

Slack vs. tightness in euro area labour markets: Growing mismatch after COVID-19?

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ABSTRACT

This paper aims to interpret labour market developments across the euro area in the wake of the COVID-19 pandemic, notably the simultaneous presence of signs of labour market slack and labour market tightness in 2021. Indicators of labour market slack and mismatch are reviewed and discussed. The Beveridge curve relationship is estimated econometrically across euro area countries to assess if upward shifts took place after the COVID-19 outbreak, since such upward shifts could indicate a possible reduction in the efficiency of matching between jobs and job seekers. As compared with previous analogous analyses (e.g., Börsch-Supan 1991; Wall – Zoega 2002; Valletta 2005; Consolo – Dias 2019) the present analysis addresses the issue of residual autocorrelation present in standard Beveridge specifications and includes skill and sectoral mismatch indicators as additional controls. The results indicate a modest and temporary upward shift in the Beveridge curves of the euro area in 2020, reversed in 2021. Even though skill mismatch temporarily increased somewhat in the wake of the COVID-19 pandemic, this appears to have had a very minor impact on the efficiency of labour market matching. Overall, the available evidence suggests that the simultaneous presence of labour market slack and tightness was a temporary phenomenon. The sharp increase in labour shortages was driven mainly by a sudden labour market recovery in a context of reduced labour supply elasticity rather than by a structural reduction in matching efficiency and major labour market reallocation needs.

KEYWORDS

labour market slack, labour shortages, mismatch, Beveridge curve, Covid-19

JEL CLASSIFICATION CODES

E24, E32, J08, J21, J63

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1. INTRODUCTION

As labour markets in the euro area started to recover after being hit by the COVID-19 outbreak, they conveyed mixed signals. While unemployment remained above pre-pandemic levels over much of 2021, labour shortages started to emerge in widening segments of the economy. Since a correct reading of these labour market signals was crucial to devise appropriate policy responses, debate was intense soon after the COVID-19 outbreak on both sides of the Atlantic. While in the US unemployment spiked and participation rates dropped considerably, in Europe, evidence of slack was more difficult to gauge: in light of the widespread use of job retention schemes, hours dropped considerably with no surge in unemployment rates.¹ In particular, there was a widespread concern that the asymmetry of the COVID shock in terms of sectors and occupations affected was going to imply substantial reallocation needs and persistent unemployment, with implications for labour market matching and the possible emergence of scarring effects (e.g., [Barrero et al. 2020](#)).²

Post-COVID labour market developments are still the subject of discussions. However, with hindsight, there is a certain agreement that the concerns raised by a possible structural labour market deterioration were most likely overstated. In the US, the discussion focused on reduced labour market participation (e.g. [European Commission 2024](#)) and on whether the Beveridge curve³ – i.e., the negative-sloping relationship between unemployment and vacancies, which is the workhorse tool to assess a possible deterioration in labour market matching from macro data – shifted outward, signalling a worsened labour market matching (e.g., [Blanchard et al. 2022](#); [Figura – Waller 2022](#); [Bok et al. 2022](#)). For Europe, the discussion focused on reduced working hours (e.g., [Acre et al. 2023](#); [Astinova et al. 2024](#)) and possible longer-term effects of short-time working schemes ([IMF 2022](#); [Ando et al. 2022](#)). In turn, there seems to be an emerging consensus that the much-feared reduction in labour market matching efficiency was not a major issue across EU countries (e.g., [Duval et al. 2022](#)).

The present paper zooms in on these labour market developments immediately following the pandemic and provides a further confirmation that the coincidence of slack and tightness in the euro area was a temporary phenomenon and that post-COVID structural mismatch was likely limited.

The present analysis goes a step beyond previous analyses of the implications of COVID-19 for possible labour market mismatches in advanced economies and in particular for the EU and the euro area (e.g. [Duval et al. 2022](#); [European Commission 2021a, 2021b](#); [OECD 2021](#)) in a number of ways. First, skills and sectoral mismatch indicators are built in this paper and tracked over the pre- and post-COVID-19 periods. Second, econometric estimations of Beveridge curves from quarterly data across a panel of euro area countries are presented with a view to identify

¹For a discussion of job retention schemes and other policy measures see, e.g., [IMF \(2022\)](#), as well as [Ando et al. \(2022\)](#).

²There was emphasis also in the policy discussions about the need to support up skilling and reskilling and enhance labour market matching in order to address post-COVID 19 reallocation needs (see, [IMF 2020](#), as well as the European Commission's Recommendation of 4.3.2021 on an effective active support to employment following the COVID-19 crisis (EASE), C(2021) 1,372 final.

³[Blanchard and Diamond \(1989\)](#) provide a classic analysis of the Beveridge curve, while [Elsby et al. \(2015\)](#) provide a recent survey. The [European Commission \(2013\)](#) and [Arpaia et al. \(2014\)](#) provide a detailed analysis of EU Beveridge curves in the aftermath of the 2008 Global Financial Crisis.

possible structural shifts in the relation between unemployment and vacancies. In contrast with previous econometric analyses of the Beveridge curve (e.g., Börsch-Supan 1991; Wall – Zoega 2002; Valletta 2005, Consolo – Dias 2019), this analysis takes into account possible biases induced by residual autocorrelation by means of panel-specific feasible GLS estimation (using the Prais-Winsten estimator). The standard Beveridge curve is augmented by a term capturing a non-linear relation between unemployment and vacancies, and by skills and sectoral mismatch variables to capture possible shifts in the Beveridge curve attributable to changes in mismatch.

The analysis suggests that the simultaneous presence of tightness and slack in the aftermath of the pandemic was not the result of a major deterioration in the matching efficiency of EU labour markets. The econometric analysis indicates only a modest upward shift of Beveridge curves in 2020, reversed in the course of 2021. This means that the Beveridge curves do not appear to have shifted outwards significantly, implying no significant deterioration of matching efficiency. Even though skill mismatch temporarily increased somewhat in the wake of the pandemic, this had only a very minor impact on labour market matching. The Beveridge curve estimation indicates that this variable explains little of the unemployment increase in the aftermath of COVID-19, and that this effect dissipated by early 2022. Moreover, while the economic impacts of the pandemic had a marked sectoral character, these proved mostly transitory, as witnessed by the return of the dispersion of sectoral labour shortages to pre-pandemic levels.

