



D6.3 – User guide to the European Skills Deficiencies index and contextual indices

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Reviewed by:	V.2	JYU	Jaana Kettunen	18/09/2026
		UNI LODZ	Ewa Kusideł	21/09/2026
		IER	Emily Erickson	22/09/2026
		IER	Terence Hogarth	22/09/2026
		ESRI	Elisa Staffa	28/09/2026
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Abbreviations

D: Deliverable

EU: European Union

ESDI: European Skills Deficiencies Index

PU: Public

WP: Work Package

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Summary

What does the index measure?

The **European Skills Deficiencies Index (ESDI)** is a composite indicator that benchmarks EU27 countries and the United Kingdom based on their relative levels of skills deficiencies. It is formed of two pillars:

- ✓ Pillar 1 - skill shortages comprises indicators pertaining to both the labour demand and the labour supply measuring skill shortages (i.e., situations where employers cannot recruit suitably skilled candidates from the external labour market); and
- ✓ Pillar 2 - skill gaps comprises indicators pertaining to both the labour demand and the labour supply measuring skill gaps (i.e. situations where workers do not possess the skills required by their jobs).

The index is primarily available at country level. Two adapted versions of the methodology benchmark occupations and sectors; these latter two versions are only available at European level.

What is a composite indicator (an index)?

It is an aggregate score that structurally combines individual underlying indicators (measures) into thematic dimensions, which are then grouped into broader strategic pillars that roll up to form the final index. This hierarchical framework allows complex, multi-dimensional concepts to be measured and tracked through a single, synthesized value.

To support the interpretation of observed skills deficiencies, **two complementary contextual composite indicators** have been developed.

- ✓ The **Structural Labour Market Pressure Index** benchmarks structural factors that may affect future skills needs, including technological and labour market trends.
- ✓ The **Mitigating Factors Index** benchmarks the capacity of education and training systems to develop and renew skills.

Intended users of the ESDI and the contextual composite indicators: policymakers, trade unions, employers, industry associations, and citizens.

How to read the score?

- ✓ The European Skills Deficiencies Index is measured on a 0-100 scale (same for the context indicators).
- ✓ Scores represent relative positions within the distribution observed across the EU27 and the United Kingdom during the 2015-2024 reference period. Therefore, scores should not be interpreted as percentages. Instead, they indicate a country's, occupation's, or sector's relative position compared with other countries in the index.

Composite indicator	Meaning of a low score	Meaning of a high score
European Skills Deficiencies Index (ESDI)	Low levels of skills deficiencies; fewer skills shortages and skill gaps; <u>more favourable outcome.</u>	High levels of skills deficiencies; more skills shortages and skill gaps; <u>less favourable outcome.</u>
Structural Labour Market Pressure Index	Weak labour market and technological pressures on skills demand; lower risk of future skills shortages and gaps; <u>more favourable outcome.</u>	Strong labour market and technological pressures on skills demand; greater risk of future skills shortages and gaps; <u>less favourable outcome.</u>
Mitigating Factors Index	Weaker educational and training outcomes; lower capacity to develop and renew skills; <u>less favourable outcome.</u>	Stronger educational and training outcomes; greater capacity to develop and renew skills; <u>more favourable outcome.</u>

Usage examples:

- ✓ Compare scores against EU average or median.
- ✓ Compare countries with peer countries or regions.
- ✓ Analyse ranks and quartiles.
- ✓ Monitor changes over time.
- ✓ Interpret the three composite indicators together.
- ✓ Examine differences between pillars.

1. Purpose of the European Skills Deficiencies Index and of the contextual indices

1.1. What does the European Skills Deficiencies Index measure?

Skill mismatches refer to the capacity of skill supply to meet skills demand. It refers to both the under- and over-supply of skills. From the under-supply side, a distinction is typically made between skill shortages and skill gaps (see McGuinness et al. 2018¹, for further information). Skill shortages refer to the short supply of applicants with the skills, qualifications or experience required to fill vacancies advertised in the external labour market. It is important to make a distinction here between skill shortages and labour shortages. Where shortages arise because employers offer terms and conditions of employment below the going rate for a job this will result in a labour rather than skill shortage. Skill shortages refer to the vacancies which cannot be filled because of a shortage of skills in the external labour market.

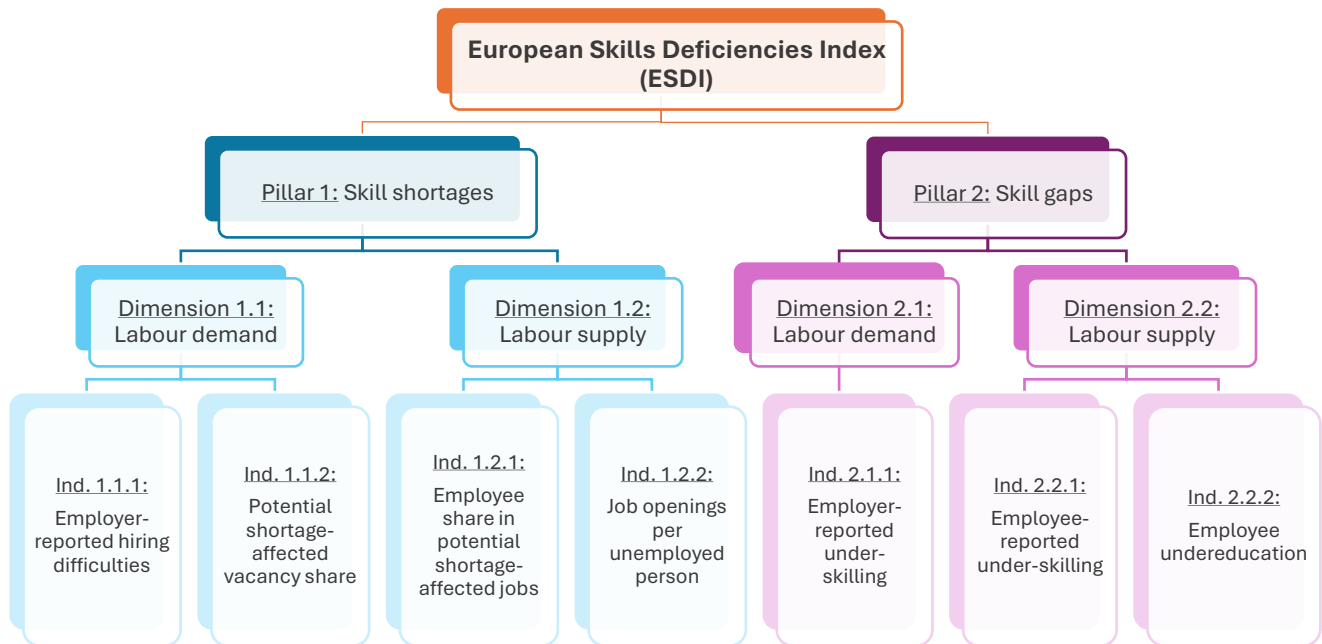
Skill gaps refer to the capacity of existing employees to undertake their current jobs. This may arise because of recruiting people with skills below those required in a job, technological and organisational change in the workplace, and/or a lack of employer-provided training. They are also likely to arise where employers are relatively high-performing ones which may be experiencing rapid change such as through the adoption of the latest, cutting-edge new technologies. In combination, skills shortages and skill gaps give an indication of the overall scale of the skills deficit a country, occupation or sector might be facing. But it needs to be borne in mind that each type of skill deficit is driven by a distinct set of factors.

The **European Skills Deficiencies Index (ESDI)** is a composite indicator that benchmarks skills deficiencies across EU countries at country level; using two adapted versions of the framework, the index benchmarks skills deficiencies across occupations, and sectors at EU level. In this context, skills deficiencies encompass both skill shortages and skill gaps. A distinctive feature of the ESDI is that it brings these two dimensions together within a single measurement framework. To the best of our knowledge, it is the first EU-level composite indicator to jointly measure both skill shortages and skill gaps, thereby providing a broader and more comprehensive assessment of skills deficiencies than approaches focusing on only one dimension.

