matching process and cause an outward shift of the Beveridge curve. Shifting from general labour market trends to the labour market developments in specific education groups, many studies have found that the labour market mismatch in the form of over-education or over-skilling is associated with negative labour market outcomes in the form of lower wages, reduced job satisfaction and a higher labour turnover (Mavromaras *et al.* 2013).

Gavriliuță *et al.* (2022) analyse the correlation between education levels and employability rates in the EU-28 during the COVID-19 economic crisis, estimating the impact of social restrictions of the pandemic in the field of employability. They found a positive relationship between tertiary education (university, post-university studies, or PhD) and high levels of employability in the EU-28 during the 2019-2021 period and observed the fact that employability rates are related to high levels of education. The results show that high levels of association between education level and employment rates are visible in Sweden, Germany, the Netherlands, and the Baltic states. In contrast, for Greece, Spain and Italy they estimated a strong association between low levels of tertiary education and low levels of employment (Gavriliuță *et al.* 2022, p. 15).

Considering the existing theoretical background and the analysis of previous empirical studies, the labour market developments in different education groups are evaluated, as well as the relationship between newly created hires and current labour market conditions, i.e., unemployment and vacancies. The construction of the Beveridge curves allows for the comparison of the movements in the labour market among different education groups, as well of these movements with the aggregate labour market trends in a specific country. The calculation of labour market tightness allows for the analysis of the differences in movements in tightness amongst different education groups. By estimating different matching functions, one obtains the estimates of the success of the matching process (matching efficiency) in the selected EU countries.

Based on the initial research question and the analysis of the existing available literature, two basic research hypotheses are formed:

H1: Workers groups with different educational levels follow similar trends as the aggregate labour market.

H2: Workers groups with different education levels show similar labour market tightness and matching efficiency as the aggregate labour market.

Therefore, it is expected that the differences in education levels do not have a significant influence

on labour market movements. In other words, economic downturns, which lead to increased unemployment and lower vacancies, will be felt in a similar way regardless of the differences in education levels and the same outcome is expected during expansions. Moreover, one can expect that the labour market segments with different education levels experience similar movements in labour market tightness and matching efficiency over time as well.

3. Data and methodology

3.1. Data

This analysis covers five EU countries - Austria, Croatia, Estonia, Slovenia, and Spain for which data disaggregated according to education were available. The data are monthly, from January 2010 to October 2022, and were collected and provided to us by national employment offices. The dataset includes three variables – Employed, Unemployed and Vacancies. Employed represents new hires, flows from the stock of the unemployed people into employment based on a new employment relationship (work contract) or the start of other business activities by the previously unemployed person. Unemployed is a stock variable which represents the number of unemployed persons in the records on the last day of the month. The variable Vacancies represents the stock of demanded workers that employers reported to the Employment Service during a given month.

For each of these countries, the three labour market variables are disaggregated by education according to the national employment office data collection practices. The data for Spain is disaggregated by 9 different ISCED education levels. The data for Slovenia is disaggregated in a similar way, only without the data for level 0 – Early childhood education. Austrian data is split into five categories: Compulsory education, Vocational education, High school, Higher education and Academic education. The data for Estonia is split into only three groups – Lower education, Middle level education and Higher education. Croatian data includes those without completed elementary education, those with completed elementary education, those with completed high school, and the two groups with the highest education levels – those with the first level of higher education and those with an university degree. Unfortunately, it was impossible to unify the levels of education among the countries since different national employment offices collect data in different ways, and these are often not fully comparable. Since the focus is on the developments within each country, this does not pose a problem for

testing the main hypotheses of the paper.

To construct the Beveridge curve, typically the unemployment rate is defined as the ratio of unemployed workers to the sum of employed and unemployed workers. Usually, the textbook measure of the job vacancy rate relates the number of vacancies to the size of the labour force (Obadić 2005), while statistical databases (for example, Eurostat) often provide slightly different measures and define it as the ratio of job openings to the sum of employed workers plus job openings (Shimer 2005). Both measures are commonly used, but it is of course important to be consistent when comparing job vacancy rates across regions and time. The approach to creating the Beveridge curves taken in this paper is slightly different to those two. Since the data on vacancies, unemployment and newly employed workers was obtained from different national employment offices, the disaggregated data on the stock of currently employed workers needed to calculate the unemployment and vacancy rates was not available. Unfortunately, this data does not exist disaggregated in line with the method of collecting the data on vacancies by national employment offices.

This, however, does not pose a problem for the construction of the Beveridge curves. According to the previous definitions both the unemployment and the vacancy rate have the same denominator – either the sum of employed and unemployed workers or the sum of employed workers and job openings. Therefore, dividing the numerator by the same number does not change the shape of the Beveridge curves, but only expresses values as percentages. Thus, the number of vacancies and the number of unemployed workers is used instead of vacancy and unemployment rates. Such practice can be found in different papers (Gomez-Salvador and Soudan 2022; Lange and Papageorgiou 2020, etc.).

To better explain possible compatibility between the existing offers and needs in the labour market, different matching functions for each observed country and for each educational group are estimated.

3.2. Methodology

In almost all macroeconomic models with search and matching friction, the flow of new hires to the stock of vacancies and unemployment is modelled using the aggregate matching function (Petrongolo and Pissarides 2001; Pissarides 2000; Bernstein *et al.* 2022). The matching function is used in labour market analysis to understand how the numbers of job vacancies and unemployed workers relate to one another and how changes in one variable affect the other. It is also

used to estimate the number of matches in the labour market and to study the effects of different labour market policies on the matching process. One of the most common aggregate matching function models used in the labour market is the Cobb-Douglas matching function. The function is typically represented as (Blanchard and Diamond 1992; Kohlbrecher *et al.* 2014; Barnichon and Figura 2015, Lange *et al.* 2020):

$$M_t = \beta U_t^\alpha V_t^{1-\alpha} \quad (1)$$

where M is the number of matches (hires) or the number of outflows from unemployed to employed, U is the number of unemployed workers, V is the number of vacancies, and β indicates the efficiency of the labour market matching process. Exponents α and $1-\alpha$ are parameters that reflect the responsiveness of matches to changes in vacancies and unemployment, respectively, and t stands for the time period. The matching function is strictly increasing, strictly concave, twice differentiable in both arguments and exhibits constant returns to scale (Petrongolo and Pissarides 2001). The Cobb-Douglas matching function is ubiquitous in search and matching models, even though it imposes a constant elasticity of matches with respect to vacancies that is unlikely to hold empirically (Kohlbrecher *et al.* 2014; Bernstein *et al.* 2022, p. 18).

Following Barnichon and Figura (2015, p. 225) and Consolo and da Silva (2019, p. 6), the job finding rate f_t is defined as the ratio of new hires to the stock of unemployed, $f_t = \frac{M_t}{U_t}$, so that

$$f_t = \beta \theta_t^{1-\alpha} \quad (2)$$

where $\theta = \frac{V}{U}$ represents labour market tightness. The matching function is estimated in the log-linear form

$$\ln f_{i,t} = \beta_0 + (1 - \alpha) * \ln \theta_{i,t} + \varepsilon_{i,t} \quad (3)$$

The variable f (*the job finding rate*) represents new hires expressed as a percentage of unemployment. θ represents labour market tightness and higher tightness should result in a higher job-finding rate. ε denotes regression residuals which measure the matching efficiency. Subscript i refers to different countries for which separate regression equations are estimated, $i =$ Austria, Croatia, Estonia, Slovenia, and Spain. Subscript t refers to monthly data from February 2010 to October 2022. The equation is estimated by OLS.

