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Understanding Beveridge Curve Shifts in Slovakia: Implications for Matching Efficiency and Labour Market Policies

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Since the global financial crisis, Slovakia's Beveridge curve has shifted multiple times to the left, indicating a reduction in the unemployment rate for each vacancy rate. Through panel data analysis and the use of a standard aggregate matching function, we estimate the elasticity of the matching or job-finding rate in relation to vacancies and matching efficiency in Slovakia. Our findings show that the elasticity of job matching with respect to vacancies in Slovakia aligns with similar estimates from other EU countries though there remains significant heterogeneity across sectors and geographical areas. We find that strong labour demand and sectoral-level improvements have supported recent Beveridge curve shifts, but productivity growth has slowed, implying that rising employment has not been matched by efficiency gains.

Slovakia's Beveridge curve has shifted leftward between 2010 and 2023, indicating a decline in the unemployment rate at each vacancy level.

An overall increase in employment, a reduction in long-term unemployment and increase in labour market tightness have been the key drivers.

Estimated elasticity of job matching with respect to vacancy in Slovakia is comparable to the matching elasticities of other EU countries.

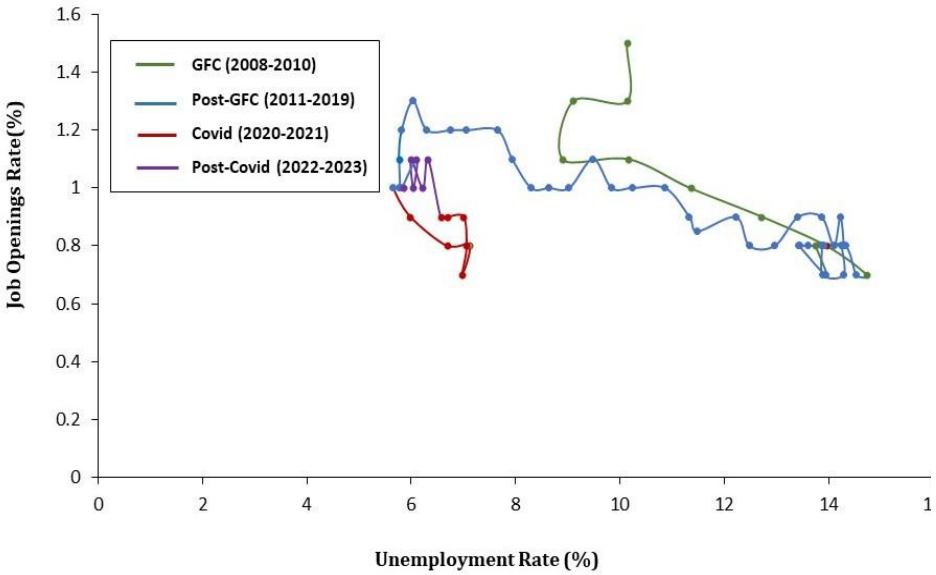
Matching efficiency has been steadily improving across sectors over time, likely reflects structural changes and overall macro developments in Slovakia

Policies focused on closing skill gaps, regional labour market integration, and improved innovation are required so that job growth translates into productivity gains.

Shifts in the Slovak Beveridge curve

The Beveridge curve has shifted leftward in Slovakia from 2010 to 2023. The Beveridge curve[1] represents the inverse relationship between the unemployment rate and the job vacancy rate over time. Chart 1 illustrates Slovakia's Beveridge curve since 2008.

Chart 1
Shifts in Beveridge Curve of Slovakia



Source: Statistical office data, NBS calculation

The period between 2010 and 2023 was characterised by an increase in employment resulting from both a decrease in inflow to unemployment and an increase in outflow from unemployment. The unemployment rate declined from 14% to 6% and the vacancy rate improved**.** Charts 2 and 3 illustrate that, despite episodes of sharp increases in unemployment during 2008 and 2010, the inflow to unemployment has generally been decreasing over time. Additionally, the outflow from unemployment to employment has risen in the period after the Great Financial Crisis (GFC). This is reflected by movement along the Beveridge curve to the left during 2011-2019.

[1] Beveridge (1944).