The two types of skills deficiencies constitute the pillars of the ESDI, each one of them being composed of measures representing the labour demand and labour supply sides. The detailed structure of the composite indicator is presented in Figure 1. A key strength of the ESDI is that it combines indicators from both the labour demand and labour supply sides, providing a more comprehensive picture of skills deficiencies than approaches that focus on only one perspective. The framework also integrates objective and subjective measures, enabling direct stakeholder perceptions to be considered alongside statistical evidence and strengthening the robustness of the resulting estimates. Detailed description, data sources, and methodology are briefed in the Appendix.

¹ McGuinness, S., Pouliakas, K., & Redmond, P. (2018). 'How useful is the concept of skills mismatch?' *Journal of Economic Surveys*, 32(4), 983–1015

Figure 1. European Skills Deficiencies Index (ESDI) - structure



1.2. What do the contextual indicators measure?

To support the interpretation of observed skills deficiencies, two complementary contextual indices have been developed. These indices do not measure skills deficiencies directly; rather, they represent conditions associated with skills needs and development. Together, they provide an important added value to the ESDI by offering complementary perspectives on both the demand for skills and the capacity to develop and renew skills. This enables users to interpret observed skills deficiencies in the context of the broader labour market and educational conditions associated with their emergence, persistence, or mitigation.

First, the **Structural Labour Market Pressure Index** measures and benchmarks technological and labour market developments across EU countries, occupations, and sectors. It captures structural trends or external factors that drive the demand for skills and, consequently, contribute to the emergence or persistence of skill shortages and skill gaps over time.

Second, the **Mitigating Factors Index** measures and benchmarks the capacity of countries to develop and renew skills through education and training systems. It is based on indicators related to educational attainment in formal education, and engagement in lifelong learning. It is a measure of skills supply. These indices act as proxies for skills formation and may help mitigate skills deficiencies by increasing the supply and adaptability of skills. The index therefore represents the capacity to form and renew skills. It does not measure the skills that people hold. Unlike the ESDI and the Structural Labour Market Pressure Index, the Mitigating Factors Index is not adapted for occupations and sectors. The detailed structure of the two context composite indicators is presented in Table 1 below. Detailed description, data sources, and methodology are briefed in the Appendix.

Table 1. Context indicators - structure

Index	Pillar	Dimension	Indicator
Structural Labour Market Pressure Index	Technological shifts	Internal innovation	Patent applications
		Technology adoption – enterprises	AI adoption in enterprises
			Rise of technical skills in digital occupations
	Labour market trends	Employment growth	
		Working hours growth	
		Working age population growth	
Mitigating Factors Index	Formal education outcomes		Tertiary education graduates
			STEM graduates from tertiary education
			VET graduates from upper and post-secondary education
	Lifelong learning		Participation in lifelong learning

Summary

Distinctive feature of the European Skills Deficiencies Index: it brings together two dimensions of the under-supply of skills (skills shortages and skills gaps) within a single measurement framework.

Key strengths of the European Skills Deficiencies Index:

- ✓ it combines indicators from both the labour demand and labour supply sides, providing a more comprehensive picture of skills deficiencies
- ✓ it integrates objective and subjective measures, enabling direct stakeholder perceptions to be considered alongside statistical evidence and strengthening the robustness of the resulting estimates

The context indicators bring added value to the European Skills Deficiencies Index by offering complementary perspectives on both the demand for skills and the capacity to develop and renew skills. The European Skills Deficiencies Index and the context indicators provide a comprehensive view of skills challenges in Europe, each one answering to a separate question:

- ✓ **The European Skills Deficiencies Index:** How do countries compare in terms of skills deficiencies?
- ✓ **The Structural Labour Market Pressure Index:** How do countries compare in terms of labour-market and technological pressures that may affect skills demand?
- ✓ **The Mitigating Factors Index:** How do countries compare in terms of education and lifelong-learning conditions that affect skills supply?

1.3. Intended users and policy applications

The European Skills Deficiencies Index is designed to support a wide range of stakeholders involved in labour market, skills, education, and economic policy. Its primary users include policymakers, trade unions, and employers' and industry associations. Education and training providers and individual citizens may also benefit from the insights it provides.

Policymakers at both national and European levels are key users of the index. This includes ministries and European institutions involved in skills, employment, and investment policies. The country-level results enable policymakers to benchmark performance against the EU average and other countries and monitor developments over time. The indices can also facilitate the identification and exchange

of good practices between countries facing similar challenges. At the European level, the indices can support evidence-based policy coordination and help identify countries, occupations, or sectors that may require particular attention due to high levels of skills deficiencies or increased structural labour market pressures.

Trade unions, particularly European level ones, can use the occupation-level results to understand whether the occupation is experiencing significant skills shortages or skills gaps. In addition, the Structural Labour Market Pressure Index can further help them understand how technological change and labour market developments may affect the future demand for skills in the occupations they represent. These insights can support social dialogue, workforce development initiatives, and advocacy efforts. Similarly, employers and industry associations, particularly European level ones, can use the sector-level results to assess current and emerging skills challenges within their sectors.

Lastly, to a lesser extent, education and training providers as well as individual citizens such as students, jobseekers, and workers, may use the indices to gain insights into labour market trends and skills needs. The results can inform guidance provision and support people's own career planning, training decisions, and reskilling or upskilling efforts by highlighting occupations and sectors where skills demand is particularly strong or expected to increase in the future.

Summary

The European Skills Deficiencies Index is designed to support a wide range of stakeholders involved in labour market, skills, education, and economic policy.

User group	Typical use
Policymakers (national and European)	Benchmark skills deficiencies against the EU average and peer countries; monitor trends over time; identify policy priorities; support the design, targeting and evaluation of skills, employment and education policies; identify good practices from better-performing countries.
European institutions and funding bodies	Identify countries, occupations and sectors facing high skills deficiencies or labour market pressures; support evidence-based policy coordination and investment decisions.
Trade unions	Assess skills shortages and skill gaps in the occupations they represent; support social dialogue, workforce development initiatives and advocacy activities.
Employers and industry associations	Identify skills challenges in specific sectors; engage with policymakers and education providers on skills development priorities.
Education and training providers	Understand current and future skills needs; anticipate demand for education and training programmes; plan participant capacity; support discussions with policymakers and funding bodies on training needs.
Students, job	Explore labour market trends; identify occupations and sectors with strong or growing

2. How to read the score

Both the European Skills Deficiencies Index and the context indicators (the Structural Labour Market Pressure Index and the Mitigating Factors Index) are expressed on a scale from 0 to 100, where 0 represents the lowest observed value and 100 the highest observed value recorded across the EU27 and the United Kingdom during the 2015-2024 reference period². The scores therefore reflect relative

² The reference period remains fixed at 2015-2024 and is not updated in subsequent releases.

positions within the observed distribution and facilitate comparisons across countries, occupations, sectors, and over time.

For the **European Skills Deficiencies Index (ESDI)**, a score of 0 indicates the lowest level of skills deficiencies observed during the reference period, while a score of 100 indicates the highest level of skills deficiencies. Consequently, lower scores reflect improved skills matching, as they indicate fewer skills shortages and skill gaps. Countries, occupations, or sectors with lower ESDI scores are therefore closer to the lowest observed level of skills deficiencies, whereas higher scores indicate a greater prevalence of skills deficiencies.

It is important to note that the ESDI measures relative performance. As a result, a score should not be interpreted as the percentage of jobs affected by skills deficiencies. Instead, it indicates where a country, occupation, or sector stands in relation to the range of skills deficiencies observed across all countries included in the index during the 2015-2024 period. Therefore, changes in the ESDI score over time should be interpreted as changes in a country's relative position within the overall distribution of skills deficiencies. Because scores are calculated against a fixed reference period, movements in a country's score reflect both changes in its own level of skills deficiencies over time and changes relative to the performance of other countries.

