Staff memo

The relationship between growth and unemployment at the regional level – what do Swedish data tell us about cyclical and structural factors?

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Staff Memos

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Summary

Unemployment in Sweden has risen by around 1.5 percentage points over the past two years. A key question is how much of this increase is cyclical – driven for example by weaker demand – and how much is structural, that is, linked to more persistent differences in how labour markets function across regions and groups. To shed light on this, we analyse a regional Okun relationship in which economic activity is measured as GDP growth, and where variation in the response is captured through interactions with regions' structural characteristics.

We address two questions: how quickly and how persistently unemployment falls, on average, when GDP grows, and whether this response varies with factors such as employment, unemployment, population density, degree of urbanisation, the share of foreign-born residents, and educational attainment. By separating common macroeconomic effects from regional differences, we assess the extent to which changes in unemployment are mainly cyclical or partly structural. The analysis uses local projections on regional panel data for 2000–2023. National GDP fluctuations serve as business-cycle impulses, interacted with regions' structural characteristics.

The results show a clearly negative Okun relationship: higher GDP growth is followed by lower unemployment, with the strongest effect after about one year. The size of the response varies systematically. Regions with high employment and greater mobility adjust more quickly and strongly, while regions with high unemployment, a large share of foreign-born residents, or high population density show weaker adjustments. This pattern also holds when breaking the analysis down by education and country of birth – effects are stronger for individuals born in Sweden and for those with at least upper-secondary education.

Taken together, economic activity is the dominant driver of short-term movements in unemployment across Swedish regions. At the same time, labour-market structure shapes both the strength and the speed of the response to an increase in GDP. Regions with more favourable conditions in terms of labour supply, skills composition, and matching opportunities adjust more quickly, whereas regions with high unemployment, a large share of foreign-born residents, or other structural challenges exhibit a weaker and more protracted adjustment. These differences are moderate in size but statistically clear.

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1 Background and issues

Over the past two years, unemployment in Sweden has risen by around 1.5 percentage points to almost 9 per cent.[2] At the same time, there is considerable regional dispersion: in some regions, unemployment has risen much faster than in others, despite broadly similar cyclical conditions.[3]

The key question, therefore, is how much of the upturn is due to cyclical weakness – a temporary slowdown in demand – and how much reflects structural changes and differences in how well labour market's function. One way to approach this question empirically is to measure how strongly unemployment typically responds to changes in output: the Okun relationship.

At the national level, the stability of the Okun relationship has been studied by Karlsson and Österholm (2021), who find that it is relatively stable for Sweden. At the regional level, differences in industrial structure, labour-force composition, and matching efficiency come into play. This makes regional variation particularly informative when assessing labour-market performance.

Blanchard and Wolfers (2000) emphasise the interaction between economic shocks and institutions. Thus, unemployment is determined not only by the strength of shocks but also by labour-market functioning – mobility, industrial structure, wage formation, and matching efficiency.[4] Calmfors and Holmlund (2000) summarise theoretical and empirical results on equilibrium unemployment and show that it is determined by the interaction between price and wage setting and by search and matching frictions, implying that macro shocks can have long-lasting effects. Within this theoretical framework, the strength of an Okun-type relationship may vary across settings depending on institutions and matching.

Swedish studies confirm clear regional mechanisms. Aranki and Löf (2008) find that matching efficiency varies markedly across regions and that metropolitan areas – despite their dynamism – tend to have lower matching efficiency than more sparsely populated regions. Häkkinen Skans and Wasén (2025) also show that matching in Sweden has weakened over time, particularly since the 2008 financial crisis, as a growing share of the unemployed stand further from the labour market.

[2] According to the Labour Force Survey (LFS), in September 2025 around 5.24 million people were employed (not seasonally adjusted), while 476,000 people were classified as unemployed, corresponding to an unemployment rate of 8.3 per cent. In seasonally adjusted terms, unemployment stood at 8.7 per cent. At the same time, according to the Swedish Public Employment Service's register data, 364,000 people were registered as unemployed (6.9 per cent of the labour force), a figure that includes both individuals immediately available for work and those participating in labour-market programmes. The corresponding share one year earlier was 6.8 per cent.

[3] According to the Swedish Public Employment Service's statistics for August 2025, unemployment was 3.8 per cent in Norrbotten County, 3.9 per cent in Gotland County, and 4.4 per cent in Jämtland County, while the corresponding figures in Skåne and Västmanland Counties were 9.0 and 8.6 per cent respectively. At the municipal level, the differences were even larger – ranging from 2.4 per cent in Gällivare to more than 13 per cent in Perstorp. According to the LFS, developments between 2022 and 2024 show that unemployment increased the most in Västra Götaland County (+2.3 percentage points) and in Stockholm, Uppsala, Kalmar, and Västernorrland Counties (+1.3), while it declined markedly in Södermanland (–3.3) and Gävleborg Counties (–2.0). In several northern counties – such as Norrbotten (–0.4) and Jämtland (+0.5) – the changes were small. This illustrates the substantial regional variation in labour-market developments despite a broadly shared cyclical environment.

[4] Blanchard and Wolfers (2000) built on a long tradition of research linking macro shocks and institutions. For example, Gottfries and Horn (1987) show how union wage setting creates persistence following temporary shocks; Blanchard and Summers (1987) develop the hysteresis argument, whereby shocks become persistent through insider–outsider dynamics; Mortensen and Pissarides (1994) analyse how institutional parameters shape the labour market's response to productivity and redistribution shocks; and Nickell (1997) links unemployment developments across OECD countries to the interaction between institutions and common shocks. Ljungqvist and Sargent (1998) also show how "turbulence" interacts with benefit systems and taxation, thereby generating large cross-country differences in unemployment. These studies offer foundational insights for understanding how shocks and institutions interact to shape equilibrium unemployment.

Overall, this provides strong justification for adopting a regional and structural perspective on the Okun relationship.

2 Method

We analyse how economic activity affects unemployment in different parts of Sweden using panel data at the regional level. The basic idea is to compare how unemployment in each region changes as economic activity – measured by real gross domestic product (GDP) – fluctuates.

We use local projections (Jordà 2005) to track the evolution of unemployment following changes in GDP at horizons of 0–3 years. In this study, the method aims to describe dynamic co-movements rather than to identify causal effects via exogenous shocks. Local projections are well suited for such descriptive applications (Jordà and Taylor 2025).

In practice, we estimate the change in unemployment h years after a change in GDP in year t. By repeating this for $h = 0, \dots, 3$ years, we map the strength and persistence of the relationship.

Dataset and time period

The analysis is based on a panel dataset covering all Swedish regions during the period 2000–2023. The period captures booms and downturns – including the financial crisis, the pandemic, and the recent phase of rising interest rates – as well as changes in the structure and dynamics of the labour market.

Data come from the Swedish Public Employment Service and Statistics Sweden, partly compiled in Kolada.[5] Unemployment is measured as open unemployment per inhabitant aged 16–64 and is analysed in logarithmic form, which means that changes can be interpreted as approximate percentage changes.[6] GDP is measured in real terms and analysed as annual growth (ΔGDP). We also use unemployment from the LFS, but this does not materially affect the conclusions or the overall results – see Appendix A.

Model specification

The estimated model can be written as:

$$\Delta^h u_{i,t+h} = \alpha_i + \beta_h \Delta Y_t + \gamma_h \left(\Delta Y_t \times F_{i,t-1}\right) + \delta_h X_{i,t} + \varepsilon_{i,t+h},$$

[5] Kolada (the Municipal and Regional Database) is an open database that provides key indicators for Sweden's municipalities and regions, used for benchmarking and for monitoring and financial outcomes. The database is managed by the Council for the Promotion of Municipal Analysis (RKA).

[6] We use the number of openly unemployed as a share of the population rather than the number of registered unemployed. The former captures the direct employment response to the business cycle, while the latter also reflects variations in labour-market programmes and institutional factors. If the number of registered unemployed were used instead, differences between regions could be partly driven by variations in programme intensity or labour-market policy initiatives rather than by differences in underlying cyclical sensitivity. While the Swedish Public Employment Service's initiatives are governed nationally, they are adapted regionally, and the Swedish National Audit Office has shown that their scope and focus vary across regions (RiR 2015:22 and RiR 2025:20). The choice of measure does not, however, materially affect the overall results. When the model is estimated using registered unemployment instead, broadly the same countercyclical pattern emerges, although with somewhat clearer regional differences. This suggests that variations in programme intensity and the composition of programme participants may contribute to differences in adjustment speeds. See also footnote 12. The results are likewise robust to calculating unemployment as a share of the labour force rather than the population; the main relationships and countercyclical patterns remain unchanged regardless of the measure used.

Where $\Delta^h u_{i,t+h}$ is the change in the open unemployed per capita in region i over h year[7], ΔY_t is the change in GDP (the national "cyclical change"), $F_{i,t-1}$ is a variable that captures structural features in the region (e.g. degree of urbanisation, share of foreign-born residents, or the number of outward migrants), $X_{i,t}$ is a set of control variables such as lags of the dependent variable and $F_{i,t-1}$, α_i are region fixed effects capturing time-invariant regional differences, and $\varepsilon_{i,t+h}$ is the error term.[8]

The interaction between ΔY_t and $F_{i,t-1}$ means that the effect of cyclical changes differs depending on the labour-market conditions of the region. The coefficient γ_h measures how sensitivity to GDP varies with structural differences.[9] This allows us, for example, to compare regions with low employment (p10) to those with high employment (p90) and assess whether the effect of growth on unemployment is stronger or weaker in one setting than the other.

The total marginal effect (ME) of GDP on unemployment in a region with level F is:

$$\frac{\partial \Delta^h u_{i,t+h}}{\partial \Delta Y_t} = \beta_h + \gamma_h F.$$

Figure 1 illustrates this marginal effect for three levels of F: F_{p10}: 10th percentile, F_{p50}: median (typical value of the different aspects of the region's labour market) and F_{p90}: 90th percentile. The three lines in the figure therefore show:

$$Effect(F_p) = \beta_h + \gamma_h F_p, \quad \text{för} \quad p \in \{10,50,90\}.$$

Shaded areas indicate 95 per cent confidence intervals around each impulse response.

Structural measures and interpretation

Structural measures are broadly defined as factors that may affect how effectively employment and unemployment respond to changes in demand. They capture both matching efficiency and adaptability. The following indicators are used:

1. **Employed persons per capita** – a composite measure of labour intensity and capacity to translate output into employment. Higher levels may also reflect age structure, industry composition, and education.
2. **Unemployment rate (per cent)** – inversely reflects, among other things, the speed of the matching process and population composition. A high unemployment rate indicates larger inflows into unemployment or greater matching frictions, which may dampen how quickly increased demand translates into higher employment.
3. **Population per square kilometre** – a direct measure of population density that captures the geographical concentration of workers and employers. Denser regions typically have more matching opportunities and shorter search processes but may also face stronger competition for housing and higher local service costs.
4. **Urbanisation rate** – the share of the population living in urban areas. Reflects economic diversification and access to specialised labour markets.
5. Share born abroad – captures linguistic, cultural, and integration-related factors.

[7] $\Delta^h u_{i,t+h}$ can thus be interpreted as approximate percentage changes in the number of openly unemployed per capita.

[8] We cluster the standard errors at the region level, making the inference robust to serial correlation and heteroskedasticity within regions.

[9] To examine the extent to which the results depend on the choice of business-cycle measure, we follow Amberg (2025) and also estimate the regression using the change in the GDP gap as the explanatory variable.

6. **Share of outward migrants** – a measure of mobility and regional attractiveness. High out-migration may indicate weak labour demand or low regional attachment.

All indicators are z-standardised[10]. We retain the original interpretation of the variables. A higher value does not necessarily imply greater friction but reflects the region's relative position. These indicators follow previous studies of matching conditions and related labour-market aspects, including Aranki and Löf (2008), Håkansson (2014), Häkkinen Skans and Wasén (2025), and the Fiscal Policy Council (2024). Taken together, they provide a broad and nuanced picture of how labour-market structure, mobility, and adaptability differ across Swedish regions.[11]

Correlation patterns and data dimensions. Several indicators are correlated – in particular the share born abroad, urbanisation rate, population density, and degree of urbanisation – which largely reflect an urbanisation dimension.

By contrast, employment per capita and the unemployment rate show weaker relationships with the other indicators. These variables appear to capture a separate dimension of labour-market functioning, reflecting differences in industry composition, labour-force participation, and institutional conditions rather than variation in urbanisation. They can therefore be interpreted as indicators of longer-run differences in the effective use and integration of the workforce.

This structure entails a risk of multicollinearity and complicates the interpretation of individual coefficients.