The regression residuals $\varepsilon_{i,t}$ from equation 3 capture the efficiency of the matching process or movements in the matching efficiency for a particular education group in a specific country. The theoretical

relationship between the job-finding rate and labour market tightness is positive – higher tightness should result in a higher job-finding rate. Why is matching efficiency measured using regression residuals? If we assume that regression residuals are negative in a certain time period, it would indicate that the difference between the real (observed, empirical) job-finding rate and the job-finding rate predicted by the estimated matching function is negative. In other words, the observed job-finding rate is lower than what one would expect based on the corresponding level of the labour market tightness (the explanatory variable in the regression equation) and the estimated matching function. This means that, for some reason independent of the current level of labour market tightness, the job-finding rate decreased. This decrease is interpreted as a decrease in the matching efficiency. For example, such a trend occurred in the EU after the 2008 crisis when labour market efficiency and tightness started to move in opposite directions (Consolo and da Silva 2019). Positive residuals from the estimates of the matching function are interpreted in a similar fashion, as an increase in the matching efficiency, or a higher observed job-finding rate compared to what one would expect based on the corresponding labour market tightness level for that period.

Before calculating labour market tightness and estimating the matching functions and matching efficiency, the Beveridge curves are constructed using the data for vacancies and unemployment. As explained in the Data section, the Beveridge curves are constructed by using the total number of vacancies and unemployed workers instead of expressing them

as vacancy and unemployment rates. This does not change the shapes of the Beveridge curves, therefore allowing for the analysis of the movements along the Beveridge curve, as well as the inward and outward shifts in the Beveridge curve.

4. Results

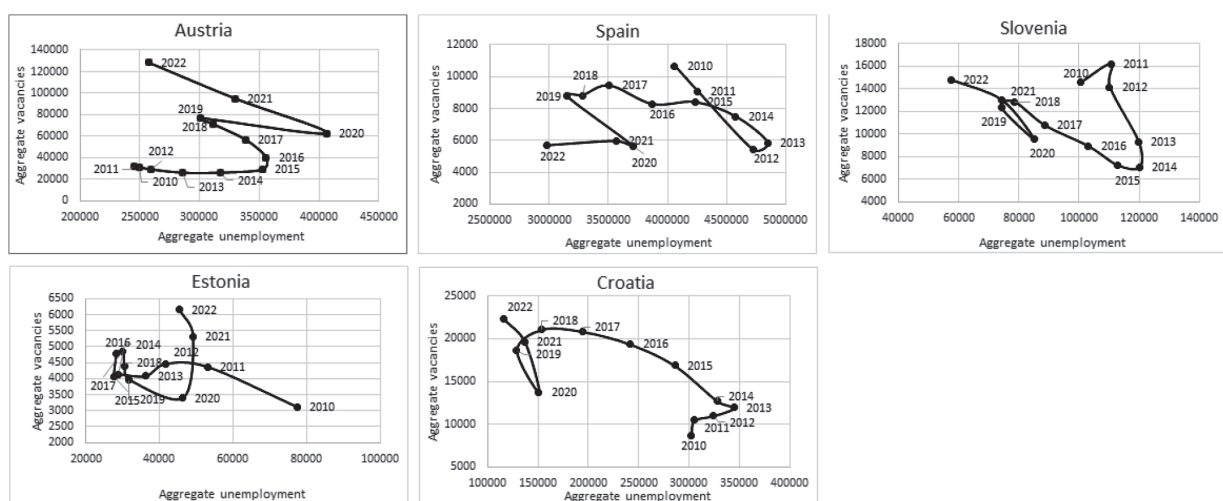
The results section is divided into three parts. First, the Beveridge curves are presented for the aggregate labour market of each observed country, as well as the Beveridge curves disaggregated by education. Secondly, the estimates of the labour market tightness and matching efficiency for different education groups for each country are presented and explained.

4.1. Beveridge curves for the aggregate labour markets

The shape and the position of the Beveridge curves provide important information about the functioning of the labour market. The aggregated Beveridge curve is a combination of different country-specific dynamics (Consolo and da Silva 2019). Therefore, the aggregate Beveridge curves (Figure 1) can shed light on the nature of the aggregate matching process and are presented for the selected five countries over the January 2010 – October 2022 period.

The aggregate Beveridge curves for Slovenia show an inward shift over time. For the same level of aggregate vacant positions available in the country, the level of aggregate unemployment almost halved when

Figure 1. The aggregate level Beveridge curves for selected countries, 2010-2022, annual averages



Source: Authors' calculation based on Public Employment Service Austria, Croatian Employment Services, Estonian Unemployment Insurance Fund, Employment Service of Slovenia and Spanish Public Employment Service data.

comparing the starting and the ending years of the 2010–2022 period. The inward shifts of the Beveridge curves indicate steady improvements in labour market conditions in Croatia, Slovenia and Spain because all three experienced a significant reduction in total unemployment, but only Slovenia managed it with approximately the same number of vacancies. Spain, on the other hand, shows both a decrease in unemployment and vacancies over time. After the period of worsening labour market conditions from 2010 to 2013, unemployment decreased significantly until 2019, along with an increase in vacancies. In 2020 there was a movement along the Beveridge curve, with unemployment increasing and vacancies decreasing. The labour market recovered in 2021 and 2022, with an inward shift of the Beveridge curve, i.e., with a simultaneous decrease in unemployment and vacancies.

The Beveridge curve for Croatia shows a typical anticlockwise movement characterised by an increase in vacancies that is faster than the decrease in unemployment during the recovery phase. This, however, does not necessarily mean that improvements in the matching process between the unemployed workers and the vacant positions are the only factor responsible for this inward shift. For example, Croatia experienced strong emigration during this period, which partially accounts for the decline in aggregate unemployment. The Austrian Beveridge curve, on the other hand, shows outward movements over time, implying a less efficient matching process. An outward shift is especially visible in 2020, after the start of the

COVID-19 pandemic. The Austrian economy quickly recovered afterwards, and 2021 and 2022 saw an increase in vacancies along with a decrease in unemployment, a shift along the Beveridge curve.

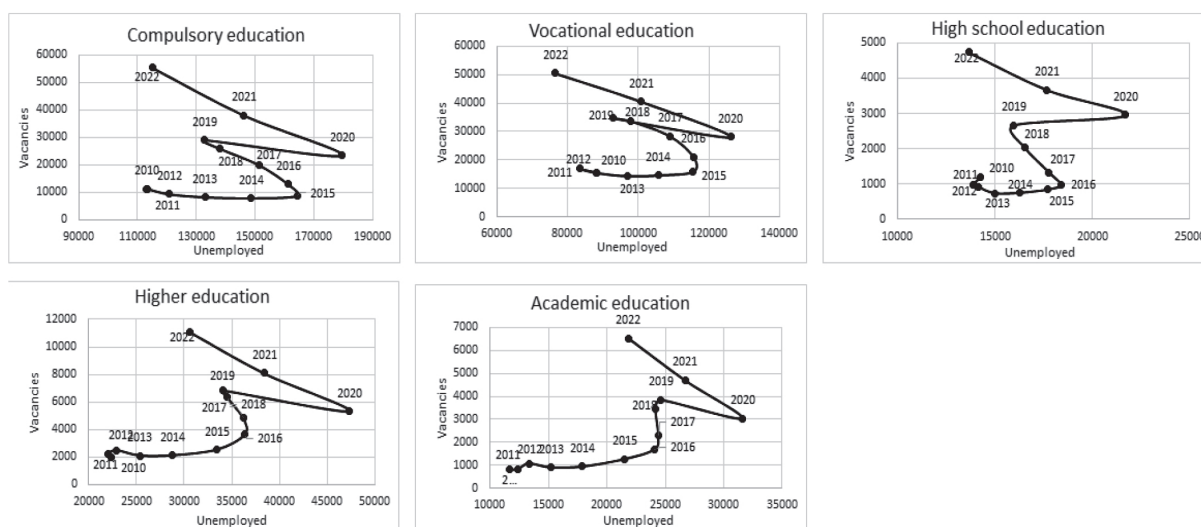
The Beveridge curve for Estonia first shows an inward shift and then a strong vertical shift to the right following the COVID-19 pandemic. Interestingly enough, Croatia, Spain and Slovenia did not record such shifts during and after the pandemic period. A relatively strong increase in the number of vacancies in Austria, Croatia and Estonia in the last two post-pandemic years is a potential indicator of strong cyclical shifts which are probably caused by labour shortages and overheating of the economy. Further analysis displays disaggregated Beveridge curves according to different levels of education.