An increase in the ESDI score compared with the previous year indicates a deterioration in performance, reflecting an increase in skills deficiencies. Conversely, a decrease in the score indicates an improvement, reflecting a reduction in skills deficiencies. For example, if a country's ESDI score increases from 40 to 50 between two years, this suggests that skills deficiencies have increased.

A similar interpretation applies to the **Structural Labour Market Pressure Index**. A score of 0 represents the lowest level of structural labour market and technological pressures observed during the 2015-2024 reference period, while a score of 100 represents the highest level observed. Consequently, lower scores indicate a more favourable position vis-à-vis skills matching, characterised by weaker structural pressures on skills demand, whereas higher scores indicate stronger labour market and technological pressures that may contribute to the emergence or persistence of future skills shortages and skill gaps. As with the ESDI, an increase in the Structural Labour Market Pressure Index score over time indicates that structural pressures have intensified, while a decrease suggests that these pressures have weakened.

The **Mitigating Factors Index** should be interpreted differently. A score of 0 corresponds to the lowest level of educational and training outputs observed during the 2015-2024 reference period, while a score of 100 corresponds to the highest level observed. Consequently, higher scores reflect improved performance in relation to educational outputs, indicating stronger conditions for skills formation through education, training, and lifelong learning. Conversely, lower scores suggest a more limited capacity to supply skills in demand. Changes over time should be interpreted accordingly: an increase in the Mitigating Factors Index score indicates an improvement in performance and a strengthening of mitigating factors, while a decrease indicates a deterioration in these factors. As a result, countries

with higher scores are generally better positioned to address current and future skills deficiencies through the development and renewal of human capital.

Summary

- ✓ The European Skills Deficiencies Index is measured on a 0-100 scale (same for the context indicators).
- ✓ Scores represent relative positions within the distribution observed across the EU27 and the United Kingdom during the 2015-2024 reference period. => Scores should not be interpreted as percentages. Instead, they indicate a country's, occupation's, or sector's relative position compared with other observations in the index.

Composite indicator	Meaning of a low score	Meaning of a high score
European Skills Deficiencies Index (ESDI)	Low levels of skills deficiencies; fewer skills shortages and skill gaps; <u>more favourable outcome</u> .	High levels of skills deficiencies; more skills shortages and skill gaps; <u>less favourable outcome</u> .
Structural Labour Market Pressure Index	Weak labour market and technological pressures on skills demand; lower risk of future skills shortages and gaps; <u>more favourable outcome</u> .	Strong labour market and technological pressures on skills demand; greater risk of future skills shortages and gaps; <u>less favourable outcome</u> .
Mitigating Factors Index	Weaker educational and training outcomes; lower capacity to develop and renew skills; <u>less favourable outcome</u> .	Stronger educational and training outcomes; greater capacity to develop and renew skills; <u>more favourable outcome</u> .

3. Interpreting and comparing results

The **European Skills Deficiencies Index** and the **context composite indicators** can be used to benchmark performance across countries, occupations, sectors, and over time. Benchmarking helps users understand whether observed levels of skills deficiencies, labour market pressures, or mitigating factors are relatively high or low and identify areas requiring policy attention.

3.1. Compare scores against EU average or median score

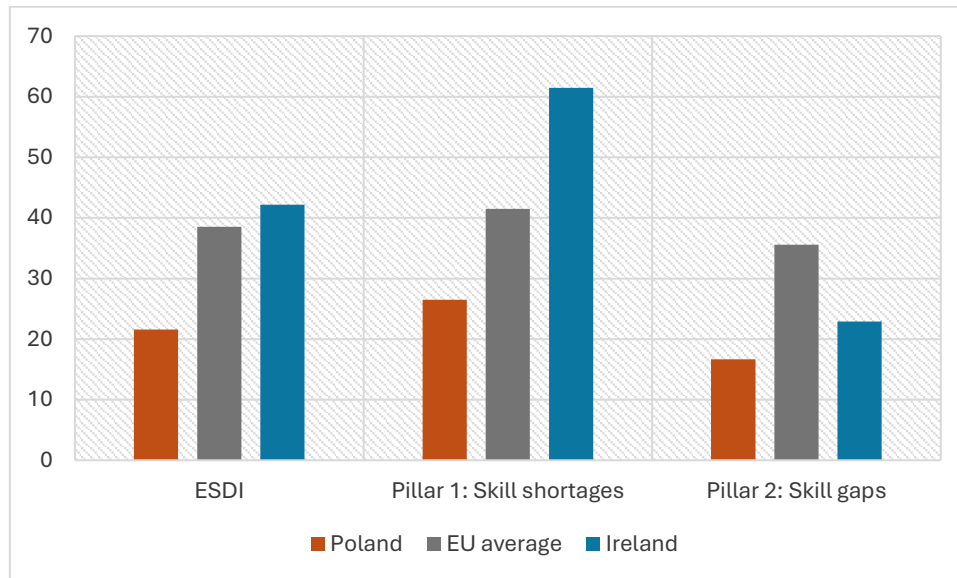
Comparing results against the EU average³ provides a simple and intuitive way to assess whether a country, occupation, or sector performs above or below the overall European benchmark. Such comparisons can help users identify areas where skills challenges are particularly acute and where additional policy attention may be warranted.

For the **European Skills Deficiencies Index (ESDI)** and the **Structural Labour Market Pressure Index**, scores above the EU average indicate comparatively less favourable outcomes, while scores below the EU average indicate comparatively better performance. By contrast, for the **Mitigating Factors Index**, scores above the EU average indicate stronger educational and training outcomes, while scores below the EU average indicate weaker conditions for skills formation.

³ The United Kingdom is not included in the EU average.

As an example, in 2024 Poland recorded an ESDI score of 22, compared with an EU average of 39 (see Figure 2 below). This means that Poland's overall level of skills deficiencies was 17 points below the European benchmark, indicating a comparatively more favourable skills situation than that observed for the average European country. The comparison can be further refined by examining the two dimensions of the index separately. Poland's score for skill shortages was 27, compared with an EU average of 42, while its score for skill gaps was 17, compared with an EU average of 36.

Figure 2. ESDI and its pillar scores, Poland, Ireland and EU average, 2024



The results suggest that Poland performs better than the EU average on both dimensions. The advantage is somewhat stronger for skill gaps (19 points below the EU average) than for skill shortages (15 points below the EU average). In other words, Poland appears to face relatively fewer challenges related to deficiencies in workers' skills than the average European country, while recruitment difficulties resulting from shortages of suitably qualified candidates, although still comparatively limited, remain slightly more pronounced.

By contrast, Ireland records an ESDI score above the EU average (see Figure 2), indicating a comparatively less favourable skills situation than that observed, on average, across EU countries. Looking at the two pillars separately reveals a more nuanced picture. Ireland performs worse than the EU average on skill shortages but better on skill gaps. This suggests that Ireland's comparatively higher level of skills deficiencies is driven primarily by recruitment difficulties and shortages of suitably qualified workers rather than by deficiencies in the skills of those already employed. In other words, the challenge appears to be more closely related to the availability of workers with the required skills than to skill gaps within the existing workforce.

Moreover, users are encouraged to compare all three composite indicators against the EU average rather than focusing on a single score. Doing so provides a more complete picture of current skills deficiencies, future labour market pressures, and the capacity of education and training systems to respond to those challenges.