Residualisation of structural indicators. To avoid several indicators capturing the same underlying dimension, we purify each variable before using it in the local projections. This is done by residualising each indicator on all the others. The residualised variable therefore represents the component of, for example, urbanisation or the share of foreign-born residents that cannot be explained by the other indicators in the set. Following residualisation, each indicator can be interpreted as a more specific measure of a structural feature of the regional labour market.

$$F_t = F_t|\widehat{other}F_t + F_t^{\perp} \quad ,$$

where $F_t|\widehat{other}F_t$ is the part of F_t explained by the remaining indicators, and $F_t^{\perp}$ is the residual – the unique component that is orthogonal to the others.

It is this orthogonal residual, $F_t^{\perp}$ that we use in the interaction terms between changes in Y_t and the structural factors in the local projections.[12]

[10] Z-standardisation means that each variable is first converted into its deviation from the mean and then divided by its standard deviation. The result is a scale where the mean equals zero, and one unit on the scale corresponds to one standard deviation. The percentiles p10, p50, and p90 refer to this z-scale (approximately: p10 well below the average, p50 at the average, and p90 well above the average).

[11] Aranki and Löf (2008) show clear regional differences in matching and link lower matching efficiency to high population density and urbanisation (indicators 3–4). Håkansson (2014) estimates aggregate matching functions and shows how the unemployment rate and job-finding probabilities co-move with the business cycle and labour-market frictions (indicators 1–2). Häkkinen Skans and Wasén (2025), as well as the Fiscal Policy Council (2024), emphasise composition effects – particularly the share of foreign-born residents – as a key explanation for lower matching efficiency (indicator 5), and discuss mobility and regional attractiveness as part of the broader mismatch problem (indicator 6). Taken together, these studies support the view that the indicators capture both matching efficiency and adaptability across Swedish regions. However, the indicators should be regarded as approximate measures of different structural features and frictions. Other structural differences between regions – for example in industrial composition, educational attainment, or demographic structure – may also contribute to the observed variation. The results should therefore be interpreted as indicative.

[12] The results are robust to controlling for other F_t in the local projections.

Are the estimated differences between regions statistically significant? Figure 2 shows the difference in the estimated business cycle effect between regions with high and low levels of the selected structural variable $F_{t-1}^{\perp}$. Unless otherwise stated below, we denote the residualised variable as F_t to economise on notations. The starting point is the same local projection model as for Figure 1:

$$\Delta^h u_{i,t+h} = \alpha_i + \beta_h \Delta Y_t + \gamma_h (\Delta Y_t \times F_{t-1}) + \delta_h X_{i,t-1} + \varepsilon_{i,t+h},$$

where β_h captures the average effect of a change in GDP on unemployment and γ_h indicates how this effect changes as friction $F_{i,t-1}$ increases.

The difference between the marginal effects is calculated as:

$$\Delta Effect_h = [\beta_h + \gamma_h F_{p90}] - [\beta_h + \gamma_h F_{p10}] = \gamma_h (F_{p90} - F_{p10}).$$

This expression, $\Delta Effect_h$, therefore represents the difference in cyclical sensitivity between a region at the 90th percentile and one at the 10th percentile of the "friction distribution".

Figure 2 plots these differences $\Delta Effect_h$ across horizons $h = 0,1,2,3$. Asterisks indicate horizons where the difference is statistically significant, and the shaded bands show 90-per-cent confidence intervals.

Interpretation of impulse responses. The economic intuition behind the local projections can be summarised as follows:

- If the relationship between GDP and unemployment is strong and persistent over the business cycle, this implies that the labour market rapidly translates both increases and decreases in demand into changes in employment and unemployment. In such cases, unemployment is primarily cyclical.

- If the relationship is weak or fades quickly, this may indicate the presence of structural frictions that dampen both improvements when the economy expands and deteriorations when it contracts.

Thus, what matters is not only the slope of the Okun relationship, but also how that slope varies over time and across regional contexts.

3 Results

A 1-per-cent increase in GDP is typically followed by a decrease in open unemployment per capita of around 4 per cent after one year (Figure 1).[13] The effect then diminishes in years two and three.[14] The relationship is therefore initially negative – a regional Okun relationship – but short-lived.

[13] The effects can also be interpreted symmetrically for a reduction in GDP, with the sign of the responses reversed. To test the extent to which the results depend on the choice of business-cycle measure, we follow Amberg (2025) and also estimate the regression using the change in the GDP gap as the explanatory variable. We use the National Institute of Economic Research's (NIER) GDP-gap series as of September 2025. The results prove robust: standard errors are somewhat smaller, and regional heterogeneity becomes slightly more pronounced. The coefficients are somewhat more negative in magnitude, but the conclusions are not driven by the choice of business-cycle indicator.

[14] A 4-per-cent decrease in unemployment means that the number of unemployed persons per capita falls by 4 per cent — not that the unemployment rate declines by 4 percentage points. With an unemployment rate of 8.1 per cent of the labour

Regional heterogeneity is small to moderate on average. The difference in the marginal effect between p90 and p10 for each residualised structural variable is around half a percentage point at the one-year horizon, compared with a total effect of around four per cent (Figure 2). These differences are statistically significant in several cases, but small relative to the overall response.

The pattern is, however, systematic: regions with high unemployment, high population density, and a large share of foreign-born residents exhibit a weaker decline when GDP increases. Unemployment in regions with high employment and higher outward migration reacts somewhat more strongly. The differences relate mainly to magnitude rather than direction.

This interpretation is consistent with the theory of interactions between macro shocks and institutions (Blanchard and Wolfers 2000) and with earlier Swedish evidence of a clear but dynamic Okun relationship (Aranki, Friberg and Sjödin 2010). Partially fading effects align with cyclical variation in matching quality (Fredriksson, Hensvik and Nordström Skans 2018). The weaker elasticities in regions with high unemployment and a large share of foreign-born residents are consistent with evidence of declining matching efficiency in recent years (Häkkinen Skans and Wasén 2025; Swedish National Audit Office 2017).

Overall, the common cyclical impulse dominates unemployment dynamics, but regional structures influence the strength and persistence of the relationship. The differences are moderate but statistically robust.[15]

Differences between groups – education and country of birth

The Swedish Public Employment Service's situation report (Q2 2025) shows large differences in unemployment across education levels and between those born in Sweden and those born abroad.

In Västerbotten County, 21 per cent of the registered unemployed lacked upper-secondary education, compared with 31 per cent nationally. Unemployment among the low-educated was 13 per cent, compared with 5.3 per cent in the overall population of Västerbotten (national levels: 20 and 6.9 per cent, respectively). In Blekinge, 32 per cent of the registered unemployed had no upper-

force (about 0.46 million people out of a labour force of 5.7 million), such a reduction would imply that the number of unemployed falls to roughly 0.44 million. This corresponds to an unemployment rate of about 7.8 per cent, i.e. a decline of around 0.3 percentage points. See the Appendix for a discussion of unemployment measures and for results where the dependent variable is the unemployment rate in per cent according to the Labour Force Survey (LFS). The magnitude of the results in that specification is consistent with these back-of-the-envelope calculations. The results are also similar when we instead use registered unemployment (rather than open unemployment). The heterogeneous effects are likewise similar, although somewhat more pronounced.

[15] As a complement, we have also estimated the model with the number of unemployed in labour market programmes as the dependent variable. The results confirm the clear countercyclical dynamics: an increase in GDP is followed by a decrease in programme unemployment, with an effect of around -4 to -6% after one year. However, the effect is somewhat more sluggish and more heterogeneously distributed across regions than for the openly unemployed. In regions with high unemployment, low employment rates and a high share of foreign-born, the decline is smaller and the effect more prolonged over time. This suggests that cyclical movements in programme unemployment partly reflect differences in programme intensity, participation structure and local conditions rather than simply variations in actual labour demand.

To test the extent to which the results are affected by regional differences in demand and in production structure, the model has also been estimated with growth in gross regional product (GRP) as a control variable. GRP provides a direct measure of local economic activity and captures differences in the composition of the economy between regions. However, the inclusion of this variable does not significantly affect the results. As an additional indicator of the regions' production structure, we have included per capita greenhouse gas emissions (tonnes of CO_2 equivalent) from the National Emissions Database. The measure reflects the energy- and capital-intensive part of production in the region and serves as a proxy for business structure and local cyclical sensitivity. The results show that regions with higher emissions – typically more industrialised – exhibit somewhat weaker sensitivity to GDP changes, suggesting that employment there is less cyclically mobile. However, the inclusion of the variable does not significantly affect the main results, possibly reflecting the fact that the regionally constant effects already capture long-term differences in industry structure and production patterns.

secondary education; unemployment among this group was 22 per cent, compared with 7.1 per cent for the population as a whole.

Similar differences hold for those born abroad. In Uppsala County, foreign-born individuals accounted for 54.5 per cent of the registered unemployed; the corresponding shares were 45 per cent in Blekinge and 58 per cent in Södermanland County. In the latter, the unemployment rate among foreign-born individuals was 19.6 per cent, compared with 4.8 per cent among the native-born.

Overall, regional differences in educational attainment and population composition covary strongly with unemployment levels and labour-market attachment. This motivates a closer analysis of how GDP changes translate into reduced unemployment across groups. The results in Figures 3–14 show that the relationship is present in all groups, but that differences relate primarily to the strength of the effects, not their direction.

For unemployed persons with **post-secondary education** (Figures 3–4), a 1-per-cent increase in GDP reduces unemployment by around 5–6 per cent already within the current year—somewhat stronger than the average effect for the total population.[16] Regional differences, however, are substantial: up to 2–3 percentage points between regions at the 90th and 10th percentiles of the structural indicators. This suggests that even the highly educated face region-dependent variation in how quickly increased demand translates into employment, particularly in regions with differing employment and unemployment levels.

For openly unemployed persons **without upper-secondary education** (Figures 5–6), the effects are weaker. A 1-per-cent increase in GDP reduces unemployment by around 4 per cent, and the effect varies markedly across regions. In particular, regions with already high unemployment experience a smaller decline, indicating more pronounced structural barriers in these labour markets.

For those with **upper-secondary education** (Figures 7–8), the pattern is the opposite. Unemployment falls more rapidly—by 7–8 per cent within one year—and the effect is relatively uniform across regions. Neither the degree of urbanisation nor the share of foreign-born residents yields significant differences, and unemployment among the upper-secondary educated even falls more in high-unemployment regions. This suggests that upper-secondary graduates respond most proportionally to changes in demand, regardless of regional labour-market structures.

When unemployment is broken down by country of birth, further nuances emerge. For **individuals born in Sweden** (Figures 11–12), unemployment falls by around 7 per cent following a 1-per-cent increase in GDP, similar to the pattern for the upper-secondary educated. Regionally, the largest differences arise between counties with different employment levels—unemployment falls by

[16] The results remain largely unchanged if unemployment is instead measured relative to the number of individuals with the corresponding level of education (or region of birth), rather than relative to the total population. The difference between the two measures can be written as $log(u_g/N) = log(u_g/N_g) + log(N_g/N)$, where u_g is the number of unemployed in group g, N_g the size of that group and N is the total population. The first term measures the group's unemployment relative to its own size, while the second term reflects the group's share of the population. Thus, the choice of denominator merely determines whether the composition term $\Delta log(N_g/N)$ is implicitly included or excluded in the estimation. As long as changes in the group's population share do not systematically covary with GDP fluctuations, the estimate of β_h is unaffected. In the presence of cyclical migration (e.g., rising group shares during economic upturns), the estimated β_h may become slightly less negative, as changes in group composition move in the opposite direction of the cyclical decline in unemployment. In practice, the effect is small, and our results are robust to either definition.

roughly three percentage points more in regions with high employment—while other structural indicators contribute little.

For **people born in Europe** (Figures 9–10), the effect is slightly weaker, at around 5–6 per cent, but follows the same pattern: unemployment declines more sharply in regions with high employment. Differences range from –1 to +3 percentage points depending on the structural profile, with effects peaking after two to three years.