4.2. Beveridge curves disaggregated by education levels

This section presents and analyses the Beveridge curves formed for each analysed country and for different education levels.

Beveridge curves disaggregated by education for Austria show similar and highly comparable behaviour to the aggregate Beveridge curve for Austria displayed in Figure 1. Beveridge curves for different education level groups show similar patterns, with the slight exception of the Academic education group in the initial period. This leads to the conclusion that differences in education levels do not influence the

Figure 2. Disaggregated Beveridge curves for different levels of education, Austria



Source: Authors' calculations based on Public Employment Service Austria (2022) data.

shape of the Beveridge curves for Austria, and all education groups recorded similar movements as those in the aggregate labour market.

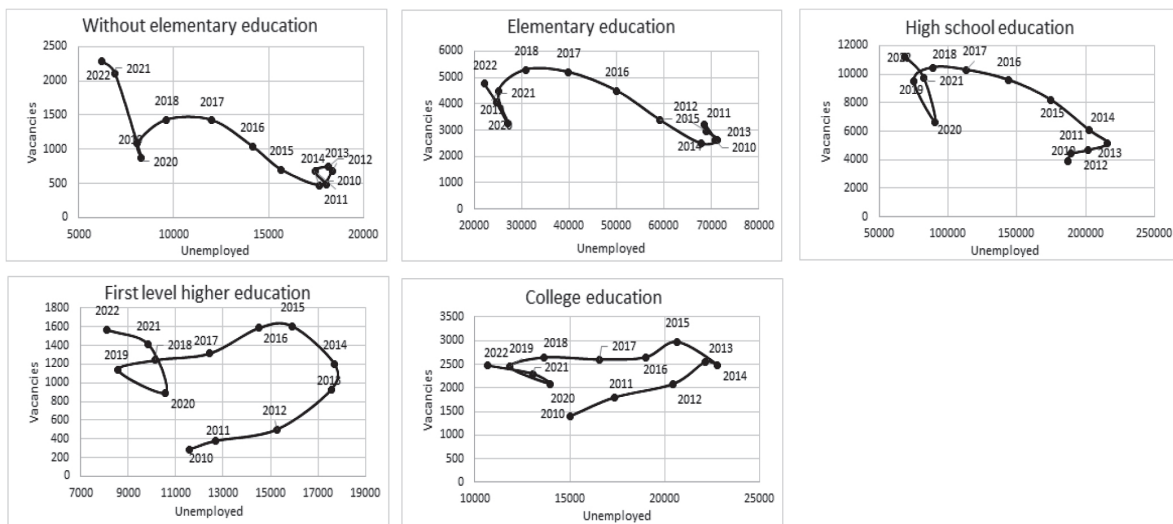
The Beveridge curves in Croatia for categories “Without elementary education”, “Elementary education” and “High school education” are relatively similar, showing a negative relationship between unemployment and vacancies, as well as the improvement in labour market conditions for the unemployed workers in 2022 when compared to 2010. “First level higher education” and “University education” groups follow similar movements but also show that the relative decrease in the number of unemployed workers from 2010 to 2022 was less pronounced compared to the other three education groups. The mentioned decrease is especially present in the last two post-pandemic years when all education groups recorded increases in the number of vacancies, pointing to labour

shortages in the economy.

The Beveridge curves for all three education groups in Estonia show somewhat similar movements. An inward shift from 2010 is visible in all three education groups, and then a strong, almost vertical shift caused by a significant increase in vacancies in 2022. Such a shift is especially noticeable at the highest levels of education indicating a significantly increased demand and a strong shortage of highly educated workers. Therefore, all education groups in Estonia follow relatively similar labour market trends.

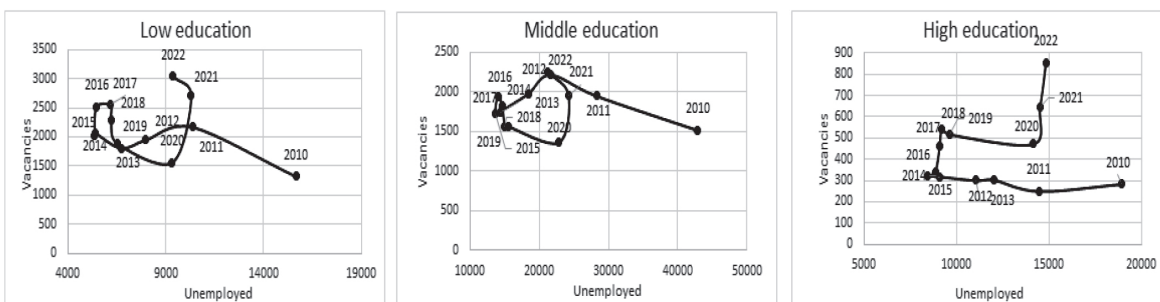
Beveridge curves disaggregated by education level for Slovenia show different behaviour over time. ISCED 6 and 7 levels clearly show the negative relationship between vacancies and unemployment. ISCED 1 and 2, as well as ISCED 4 and ISCED 5 education levels mostly resemble the aggregate Beveridge curve shape for Slovenia. The aggregate Beveridge

Figure 3. Disaggregated Beveridge curves for different levels of education, Croatia



Source: Authors’ calculations based on Croatian Employment Services (2022) data.

Figure 4. Disaggregated Beveridge curves for different levels of education, Estonia

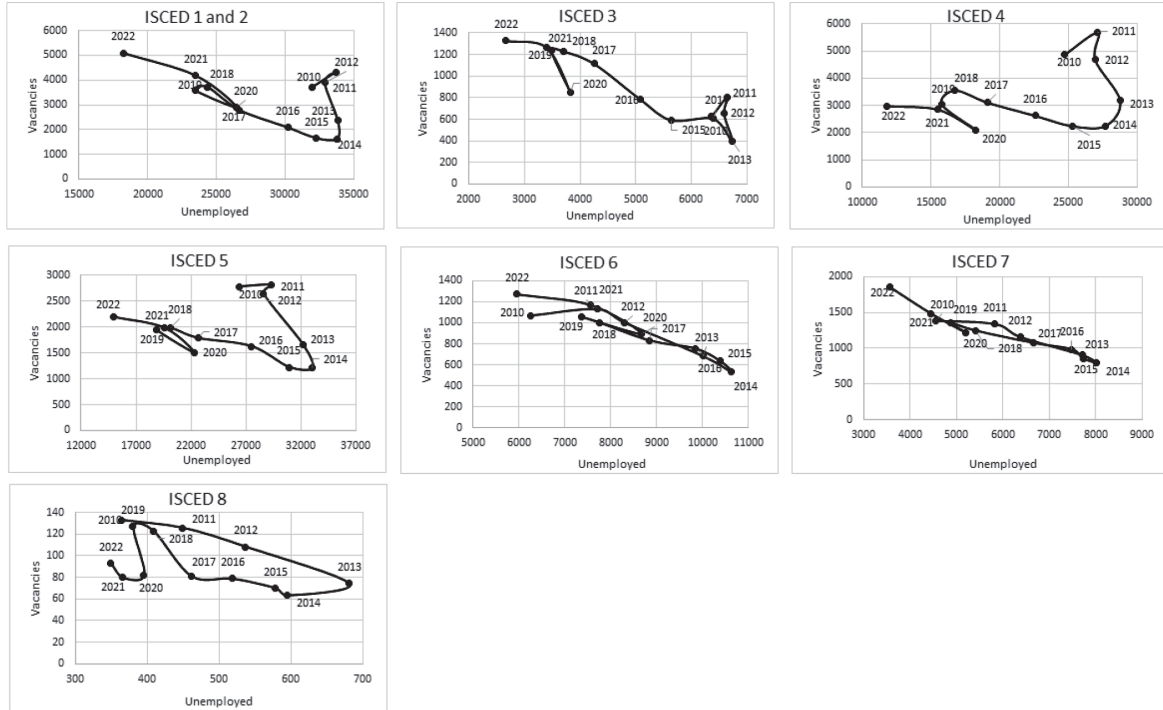


Source: Authors’ calculations based on Estonian Unemployment Insurance Fund (2022) data.

curve shows a similar shape to the curves for these education levels since most unemployed workers and vacant positions belong to these education groups.