Finally, users should keep in mind that the EU average serves as a relative benchmark rather than a policy target. A country performing better than the EU average may still face significant skills challenges, while a country performing worse than the average may nevertheless show positive

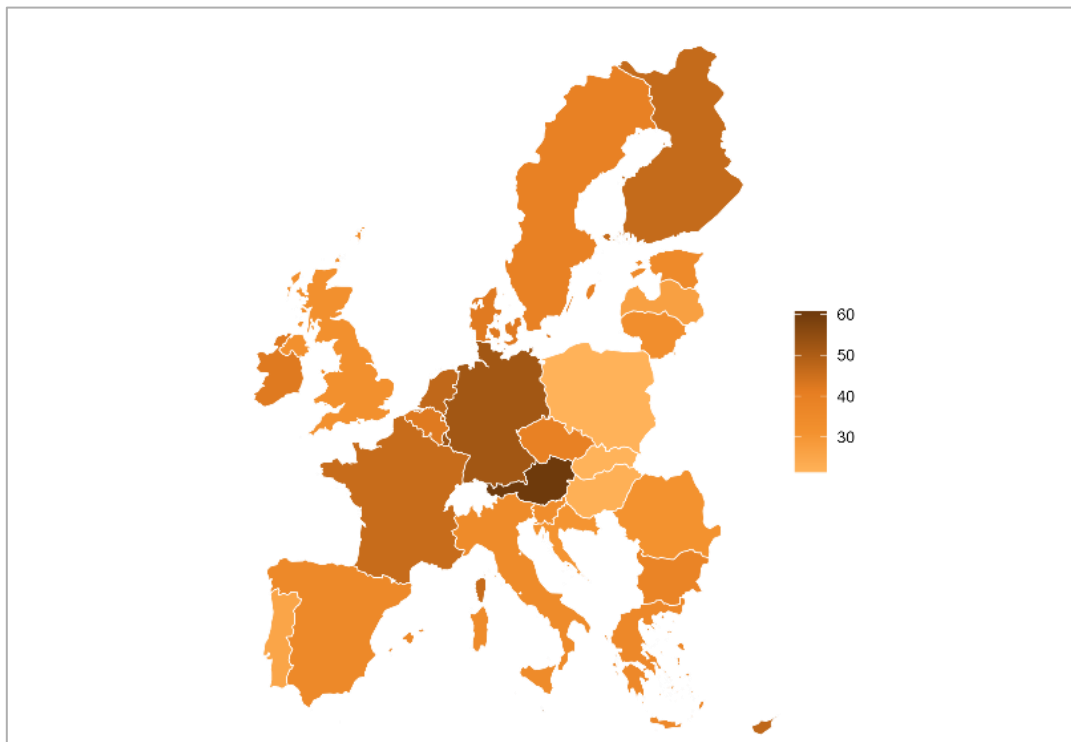
progress over time. For this reason, comparisons with the EU average should be complemented by analyses of trends over time, peer-country comparisons, and assessment of the individual dimensions captured by the SkillsPULSE indicators.

3.2. Comparing scores against peer countries

While comparisons with the EU average provide a useful overall benchmark, comparisons with geographically proximate or economically similar countries can offer additional insights into relative performance. Such comparisons help users assess whether observed levels of skills deficiencies reflect broader regional patterns or country-specific circumstances.

Figure 3 presents the geographical distribution of the European Skills Deficiencies Index across Europe in 2024. Several regional patterns can be observed. In particular, many Central and Eastern European countries, including Poland, Slovakia, Hungary, Latvia, and Romania, record comparatively low levels of skills deficiencies. By contrast, a number of Western and Northern European countries, such as Austria, Luxembourg, Germany, and the Netherlands exhibit higher levels of skills deficiencies. These regional differences appear to be driven primarily by variations in skill shortages, while patterns in skill gaps are more heterogeneous across countries.

Figure 3. Geographical distribution of ESDI scores, 2024



One possible explanation for this pattern is that countries with tighter labour markets, ageing populations, and strong labour demand often experience greater recruitment difficulties, leading to higher measured levels of skills deficiencies. In contrast, some Central and Eastern European countries may record lower levels of skills deficiencies partly because labour demand pressures are

less intense or because labour supply conditions differ. Consequently, a comparatively low ESDI score should not automatically be interpreted as evidence of a well-functioning skills system.

This is precisely why the **Structural Labour Market Pressure Index** should be considered alongside the ESDI. The index helps distinguish whether low levels of skills deficiencies reflect genuinely favourable skills matching outcomes or whether they are partly the result of lower labour market and technological pressures. Similarly, countries with relatively high ESDI scores may be experiencing strong labour demand and rapid structural change rather than weaknesses in skills formation alone (see Section 3.5 for an illustration of how the ESDI and contextual indicators can be read in combination).

Peer-country comparisons can therefore help stakeholders identify countries facing similar economic, demographic, or labour market conditions and assess whether differences in performance may be associated with policy choices, institutional arrangements, or labour market structures. However, such comparisons should be viewed as a starting point for further analysis rather than as evidence of causal relationships.

3.3. Comparing ranks and quartiles

Composite indicators are often used to rank countries according to their relative position. Compared with raw scores, rankings provide a simple and intuitive way of understanding how a country compares with its peers and where it stands within the overall distribution of results. For this reason, rankings are frequently used in policy discussions and public communication.

In the case of the European Skills Deficiencies Index (ESDI), countries are ranked from the highest to the lowest level of skills deficiencies. A country ranked first records the highest level of skills deficiencies, while a country ranked last records the lowest level. Rankings therefore provide a direct indication of relative performance among participating countries.

To facilitate interpretation, countries may also be grouped into quartiles, with each quartile representing approximately one-quarter of the distribution. Quartiles help identify groups of countries facing broadly similar levels of skills deficiencies and can be particularly useful when score differences between neighbouring countries are relatively small.

Based on the 2024 ESDI results, the countries can be grouped as follows:

- First quartile (highest skills deficiencies): Austria, Malta, Luxembourg, Germany, Cyprus, Netherlands, Finland.
- Second quartile: France, Belgium, Ireland, Denmark, Sweden, Czechia, Bulgaria.
- Third quartile: Greece, Spain, Estonia, Italy, Slovenia, Lithuania, United Kingdom.
- Fourth quartile (lowest skills deficiencies): Romania, Croatia, Latvia, Portugal, Hungary, Poland, Slovakia.

For example, Poland ranks 27th out of 28 countries, while Slovakia ranks 28th, placing both countries in the quartile with the lowest observed skills deficiencies. By contrast, Austria, Malta, and Luxembourg occupy the top positions of the ranking and belong to the quartile with the highest skills deficiencies.

Quartiles can be particularly useful for identifying broad performance groups. For instance, a country moving from the second to the third quartile can be interpreted as having improved its position relative to a substantial number of peer countries even if the underlying score change is modest. Likewise, policymakers may choose to focus on moving their country into a lower-deficiency quartile rather than targeting a specific score.

Rankings should not be interpreted in isolation. Countries occupying adjacent positions in the ranking may have almost identical scores, while countries within the same quartile may still exhibit meaningful differences in their levels of skills deficiencies. Users are therefore encouraged to use ranks to assess relative performance and scores to assess the magnitude of differences between countries.

In practice, ranks and quartiles provide the most accessible starting point for benchmarking, while the underlying scores offer additional information on how large the performance gaps between countries actually are. For example, comparisons against the EU average and comparisons based on ranks or quartiles provide complementary perspectives on performance. A country may be located in the lowest-deficiency quartile while only being slightly below the EU average. Conversely, a country may be substantially below the EU average yet remain in the same quartile as several neighbouring countries. In such cases, the quartile highlights relative standing, whereas the comparison with the EU average highlights the magnitude of the difference.

The distinction is particularly important because the distribution of scores is not necessarily uniform. Large differences in scores may exist between quartiles, while countries within the same quartile may have very similar scores. As a result:

- EU average comparisons are most useful for assessing the distance from the European benchmark;
- ranks are most useful for identifying a country's relative position among its peers; and
- quartiles are most useful for identifying broad groups of countries with similar performance levels.