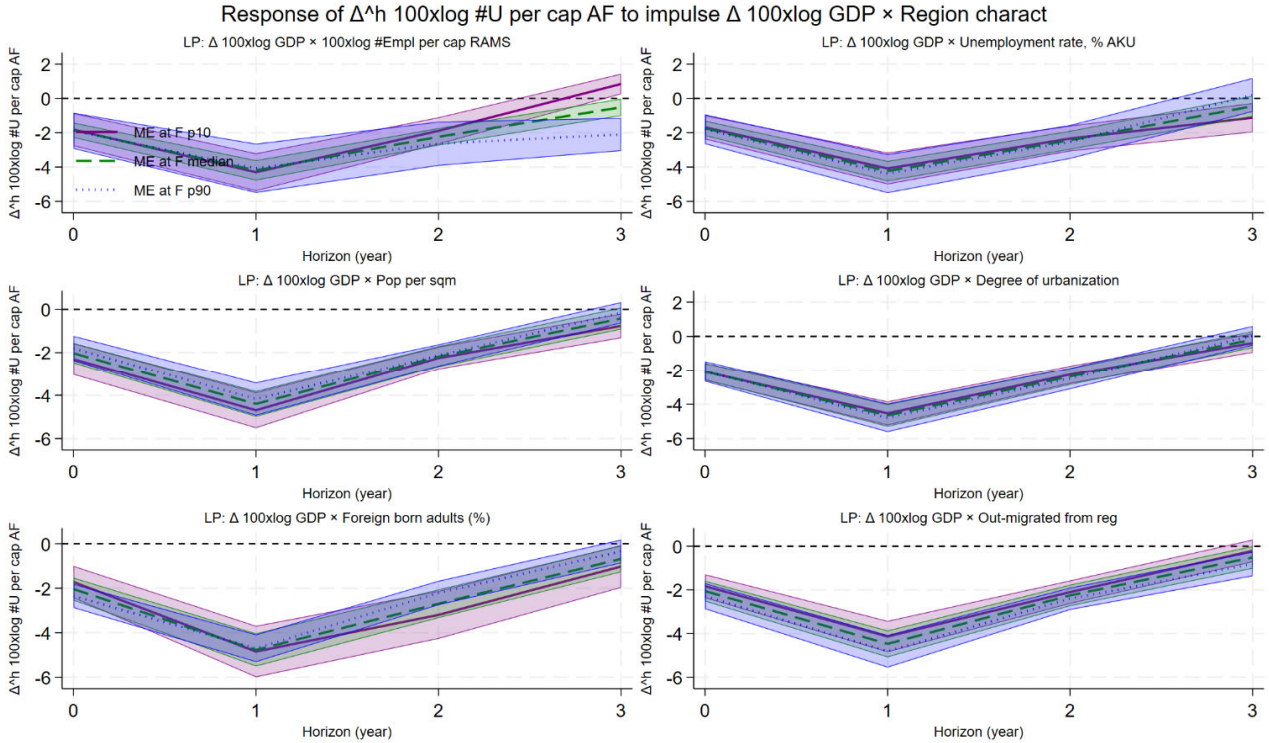
For **people born outside Europe** (Figures 13–14), the relationship is markedly weaker. Unemployment falls by only 2–3 per cent after a 1-per-cent increase in GDP, and regional variation is large. In regions with a low share of foreign-born residents, unemployment among this group falls by around five percentage points more than in regions with a high share. The degree of urbanisation exhibits a similar pattern but in the opposite direction: in more urbanised regions, unemployment among the foreign-born declines more. This suggests that urban environments may facilitate labour-market entry via more diverse industries and networks, but also that urbanisation and the foreign-born share partly capture overlapping structural dimensions. Differences between these variables should therefore be interpreted with caution. They are likely not independent but rather different expressions of the same underlying urbanisation-composition dimension.

This observation aligns with the Public Employment Service's assessment that integration opportunities for the foreign-born vary significantly with factors such as industrial structure, the prevalence of small firms, and access to service-sector jobs—features concentrated in urban regions. It is likely that municipal-level or individual-level data would be required to disentangle these interacting factors more precisely, as regional-level residualisation cannot fully isolate the structural dimensions.

Overall, the results show that the national cyclical impulse has the strongest impact among people born in Sweden and those with upper- or post-secondary education, while the effect is weaker among the low-educated and among those born outside Europe.[17] These patterns are consistent with the descriptive evidence in the Public Employment Service's report and with previous research on matching conditions in Sweden (Fredriksson, Hensvik and Nordström Skans 2018; Häkkinen Skans and Wasén 2025). Economic upturns reduce unemployment across all groups, but the degree of responsiveness depends on education level and integration conditions. This suggests that macroeconomic impulses are filtered to a considerable extent through the structural characteristics of regions and labour markets.

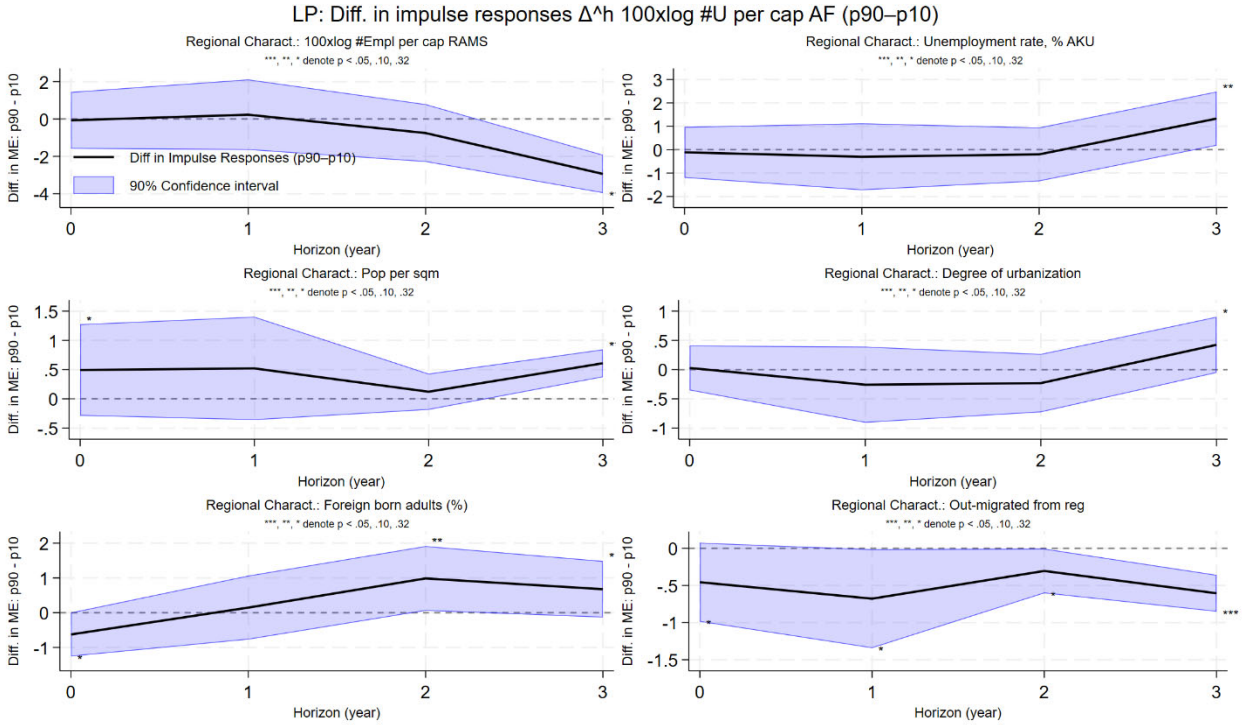
[17] Regarding the effects of GDP changes on open unemployment across age groups, the magnitude of the response declines with age (results not shown). Unemployment among individuals aged 18–24 falls both immediately and persistently. For unemployed persons aged 55 and over, the decline is noticeably smaller and is statistically significant only in the current year (h = 0) and in year 1.

Figure 1. Response of open unemployment per capita in Swedish regions to GDP growth, by regional labour-market characteristics



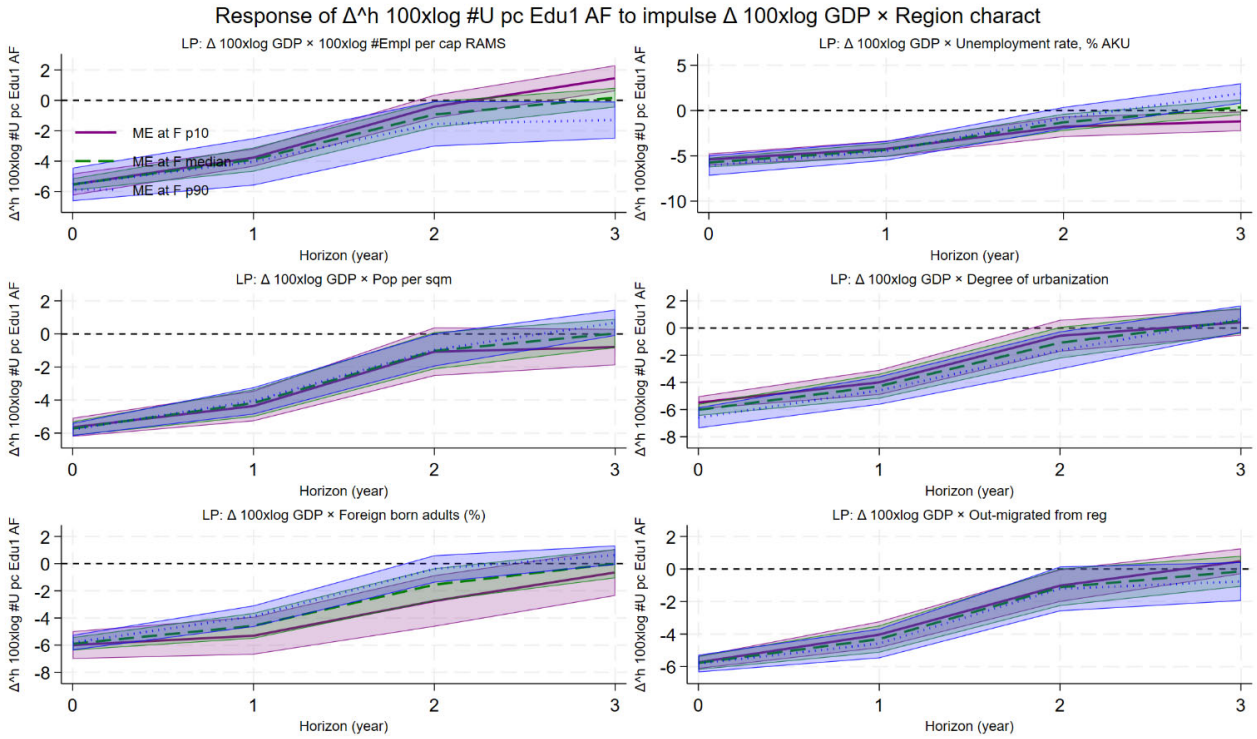
Note. The lines show the estimated marginal effect of a 1-per-cent increase in GDP on open unemployment per capita at the p10/median/p90 levels of regional labour-market characteristics. Values below zero indicate that unemployment falls as GDP rises; differences between the lines show how strongly this response varies with the level of regional characteristics. Shaded areas denote 95 per cent confidence intervals. The outcome is expressed in per cent (log measure) or percentage points (level measure), as described in the text.

Figure 2. Difference in cyclical sensitivity between Swedish regions with high and low levels of regional labour-market characteristics (p90–p10)



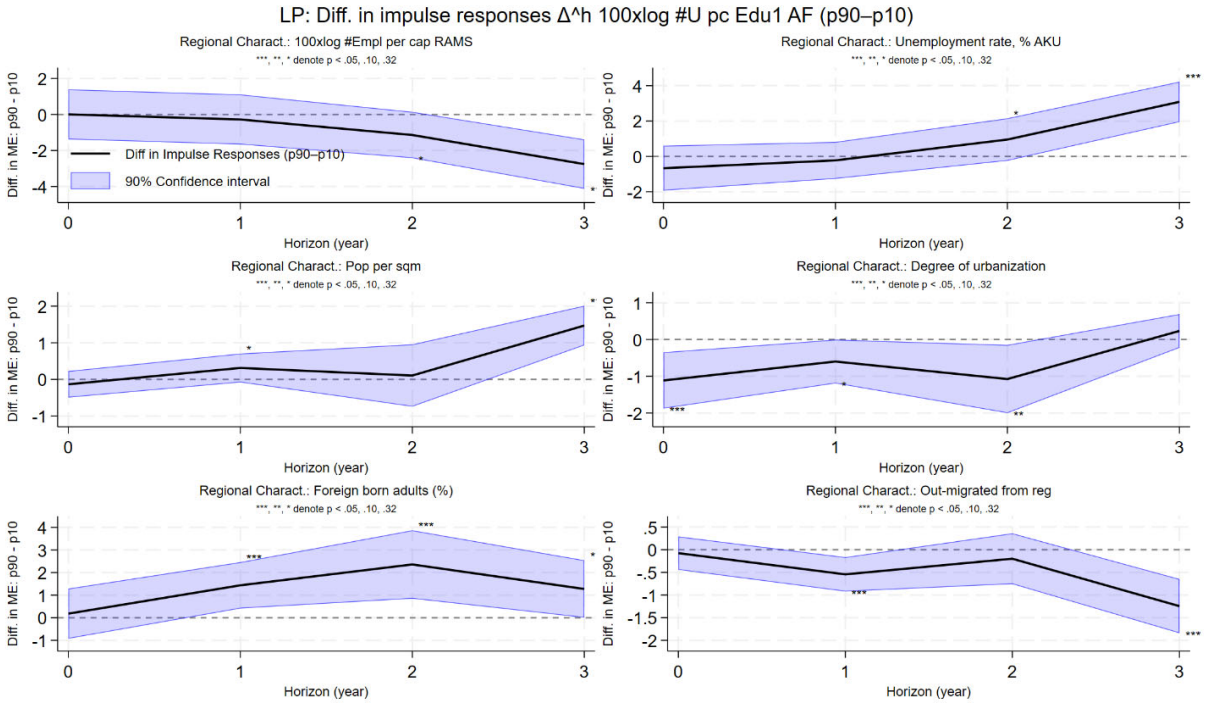
Note. The figure shows the difference in cyclical sensitivity of open unemployment per capita between regions with high and low levels of regional labour-market characteristics (p90–p10). A negative value indicates that unemployment falls more in regions with higher levels of the structural variables — meaning that the cyclical impulse has a stronger impact there. A value close to zero or positive implies that the effect is weaker or more short-lived in these regions, suggesting that structural differences and frictions dampen the transmission of the business cycle. Asterisks denote horizons where the difference is statistically significant at the indicated confidence levels.