The focus of this paper is the immediate aftermath of the COVID-19 pandemic, up to the second half of 2021, but the analysis covers data up to the second half of 2024. Despite the energy shock, euro area labour markets remained resilient over the period 2022–2024, notably in light of strong corporate profits in a context of falling real wages. Unemployment fell to historical lows while labour shortages, peaking in the second half of 2022, returned, by late 2024, to levels close to those observed in 2019.⁴ These subsequent developments contributed to keeping euro area labour markets along the steep portion of the Beveridge curve. Overall, estimations in this paper suggest that euro area Beveridge curves did not shift outwards over this post-pandemic period.

The rest of the paper is organised as follows. The next two sections set the scene for the analysis. Section 2 surveys labour market developments in the euro area over the pandemic period, including employment, unemployment, and activity rates, while Section 3 establishes that in 2021, labour market tightness and shortages seemed to have increased while labour market slack was still elevated in some countries. In the main part of the analysis, Section 4 assesses recent developments in the relationship between vacancies and unemployment, providing an econometric analysis of the Beveridge curve relationship for the panel of euro area countries and an analysis of mismatch indicators to draw conclusions about developments in matching efficiency in the euro area in the pandemic outbreak. Section 5 offers concluding remarks.

⁴For a more detailed analysis of labour market developments in the euro area over the energy crisis, see Kiss et al. (2024).

2. LABOUR MARKET DEVELOPMENTS IN THE EURO AREA IN THE AFTERMATH OF THE PANDEMIC

The interpretation of labour market data over the pandemic period was complicated by the interplay of measures to contain the pandemic, including lockdowns and other health-related measures, and of economic support measures, notably job-retention schemes and, in particular, short-time work schemes, which helped contain labour shedding during lockdowns. Short-time work schemes blurred the interpretation of most labour market variables (employment, unemployment, wages) and reduced their cross-country comparability (Koester et al. 2020, as well as Koester – Hahn 2020). Containment measures affected not only the incentives for employers to keep workers, but also the incentives of workers to search for jobs or accept job offers. A further difficulty in data interpretation was that COVID-19 accelerated pre-existing trends linked, among other things, to a growing relative demand for teleworkable occupations (European Commission 2021b). This made it more difficult to untangle effects linked only to the pandemic from longer-term trends.

Despite these issues, some stylised facts can be distilled related to the pandemic-related recession and recovery. First of all, the recovery was very dynamic. Euro area GDP rebounded at a rate of 6.3% in 2021 after a contraction of –6.0% in 2020. After a slowdown early in 2021, economic growth regained traction in the second half of 2021, helped by progressively increasing vaccination rates and easing policy restrictions as societies emerged from the second wave of the pandemic.

Second, while working hours contracted to a similar extent as value added over the pandemic, the drop in employment, though significant, was muted by comparison (Figure 1). The muted employment impact was largely a result of the extensive policy support provided, including, in particular, job retention schemes.⁵ By the end of 2021, value added and employment reached their pre-pandemic levels in the euro area, while hours worked lagged somewhat behind (Figure 1). As hours worked per person had been on a long-term negative trend already before the pandemic, some of the decrease in hours is likely to partially reflect a permanent shift towards shorter working weeks (see, e.g., Acre et al. 2023; Astinova et al. 2024).

Third, and closely related to the previous point, even at the peak of the pandemic in 2020-Q2, the increase in unemployment remained significantly below what would have been expected based on the historical relationship between GDP and unemployment (Okun's law; see European Commission 2020). Contributing reasons were not just the short-time work schemes, but also considerable (temporary) outflows to inactivity, as job search was complicated by health concerns, policy restrictions, and care responsibilities. Unemployment in the euro area peaked at 8.7% in 2020-Q3. After a slight uptick at the beginning of 2021, it fell below pre-pandemic levels by the end of 2021 (at 7.2% in 2021-Q4 as compared to 7.4% two years earlier, see Figure 2).⁶ While some people became unemployed, others became (at least temporarily) inactive: the activity rate fell by 2.5 percentage points to reach a low of 71.1% in 2020-Q2, before recovering strongly. By 2021-Q3, the activity rate in the euro area surpassed pre-pandemic levels (at 74.1% in 2021-Q3).

⁵For the impact of job retention schemes, see McDonnell et al. (2022) and Kiss et al. (2024).

⁶Unemployment continued to decline, reaching 6.4% by 2024-Q3.

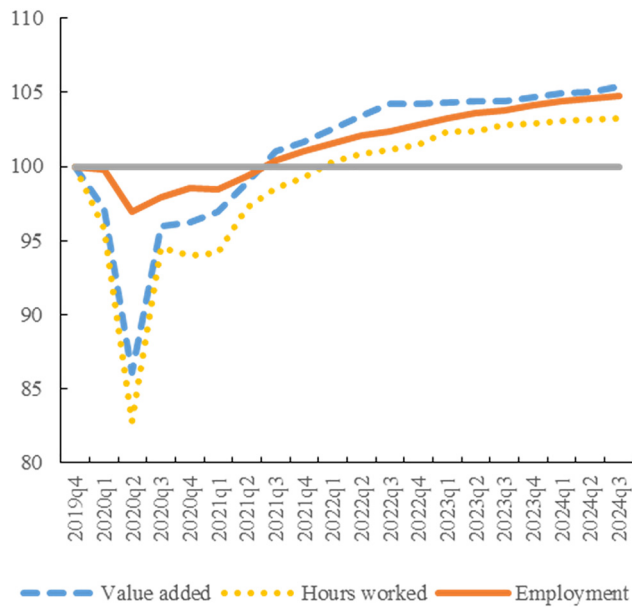


Figure 1. Output and employment dynamics in the euro area (2019-Q4 = 100)

Note: Value added is calculated based on gross value added in chain-linked volumes (index 2015 = 100). Employment, both in hours worked and in persons, is based on domestic concepts. Data are seasonally and calendar adjusted.

Source: Eurostat, quarterly national accounts data.