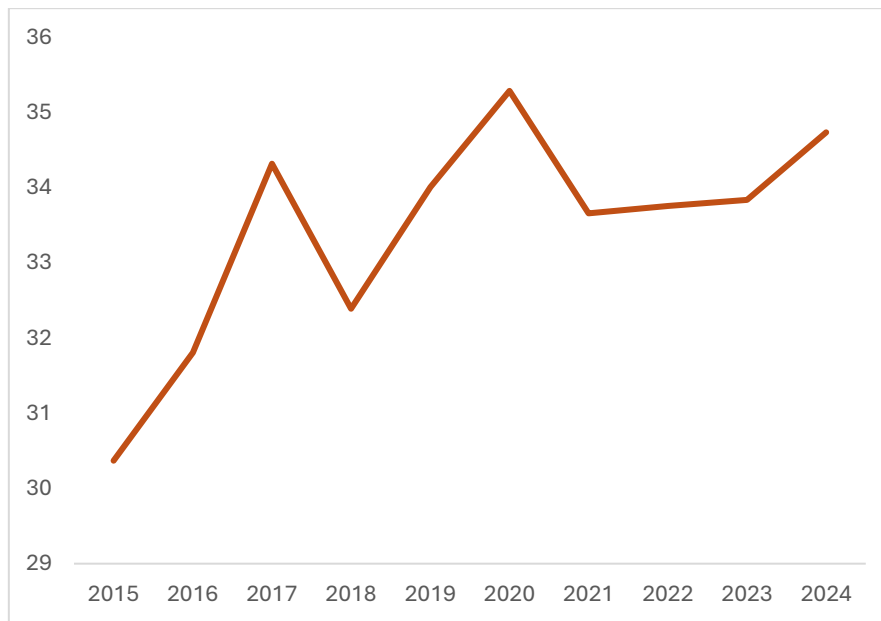
3.4. Comparing the performance of one country over time

One of the main advantages of the **European Skills Deficiencies Index** is that it allows users to monitor how skills deficiencies change over time. Time-series comparisons help identify whether skills challenges are becoming more or less severe and whether a country is improving or deteriorating relative to other countries.

When analysing developments over time, users should consider both the index score and the country's position in the ranking distribution (rank or quartile). Score changes provide information on the magnitude of change, while rank and quartile changes indicate whether a country's relative position has improved or deteriorated compared to its peers.

Figure 4 shows how Italy's ESDI score between 2015 and 2024 changed. During this period, Italy's score increased from approximately 31 in 2015 to almost 35 in 2024. Since higher ESDI scores indicate higher levels of skills deficiencies, this change suggests a moderate deterioration in Italy's skills situation over the period. However, the increase was relatively limited, with the score remaining within a narrow range of around five points throughout the entire period.

Figure 4. Evolution of Italy's ESDI score, 2015-2024



The analysis of quartiles provides additional context by showing whether changes in ranking are large enough to move a country into a different performance group. Italy spent most of the 2015-2024 period in the third quartile, corresponding to countries with relatively low levels of skills deficiencies. In 2019, 2021 and 2022, however, Italy moved into the fourth quartile, placing it among the countries with the lowest levels of skills deficiencies in Europe. This quartile shift should, however, be interpreted as moderate rather than substantial, as Italy entered the fourth quartile only marginally, occupying the first position within that group (rank 22 out of 28 countries). Consequently, the move reflects a relatively small change in Italy's relative standing rather than a marked transition to a distinctly different performance category. Similarly, the return to the third quartile in 2024 is associated with a moderate deterioration in relative performance rather than a major change in the country's overall skills situation.

It is important to note that changes in scores and changes in quartile positions provide different types of information. While Italy's ESDI score increased between 2019 and 2021, indicating a deterioration in its level of skills deficiencies, Italy's relative position compared with other countries improved during the same period. This apparent contradiction reflects the fact that many European countries experienced a similar deterioration in performance, resulting in a general upward shift in ESDI scores across the EU. As a consequence, Italy moved into the fourth quartile despite recording higher scores than in some earlier years. The quartile analysis therefore captures a country's performance relative to other countries in a given year, whereas the score reflects performance relative to the distribution of scores observed across all countries and years in the 2015-2024 reference period. Using both perspectives provides a more complete understanding of developments over time, allowing users to distinguish between changes in a country's absolute performance against the fixed reference period and changes in its position relative to its European peers in a given year.

Taken together, the score, ranking, and quartile analyses suggest that Italy's level of skills deficiencies remained broadly stable over the period. While the country's relative position fluctuated and occasionally crossed the boundary between the third and fourth quartiles, these movements generally occurred close to the quartile threshold and therefore indicate incremental rather than fundamental changes in performance.

3.5. Comparing performance across composite indicators

To gain a more comprehensive understanding of skills deficiencies, the results of the European Skills Deficiencies Index (ESDI) should be interpreted alongside the two contextual composite indicators. While the ESDI measures the current extent of skills deficiencies, the Structural Labour Market Pressure Index provides insights into the labour market and technological pressures that may contribute to their emergence or persistence, and the Mitigating Factors Index captures the capacity of education and training systems to develop and renew skills. Interpreting the three indicators together therefore enables users not only to assess the current level of skills deficiencies, but also to better understand the factors that may be driving them and the mechanisms that may help address them. As a result, the combined interpretation of the three indicators provides a more complete picture of skills challenges than any single indicator considered in isolation.

The three composite indicators can be analysed using the same benchmarking approaches described in the previous sub-sections. Users may compare performance against the EU average or median to determine whether a country, occupation, or sector performs above or below the European benchmark for each indicator. The indicators may also be examined through ranks and quartiles, allowing users to assess relative performance and identify broad groups facing similar skills challenges. In addition, comparisons across peer countries or regions can help identify common patterns, differences in performance, and potential good practices. Finally, analysing the evolution of the three indicators over time provides insights into whether skills deficiencies, labour market pressures, and mitigating factors are improving or deteriorating. Combining these different benchmarking perspectives enables a richer understanding of both the scale and the underlying drivers of skills challenges.

For example, Figure 5 compares Finland's performance with the EU average across ESDI and contextual indicators in 2024. The arrows indicate the direction of change in Finland's scores compared with the previous year. For the ESDI and the Structural Labour Market Pressure Index, a downward arrow represents an improvement because lower scores indicate more favourable outcomes. For the Mitigating Factors Index, an upward arrow represents an improvement because higher scores indicate stronger skills formation capacity.

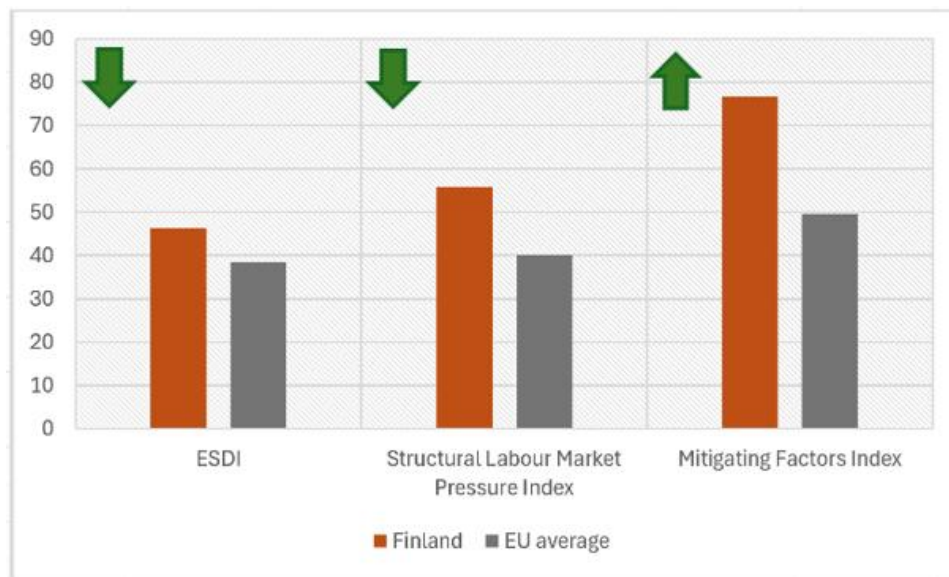
Finland records an ESDI score of 47, compared with an EU average of 39.⁴ This indicates that Finland experiences higher levels of skills deficiencies than the average European country. The ESDI decreased between 2023 and 2024, suggesting a modest improvement in Finland's skills situation over the most recent year.