Figure 3. Response of open unemployment among post-secondary educated individuals per capita in Swedish regions to GDP growth, by regional labour-market characteristics.



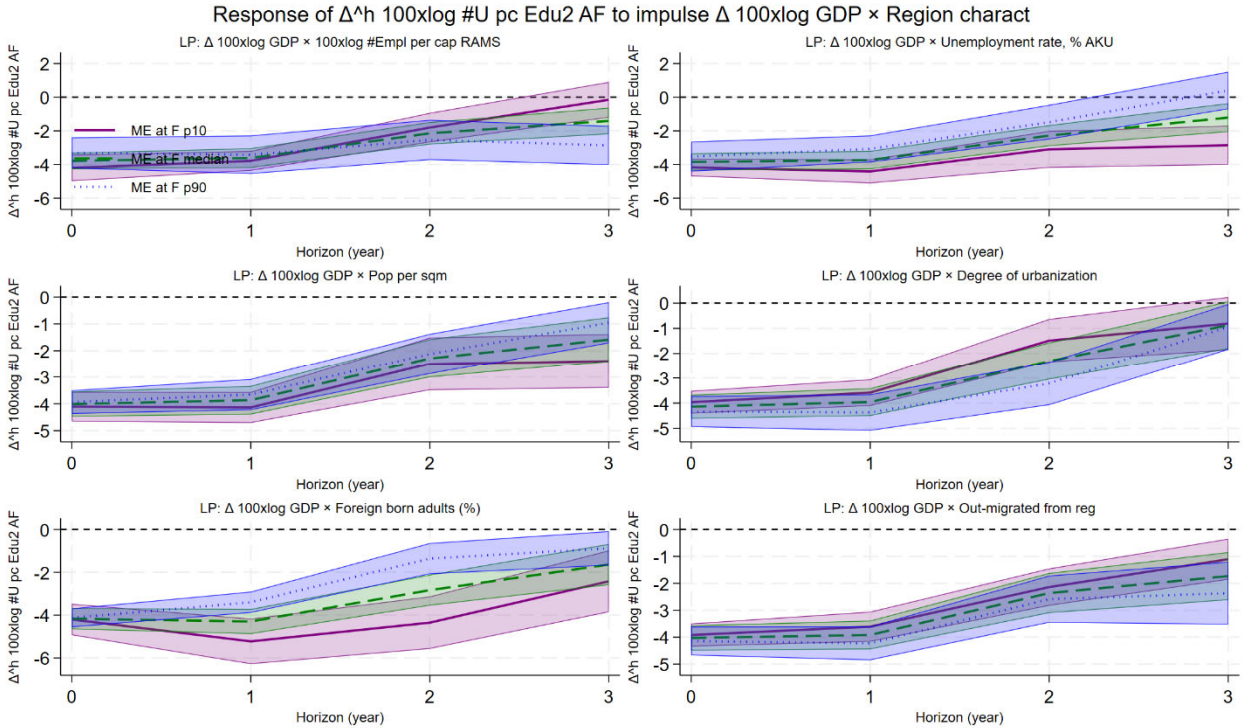
Note. The lines show the estimated marginal effect of a 1 per cent increase in GDP on open unemployment among individuals with post-secondary education per capita at the p10/median/p90 levels of regional labour-market characteristics. Values below zero indicate that unemployment falls as GDP rises; differences between the lines show how strongly this response depends on the level of regional characteristics. Shaded areas: 95 per cent confidence intervals. The outcome is expressed in per cent (log measure) or percentage points (level measure), as indicated in the text.

Figure 4. Difference in cyclical sensitivity of open unemployment among individuals with post-secondary education per capita between regions with high and low regional labour-market characteristics (p90–p10)



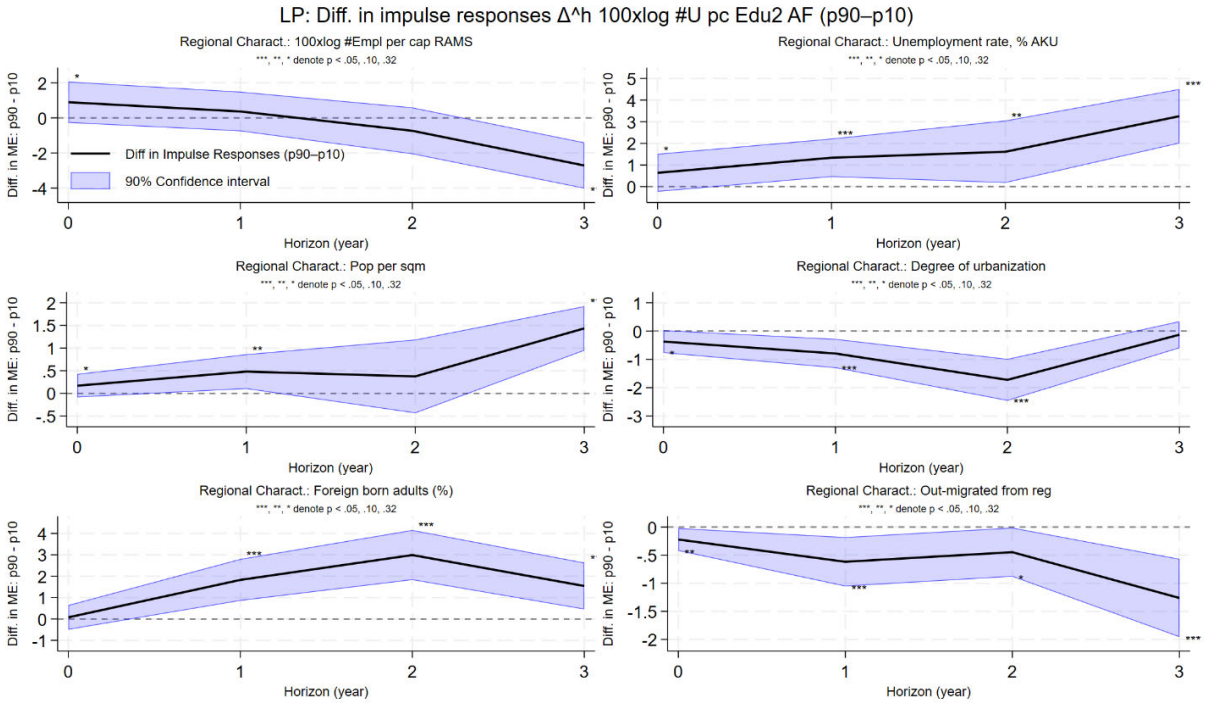
Note. The graph shows the difference in cyclical sensitivity of open unemployment among individuals with post-secondary education per capita between regions with high and low values of the regional labour-market characteristics (p90–p10). A negative value means that unemployment falls more in regions where the structural variable is high – i.e., the cyclical impulse has a stronger effect there. A value close to zero or positive indicates that the effect is weaker or more short-lived in these regions, suggesting that structural differences and frictions dampen the transmission of the business cycle. Asterisks mark horizons where the difference is statistically significant at different confidence levels.

Figure 5. Response of openly unemployed individuals with pre-upper-secondary education per capita in Swedish regions to GDP growth with different regional labour-market characteristics.



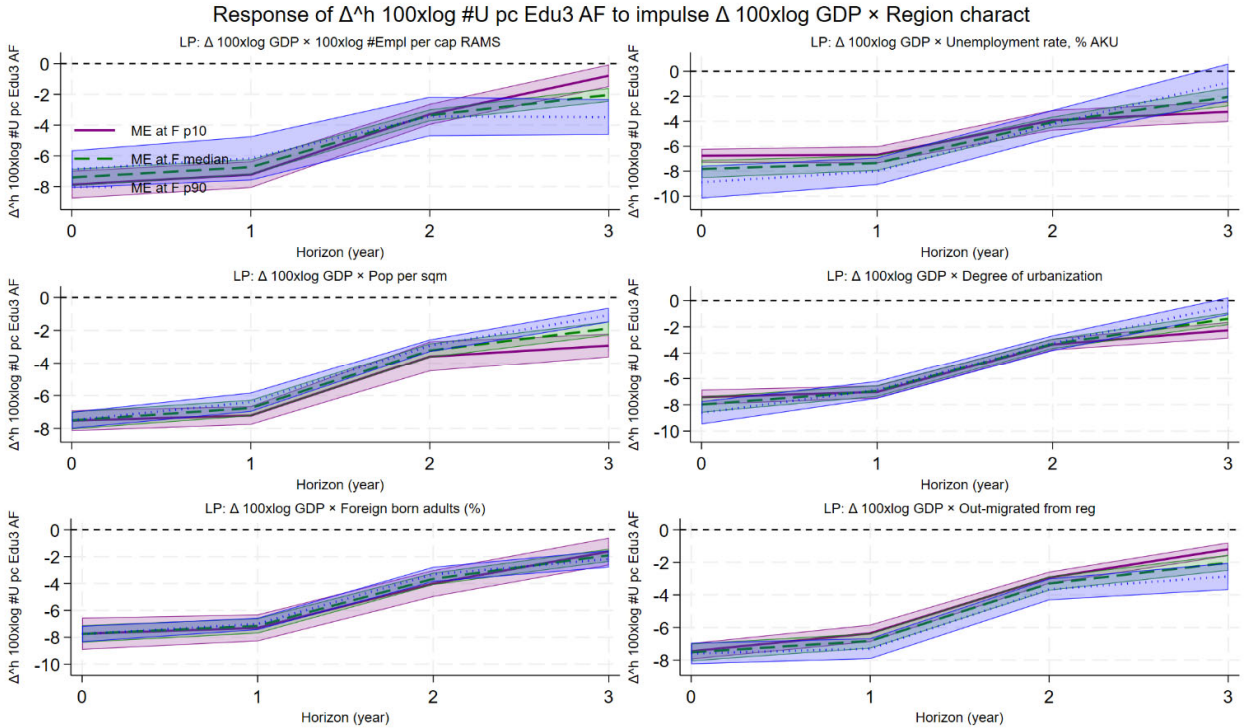
Note. The lines show the estimated marginal effect of a 1-per-cent increase in GDP on open unemployment among individuals with pre-upper-secondary education per capita at the p10/median/p90 levels of regional labour-market characteristics. Values below zero indicate that unemployment falls as GDP rises; differences between the lines show how strongly this response depends on the level of regional characteristics. Shaded areas: 95 per cent confidence intervals. The outcome is expressed in per cent (log measure) or percentage points (level measure), as indicated in the text.