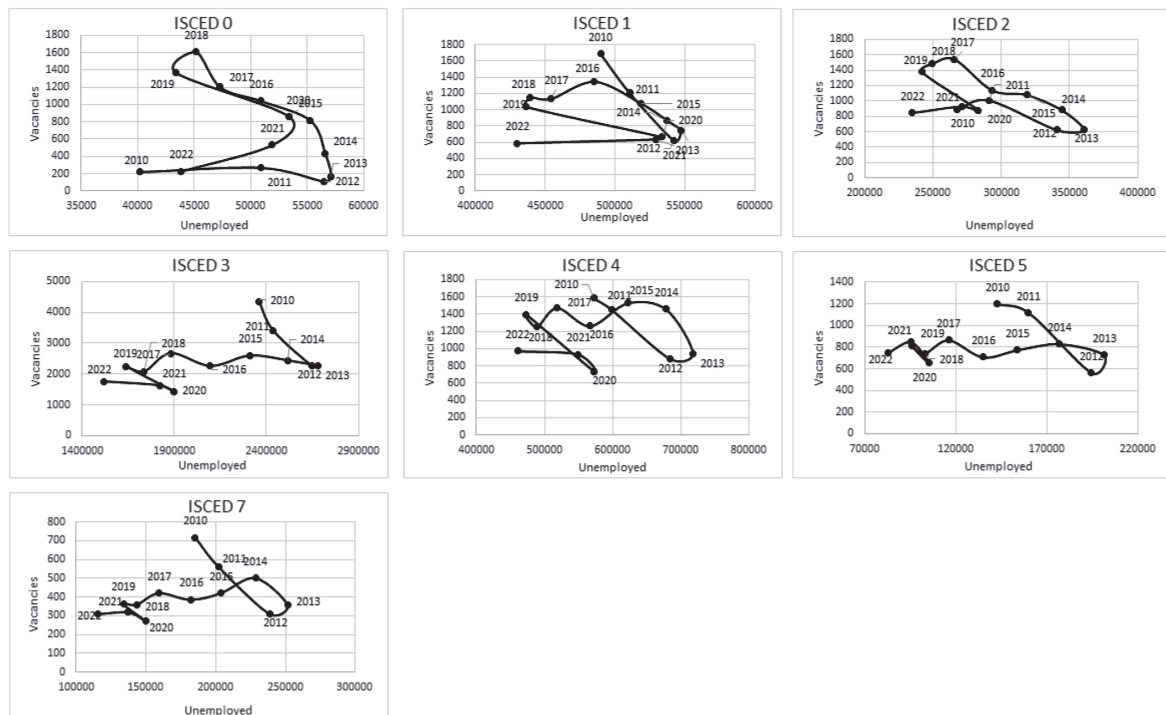
Disaggregated Beveridge curves for Spain demonstrate considerable differences in shapes. While some of the curves, for example, those for ISCED 3, 5 and 7

Figure 5. Disaggregated Beveridge curves for different levels of education, Slovenia



Source: Authors' calculations based on Employment Service of Slovenia (2022) data.

Figure 6. Disaggregated Beveridge curves for different levels of education, Spain



Source: Authors' calculations based on Spanish Public Employment Service (2022) data

educational levels have rather similar patterns to the aggregate one, the curves for ISCED 0 and 1 educational levels differ from the movement of the other education groups. In line with the aggregate Beveridge curve for Spain, most education groups recorded an inward shift of the Beveridge curve over time as Spain witnessed a strong decrease in unemployment. A smaller inward shift is noticeable for groups with lower education levels (ISCED 0, 1 and 2) compared to ISCED 5 and ISCED 7 groups. The Beveridge curve for the ISCED 6 level is not shown due to a relatively low number of observations.

The next section presents the labour market tightness and the estimates of the matching efficiency for different education groups for each country.

4.3. Empirical matching process – labour market tightness and matching efficiency

This section proceeds with the second step of the analysis to explain the level of labour market tightness and efficiency of the matching process. Therefore, the movements in labour market tightness are shown and the results of the estimation of matching efficiency in line with Equation 3 are presented. The results for different countries are presented in alphabetical order.

The results for Austria show that labour market tightness is continuously increasing throughout the period with significant growth after 2020 in all five education groups. This increase is the greatest for groups of workers with lower education levels, Compulsory and Vocational education. Matching efficiency shows similar general trends in all five education groups as

Figure 7. Tightness by education levels, Austria, January 2010 – October 2022

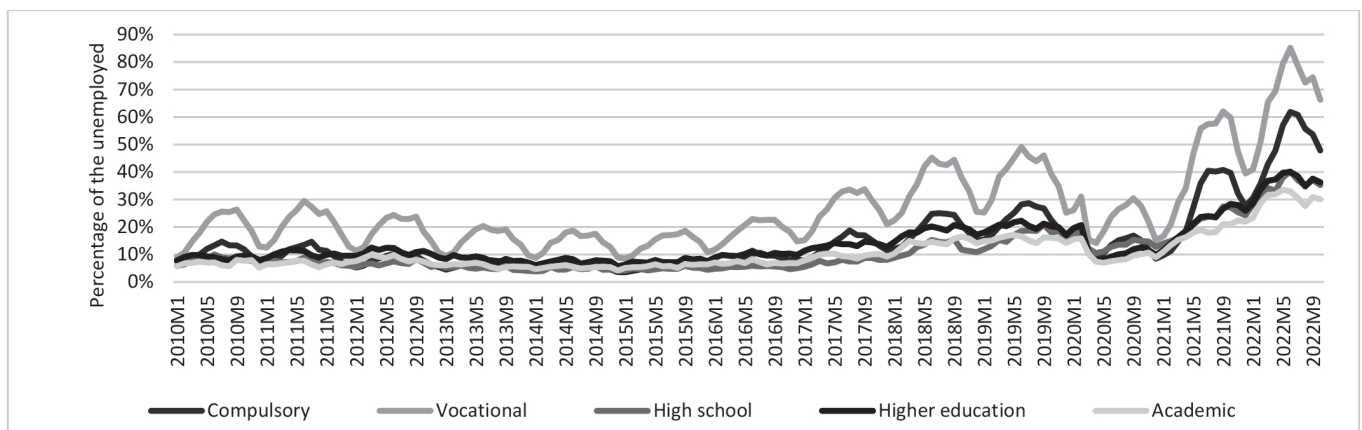
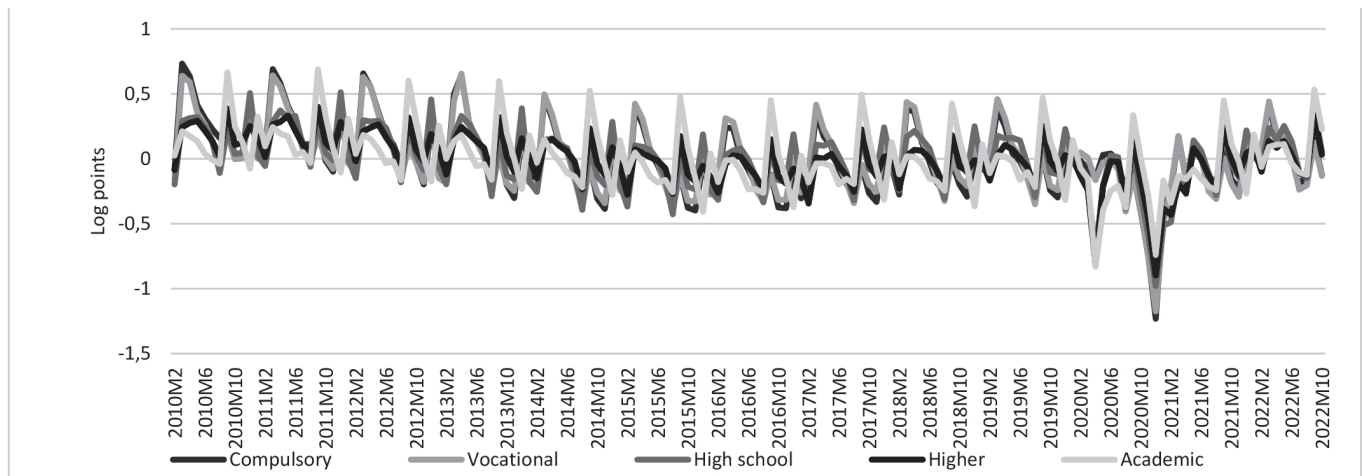