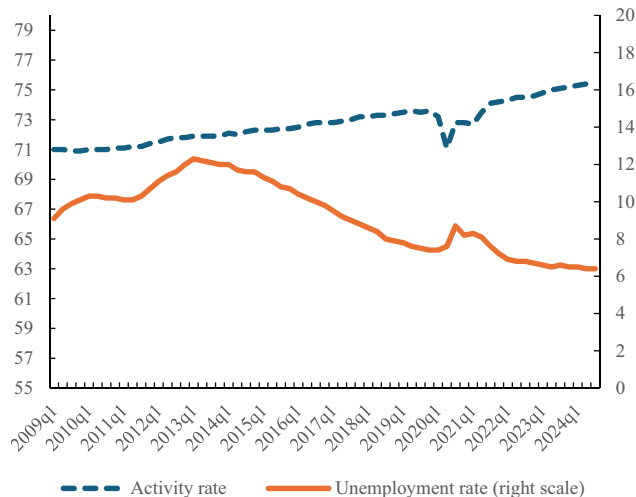


Figure 2. Unemployment and activity rates in the euro area

Note: The activity rate is shown for the age group 15–64, while the unemployment rate refers to age group 15–74. Both are seasonally adjusted but not calendar-adjusted quarterly data.

Source: Eurostat, Labour Force Survey.

The importance of temporary transitions into inactivity can also be seen in the indicator of labour market slack developed by Eurostat allows us to look at a broader notion of labour market underutilisation (or ‘unmet need for employment’). The concept of labour market slack includes, in addition to unemployed people, part-time workers who want to work more hours (‘underemployed’), people who are available to work but are currently not looking for a job, and people who are looking for work but are not immediately available. The latter two groups are inactive, rather than unemployed, because they are either not looking for a job or not immediately available to start working.

In 2021-Q2, the euro area labour market slack peaked at around 17.5% of the extended labour force, compared with 21% at its previous peak after the financial crisis in 2014-Q1 (Figure 3).⁷ Slack increased both on account of the number of unemployed and of those available to work but not seeking a job. After being very stable through the previous business cycle, the share of those available to work but not seeking employment increased from 3.6% of the extended labour force in 2019-Q4 to 6.1% in 2020-Q2. Containment measures and health

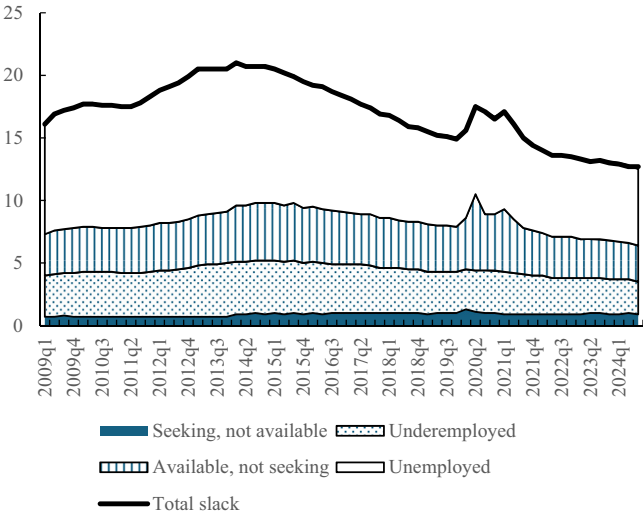


Figure 3. Labour market slack and its components in the euro area
Note: Data are seasonally adjusted, refer to age group 15–74, and are expressed as % of the extended labour force.
Source: Eurostat, Labour Force Survey.

⁷The extended labour force includes, in addition to those economically active those who are available to work but not seeking as well as those seeking to work but not available.

concerns are likely to have played a role in this. By the end of 2021, this ratio had also returned to its pre-pandemic level in the euro area, after a brief uptick in the first quarter of 2021.

Fourth, these labour market developments played out in a demographic context in which the working-age population was declining in the euro area by roughly one percent over two years (Figure 4). This is also an element that sets apart post-pandemic labour market developments from previous business cycles, as the working-age population increased between 2000 and 2008 and stagnated between 2008 and 2015, while a gradual downward trend set in after that.⁸ Nevertheless, on the back of a continued increase in activity rates, the total labour force nearly recovered to pre-pandemic levels by the end of 2021 and went on to surpass these in 2022.⁹

3. A PERIOD OF SOARING LABOUR MARKET TIGHTNESS AMID SIGNS OF REMAINING SLACK IN 2021

The pandemic brought a sharp fall in job vacancies in the euro area, followed by a steep recovery (Figure 5). By the end of 2021, the euro area vacancy rate (with 2.7% of all posts vacant) surpassed its pre-pandemic level, which was itself a historical high (2.3% in 2019-Q2). Reported labour shortages showed a very similar pattern: a sudden drop in 2020-Q2, followed by a dynamic recovery, which led to historical highs by the end of 2021 (with about 25% of employers reporting that labour is a factor limiting production). The patterns were not uniform

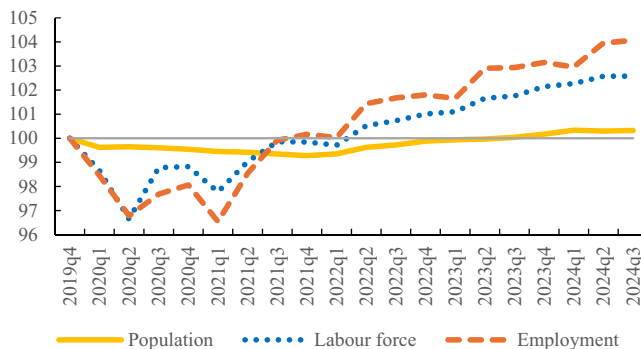


Figure 4. Working-age population (age 20-64), labour force and employment in the euro area (2019-Q4 = 100)

Source: Eurostat, Labour Force Survey.

⁸This downward trend was temporarily reversed by the arrival of people fleeing Russia's war in Ukraine in 2022, but long-term projections continue to predict a trend of shrinking working-age population.

⁹Reduced mobility and migration flows also contributed to muted demographic trends during the pandemic period.

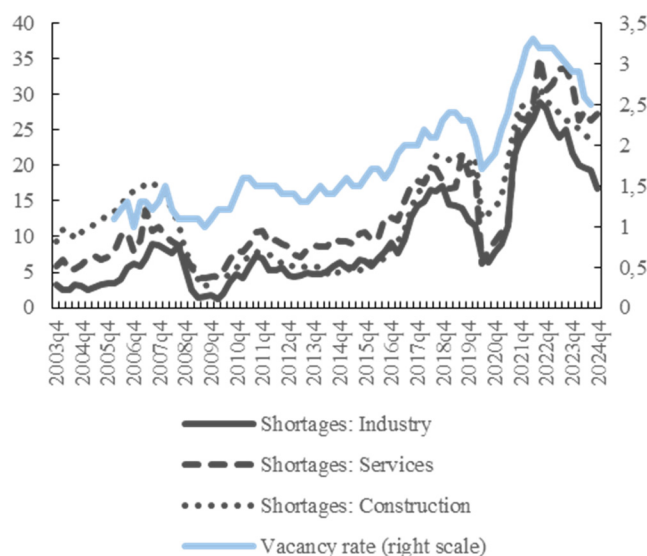


Figure 5. Labour shortages and vacancy rate, euro area

Notes: The labour shortage indicators reflect the share of firms reporting that labour is a factor limiting their production. The vacancy rate is defined as the ratio of vacant posts to all posts (occupied and vacant), covering industry, construction and services (sectors B to S).