Figure 6. Difference in cyclical sensitivity of open unemployment among individuals without upper-secondary education per capita between regions with high and low regional labour-market characteristics (p90–p10)



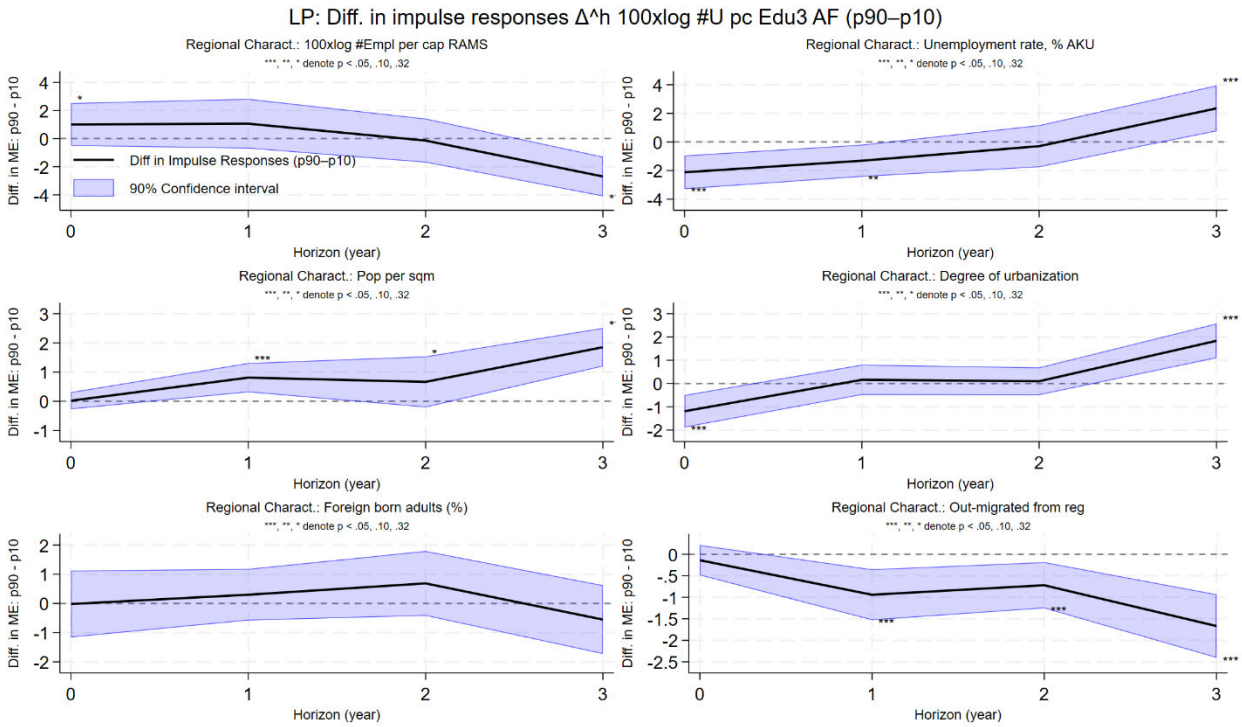
Note. The figure shows the difference in cyclical sensitivity of open unemployment among individuals without upper-secondary education per capita between regions with high and low regional labour-market characteristics (p90–p10). A negative value means that unemployment falls more in regions with high values of the regional variables – implying that the cyclical impulse has a stronger impact there. A value close to zero or positive indicates that the effect is weaker or more short-lived in these regions, suggesting that structural differences and frictions dampen the transmission of the business cycle. Asterisks mark horizons where the difference is statistically significant at various confidence levels.

Figure 7. Response of open unemployment among individuals with upper-secondary education per capita in regions to GDP growth with different regional labour-market characteristics.



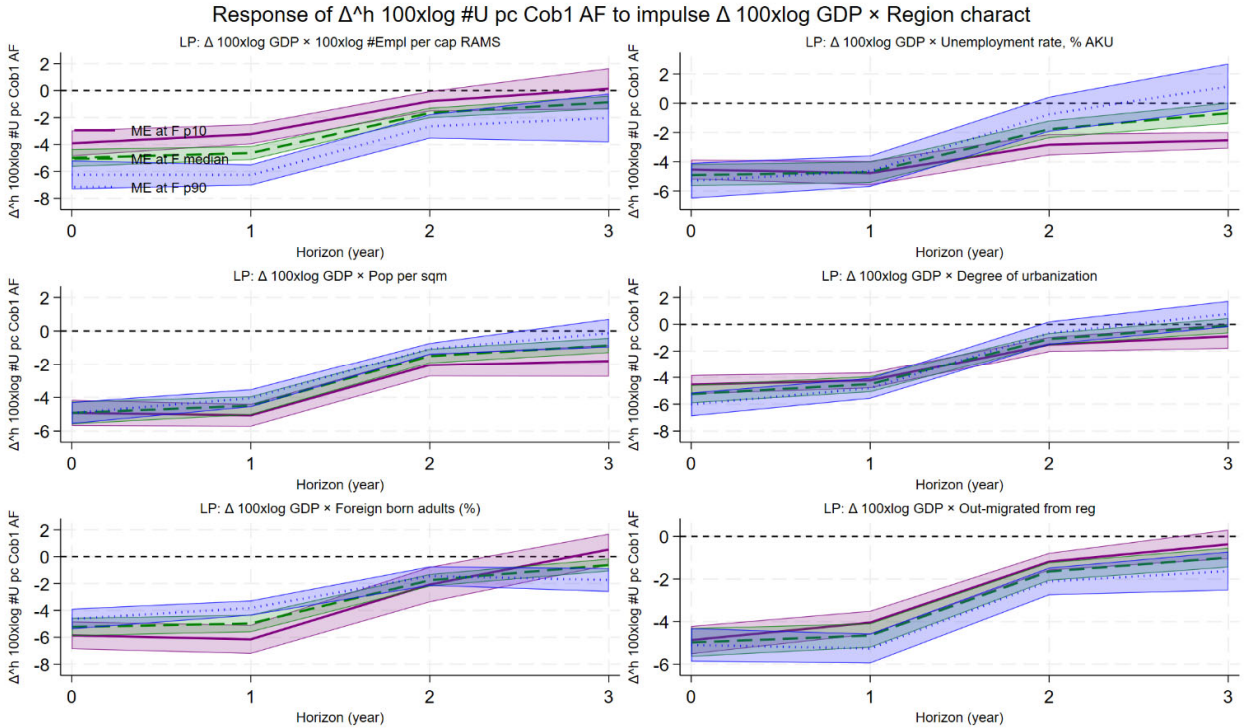
Note. The lines show the estimated marginal effect of a 1 per cent increase in GDP on open unemployment among individuals with upper-secondary education per capita at p10/median/p90 of regional labour-market characteristics. Values below zero mean that unemployment falls as GDP rises; differences between the lines indicate how strongly this depends on the level of regional characteristics. Shaded areas: 95 per cent CI. The outcome is reported in per cent (log measure) or percentage points (level measure), as indicated in the text..

Figure 8. Difference in cyclical sensitivity of open unemployment among individuals with upper-secondary education per capita between regions with high and low regional labour-market characteristics (p90–p10)



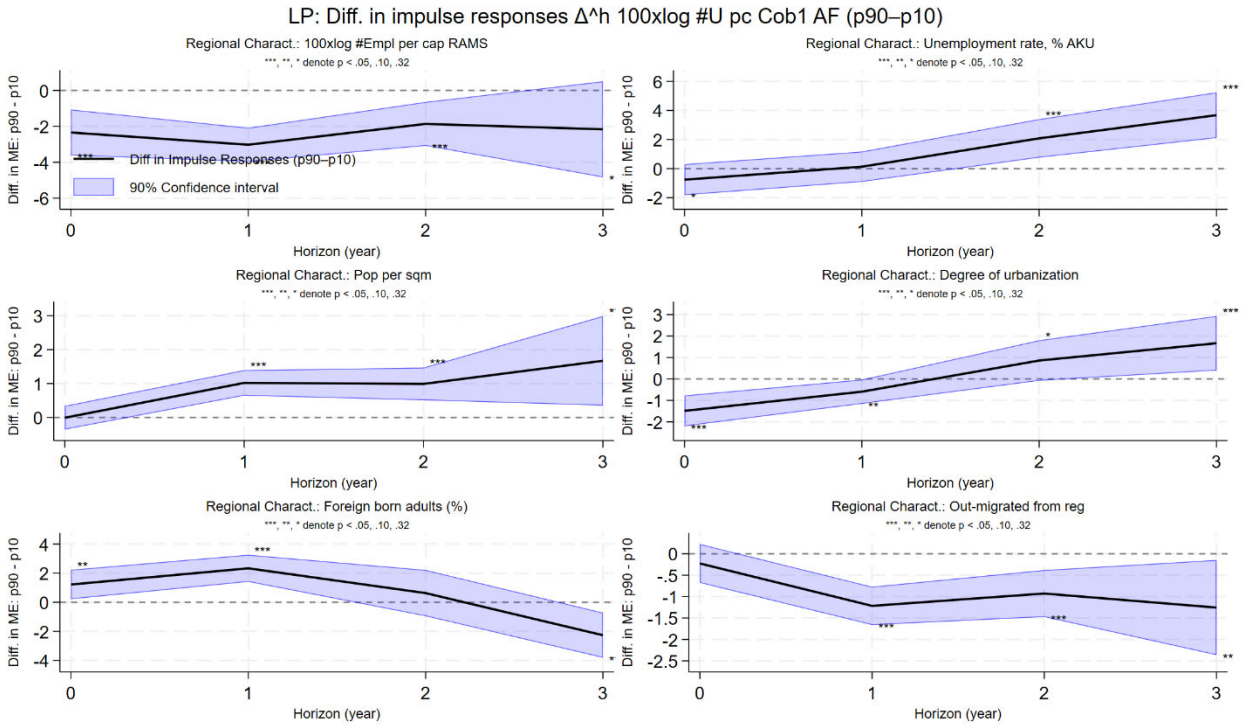
Note. The figure shows the difference in cyclical sensitivity of open unemployment among individuals with upper-secondary education per capita between regions with high and low values of the regional labour-market characteristics (p90–p10). A negative value means that unemployment falls more in regions with high values of these characteristics – the cyclical impulse therefore has a stronger impact there. A value close to zero or positive indicates that the effect is weaker or more short-lived in such regions, suggesting that structural differences and frictions dampen the transmission of the cycle. Asterisks denote horizons where the difference is statistically significant at various confidence levels.

Figure 9. Response of open unemployment among people born in Europe per capita in Swedish regions to GDP growth, conditional on different regional labour-market characteristics.



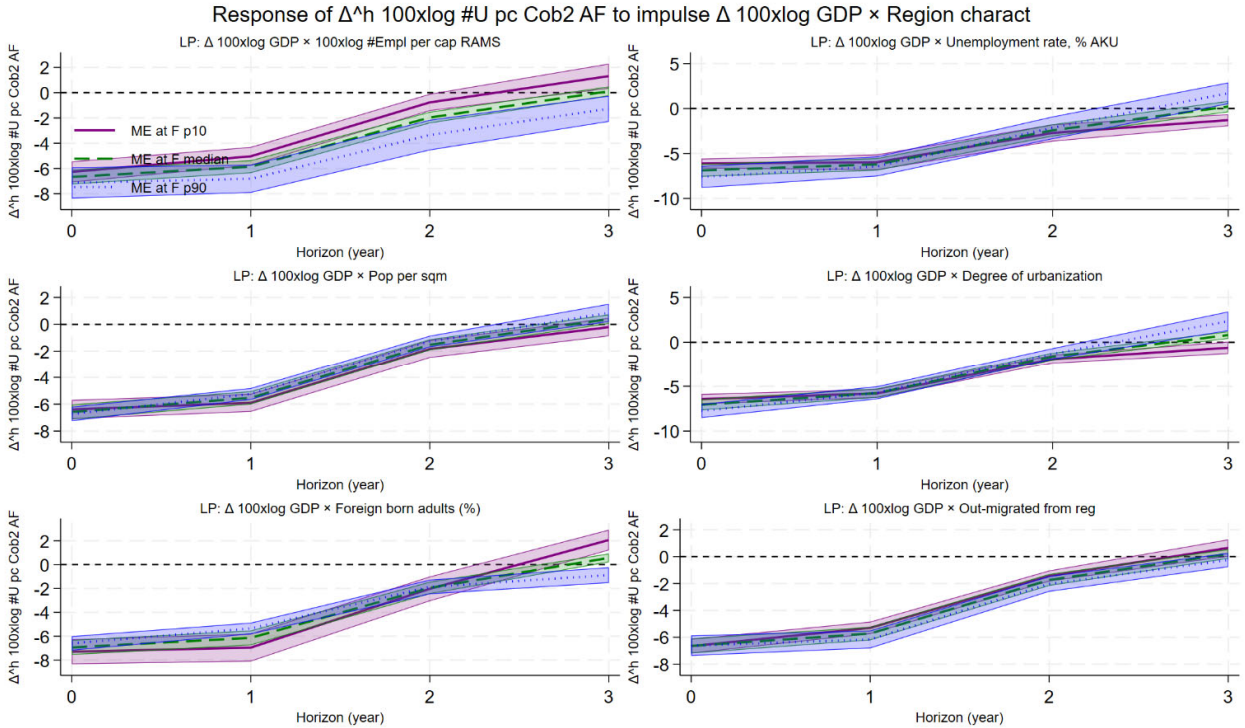
Note. The lines show the estimated marginal effect of a 1 per cent increase in GDP on open unemployment per capita among people born in Europe, evaluated at the p10/median/p90 levels of regional labour-market characteristics. Values below zero indicate that unemployment falls as GDP rises; differences between the lines show how strongly this response varies with the level of regional characteristics. Shaded areas denote 95 per cent confidence intervals. The outcome is expressed in per cent (log measure) or percentage points (level measure), as indicated in the main text.