Figure 8. Matching efficiency by education levels, Austria, Feb 2010 – October 2022



Source: Authors’ calculations based on Public Employment Service Austria (2022) data.

well, though some groups (for example, Academic) have higher amplitudes. Matching efficiency was, on average, higher during the early years of the period for all groups and experienced a slump in 2020 due to disruptions caused by the pandemic and lockdowns but recovered afterwards. In general, post-pandemic increases in tightness for all education groups led to improvement in the matching efficiency, pointing to the conclusion that the education and skills of Austrian workers, regardless of their education level, were in line and matched with the labour market needs. This is most evident for workers with Compulsory and Vocational education, who experienced the strongest increases in labour market tightness without a decrease in matching efficiency. Regarding the matching efficiency, a similar conclusion holds as for the

Beveridge curves – all groups of workers, regardless of education levels, follow similar trends.

When it comes to labour market tightness in Croatia, all education groups experienced an increase in tightness towards the end of the period. The tightness was relatively high in 2018 and 2019, especially for those with a university education, and experienced a temporary slump in 2020. The rebound was strong, resulting in higher than average tightness in 2022 compared to 2018 and 2019. Two groups of workers, those without elementary education and those with a university education, show the highest tightness at the end of the period.

Turning the attention to the matching efficiency, matching efficiency for all education groups in Croatia remained relatively stable and equal over time,

Figure 9. Tightness by education levels, Croatia, January 2010 – October 2022

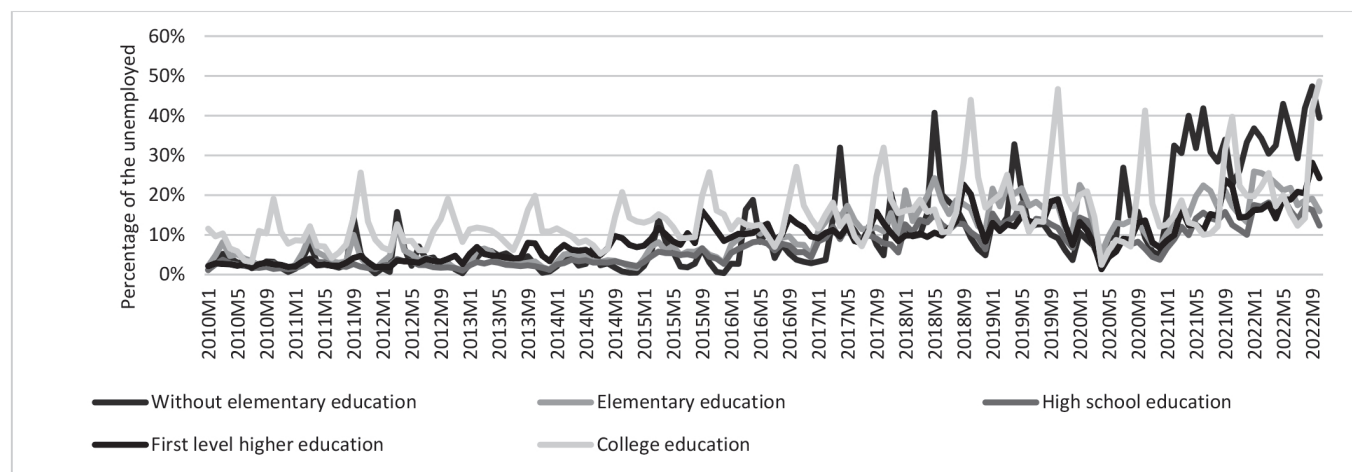
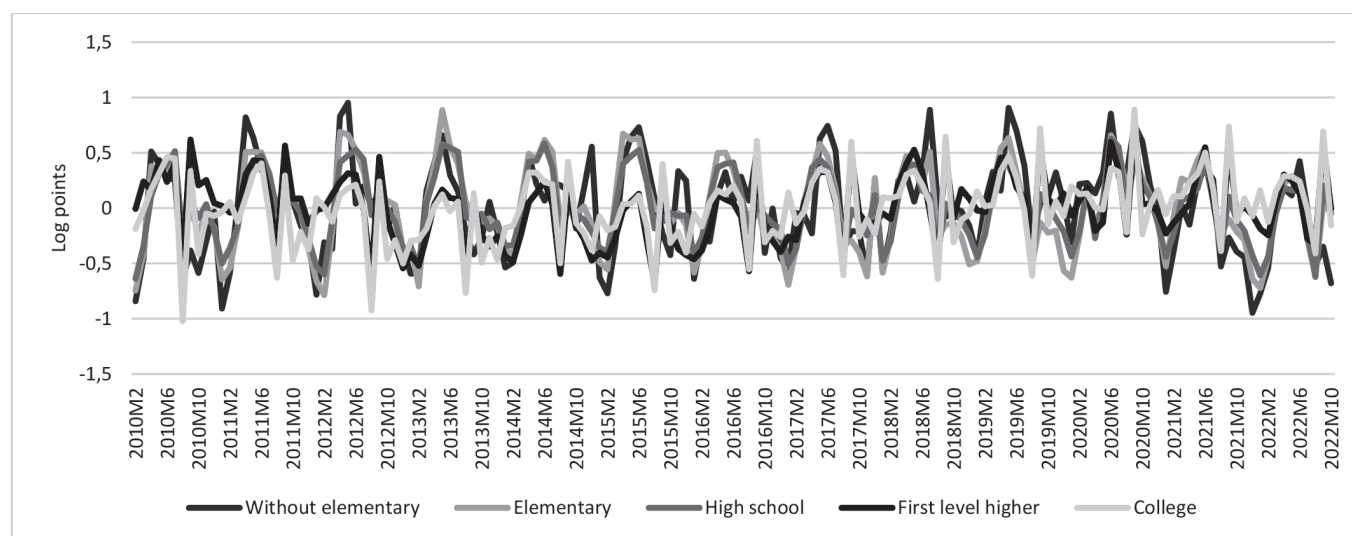


Figure 10. Matching efficiency by education levels, Croatia, February 2010 - October 2022



Source: Authors' calculations based on Croatian Employment Services (2022) data.

without periods of noticeable increases or decreases. There is, however, an obvious drop in the matching efficiency for workers without elementary education towards the end of the period, precisely when the tightness increased. This means that, during the time that the demand for workers without elementary education increased strongly, this increase in demand did not result in increases in the job finding in line with what one would expect based on the estimate of the matching function. The Croatian labour market for relatively uneducated workers was very tight in 2021 and 2022, resulting in a strong inflow of foreign workers with the same characteristics. This drop in matching efficiency can therefore be attributed to

employers hiring foreign workers because they were unable to meet their needs among the pool of domestic ones. Those employed foreign workers were not previously registered with the Croatian Employment Services. Workers with a university education, on the other hand, show stable levels of matching efficiency at the end of the observed period, indicating that higher tightness didn't lead to reduced matching efficiency. Therefore, their skills and knowledge are in line with the demands of the labour market. Workers with elementary and high school education recorded a slight drop in matching efficiency during the period of increased tightness in 2021 and 2022.