At the same time, Finland records a Structural Labour Market Pressure Index score of almost 56, substantially above the EU average of about 40. This indicates that Finland faces stronger labour market and technological pressures than most European countries. The labour market pressures also eased slightly compared with the previous year, although they remain significantly above the European benchmark.

The picture is different for the Mitigating Factors Index. Finland achieves a score of almost 77, compared with an EU average of 50. This value reflects high educational attainment and high participation in learning. It indicates capacity to form and renew skills rather than the level of skills currently held. The index's scores suggest that the mitigating factors strengthened between 2023 and 2024.

⁴ The United Kingdom is not included in the EU average.

Figure 5. ESDI and contextual indicator scores, Finland and the EU average, 2024



Note: Arrows indicate annual change for Finland. For ESDI and Structural Labour Market Pressure Index, the decrease in the score means an improved labour market situation. For the Mitigating Factors Index, the increase in the score means an improved situation.

Taken together, the three indicators provide a more nuanced interpretation than any individual index in isolation. Looking only at the ESDI could lead users to conclude that Finland performs relatively poorly because it faces above-average skills deficiencies. The contextual indicators, however, suggest a more balanced interpretation. Finland combines a relatively high level of skills deficiencies with exceptionally strong educational and training outcomes and a recent reduction in both skills deficiencies and structural labour market pressures.

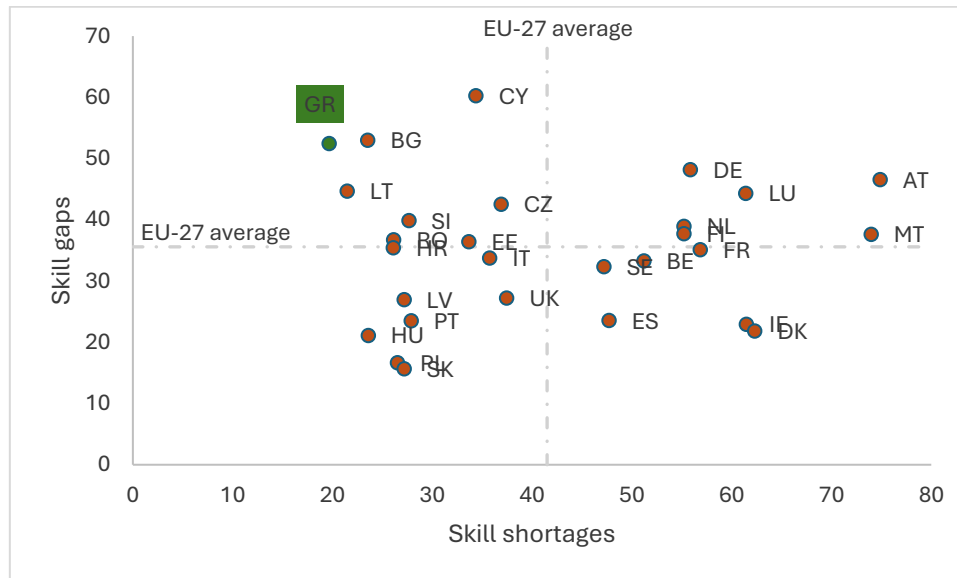
One possible interpretation is that Finland's skills deficiencies are partly driven by the challenges associated with a highly dynamic economy and strong demand for skills. Indeed, Finland consistently ranks among the countries experiencing the highest structural labour market pressures. At the same time, the country's very strong performance on the Mitigating Factors Index suggests that Finland records high values on the education and lifelong-learning indicators.

3.6. Comparing results across pillars

To gain more granular information on the nature of skills deficiencies, users should complement the analysis of the overall European Skills Deficiencies Index (ESDI) with an examination of its two underlying pillars: Pillar 1: Skill shortages and Pillar 2: Skill gaps. While the overall ESDI provides a summary measure of skills deficiencies, the pillar scores reveal whether these deficiencies are driven primarily by difficulties in recruiting suitably qualified workers or by shortcomings in the skills possessed by the existing workforce. Examining the pillar structure therefore helps identify the specific sources of skills deficiencies and can support the design of more targeted policy interventions.

For example, Greece is slightly below the EU-27 average⁵ in case of the European Skills Deficiencies index, suggesting that its overall level of skills deficiencies is that of an average European country. However, there are substantial differences between the two pillars (see Figure 6). Greece records a skill shortage score well below the EU average, indicating comparatively limited recruitment difficulties, while its skill gaps score is considerably above the EU average, placing it among the countries facing more pronounced challenges related to the skills of the existing workforce.

Figure 6. Skill shortages vs. Skill gaps, 2024



This contrast indicates that Greece's skills deficiencies are not primarily driven by recruitment difficulties or shortages of suitably qualified candidates. Instead, they appear to be driven predominantly by skill gaps, suggesting that the skills possessed by workers are not fully aligned with the requirements of their jobs. While employers in Greece appear to face comparatively fewer difficulties in finding workers than those in a typical European country, they are more likely to encounter challenges related to the quality, relevance, or adequacy of the skills available within the workforce.

The usefulness of pillar-level analysis becomes even more apparent when examining developments over time. Between 2015 and 2021, Greece experienced a gradual increase in both pillars. The skill shortages score rose from 7 to 22, while the skill gaps score increased from 57 to 63. Since 2021, however, both indicators have declined. By 2024, the skill shortages score had fallen to 20 and the skill gaps score to 52, contributing to a reduction in the overall ESDI from 43 in 2021 to 36 in 2024.

Despite this recent improvement, the change in the two pillars suggests that the fundamental nature of Greece's skills challenges has remained broadly unchanged over the period. Throughout 2015-2024, skill gaps consistently represented the dominant source of skills deficiencies, remaining substantially higher than skill shortages in every year. Although the gap between the two pillars narrowed slightly over time, Greece continues to exhibit a profile characterised by relatively limited recruitment pressures but persistent skills mismatches within the workforce.

⁵ The United Kingdom is not included in the EU average.

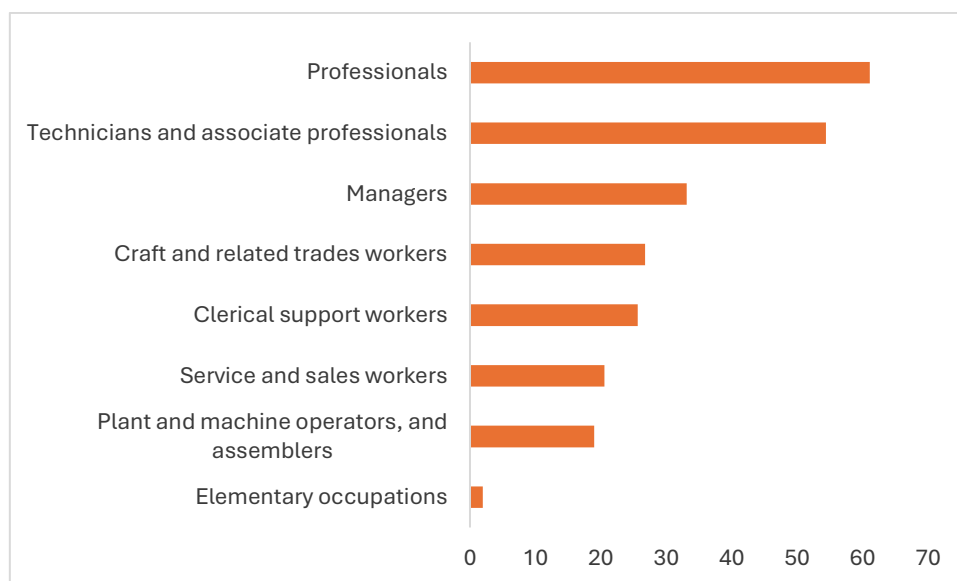
This pattern may point towards policy priorities that differ from those of countries where skill shortages are the dominant challenge. In the Greek case, interventions aimed at improving the quality and relevance of skills, strengthening upskilling and reskilling opportunities, supporting lifelong learning, and improving the alignment between education and labour market needs may be particularly important. By contrast, measures designed primarily to expand labour supply may be less critical than in countries experiencing acute recruitment difficulties.