Source: EU Business Survey (labour shortages) and Eurostat (vacancy rate).

across sectors. In 2020, labour shortages fell most in services and less so in industry and construction. In contrast, in 2021, shortages increased in services at a higher rate than in industry. Both vacancies and reported shortages reached a peak in mid-2022, starting to ease gradually afterwards.

By the end of 2021, there was significant heterogeneity in the labour market situation across the euro area, with some countries showing signs of slack, others of tightness. In particular, a negative relationship could be observed between the unemployment rate and vacancies in a cross-section of countries (Figure 6).

- Some countries showed comparatively low unemployment rates and high vacancy rates, suggesting comparatively tight labour markets (e.g., in Austria, Belgium, Germany, the Netherlands, in the upper left quadrant of the graph).
- In another group of other countries, the situation was the opposite: comparatively high unemployment rates and low vacancy rates, suggesting labour market slack (e.g., in Greece and Spain and, to a lesser extent, Italy, in the lower right quadrant of the graph).
- In still other countries, the situation was intermediate. A group of Member States displayed comparatively low levels of both unemployment and vacancy rates (Ireland, Portugal, Slovakia, situated below the fitted line in Figure 6), while another group displays relatively high levels of both (e.g., Finland, Latvia, situated above the fitted line). This could be because intermediate levels of unemployment could be associated with tight labour markets in some

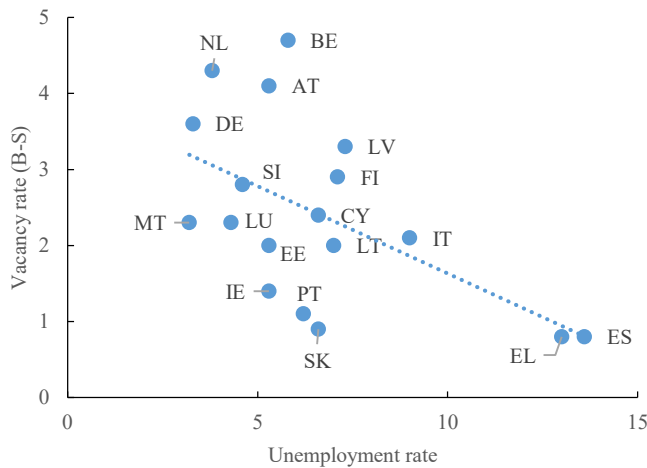


Figure 6. Vacancies and unemployment across countries in the euro area, 2021-Q4

Note: Seasonally adjusted data. The vacancy rate covers industry, construction and services (sectors B-S). Data on vacancies is missing for France.

Source: Eurostat.

countries but slack labour markets in others. It could also be for statistical reasons, if the vacancy rate is higher in one country than in another, at any point of the business cycle.

Regarding cross-country patterns of changes in unemployment and job vacancies across the euro area countries after the COVID-19 outbreak, some labour markets became tighter, while others experienced a higher vacancy rate despite a still elevated unemployment rate as compared to pre-pandemic levels.

- By the end of 2021, labour markets appeared to be tighter than pre-pandemic in eight countries where unemployment fell and vacancies rose (Cyprus, Greece, Italy, Luxembourg, Malta, the Netherlands, Portugal, and Spain in the upper left quadrant of Figure 7). Some countries exhibited this pattern with a relatively small increase in vacancies (Greece, Malta, Portugal, Spain) or a small decrease in unemployment (Cyprus).
- In contrast, the labour market in Slovakia exhibited, at the end of 2021, somewhat higher unemployment and somewhat lower vacancies than pre-pandemic (lower right quadrant of Figure 7). This suggests a slacker labour market than in 2019, although to a small degree.
- In turn, both unemployment and vacancy rates increased in nine countries (Austria, Belgium, Estonia, Finland, Germany, Ireland, Latvia, Lithuania, Slovenia in the upper left quadrant of Figure 7). The rise in unemployment was relatively small in Germany, Finland and Lithuania, but also in most other countries it was below one percentage point. In turn, in Estonia and Latvia, the increase in vacancies was relatively small.
- This means that, while unemployment, employment, and activity rates in the euro area returned to pre-pandemic levels by late 2021, some countries were characterised by remaining labour market slack and a concurrent increase in labour market tightness. Such developments justify exploring whether labour market matching may have deteriorated over the pandemic.

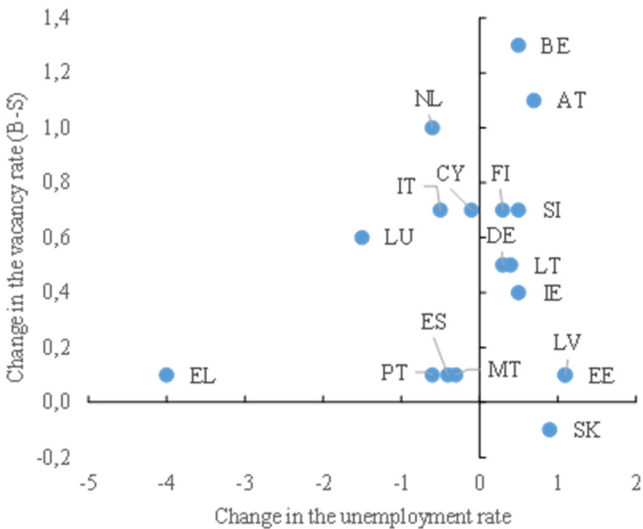


Figure 7. Vacancies and unemployment across the euro area, change over 2019-Q4 to 2021-Q4, percentage points

Notes: Seasonally adjusted data. The vacancy rate covers industry, construction and services (sectors B-S). Data on vacancies is missing for France.

Source: Eurostat.