Figure 11. Tightness by education levels, Estonia, January 2010 – October 2022

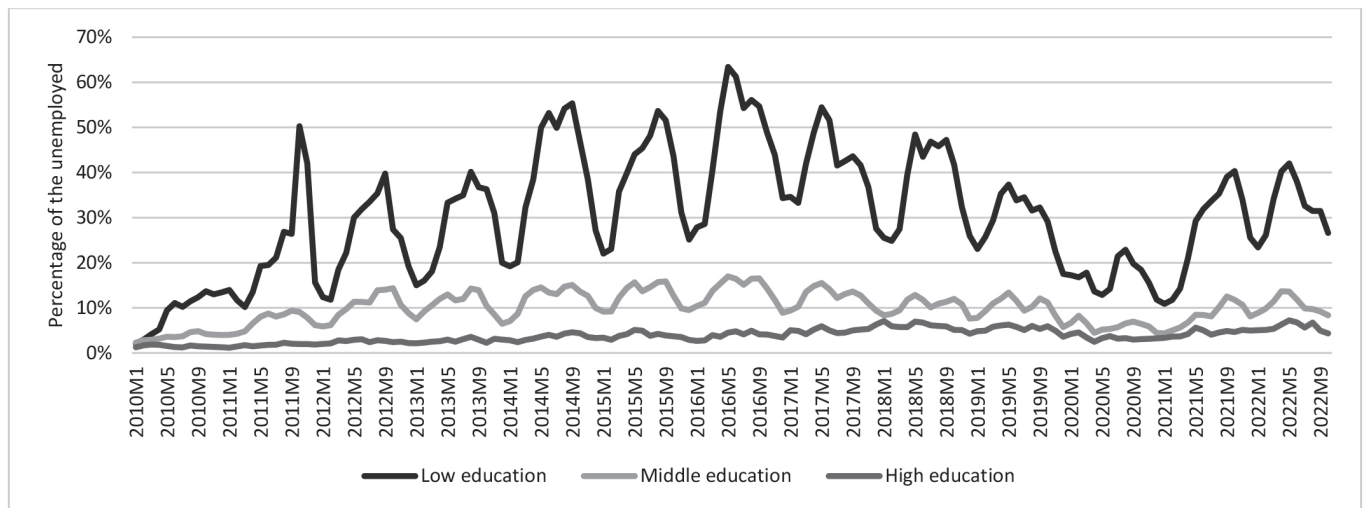
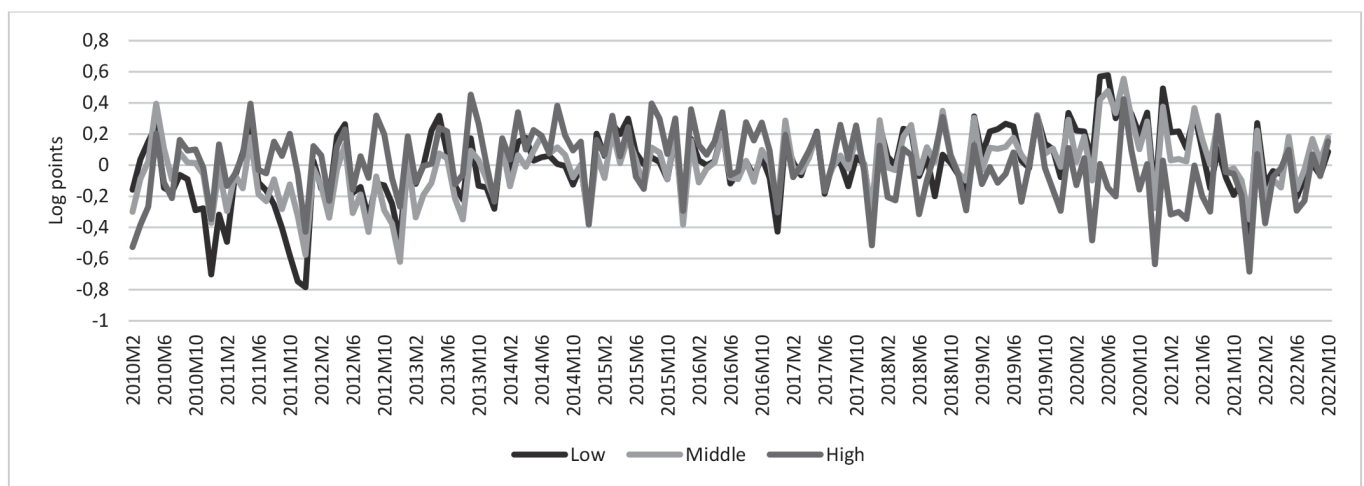


Figure 12. Matching efficiency by education levels, Estonia, Feb 2010 – October 2022



Source: Authors' calculations based on Estonian Unemployment Insurance Fund (2022) data.

The results for Estonia show that matching efficiency for workers with low and middle education increased over time, being at the lowest point during the 2010-2013 period, and surprisingly reaching a peak in 2020 after the “lockdown” period. On the contrary, workers in the „High” education group experienced a drop in matching efficiency from 2019 to 2021, with matching efficiency rebounding in 2022 and converging to the efficiency of the other two groups. All three education groups experienced a drop in labour market tightness in 2020, and a rebound to approximately previous levels of tightness afterwards. A significant difference in the levels of tightness, with the average

tightness in the „Low” education group considerably higher compared to the average tightness for workers with „High” education, can perhaps be explained by the searching behaviour of employers as employers search for highly educated workers and professionals more and more through other channels aside from the national employment office.

In line with the trends in other countries, labour market tightness in Slovenia slumped in 2020 in all ISCED education groups and rebounded afterwards. The labour market was relatively tight in 2022, with the highest tightness in ISCED 7 (Master’s or equivalent level) and ISCED 3 (Upper secondary education)

Figure 13. Tightness by education levels, Slovenia, January 2010 – October 2022

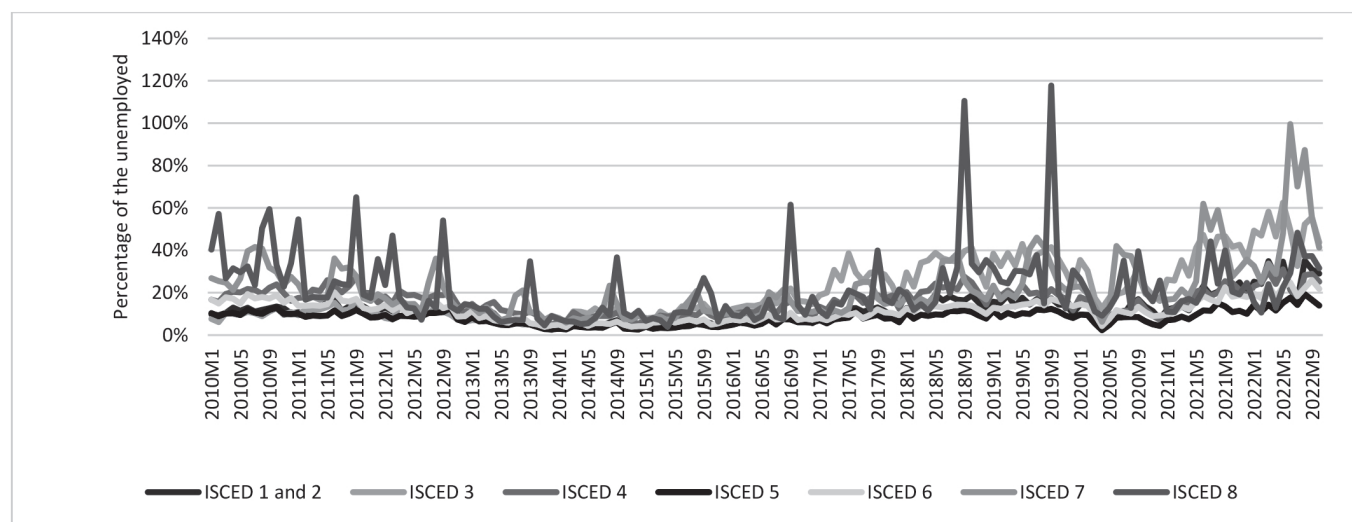
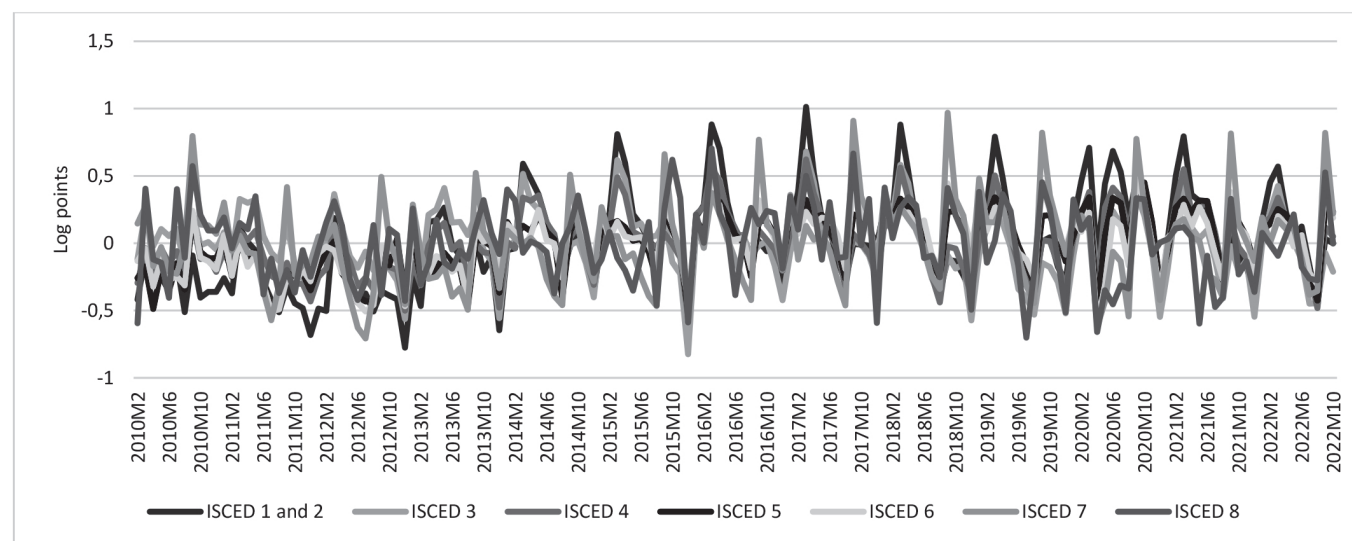