Chart 2
Inflow to Unemployment (% of labour force)

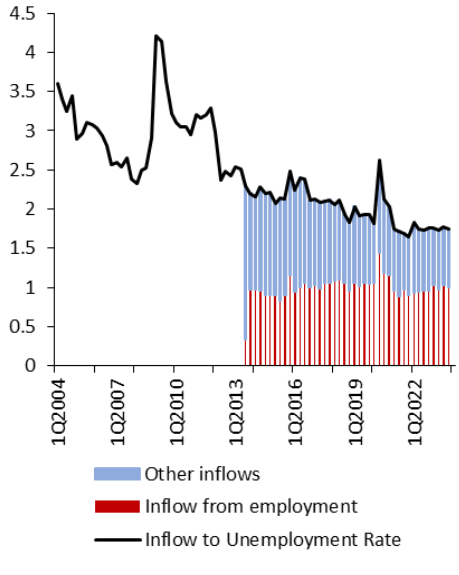
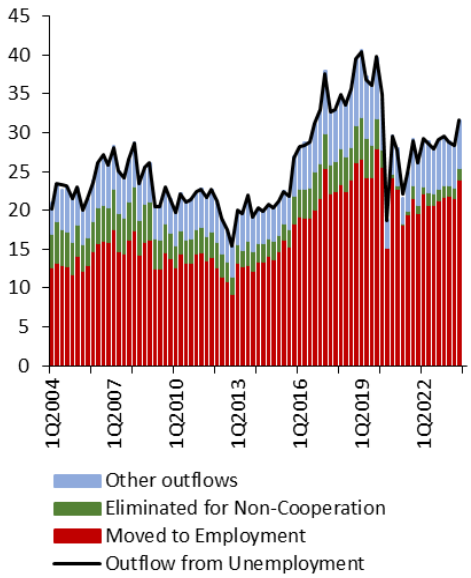


Chart 3
Outflow from Unemployment (% of unemployed)



Source: Statistical office data, NBS calculation

Other stylised facts include a decrease in long term unemployment and an increase in labour market tightness (more vacancies per unemployed person). While recruiting intensity[2] typically declines during recessions, we observed a stronger recovery following the COVID-19 pandemic compared to the global financial crisis (GFC). Similarly, the mismatch index[3], which tends to rise during recessions, has shown a quicker decline post-COVID compared to the GFC (chart 4). The share of long-term unemployment in Slovakia has also declined (see chart 5). Long-term unemployment can erode job-related skills, making it more challenging for individuals to secure employment. Therefore, the decrease in long term unemployment (over 1 year) has been beneficial to improve job finding.

The aim of this paper is to study the extent to which improved structures and institutions of the labour market can account for the shift in the Beveridge curve through improved matching of job seekers with vacancies. In other words, we wish to address the question whether the improved labour market performance is a result of improved market efficiency or whether the drivers have been broader macroeconomic and structural phenomena.

[2] Recruiting intensity = job vacancies / total employees.
[3] Mismatch index = (job vacancies - unemployed) / unemployed.

Chart 4
Mismatch Index and Recruiting Intensity (2008 Q1=100)

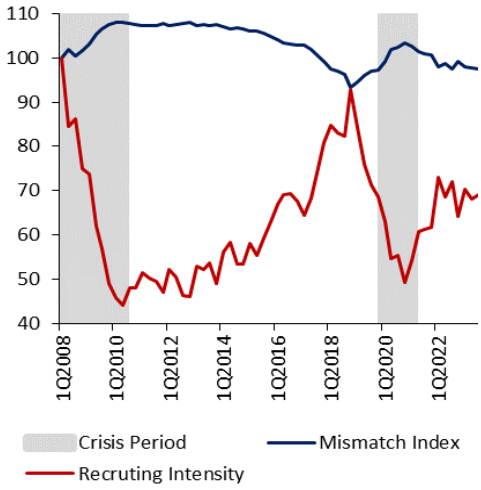
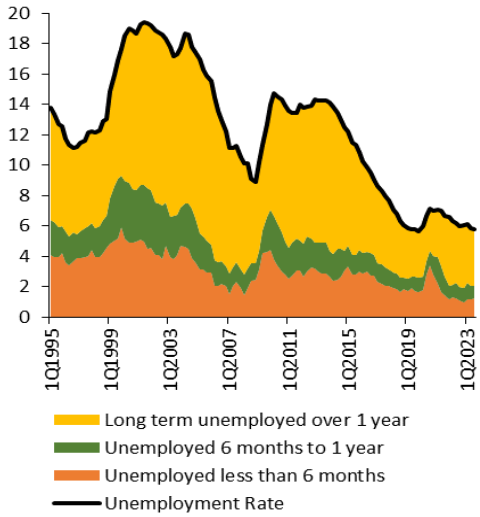


Chart 5
Duration Distribution Unemployed (%)



Source: Statistical office data, NBS calculation

Matching function with sectoral and regional heterogeneity

We use a standard aggregate matching function to estimate the elasticity of the job-finding rate in relation to vacancies as well as the matching efficiency. The aim is to understand the role of matching efficiency and matching elasticity in the decrease in unemployment at each vacancy level and the shifts in the Beveridge curve. Our analysis reveals that the estimated elasticity of job matching with respect to vacancies in Slovakia is comparable to that of other EU countries in the literature. Additionally, by conducting separate estimations of the matching function across different industries and regions, we uncover evidence of heterogeneity in matching elasticity. Industries and regions with higher matching elasticity in relation to vacancies tend to achieve more job matches for a given increase in the number of vacancies compared to industries and regions with lower matching elasticity.