3.7. Occupational and sectoral ESDI

Using two adapted versions of the framework, the European Skills Deficiencies Index benchmarks skills deficiencies across occupations, and sectors at EU level. The interpretation remains unchanged compared to the country-level index. Scores may take values from 0 to 100, where 0 is the least level of skills deficiencies over 2015-2024 across all evaluated occupations/sectors; and 100 is the highest level of skills deficiencies. Results may be visualised across occupations/sectors to compare their performance against each other. Comparisons with the average or median value can also be performed. Similar to the country-level example, comparing results across pillars could provide additional information on the skills deficiency area (skills shortages or skills gaps) that needs more attention. In addition, the Structural Labour Market Pressure Index has adapted versions for occupations and sectors; therefore, the interpretation of ESDI results can be made in conjunction with those of the Structural Labour Market Pressure Index.

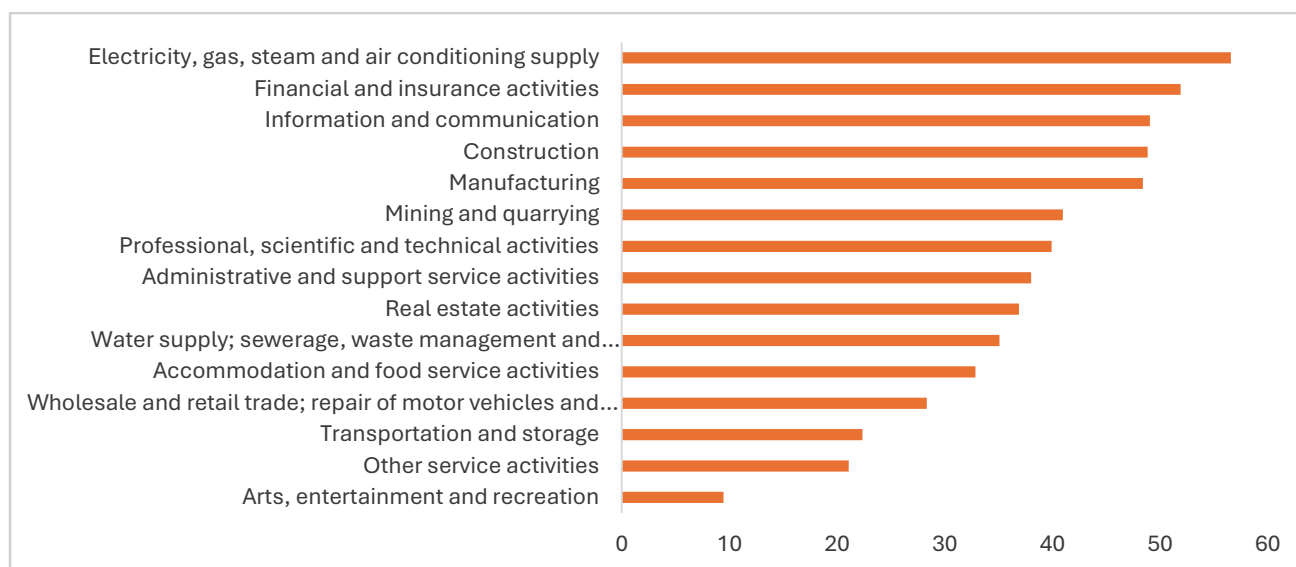
Two examples on interpreting the adapted ESDI scores (one for occupations and one for sectors) are presented below. They show how to compare results across occupations/sectors. First, Figure 7 shows the distribution of occupations according to the European Skills Deficiencies Index in 2024. Accordingly, “Professionals,” and “Technicians and associate professionals” are the two occupations that face the highest skills deficiency levels. On the other hand, “Elementary occupations” face lower skills deficiencies.

Figure 7. Occupational ESDI scores 2024



Second, Figure 8 shows the distribution of sectors according to the European Skills Deficiencies Index in 2024. Accordingly, the “Electricity, gas, steam and air conditioning supply” and the “Financial and insurance activities” are the two sectors that face the highest skills deficiencies levels. On the other hand, “Arts, entertainment and recreation” face lower skills deficiencies.

Figure 8. Sectoral ESDI scores 2024



4. Data and methodological considerations

As with any statistical tool, the results of the European Skills Deficiencies Index should be interpreted in light of several data and methodological considerations. Understanding these considerations helps users draw appropriate conclusions and avoid over-interpreting individual scores or rankings.

Data availability and timeliness: Some of the indicators used in the construction of the indices are derived from surveys that are not conducted annually. As a result, data for certain years are not directly available and must be estimated using statistical techniques. In addition, some survey questions have been discontinued or modified over time, limiting the availability of comparable information across years. Consequently, some results may not fully reflect the most recent changes in labour market conditions.

To address this challenge, the composite indicators combine survey-based information with more frequently updated statistical and administrative data. Nevertheless, users should bear in mind that some indicators may capture longer-term trends more accurately than short-term developments.

Country-specific data limitations: For a small number of countries, data availability is more limited than for others. In particular, several indicators for the United Kingdom are only available up to 2019. Consequently, more recent UK results should be interpreted with caution, as they may reflect labour market conditions that existed prior to the COVID-19 pandemic rather than current developments.

Limited granular disaggregation: The published ESDI results are presented at country level and, in separate analyses, at the European level for occupations and sectors. Due to data limitations, it is

currently not possible to produce statistically reliable results for all countries at detailed occupation, sector, or regional levels. In particular, survey sample sizes are often too small to support robust comparisons for individual occupations or sectors within countries.

Measurement limitations: The indicators measure skills deficiencies using the best available European data sources. However, no single dataset can fully capture all aspects of skills shortages and skill gaps. Some indicators provide direct evidence based on the views of workers and employers, while others measure skills deficiencies indirectly through labour market conditions, job vacancies, or educational outcomes. As a result, the composite indicators should be viewed as evidence-based estimates rather than exact measurements of skills deficiencies.

Online vacancy data limitations: Some indicators use online job vacancy data. While these data provide a timely and valuable source of labour market information, online vacancies may not reflect all occupations and sectors to the same extent. In particular, occupations that rely less on online recruitment may be underrepresented. As a result, certain sectors or occupations may be measured more accurately than others. Robustness checks indicate that this limitation has only a limited impact on the overall rankings, but it should nevertheless be considered when interpreting the results.

Impact of methodological choices: Like all composite indicators, the ESDI relies on a set of methodological choices regarding data treatment, normalisation, weighting, and aggregation. Alternative methodological approaches may produce slightly different rankings. Extensive robustness and sensitivity analyses were conducted during the development of the indicators and showed that the overall results remain highly stable under reasonable alternative assumptions (see [Technical report for the European Skills Deficiencies Index \(ESDI\) – Summary, SkillsPULSE](#)). Stability of rankings does not imply stability of scores as the score values themselves are sensitive to the choice of data treatment, normalisation, weighting and aggregation method. Nevertheless, rankings should be interpreted as informed estimates rather than exact measures of performance.