Figure 10. Difference in cyclical sensitivity of open unemployment among people born in Europe per capita between regions with high and low regional labour-market characteristics (p90–p10)



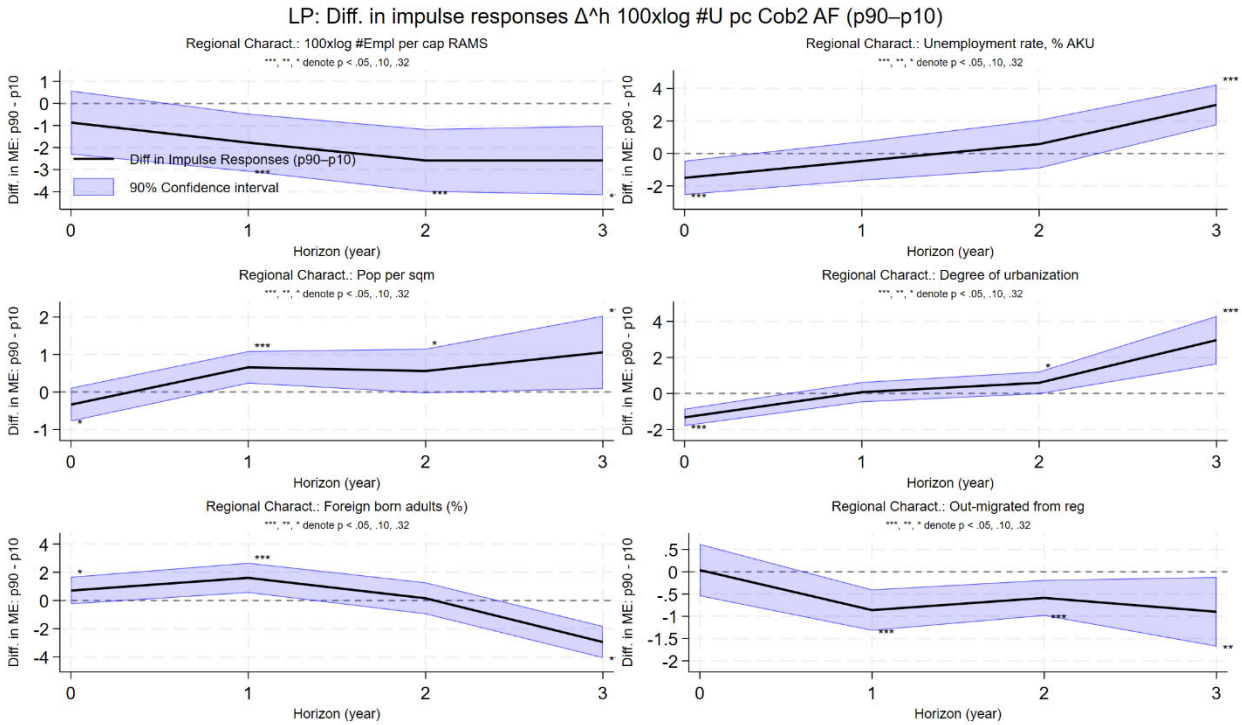
Note. The graph shows the difference in cyclical sensitivity of open unemployment among people born in Europe per capita between regions with high and low regional labour-market characteristics (p90–p10). A negative value means that unemployment falls more in regions with high values of the regional variables – that is, the cyclical impulse has a stronger impact there. A value close to zero or positive indicates that the effect is weaker or more short-lived in these regions, suggesting that structural differences and frictions dampen the transmission of the business cycle. Asterisks mark horizons where the difference is statistically significant at different confidence levels.

Figure 11. Response of open unemployment among people born in Sweden per capita in regions to GDP growth, conditional on different regional labour-market characteristics.



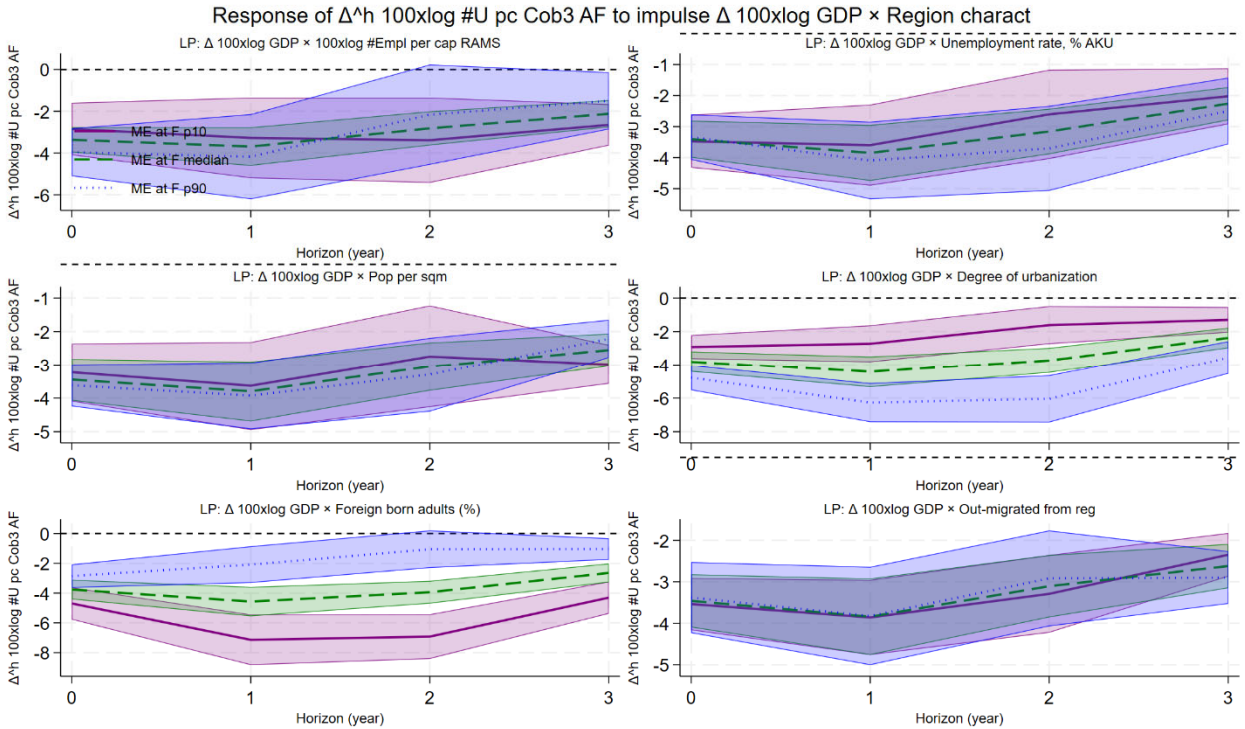
Note. The lines show the estimated marginal effect of a 1-per-cent increase in GDP on open unemployment among people born in Sweden per capita at the p10/median/p90 levels of regional labour-market characteristics. Values below zero mean that unemployment falls as GDP rises; differences between the lines indicate how strongly this response varies with the level of regional characteristics. Shaded areas: 95 per cent confidence intervals. The outcome is expressed in per cent (log measure) or percentage points (level measure), as described in the text.

Figure 12. Difference in the cyclical sensitivity of open unemployment among people born in Sweden per capita between regions with high and low regional labour-market characteristics (p90–p10)



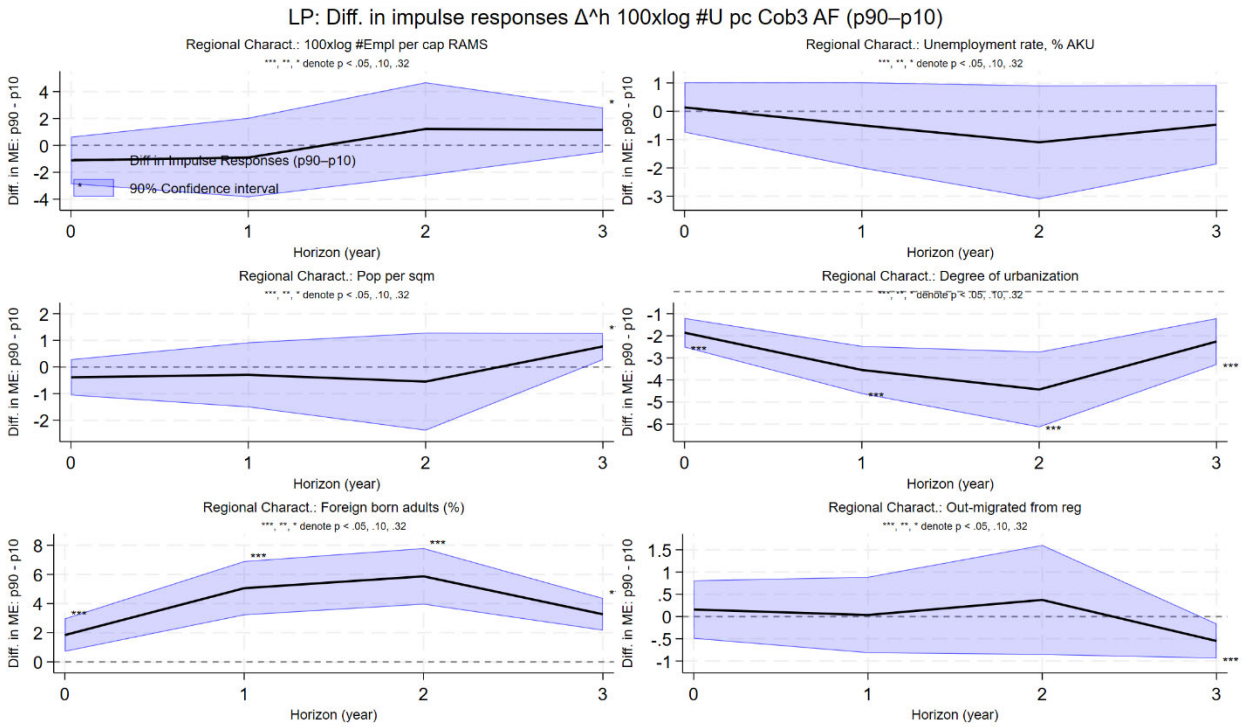
Note. The graph shows the difference in cyclical sensitivity of open unemployment among people born in Sweden per capita between regions with high and low regional labour-market characteristics (p90–p10). A negative value means that unemployment falls more in regions with higher values of the regional variables – that is, the cyclical impulse has a stronger impact there. A value close to zero or positive indicates that the effect is weaker or more short-lived in these regions, suggesting that structural differences and frictions dampen the transmission of the business cycle. Asterisks mark horizons where the difference is statistically significant at different confidence levels.

Figure 13. Response of open unemployment among people born outside Europe per capita in regions to GDP growth, conditional on different regional labour-market characteristics.



Note. The lines show the estimated marginal effect of a 1 per cent increase in GDP on open unemployment per capita among people born outside Europe at the p10/median/p90 levels of regional labour-market characteristics. Values below zero indicate that unemployment falls as GDP rises. Differences between the lines show how strongly this response depends on the level of regional characteristics. Shaded areas denote 95 per cent confidence intervals. The outcome is expressed in per cent (log measure) or percentage points (level measure), as indicated in the text.

Figure 14. Difference in the cyclical sensitivity of open unemployment per capita among people born outside Europe between regions with high and low regional labour-market characteristics (p90–p10)



Note. The graph shows the difference in cyclical sensitivity of open unemployment per capita among people born outside Europe between regions with high and low regional labour-market characteristics (p90–p10). A negative value means that unemployment falls more in regions with high values of the regional variables – the cyclical impulse thus has a stronger impact there. A value close to zero or positive indicates that the effect is weaker or more short-lived in these regions, suggesting that structural differences and frictions dampen the transmission of the cycle. Asterisks mark horizons where the difference is statistically significant at different confidence levels.

4 What can we learn about economic activity, structure and heterogeneity?

The results overall show that the relationship between growth and unemployment — Okun's law — is clearly negative even when analysed at the regional level and for different groups of job seekers. Unemployment falls noticeably when economic activity increases. However, the strength, persistence, and distribution of this effect vary systematically across regions, education levels, and countries of birth. This indicates that the transmission of the business cycle is heavily filtered through the structure of the labour market.[18]

At the regional level, a clear pattern emerges. Regions with lower frictions — measured by high employment and low unemployment — exhibit stronger and faster effects of GDP increases on unemployment. In more friction-prone regions, the relationship is weaker. This suggests that economic expansions translate into sustained employment growth to a lesser extent in such regions.