Box 1 Empirical Methodology and Data Description

We follow the Cobb-Douglas form (Petrongolo and Pissarides, 2001[4]) of the matching function for this estimation.

$$m_t = \mu_t U_t^{\alpha} V_t^{1-\alpha} \qquad \text{(i)}$$

Here, $\mu_t$is matching efficiency, m is the number of matches or new jobs found, U is number of unemployed, and V is number of vacancies, α is the elasticity with respect to unemployment[5].

[4] Petrongolo, B., & Pissarides, C. A. (2001). Looking into the black box: A survey of the matching function. Journal of Economic literature, 39(2), 390-431.

[5] In a world with no search and/or matching frictions or such issues, the labour market would adjust instantaneously to shocks. However, in this equation we consider matching frictions.

For estimation efficiency, we transform the aggregate matching function to its log linear form

$$lnf_t = ln\mu + (1-\alpha)ln\theta_t + \epsilon_t \qquad \text{(ii)}$$

$f_t = {}^{m_t}/_{U_t}$ is job finding rate and $\theta_t = {}^{V_t}/_{U_t}$ denotes labour market tightness, α is the empirical elasticity with respect to unemployment, (1- α) is the elasticity of matching with respect to vacancies or the elasticity of job finding rate with respect to labour market tightness. We calculate the matching efficiency from the residuals of this regression.

Given different skillsets and requirements in different sectors and different regions, it is important to consider the heterogeneity in matching efficiency between jobs and unemployed workers in different industries[6] and regions. Using industry/region fixed effect panel regression, the aggregate matching function equation (assuming elasticity of matching $(1-\alpha)$ is same for all sectors/regions) becomes

$$lnf_{it} = ln\mu + (1-\alpha)ln\theta_{it} + \beta_i + t + D_q + \epsilon_{it} \qquad \text{(iii)}$$

Here, β_i are industry fixed effects in the panel regression using industry data and regional fixed effect in the regional panel regression, t is a time trend. We also add quarterly dummies to account for seasonality. We use the residuals and the trend to calculate the matching efficiency over time.

In the next step, we also estimate the matching function equation for each industry and region assuming elasticities of matching are different for each industry and each region.

$$lnf_{it} = ln\mu_i + (1-\alpha_i)ln\theta_{it} + t + D_q + \epsilon_{it} \qquad \text{(iv)}$$

Here $(1-\alpha_i)$ is the elasticity of matching with respect to vacancies for each sector or each region.

To estimate the aggregate, industry and regional specific matching elasticities, we require sectoral and regional data on unemployment, vacancies and matching (job finding rate). We use the statistical office data on number of employed persons, number of unemployment persons and number of vacancies to calculate job finding rate and labour market tightness (vacancy/unemployment) for different sectors and for different regions. We use 2 separate quarterly datasets (industry and regional) from 2008 Q1 to 2023 Q4.

From the industry panel data regression results (Annex: Table 1), the estimated value of the elasticity of job matching with respect to vacancy is found to be 0.31 and significant for the aggregate economy of Slovakia. In comparison, matching elasticities in other EU countries range from 0.18 to 0.63, as reported in the literature[7]. The estimated average value of elasticity of job matching with respect to vacancy is found to be 0.48 and significant for the regional panel regression (Annex: Table 2). This implies that overall higher labor market tightness is strongly associated with greater matching efficiency.

The estimated time trend is found to be positive (0.007) and statistically significant for the industry panel regression ((Annex: Table 1), suggesting that matching efficiency has been steadily improving across sectors over this time. This improvement likely reflects structural changes and overall macro developments

[6] Lisauskaite, E. (2023). Matching Efficiency and Heterogeneous Workers in the UK. Available at SSRN 4390602.

[7] Petrongolo, B., & Pissarides, C. A. (2001). Looking into the black box: A survey of the matching function. Journal of Economic Literature, 39(2), 390-431.

in Slovakia such as technological adoption, the digitalization of job search processes, and evolving industry practices to enhance the effectiveness of worker–job matches. By contrast, in the regional panel, the time trend is slightly negative (–0.0018) but not statistically significant, indicating that after accounting for seasonality and other controls, there is no clear long-term directional change in matching efficiency across regions and the regional differences in matching efficiency are explained largely by cyclical factors (tightness). The constant coefficient for both the panels are found positive (1.27 and 2.63 for sectoral and regional panel) and significant which implies that there is still other variations unaccounted for in the regional and sectoral labour markets which are not related to the overall macro developments.