4. DID LABOUR MARKET MATCHING DETERIORATE?

4.1. Evolution of unemployment and vacancies for the euro-area aggregate

The relationship between job vacancies and unemployment is often used to assess the efficiency of matching between labour supply and demand. Over the business cycle, vacancies and unemployment exhibit a negative relationship, known as the ‘Beveridge curve’: in good times, there are many job vacancies while unemployment is low, while the opposite happens during bad times. That said, vacancies and unemployment might also move in the same direction. This could occur for temporary reasons, as it may take time for vacancies to be filled in a recovery. However, if the shift is persistent, it could indicate a changed ability of the labour market to match jobseekers with posted jobs, i.e., it may signal changes in matching efficiency.¹⁰

Figure 8 shows the Beveridge curve for the euro area aggregate using labour shortages as a proxy for the vacancy rate. As Figure 5 shows, reported labour shortages are highly correlated with the vacancy rate, but they allow for a longer period of analysis. Shortages dropped significantly at the COVID-19 outbreak in 2020-Q2, while an increase in unemployment followed in

¹⁰Blanchard and Diamond (1989) provide a classic analysis of the Beveridge curve, while Elsby et al. (2015) provide a recent survey. The European Commission (2013) and Arpaia et al. (2014) provide a detailed analysis of EU Beveridge curves in the aftermath of the 2008 Global Financial Crisis.

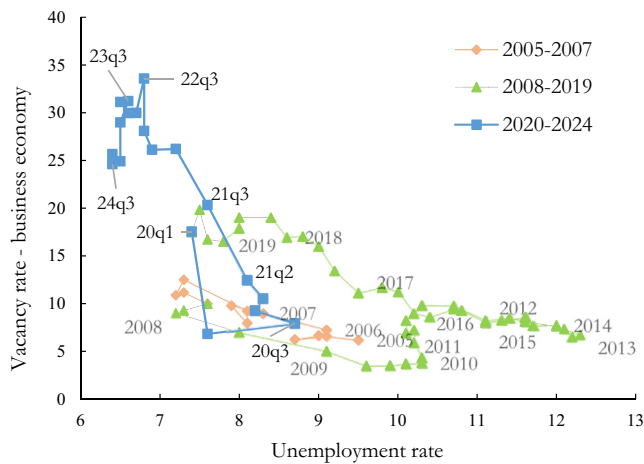


Figure 8. The Beveridge curve for the euro area 2005–2021, quarterly data

Notes: The indicator of labour shortages is defined as the share of firms reporting that labour is a factor limiting production. It is a weighted average (based on value-added weights) of sectoral indicators on manufacturing, services and construction.

Source: Eurostat (unemployment) and calculation of the authors based on EU Business Survey and Eurostat (shortages).

the third quarter. After that, shortages increased continuously, while unemployment followed the developments of the health-care situation: improving in 2020-Q4, suffering a setback in 2021-Q1 and improving after that. This pattern is in line with the experience of past business cycles: while vacancies are a leading indicator of the business cycle, unemployment moves with some lag. Negative shocks to labour demand are therefore followed by typical counterclockwise movements in the vacancy-unemployment space. However, while after the 2008 financial crisis the variation in vacancies was relatively contained compared with unemployment, the opposite could be said in the aftermath of COVID-19. The change in unemployment was moderate and short-lived, while labour shortages showed large fluctuations.

While there was a clear upward shift in the euro area Beveridge curve after the 2008 financial crisis, a similar shift is not apparent in the aftermath of COVID-19 from the simple inspection of the Beveridge curve in Figure 8. In particular, up to the peak of labour shortages were reached in the third quarter of 2022, the euro area appeared to be in the “steep section” of roughly the same Beveridge curve as in the pre-pandemic period, while from the end of 2022, shortages eased without an increase in unemployment, which could hint at either an opposite (downward) movement along the same Beveridge curve, or even a slight inward movement toward the origin. To gain more insights into this dynamic beyond this simple visual inspection, Section 4.3 sets out to do an econometric analysis on the Beveridge curve relationship.

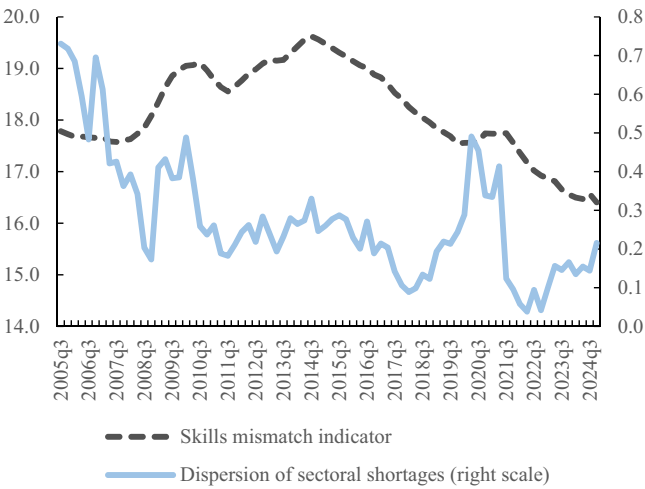


Figure 9. Skills mismatch indicator and dispersion of sectoral shortages, euro area

Notes: The skills mismatch indicator is defined as the relative dispersion of employment rates by qualification level. The dispersion of sectoral shortages is defined as the coefficient of variation of labour shortages in, respectively: industry, construction, and services. Labour shortages reflect the share of firms reporting that labour is a factor limiting production.

Source: Skills mismatch indicator: calculated by the authors based on Eurostat data. Dispersion of sectoral shortages: calculation of the authors based on the EU Business Survey and Eurostat.

4.2. Developments in sectoral and skills mismatches

If labour shortages soared during the recovery from the pandemic-related recession, while pockets of labour market slack remained at least in some countries, it is natural to ask whether labour market mismatch may have contributed to a possible fall in matching efficiency. In this paper, we consider two possible sources of labour market mismatches that are usually considered in the literature: mismatches in terms of sectors and skills.¹¹ First, differential developments in sectoral shortages can be indicative of sectoral mismatches. For instance, it has been documented that in the aftermath of the 2008 global financial crisis, employment in the housing sector and industry was particularly hit (see, e.g., [European Commission 2013](#)). To operationalise this idea, an indicator of sectoral mismatch can be calculated as the dispersion (coefficient of variation) of the three sectoral components of the labour shortage indicator (i.e., industry, services, and construction). The greater the difference across labour shortages reported in the three sectors, the higher the indicator.