When the analysis is broken down by education and country of birth, the picture becomes more nuanced. Unemployment among people with upper-secondary or tertiary education falls markedly as GDP rises — by around 6–8 per cent within a year — while the effect is much weaker among those with shorter education. For foreign-born persons from outside Europe, the decline is only 2–3 per cent and varies significantly across regions. In regions with a low share of foreign-born people and high urbanisation, the relationship is stronger, possibly indicating that networks, sectoral diversity, and institutional features of the labour market influence how quickly new matches form.

These observed differences can be interpreted in light of research on matching and search processes. Fredriksson, Hensvik and Nordström Skans (2018) show that matching quality varies over the cycle: weak labour markets tend to generate short-lived and unstable jobs, while stronger demand gradually improves match quality. In regions or groups where matching is already weak, these improvements may take longer, which can explain why the impact of GDP growth is smaller or more delayed. The international literature points to similar mechanisms. Blanchard and Wolfers (2000) show that unemployment developments in Europe reflect an interaction between macroeconomic shocks and institutional features: shocks affect all countries, but the speed of return to equilibrium depends on institutional and labour market adaptability. The results here indicate a comparable mechanism in a Swedish regional context.

[18] The results are in line with research showing that wage formation in Sweden shows limited adjustment to changes in unemployment, particularly in sectors with little scope for local wage negotiations (see Carlsson, Häkkinen Skans and Nordström Skans 2019). Such inertia may contribute to national GDP changes having larger and more lasting effects on unemployment in regions where these sectors dominate. Our results show just such a pattern: regions with higher frictions have weaker and slower reactions to economic upturns. This provides a supplementary institutional explanation for the regional variation that emerges in the relationship between GDP and unemployment.

Taken together, the findings show that national economic activity is the dominant driver of short-run unemployment dynamics, but the translation of growth into employment depends on the structure of regional labour markets. In regions with seemingly well-functioning labour markets — characterised, for example, by low unemployment and high labour force participation — adjustment is faster and more pronounced. Where structural barriers are larger, such as in areas with lower educational attainment or weaker labour market integration among the foreign-born, the effect is weaker and less persistent.

Furthermore, Appendix B shows that the relationship between growth and unemployment is asymmetric. Unemployment rises more in response to negative growth shocks than it falls in response to positive shocks of similar magnitude. This asymmetry implies that downturns have larger and more persistent consequences for the labour market than expansions. The effect is especially pronounced in regions with greater frictions, where employment tends to recover slowly after recessions. In regions with stronger labour markets, the asymmetry is smaller, indicating more symmetric adjustment.

The results therefore reinforce, rather than alter, the main conclusion. The relationship between growth and unemployment is clearly negative and shaped by structural conditions. What the results add is a deeper understanding of the distributional consequences of the business cycle. Recessions amplify existing differences across regions, while booms only partially narrow them. This pattern is consistent with international research on “downside rigidity” in labour market dynamics, whereby negative shocks tend to have larger effects on unemployment than positive shocks have on employment.

It is important to emphasise that the results should not be interpreted as causal. Since GDP growth is itself influenced by labour market conditions, some simultaneity is likely present. Identifying causal effects would require exogenous instruments — such as international demand shocks or monetary policy surprises. The patterns identified here should therefore be viewed as partial correlations that highlight which regions tend to be most vulnerable during economic downturns, rather than precise causal estimates.

The method also captures the average historical response to GDP changes, based on the actual variation observed during 2000–2023. The results thus reflect how the Swedish regional labour market has historically responded to business cycle fluctuations within this range — not how it would necessarily respond under very different macroeconomic conditions. Interpretation should therefore remain within the empirical support of the data, i.e., for changes and cyclical conditions similar in magnitude to those seen during the sample period. Extrapolation to unusual or extreme scenarios — such as deep crises or significantly altered institutions — should be undertaken with caution.

Finally, it is beyond the purpose and methodology of the study to assess which policies should be adjusted to influence unemployment. The analysis does not address

the underlying causes of GDP variation and should not be interpreted as a recommendation for monetary or fiscal policy. The purpose is instead to document how unemployment has historically co-moved with GDP, and how this adjustment differs across regions and groups.

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APPENDIX A – Differences between the Swedish Public Employment Service and Statistics Sweden's measures of unemployment

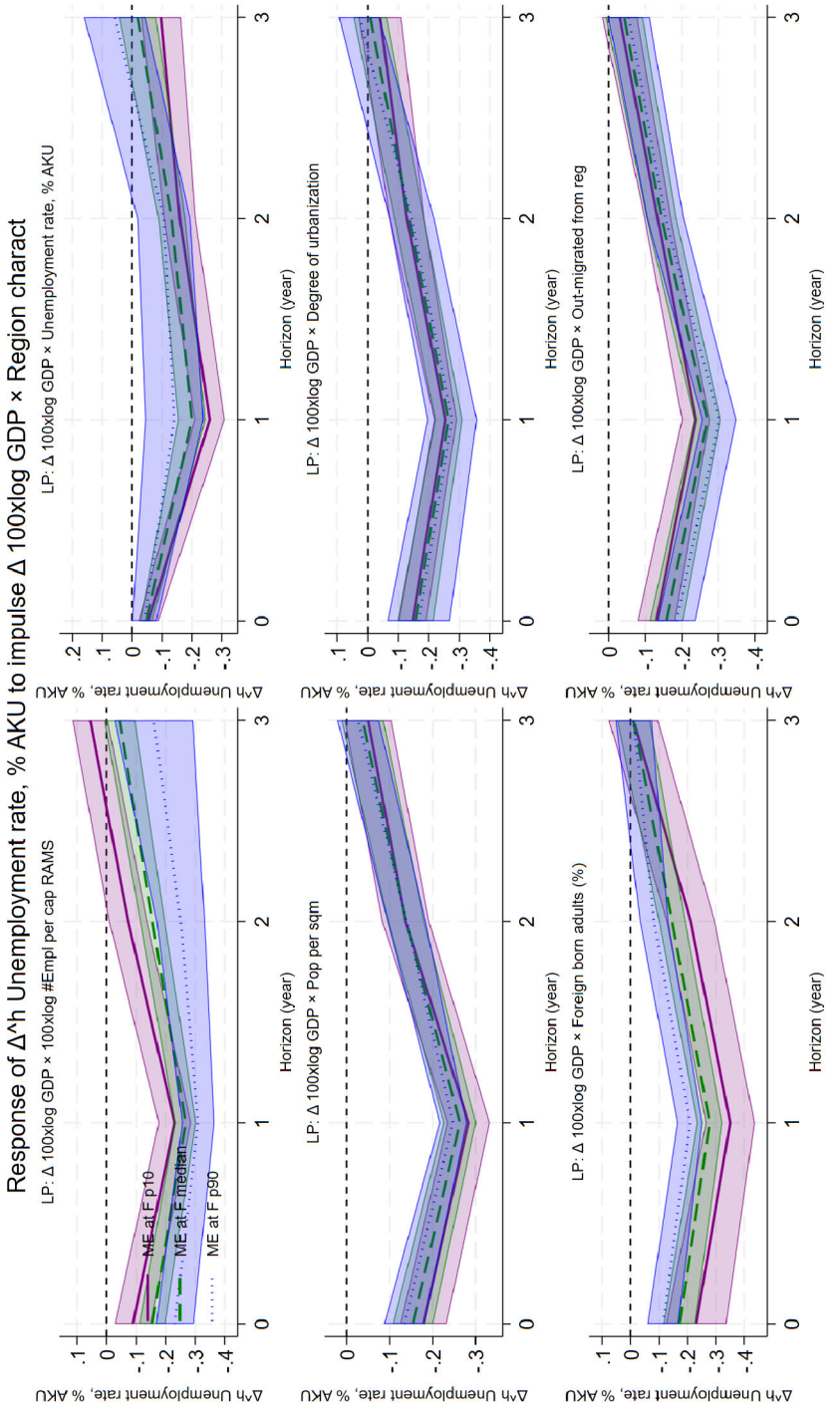
There is reason to exercise some caution when interpreting the Swedish Public Employment Service's unemployment statistics. The register-based measure of registered unemployment differs in several important respects from unemployment as defined in the Labour Force Survey (LFS), published by Statistics Sweden (SCB). While both indicators reflect labour-market conditions, they are based on different definitions, data-collection methods and underlying purposes, which can lead to level differences and temporary divergences. Figures 15 and 16 below, however, indicate that our results are not sensitive to the choice of unemployment measure.

Definitions and coverage. The LFS follows ILO and Eurostat standards and covers individuals aged 15–74 who are without work in the reference week, actively seeking employment and able to start within two weeks. Anyone who has worked at least one hour during the reference week is classified as employed, even if they are registered with the Public Employment Service. In contrast, the Public Employment Service's statistics derive from administrative registers of individuals classified as openly unemployed or participating in labour-market programmes with activity support, regardless of the number of hours worked during the reference week. As a result, the register measure includes certain part-time workers, hourly employees and individuals on short-term assignments who are nonetheless seeking work through the agency (SCB 2016).

This practical distinction means that the Public Employment Service's statistics often report a higher number of unemployed persons, particularly in periods when many jobseekers participate in labour-market programmes. According to the National Institute of Economic Research (NIER 2019), the two measures nevertheless co-move closely over time, implying that trends and turning points are generally consistent even if the levels differ.

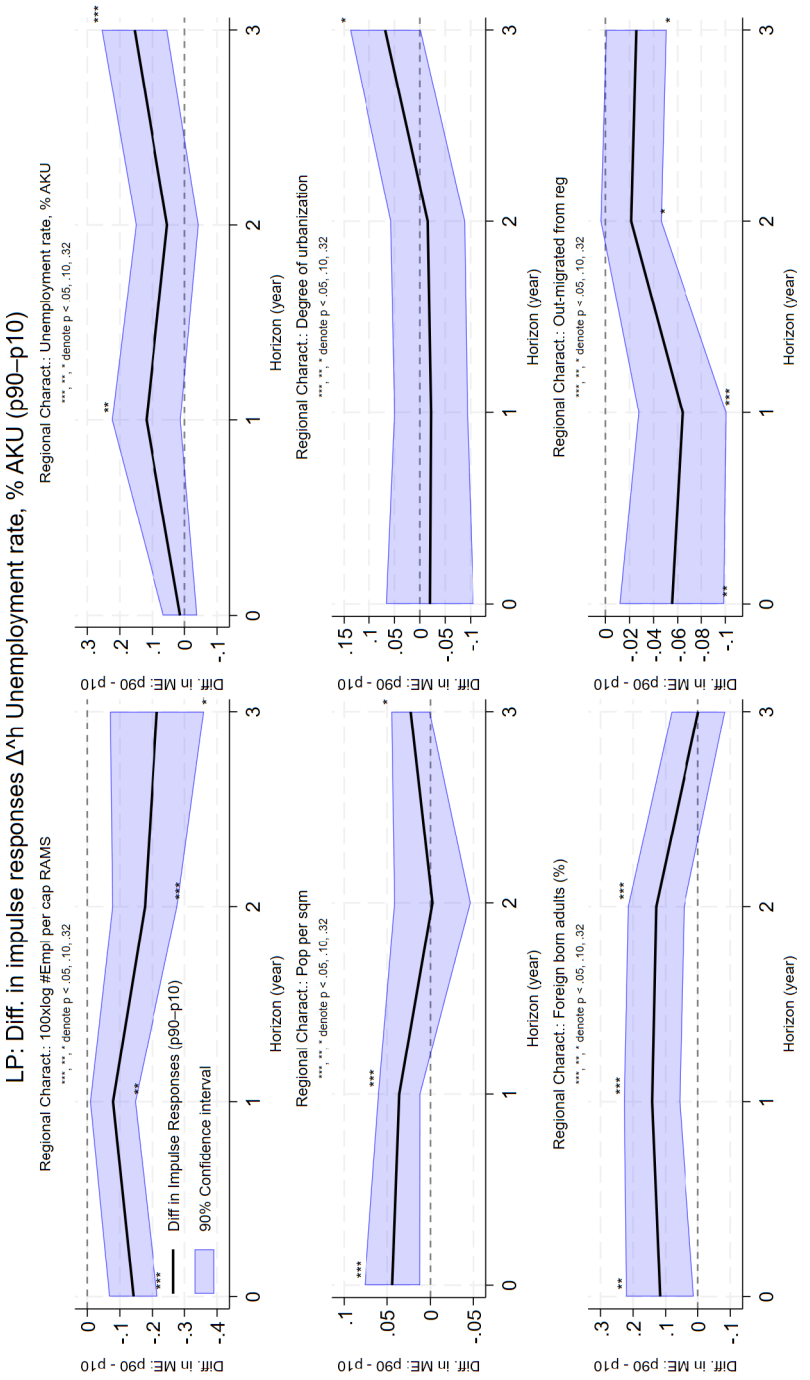
Time series and methodological changes. Differences between the measures are also shaped by methodological revisions. SCB's redesign of the LFS in 2021 introduced a new sampling framework, digital data collection and revised weighting procedures, which created a discontinuity in the time series. Sveriges Riksbank (2021) noted that these changes complicate comparisons of unemployment levels before and after the revision, although the longer-run trend in labour-market developments remains largely intact.