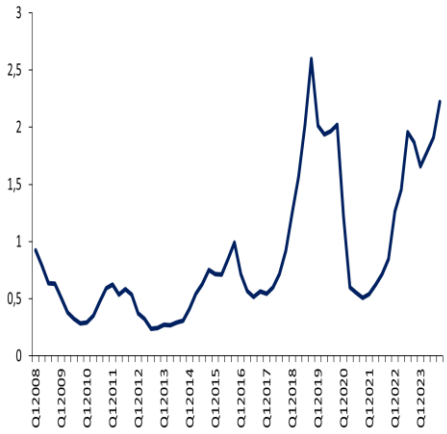
Our analysis shows significant heterogeneity in elasticities for different sectors. The estimated elasticity of matching for manufacturing and other industries is not statistically significant and lower than wholesale and retail trade, construction or some service sectors. This implies that for the same increase in job openings or vacancies in manufacturing and other industries will have lower number of actual matches compared to wholesale and retail trade or these service sectors.

We also observe significant heterogeneity in elasticities across different geographical regions. Looking at individual regions separately, the Bratislava region, which includes the capital city, has the highest elasticity of matching with respect to vacancies. So, for the same increase in job openings or vacancies Bratislava has the highest number of actual matches compared to all other regions. It is easier to fill an empty position in the Bratislava region compared to rest of Slovakia. The Košice region, Žilina and, and Banská Bystrica also exhibit significant and high elasticity of matching with respect to vacancies. The elasticities of matching for Trnava, Trenčín and Prešov are not significant and much lower than other regions.

Labour Market Tightness and Macro-developments as Drivers of Beveridge Curve Shifts

Based on the regression results, the shifts in the Beveridge curve in recent time can be more plausibly attributed to an increase in labour market tightness-reflecting a higher ratio of vacancies to unemployment (significant elasticity of matching) and macro-developments in the labour market (significant and positive sectoral time trend). Chart 8 shows that labour market tightness has increased steadily since 2015 (except for a temporary drop during the pandemic), implying a strong demand for labour as a driver for Beveridge curve shifts. Broader improvement in macroeconomic conditions also likely contributed to stronger job creation and increased hiring activities as observed in chart 4 (higher recruiting intensity and lower mismatch index over time)

Chart 6
Change in Labour Market Tightness Over Time (Ratio of Vacancy to Unemployed Persons)



Source: Statistical Office Data, NBS calculation

Chart 7
Labour productivity per person in Slovakia (% of EU-27 average)

Source: Eurostat

While rising labour market tightness and stronger job creation explain much of the shift in the Beveridge curve, this period also coincided with a marked slowdown in productivity growth. This suggests that the expansion in employment did not translate proportionally into efficiency gains, possibly due to skill mismatches, labour hoarding, or weaker technological diffusion.

Conclusion

The evidence shows that shifts in Slovakia's Beveridge curve are largely driven by rising labour market tightness and sectoral-level improvements in matching efficiency, supported by broader macroeconomic developments. Elasticities of job matching with respect to vacancies are significant at both sectoral and regional levels, though substantial heterogeneity persists across industries and regions, with bigger cities and service-oriented sectors outperforming others. While these dynamics point to strong labour demand and structural progress, the simultaneous slowdown in productivity growth suggests that job creation has not been matched by efficiency gains. For policymakers, this highlights the need to address skill mismatches, strengthen regional labour market integration, and support innovation and digitalisation in lagging sectors to ensure that employment growth translates into sustainable productivity gains.

Annex

Table 1

Aggregate and Industry Matching Functions: Elasticity with Respect to Vacancies

Industry	**Elasticity of Matching $(1-\alpha)$**
Aggregate Economy	.3141***
Time trend	.0079**
Constant term	1.2762*
Agriculture, forestry and fishing	.0847
Industry together	.1192
Construction	.8097***
Wholesale and Retail Trade	.5510*
Transportation	.6548*
Accommodation and catering services	.2645
Information and Communication	.291
Financial and Insurance Activities	.0782
Professional, Scientific, Technical activities	.5896*
Administrative and Support Activities	.2196
Public Administration	.4815
Education	.2618

Note: *** 1%, ** 5%, * 10%, N=336 (Aggregate), 44 (Sector specific)

Table 2

Aggregate and Regional Matching Functions: Elasticity with Respect to Vacancies

Region	**Elasticity of Matching $(1-\alpha)$**
Aggregate Economy (fixed effect)	.4884***
Time trend	-.0018
Constant term	2.6328***
Bratislava region	.8376***
Trnava region	.1523
Trenčín region	.1663
Nitra region	.4561*
Žilina region	.5390***
Banská Bystrica region	.3795**
Prešov region	.2847
Košice region	.4647**

Note: *** 1%, ** 5%, * 10% N=336 (Aggregate), 34-41 (Region specific)

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