¹¹For an analysis of this question in the aftermath of the 2008 Global Financial Crisis, see [European Commission \(2013\)](#), [Arpaia et al. \(2014\)](#), as well as [Hobijn and Sahin \(2013\)](#), and the references therein. This question was also analysed, for the post-Covid labour market, by [Duval et al. \(2022\)](#).

The sectoral dispersion of labour shortages started to increase already before the pandemic, as demand in industry weakened while it was strong in other sectors (Figure 9). Sectoral disparities increased significantly over the pandemic, as contact-intensive services were more affected by containment measures than other activities. For a brief period, the sectoral mismatch indicator increased to levels comparable to those seen in the recession of 2009, but then fell quickly to reach historically low levels by 2022. Overall, while pandemic containment measures affected different sectors differently, these effects proved temporary and were largely reversed in the recovery.¹² Despite some upticks, the indicator remained at historically average levels through 2023 and 2024.

Second, we consider an indicator of macroeconomic skills mismatch, defined as the relative dispersion of employment rates across the three main skill groups (low, medium, and high qualifications; see Figure 9).¹³ The greater the discrepancies between the employment rates of various skills groups, the higher the indicator.

It is apparent that while the skills mismatch indicator increased somewhat over the pandemic, this increase was small as compared to historical developments, in particular the sharp rise after 2008. The reason for the relative stability of the skills mismatch indicator is that, while the pandemic recession affected the employment of workers with lower qualifications more than those with higher qualifications, this differential effect was rather small and temporary; it was mostly erased by the beginning of 2022.¹⁴ In fact, the skills mismatch indicator continued to slide to historically record low levels through 2023 and 2024.

All in all, the preliminary evidence presented here suggests that labour market mismatches, as measured by these indicators of sectoral and skills mismatches, were not major drivers of labour market slack amid resurfacing labour shortages in the immediate aftermath of the COVID-19 pandemic.

4.3. Estimating the Beveridge curve on a panel of euro area countries

To be able to identify possible shifts in Beveridge curves based on evidence from a larger sample, the relationship is estimated across a panel of euro area countries using quarterly data. The analysis of the behaviour of time trends and regression residuals from such estimation may be exploited to gauge Beveridge curve shifts.

The analysis is conducted on quarterly data for the sample period ranging from 2003-Q3 to 2024-Q3. All 19 countries that were members of the euro area over the pandemic period are included in the panel.¹⁵ The dependent variable is the unemployment rate, sourced from Eurostat. As in the visual inspection of Section 4.1, the vacancy rate is proxied by reported labour shortages (share of firms reporting in the EU Business Survey that labour is a “factor limiting

¹²A similar conclusion has been reached by IMF analysts using a different methodology. “Sectoral job mismatch also played a role, but it rose less, and less durably, than it did after the 2008–09 global financial crisis”. See: Duval et al. (2022). For more detail on sectoral developments in the EU, see Kiss et al. (2022).

¹³For the definition of the indicator, see Kiss and Vandeplas (2015); the relationship of this indicator with matching efficiency has been analysed by European Commission (2013) and Arpaia et al. (2014).

¹⁴For more detail on the differential effect of the Covid recession on various groups of workers, see Kiss et al. (2022).

¹⁵Croatia joined the euro area in 2023. Results for a panel of all EU Member States are presented in Kiss et al. (2022). The results for this broader sample are qualitatively similar to those presented here.

production”, weighted average of industry, services, and construction) to allow for a longer period of analysis. Indicators of skills mismatch and sectoral mismatch, presented in Section 4.2, are included as potential “shifters” of the Beveridge relationship. Table 1 reports descriptive information of the variables used in the analysis. A graph plotting unemployment against labour shortages across all observations is shown in Figure 10.

The econometric approach followed in this paper is similar to that applied by Consolo and Dias da Silva (2019), who estimate a Beveridge curve relationship for the euro area aggregate and use the residual as a proxy for matching efficiency. In contrast to their work, our analysis examines developments across a panel of euro area countries. Moreover, compared with Consolo and Dias da Silva (2019) and previous studies estimating the Beveridge curve across

Table 1. Descriptive statistics, euro area countries, 2003q3–2024q3

	No of obs.	Mean	Std dev.	Minimum	Maximum
Unemployment rate	1,447	8.6	4.5	2.9	28.1
Labour shortages, all sectors	1,447	13.0	11.3	0.0	67.9
Labour shortages squared	1,447	295.7	496.2	0.0	4613.1
Skills mismatch indicator	1,447	17.6	3.9	5.9	31.4
Sectoral dispersion of labour shortages	1,447	0.7	0.7	0.0	10.0

Notes: Unemployment rate: percentage of active population, ages 15–74. Labour shortages: the % of firms reporting that labour is a factor limiting production (industry, services and construction). The sectoral dispersion of shortages is the coefficient of variation of the three sectoral components. Finally, the skills mismatch indicator is the relative dispersion of employment rates by skills levels.

Source: Authors’ calculations.

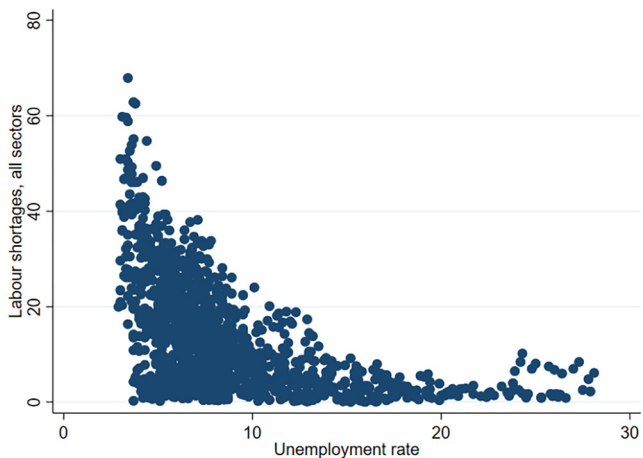


Figure 10. Unemployment and labour shortages across Euro area countries, 2003q3–2024q3

regions in specific countries (Börsch-Supan 1991; Wall – Zoega 2002; Valletta 2005), this paper takes a step forward in the estimation of such models by explicitly taking account of the residual autocorrelation present in standard Beveridge curve specifications. To address the bias resulting from the residual autocorrelation, the paper estimates regression parameters using the Prais-Winsten feasible GLS estimator (FGLS), besides the standard OLS estimator.¹⁶

Table 2 summarises the regression results. Columns (1) to (3) report results from OLS regressions, while columns (4) to (6) report results from FGLS regressions. With the latter, the estimation procedure allows for country-specific first-order autocorrelation in the disturbances and standard errors take into account the heteroskedasticity of the data. All specifications include among the explanatory variables: labour shortages, the square of labour shortages to control for the non-linearity of the relationship, and country fixed effects. Specifications (3) and (6) also include time effects to pick up joint movements of Beveridge curves (unemployment rates) across the euro area. In specifications (2) and (5) the indicators of skills and sectoral mismatch presented in Section 4.2 are also added as explanatory variables. The hypothesis is that labour market matching could be less smooth (implying higher unemployment at a given level of vacancies or shortages) at times when there is a greater imbalance between the skills demanded and supplied (skills mismatch) or when labour shortages are concentrated in some sectors only (sectoral mismatch).