Häkkinen-Skans (2019) further highlights that differences in definitions and in the propensity to register with the Public Employment Service can vary over the business cycle. In downturns, jobseekers are more likely to enrol with the agency, narrowing the gap between the LFS and the register-based measure. In upturns, the opposite occurs: a larger share of unemployed individuals according to the LFS are not registered with the agency. Response of open unemployment per capita in Swedish regions to GDP growth across different regional labour-market characteristics.



Note. The lines show the estimated marginal effect of a 1 per cent increase in GDP on relative unemployment (in per cent) according to the LFS, evaluated at the p10/median/p90 levels of regional labour-market characteristics. Values below zero indicate that unemployment falls as GDP rises; differences between the lines show how strongly this depends on the level of regional disparities. Shaded areas: 95 per cent CI. The outcome is expressed in per cent (log measure) or percentage points (level measure), as indicated in the text.

Figure 15. Difference in cyclical sensitivity between Swedish regions with high and low levels of regional labour-market characteristics (p90–p10)



Note. The figure shows the difference in cyclical sensitivity of relative unemployment (in per cent) according to the LFS between regions with high and low levels of regional labour-market characteristics (p90–p10). A negative value means that unemployment falls more in regions with high values of the regional variables — implying that the economic impulse has a stronger impact there. A value close to zero or positive indicates that the effect is weaker or more short-lived in these regions, suggesting that differences in structure and frictions dampen the transmission of the business cycle. Asterisks indicate horizons where the difference is statistically significant at various confidence levels.

APPENDIX B – Local projection with asymmetric and heterogeneous effects

In this appendix, we examine whether, and in what ways, the effect of national GDP growth on regional unemployment differs between positive and negative GDP changes, and how these effects vary with structural factors such as employment density, unemployment levels and demographic characteristics.

The methodology is the same as that described in the methodological section above, with the sole modification that positive and negative GDP changes are analysed separately. For each forecast horizon h, a separate panel regression is estimated:

$$\Delta^h u_{i,t+h} = \alpha_i + \beta_h^+ \Delta Y_t^+ + \beta_h^- \Delta Y_t^- + \gamma_h^+ \left(\Delta Y_t^+ \times F_{i,t-1}\right)$$

$$+\gamma_h^- \left(\Delta Y_t^- \times F_{i,t-1}\right) + \delta_h X_{i,t} + \varepsilon_{i,t+h},$$

where $\Delta^h u_{i,t+h}$, as above denotes the change in open unemployment per capita in region i over h years, ΔY_t is the change in GDP, $F_{i,t-1}$ is a variable capturing structural features of the region, $X_{i,t}$ are control variables, α_i are region fixed effects capturing time-invariant regional differences, and $\varepsilon_{i,t+h}$ is the error term. Unlike the baseline specification, we decompose GDP changes into positive and negative components as follows: $\Delta Y_t^+ = max(\Delta Y_t, 0)$ and $\Delta Y_t^- = min(\Delta Y_t, 0)$.

The coefficients β_h^+ and β_h^- capture the average effect of positive and negative GDP changes respectively. The interaction coefficients γ_h^+ and γ_h^- show how these effects vary with $F_{i,t-1}$.

The marginal effect of a positive GDP impulse at the friction level F is:

$$ME_h^+ = \beta_h^+ + \gamma_h^+ F$$

and the corresponding effect of a negative GDP impulse (–1%) is

$$ME_h^- = \beta_h^- + \gamma_h^- F$$

where the negative sign ensures that a GDP decline translates into an increase in unemployment.

For each horizon $h = 0, \ldots, 3$, the model is estimated with region fixed effects and standard errors clustered at the regional level.

Results and interpretation. The figure below reveals clear asymmetries: unemployment responds more strongly to negative GDP impulses (red curves) than to positive ones (blue). A downturn of -1 per cent in GDP leads to a rapid and pronounced increase in unemployment over the following one to two years, whereas a corresponding increase in GDP produces a weaker and more short-lived decline. This pattern suggests the presence of non-linear adjustment mechanisms and labour-market inertia.

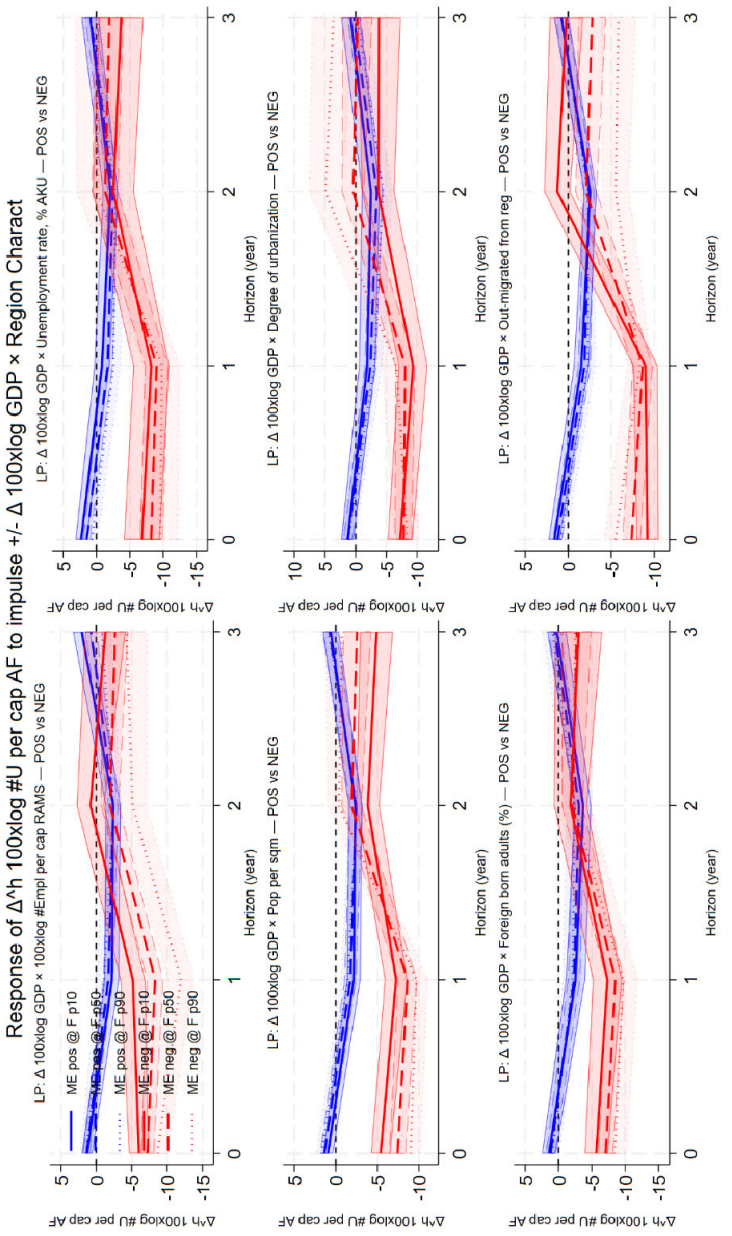
The effects typically peak after around one to two years and then subside. Positive impulses (blue) generate temporary reductions in unemployment, whereas negative impulses (red) produce more persistent increases (noting that the sign is reversed in the figure) — particularly in regions with weaker structural conditions.

Differences across the percentiles of F (p10, p50, p90) indicate that the negative effects are more heterogeneous than the positive ones. Regions with high unemployment, denser populations, or a high share of foreign-born residents are most adversely affected during downturns. Regions with stronger labour markets and higher urbanisation levels exhibit weaker responses. A higher rate of out-migration is associated with more persistent unemployment effect. For positive impulses, regional differences are small, suggesting that upswings are distributed more evenly across regions. This pattern is consistent across all panels: downturns are amplified in structurally weaker regions, while upturns tend to be smoothed out.

These asymmetries align with both search-theoretic and empirical evidence. In a search-and-matching model, Pissarides (1985) shows that negative productivity shocks raise unemployment quickly and sharply because separations occur immediately, whereas re-employment after positive shocks takes time and requires coordination between job seekers and firms. Unemployment thus “jumps up” in downturns but declines only gradually in expansions. More recent work reinforces this view: in DMP models with wage rigidities (Dupraz, Nakamura and Steinsson 2023), business-cycle dynamics become asymmetric, with negative shocks translating into higher unemployment while positive shocks are absorbed primarily through wages.

The results depicted in the figure below are consistent with this literature: negative GDP impulses generate larger and more persistent effects on unemployment than corresponding positive impulses. This suggests that labour-market recoveries are constrained by frictions, adjustment costs, and institutional features — patterns well documented in both theoretical and empirical research.

Figure 16. Response of open unemployment per capita in Swedish regions to positive and negative GDP changes, conditional on regional labour-market characteristics.



Note. The lines show the estimated marginal effect of a ±1% change in GDP on open unemployment per capita at the p10, median and p90 levels of regional labour-market characteristics. Blue lines refer to positive (POS) impulses and red lines to negative (NEG) impulses. Values below zero indicate that unemployment falls when GDP increases; for the NEG series, the effect is plotted with the opposite sign for comparability (i.e. more negative values represent a larger increase in unemployment following a GDP decline). Differences between the lines indicate the extent to which the effects depend on regional structural conditions. Shaded areas: 95 per cent CI. The outcome is expressed in per cent (log measure), as described in the text.

APPENDIX C – Weighted dependent variables: contributions by education group and country of birth

The main specification in the text analyses how changes in GDP growth affect the level of unemployment within different groups. This approach provides a direct interpretation of how unemployment levels evolve over time. In some cases, however, it may also be informative to examine how different groups contribute to the overall change in unemployment, rather than how each group develops in absolute terms.

For this purpose, an alternative, weighted dependent variable is constructed, measuring each group's change relative to the total unemployment level in the base period:

$$\Delta^h u^g_{i,t+h} = \frac{u^g_{i,t+h} - u^g_{i,t-1}}{u^T_{i,t-1}}$$

where $u^g_{i,t+h}$ is unemployment in group g (country of birth or level of education) and $u^T_{i,t-1}$ denotes total unemployment in region i. This construction implies that each group's change is weighted by the overall unemployment level in the base period, so that the sum of group-specific contributions broadly corresponds to the total change:

$$\Delta^h u^T_{i,t+h} = \frac{u^T_{i,t+h} - u^T_{i,t-1}}{u^T_{i,t-1}} \approx \sum_g \frac{u^g_{i,t+h} - u^g_{i,t-1}}{u^T_{i,t-1}}.$$

Small discrepancies may arise if group totals do not sum perfectly to the overall level—for example, due to rounding or missing observations. The aggregation is not fully exact, which is the main reason why unemployment falls immediately within the various groups (Figures 3–14) but shows a slightly more delayed pattern when the total number of unemployed per capita is used as the dependent variable (Figure 1).

This weighting allows the regression coefficients to be interpreted as effects on each group's share of the total change in unemployment, rather than on the group's absolute unemployment level. This provides a more direct analysis of how the overall response is distributed across educational groups, and thus of the underlying labour-market adjustment mechanisms.

The results for educational attainment (not shown) indicate that the total reduction in unemployment after one year—around 4 per cent—is mainly driven by developments among people with upper secondary education. Their contribution accounts for roughly 75 per cent of the total effect, corresponding to a reduction of about 3 percentage points for this group. The remaining 25 per cent is explained in roughly equal proportions by declining unemployment among those with post-secondary and pre-secondary education, each contributing around 0.5 percentage points. Overall, the findings suggest that labour-market adjustment following a macroeconomic impulse occurs largely among those with

upper secondary education, while the other educational groups play a more limited but proportionately similar role.

The results by country of birth (not shown) display a similar pattern. The total decline in unemployment after one year—around 4 per cent—is explained to about 80 per cent by reduced unemployment among people born in Sweden, corresponding to an effect of roughly 3.2 percentage points. The remaining 20 per cent is explained in roughly equal parts by falling unemployment among people born in Europe and those born outside Europe, each contributing around 0.4 percentage points. This suggests that short-term labour-market adjustment is primarily driven by developments among the native-born, while foreign-born groups make smaller but proportionally similar contributions.

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