Figure 14. Matching efficiency by education levels, Slovenia, Feb 2010 - October 2022



Source: Authors’ calculations based on Employment Service of Slovenia (2022) data.

groups. Matching efficiency for different education groups' movements is highly correlated, being lower than the average of the entire analysed period from 2010 to 2013, reaching relatively high levels during the 2015-2019 period, followed by a decrease in 2020. The average matching efficiency for all education groups in 2021 and 2022 remained only slightly lower compared to the 2015-2019 period peak. This, however, still points towards the conclusion that the educational structure of the labour market in Slovenia is adequately aligned with the needs of employers. Tightness increased during 2021 and 2022, especially for ISCED 7 and 8 groups, but this did not result in decreased matching efficiency, which means that a higher demand for workers (higher tightness)

translated directly into more matches between the unemployed workers and vacant positions without losses in efficiency.

Regarding the labour market tightness trends in Spain, it is important to emphasize that the number of vacancies in all education groups is relatively low expressed as a percentage of unemployed workers compared to other countries, resulting in lower tightness figures. This indicates that only a minority of new workers in Spain are found through the national employment office, and most of the new matches are made through alternative channels (other private employment agencies and head-hunting agencies). Therefore, these are not visible in the official national employment office's statistics for vacancies.

Figure 15. Tightness by education levels, Spain, January 2010 – October 2022

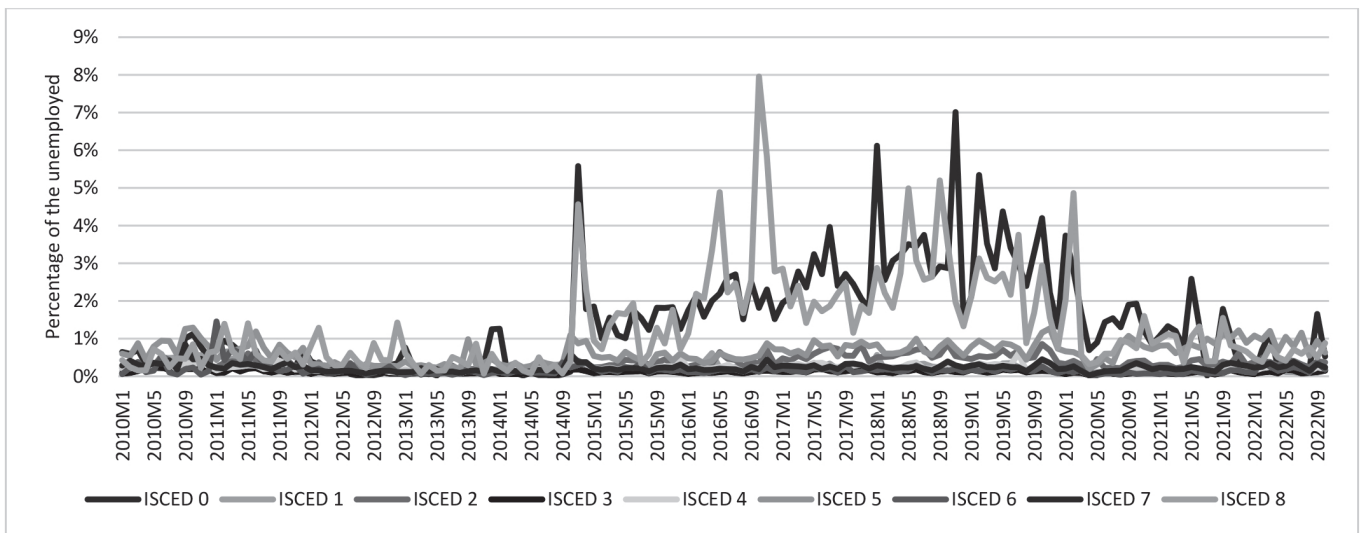
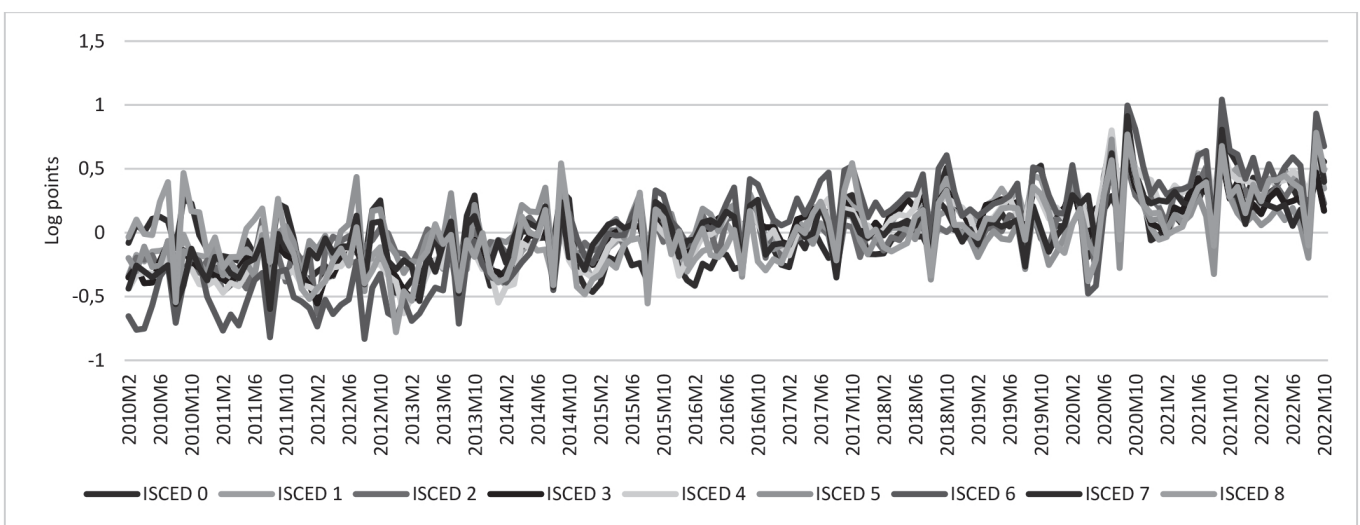


Figure 16. Matching efficiency by education levels, Spain, February 2010 – October 2022



Source: Authors' calculations based on Spanish Public Employment Service (2022) data.