The regression analysis confirms the expected negative and convex relationship between unemployment and vacancies. This finding is significant and robust with respect to alternative specifications and alternative estimation methods. The magnitude of the coefficients, however, depends on the specification, as the Beveridge curve appears to become less steeply negative once time effects and mismatch indicators are included. Moreover, the estimations by means of feasible GLS indicate that OLS estimates are affected by bias, as the slope of the Beveridge curve drops considerably. This factor, which was neglected in previous literature, needs to be taken into account. In our specific application, the bias could also affect the estimation of time trends and, therefore, the assessment of whether the Beveridge curve has shifted over time.

Turning to the other explanatory variables, Table 2 suggests that skills mismatch is associated with higher unemployment at a given level of labour shortages or vacancies and therefore, potentially, with less efficient labour market matching.¹⁷ By contrast, the dispersion of labour shortages across sectors does not appear to have an effect. This result is robust to the methods used and the specifications chosen.

The time effects estimated in these regressions can be interpreted as the component of unemployment developments that is common across Member States and is not explained by differential movements in the other explanatory variables. They are related to shifts of the Beveridge curve, as opposed to movements along the curve. Time effects can thus be interpreted as joint movements in the position of Beveridge curves across euro area Member States. The evolution of the time effects may reflect shifts in matching efficiency, although in some cases, apparent shifts could be of cyclical (transitory) nature. This is because economic developments

¹⁶Other recent approaches have dealt with the econometric issue of autocorrelation by including the lagged dependent variable in the estimation or by using co-integration techniques (e.g., Bonthuis et al. 2013; Ebeke – Everaert 2014; Bova et al. 2018).

¹⁷An alternative explanation is that changes in skills mismatches may be temporary effects of cyclical developments; they may not always reflect on matching efficiency.

Table 2. Estimation of the Beveridge curve, euro area countries, 2003q3–2024q3

	(1) OLS country effects	(2) OLS, additional variables	(3) OLS, time effects added	(4) GLS country effects	(5) GLS, additional variables	(6) GLS, time effects added
Dependent variable:			Unemployment rate			
Labour shortages, all sectors	−0.368***	−0.331***	−0.232***	−0.095***	−0.089***	−0.028**
	(0.086)	(0.069)	(0.068)	(0.011)	(0.011)	(0.011)
Labour shortages squared	0.005***	0.005***	0.005***	0.001***	0.001***	0.001***
	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Skills mismatch indicator		0.516***	0.587***		0.334***	0.331***
		(0.173)	(0.192)		(0.036)	(0.047)
Sectoral dispersion of labour shortages		0.119	0.311		−0.008	0.029
		(0.341)	(0.314)		(0.033)	(0.034)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Period effects	No	No	Yes	No	No	Yes
Observations	1,447	1,447	1,447	1,447	1,447	1,447
R-squared	0.683	0.733	0.802	.	.	.
Number of countries	19	19	19	19	19	19

Notes: Robust standard errors in parentheses. Asterisks mark estimated coefficients that are statistically significant at the 10% (*), 5% (**) and 1% (***) level. Labour shortages: the % of firms reporting that labour is a factor limiting production (industry, services and construction). The sectoral dispersion of shortages is the coefficient of variation of the three sectoral components. Finally, the skills mismatch indicator is the relative dispersion of employment rates by skill levels.

Source: Authors' calculations.

often follow a counter-clockwise movement in the unemployment-vacancy space as vacancies react faster to cyclical developments than unemployment.

Figure 11 shows the estimated time effects from specification (6) in Table 2. Between the 2008 financial crisis and the COVID outbreak, the estimated time effects broadly follow the joint movements in unemployment rates across the euro area, with an upward swing in the aftermath of the financial crisis, and a continuous improvement between 2013 and 2019. Time effects in the aftermath of the COVID outbreak show a moderate increase, followed by a downward trajectory in 2021. By 2022, the time effects reach lows not seen since 2008, and they also stabilise there in the subsequent period. This means that Beveridge curves in the euro area do not suggest a high degree of matching inefficiency by historical standards in the post-COVID period.

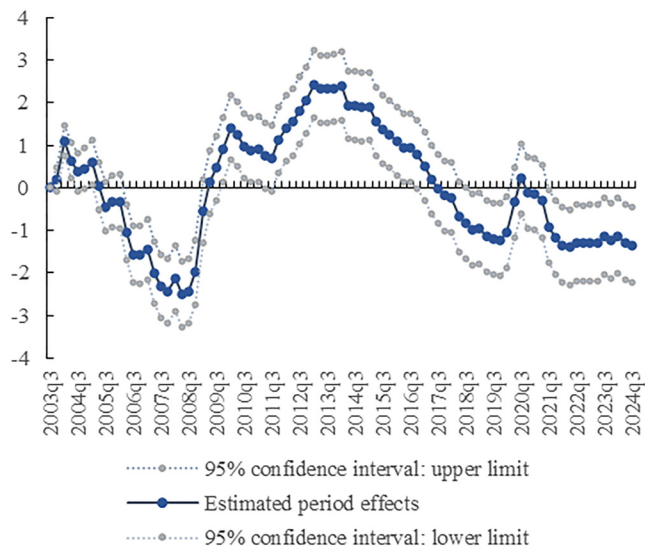


Figure 11. Joint movements of euro area Beveridge curves: estimated time effects

Note: Based on a GLS specification (6) reported in 1.

Source: Authors' calculations.