All ISCED education groups for Spain show roughly similar behaviour – the matching efficiency recorded a continuous increase over time, from relatively low levels in the first half of the period to relatively high levels at the end of the observed period. Aside from ISCED 0 and ISCED 8 groups, which experienced increases in tightness from 2015 to 2020, tightness remained roughly similar throughout the entire period in all other education groups. Along with increased matching efficiency, this implies that the mismatch between education and skills of the unemployed in different education groups and the labour market needs decreased in the 2010-2022 period.

5. Discussion and limitations

In accordance with the two research hypotheses, the Beveridge curves constructed for different education groups in Austria, Croatia, Estonia, Slovenia, and Spain provide strong evidence in favour of them. Worker groups with different levels of education do indeed experience similar trends to the aggregate trends in the labour market, which is confirmed by the similar shapes of the Beveridge curves among the different education groups.

However, there are exceptions to this general pattern in some education groups. The Austrian labour market disaggregated by education shows very similar movements in the Beveridge curves. Croatian labour market groups also follow similar trends, though with exceptions in the form of slightly different shapes of the Beveridge curves for workers with higher levels of education. ISCED groups in Slovenia follow similar general patterns as well, but certain groups show their own peculiarities. Different groups in the Estonian labour market also follow relatively similar trends. The Beveridge curves for different labour market groups in Spain resemble the aggregate Beveridge curve but with their own peculiarities in groups such as ISCED 0, 1 and 2.

Despite these exceptions, the authors believe it is reliable to conclude that in the analysed period in the selected group of countries, different education groups in the labour market follow broadly similar trends in the movements of vacancies and unemployment. In some countries, this co-movement is very strong (Austria), and in others, it is weaker (Spain, though the results for Spain need to be interpreted with caution due to the relatively low number of reported vacancies, i.e. missing data).

When it comes to the second hypothesis regarding the similarities in movements in labour market tightness and matching efficiency among the different education groups, similar conclusions hold

– different education groups experienced relatively similar trends in Austria, Croatia, Estonia, Slovenia, and Spain. This, though, is not valid for all groups and in all periods. For example, in Estonia, the matching efficiency for those with high education remained relatively stable in 2020, while the other two education groups experienced an increase.

Although the levels of tightness, as well as their volatility at different points in time, differ, similar general trends in tightness are observable in almost all education groups in the countries analysed in this paper. This co-movement is even stronger when it comes to matching efficiency. The trend of increasing matching efficiency over time is visible in all education groups in Slovenia and Spain. In Croatia, the matching efficiency remained relatively similar over the 2010-2022 period in all education groups except for workers without elementary and university education. Therefore, it can be concluded that the data and the results provide relatively strong support for the two hypotheses in the paper.

The results of our research can partly be compared with the findings of Lange *et al.* (2020), who find that the Beveridge curve shifted outwards during the Great Recession. That would also have happened in all selected countries, if the government did not implement special measures for preserving jobs during the COVID-19 period. Considering the analysis carried out and the increasingly uncertain economic circumstances that surround us, it is difficult to predict the future trends and needs of the labour market. It is becoming increasingly obvious that technological changes (introduction of more sophisticated robots, AI, etc.) in the labour market continue to be a significant driver of future changes but are no longer a key factor in determining the basic required skills. In addition to all mentioned, the labour markets in the EU member states already depend on other supply and demand factors, such as the ageing of the population, the level of economic transformation in each member state, and different and specific development of labour market institutions and policies.

Finally, some limitations related to the findings in this paper exist, so they should be interpreted with caution. The first is related to the different availability of data at the individual disaggregated level for the selected group of countries because many employment service offices in the EU countries do not collect the data disaggregated by all nine ISCED levels. Regardless of the fact that the public employment office in Estonia collected the data for only three educational groups while the other countries have data for a higher number of educational groups, we can still analyse the trends in each country separately. Second,

the data itself has some limitations considering different labour market legislation and different rules regarding the obligation of employers to report vacant positions to employment offices. In practice, public employment offices collect only a fraction of the job offers available on the market. The results of this analysis may therefore only hold for a certain segment of the labour market, since the distribution of job offers registered by public employment services is biased towards low-skilled jobs in comparison with the total number of vacancies in the labour market. Thus, the matching process analysed in this paper may differ from the full-scale matching taking place in the labour markets in these countries. Third, the last two analysed years (2020 and 2021) should be tentatively considered due to the period of lockdown and subsequent partial closures in the COVID-19 pandemic.

6. Conclusion

The analysis in this research includes the labour market data for Austria, Croatia, Estonia, Slovenia and Spain during the period from January 2010 to October 2022. The results obtained by the construction of Beveridge curves, and the estimation of labour market tightness and matching efficiency point toward the conclusion that different education groups in the same country experience relatively similar labour market trends in the movements of vacancies, unemployment, labour market tightness and matching efficiency. Several exceptions to this trend exist, but these general trends hold relatively strongly. The results indicate that differences according to the levels of education did not result in significant deviations from the aggregate labour market trends during the 2010-2022 period. Economic upswings and downswings during the business cycle have a strong impact on the labour market, and this impact was also transmitted to the disaggregated level in relatively similar ways.

Future research should make clear whether the results presented for the selected observed cases can be further generalized by extending the analysis to a larger set of countries. Considering the data on labour market vacancies, future research should aim to include both the official data from the national employment offices and the data from different private agencies. The data on vacancies from the aforementioned private agencies would give a more comprehensive picture of the labour market needs, especially in countries such as Spain in which the national employment office vacancy figures are relatively low. Labour market changes in some specific groups, such as IT workers and professionals, are not recorded in the national

employment office unemployment figures because in many countries these groups of workers often do not seek their jobs through national employment offices.

Therefore, future studies should draw attention to the quality of national data sets and put greater focus on legislative country-specific aspects. Namely, the structure of the economy, the degree of labour market flexibility, employment protection legislation rules, and some specific regional and sectoral circumstances should also be taken into consideration. But it is certainly necessary to consider how the COVID-19 pandemic has significantly changed the general situation in the labour markets around the world in the last three years, contributing to labour market tightness at almost all levels of education. In some cases, the pandemic has led to improvements in labour market efficiency as businesses have adapted to changing market conditions. In other cases, it showed weaknesses in labour market institutions and policies that will need to be addressed to improve labour market efficiency over the long term.

Note

This paper is partially supported by the Croatian Science Foundation under project 4500.

Earlier partial results of this paper were presented at the FEB Zagreb 14th International Odyssey Conference on Economics and Business, May 10-13, 2023, Poreč, Croatia and partially published in the online EFZG working paper series, 2023 (03).

We are grateful for all the comments we got from conference participants and comments on our WPS research in progress.

Endnotes

1. International Standard Classification of Education (ISCED) based on the ISCED 2022 classification includes 9 levels: ISCED 0 = Early childhood education, ISCED 1 = Primary Education, ISCED 2 = Lower Secondary Education, ISCED 3 = Upper Secondary Education, ISCED 4 = Post-secondary non-Tertiary Education, ISCED 5 = Short-cycle tertiary education, ISCED 6 = Bachelor's degree or equivalent tertiary education level, ISCED 7 = Master's degree or equivalent tertiary education level, ISCED 8 = Doctoral degree or equivalent tertiary education level (World Bank 2022).
2. The negative relationship between unemployment and job vacancies was first identified by William Beveridge in the 1940s, and therefore the current curve bears his name. With it, he wanted to determine how far the economy is from the state of full employment (Bleakly, Fuhrer, 1997, p. 1).

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