The variation in matching efficiency associated with the mismatch indicators was quite limited over the pandemic period, linked to their moderate variation and lack of significance in the case of sectoral mismatch.¹⁸ This is supported by evidence from estimating the contribution of the various explanatory variables to unemployment developments, based on the panel estimation. Figure 12 shows cumulative changes in euro area unemployment compared with the pre-pandemic situation in 2019–Q4, distinguishing the fraction of these changes associated with different drivers. The most relevant driver of increased unemployment over 2020–2021 was the labour shortage, while the contribution of skills mismatch was very limited. Despite some worsening of skill mismatch after the COVID-19 outbreak, its magnitude is insufficient to explain much of the variation in unemployment, while the immediate fall in vacancies after the pandemic was a much more relevant driver of unemployment. It is interesting to note that the negative residual in 2020–Q2 is consistent with the notion that job retention schemes significantly dampened the increase in unemployment as compared to what would have been expected based on the fall in vacancies.

By 2022, the increase in unemployment associated with the pandemic fully dissipated, mostly driven by the increase in vacancies (Figure 12). In the course of 2023 and 2024, falling skills mismatch also contributed to a fall in unemployment, and a possible joint inward shift in the Beveridge curves of euro area countries. Finally, in 2024, the residual, or unexplained

¹⁸Estimates of the time effects from a specification of the Beveridge curve without mismatch indicators follow a qualitatively similar path over the post-COVID-19 period.

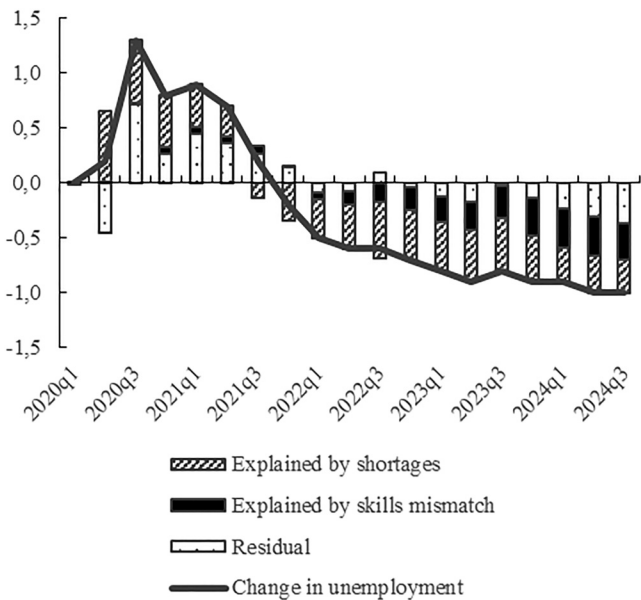


Figure 12. Factors explaining unemployment developments based on the estimations: euro area, 2020-Q1 to 2024-Q3

Note: Calculations based on GLS specification similar to column (5) reported in Table 2 (sectoral mismatch excluded).

Source: Authors' calculations.

component, also became significant, suggesting that in 2024, unemployment remained resilient beyond what is explained by still high labour shortages and falling skills mismatches.

5. CONCLUSION

Euro area labour markets were heavily hit by the COVID-19 pandemic. As soon as the recovery started, labour shortages quickly emerged, while indicators of labour market slack fell more gradually, resulting in signals of labour market tightness among the remaining slack. By the end of 2021, employment, unemployment, and activity rates returned to pre-pandemic levels in the euro area while job vacancies and labour market shortages stood at historical highs. However, in some Member States, shortages and signs of tightness were still co-existing.

The analysis presented in this paper suggests that the simultaneous presence of tightness and slack was not the result of a major deterioration in the matching efficiency of euro area labour markets. The econometric analysis indicates only a modest upward shift of Beveridge curves in 2020, already reversed in 2021. Even though skill mismatch somewhat increased in the wake of the pandemic, this appears to have had a very minor impact on labour market matching, as the Beveridge curve estimation indicates that this variable explains little of the unemployment increases in the pandemic period. Moreover, while the economic impacts of the pandemic

had a marked sectoral character, these proved mostly transitory, as witnessed by the relatively quick return of the dispersion of sectoral labour shortages to pre-pandemic levels.

If there was an outward shift in the euro area Beveridge curve, it was mild and temporary, followed by a sustained labour demand recovery consistent with a labour market positioned in the steep segment of the Beveridge curve. Since 2021, despite the energy shock, euro area labour markets remained resilient in view of strong corporate profits in a context of falling real wages, developments that contributed to keeping euro area labour markets along the steep portion of the Beveridge curve (see [Kiss et al. 2024](#)).

Overall, the findings suggest that the simultaneous presence of increased labour market slack and shortages after COVID-19 was not a structural but mainly a temporary phenomenon linked to an incipient labour demand recovery.¹⁹ The removal of containment measures led to a very sudden increase in labour demand in a context where the labour force was less reactive than usual. In particular, health risk concerns are likely to have held back some people from taking up jobs or even searching, while restrictions and containment measures hampered labour mobility, not only within countries but also across borders. Vacancy rates reacted rapidly both at the start of the lockdown and with the labour market recovery, while unemployment moved with lags. While containment and support measures (such as short-time work schemes) may have postponed some workers' decisions to seek a job in another firm or sector, this did not lead to labour market mismatches. Structural reasons may have contributed to increasing labour market shortages, in particular demographic developments, as the working-age population is on a declining path in the euro area. These developments were likely exacerbated by a slowdown of mobility and migration flows during the pandemic ([OECD 2022](#)).

While the bulk of the evidence suggests that the concurrent signs of slack and shortages post-COVID-19 were not mainly associated with worsening structural labour market mismatches, increasing mismatches cannot be ruled out going forward. Long-term trends such as population ageing and the green and digital transitions are likely to affect the skills available in the labour force as well as those demanded by employers ([European Commission 2021b](#)). More recent economic shocks hitting the euro area, including the increase in energy prices driven by Russia's war of aggression in Ukraine, also had differential sectoral effects, which could have an impact on labour market mismatches.

In a tight labour market characterised by labour shortages, policy can support the activation of groups that face barriers to work. Measures can aim to make work pay (e.g., for low-wage and second earners), provide affordable and quality childcare and long-term care, and support the labour market integration of people with a migration background. In light of an ageing labour force, policy can also strengthen incentives for workers to continue working at an older age, and support employers in hiring older workers.

In case stronger evidence emerges of labour market mismatch, policy focus could turn to supporting labour market reallocation. Targeted education and training may help the creation of skills in short supply, therefore easing labour shortages in fast-growing economic activities. Strengthening public employment services could help improve the labour market matching process.

¹⁹Such evidence is in line with recent analyses for advanced economies. See, e.g., [Duval et al. \(2022\)](#).

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