Interpretation of performance differences: The composite indicators are designed primarily to support benchmarking and the identification of broad trends and patterns. Small differences in scores or ranks should be interpreted with caution, particularly when countries have very similar performances. For example, a change of one or two positions in the ranking does not necessarily indicate a meaningful change in the underlying situation. Users are therefore encouraged to consider scores, rankings, quartiles, and trends over time together rather than focusing on a single measure.

Interpretation of associations: The SkillsPULSE indicators are designed to identify patterns, compare performance, and support evidence-based decision-making. They do not demonstrate that one factor directly causes another. For example, a country may exhibit both high labour market pressures and high skills deficiencies, but the indicators alone cannot determine the exact reasons for this relationship. Additional country-specific analysis may therefore be required before designing or evaluating policy interventions.

Revisions to underlying data: The SkillsPULSE composite indicators are based on data obtained from multiple European and international sources. From time to time, data providers may revise previously published figures to reflect improved methodologies, updated classifications, corrections to reporting errors, or the incorporation of new information. When such revisions occur, the corresponding SkillsPULSE indicators may also change. For this reason, users are encouraged to focus on broad patterns and performance groups rather than on small differences in scores or ranking positions. Where revisions occur, the most recent edition of the SkillsPULSE indicators should be considered the authoritative source of results.

Summary

Issue	What it means for users	What to do
Data availability and timeliness	Some indicators are based on surveys that are not conducted every year. As a result, some values are estimated and may not fully reflect the most recent labour market developments.	Focus on medium- and long-term trends rather than short-term fluctuations.
Country-specific data limitations	Data availability differs across countries. For example, some UK indicators are only available up to 2019.	Interpret results for the UK with additional caution.
Measurement limitations	Skills deficiencies cannot be observed directly. The indicators therefore provide evidence-based estimates based on multiple data sources.	Interpret scores as approximations of skills deficiencies rather than exact measurements.
Online vacancy data limitations	Online job advertisements may not cover all occupations and sectors equally. Some occupations may be under-represented.	ESDI includes multiple data sources to mitigate the limitation to a high extent.
Impact of methodological choices	Alternative methodological decisions may lead to slightly different scores or rankings.	Focus on broad patterns, rankings, and quartiles rather than small score differences.
Interpretation of performance differences	Small differences in scores or ranks may not represent meaningful differences in underlying skills deficiencies.	Avoid over-interpreting minor rank changes; consider quartiles and trends over time.
Interpretation of associations	The indicators identify patterns and relationships but cannot demonstrate cause-and-effect relationships.	Combine indicator results with country-specific analysis before designing policy interventions.
Revisions to underlying data	Future updates to source datasets may lead to revisions of scores, rankings, or quartiles.	Use the most recent edition of the ESDI and focus on broad trends rather than small changes.

Overall robustness and usefulness: The use of multiple complementary data sources, a transparent methodology, and extensive robustness testing provide a reliable and consistent framework for monitoring the evolution of skills deficiencies and their underlying drivers across Europe. ESDI and the context indicators provide an important evidence base to support benchmarking, policy development, and strategic decision-making.

5. Added value of the European Skills Deficiencies Index

The European Skills Deficiencies Index (ESDI) provides a harmonised and multidimensional measure of skills deficiencies across European countries, occupations, and sectors. The index brings several advantages to the European skills intelligence landscape, leading to a more comprehensive understanding of skills deficiencies and their underlying drivers.

First, the ESDI enables benchmarking across all EU Member States and the United Kingdom using a common methodological framework. This allows policymakers, education and training providers, social partners and other stakeholders to assess their performance relative to European peers, identify common challenges, and explore practices adopted in countries with similar economic, demographic or institutional characteristics.

Second, the ESDI provides a broader perspective on skills deficiencies than most existing indicators. To the best of our knowledge, it is the first EU-level composite indicator that jointly measures both skill shortages and skill gaps. By capturing challenges related both to recruiting workers with the required skills and to ensuring that existing workers possess the skills needed to perform their jobs effectively, the index offers a more comprehensive picture of skills deficiencies.

Third, the index adopts a multidimensional measurement approach by combining objective and subjective indicators and incorporating information from both the demand and supply sides of the labour market. This strengthens the robustness of the framework and improves its capacity to capture complex labour market realities that cannot be adequately described by a single indicator.

Fourth, the ESDI is complemented by two contextual indicators: the Structural Labour Market Pressure Index and the Mitigating Factors Index. While the ESDI measures current skills deficiencies, the contextual indicators provide additional insights into the labour market, technological and educational factors associated with the emergence, persistence or mitigation of those deficiencies. Together, the three indices support a more informed interpretation of results and help identify potential areas for policy intervention.

Finally, the index has been designed to support regular monitoring of skills deficiencies over time. The methodology uses a fixed reference period and a transparent calculation framework, allowing trends and changes in performance to be tracked consistently across successive updates. In addition, the indicator is operationally sustainable and can be updated through an automated production process using regularly available European data sources.

This integrated approach makes the ESDI a valuable tool for benchmarking performance, monitoring developments over time, identifying areas of concern, and supporting evidence-based skills, education and labour market policies.

Appendix: Variables and data sources

Table A.1. The European Skills Deficiencies Index - variables and data sources

Index	Pillar	Dimension	Indicator	Description	Source
European Skills Deficiencies Index (ESDI)	Skill shortages	Labour demand	Employer-reported hiring difficulties (+)	Share of employers that answered "Very difficult" or "Fairly difficult" to the survey question "How difficult is it for this establishment to find employees with the required skills?"	Based on European Company Survey data (Eurofound) using indicators findskill (2019 wave) and KOSKILL (2015 wave)
			Potential shortage-affected vacancy share (+)	Share of job ads that meet six out of six conditions simultaneously: High competency requirements within occupation; Economy wide high competency requirements; Previous experience; High wage within occupation; Economy wide- high wage; Job posting duration (detailed computation: McGuinness et al, 2026)	Based on Lightcast data using indicators ESCO_LEVEL_2, EDUCATIONAL_LEVEL, EXPERIENCE, SALARYVALUE, WORKING_HOURS
		Labour supply	Employee share in potential shortage-affected jobs (+)	Share of respondents that have jobs that meet seven out of seven conditions simultaneously: Complex job within occupation; Economy wide complex job; High volume of task requirements within occupation; Economy- wide high task requirement; Long tenure; High wage within occupation; Economy wide- high wage (detailed computation: McGuinness et al, 2026)	Based on European Skills and Jobs Survey data (Cedefop) using indicators B_ISCOD2, C_READ1P, C_READ5P, C_READ25P, C_WRITE1P, C_WRITE5P, C_WRITE25P, C_MATHBAS, C_MATHMED, C_MATHADV, C_CREAPRD, C_CREAMET, B_RTOUT, B_RTEXP, B_RTVAR, B_RTLRN, D_PC_CAT_1, D_PC_CAT_2, D_PC_CAT_3, D_PC_CAT_4, D_PC_CAT_5, D_PC_CAT_6, D_PC_CAT_7, D_PC_CAT_8, D_PC_CAT_9, D_PC_CAT_10, B_EMPDUR_CAT, F_PAY1
			Job openings per unemployed person (+)	Number of annualised vacancies to the number of unemployed	Based on Eurostat data using indicators jvs_q_isco_r2 and ifsa_uqgis
	Skill gaps	Labour demand	Employer-reported under-skilling(+)	Average employer-reported share of employees that have a lower level of skills than is needed in their job.	Based on European Company Survey data (Eurofound) using indicator underskill_d
		Labour supply	Employee-reported under-skilling(+)	Share of employees that answered "I need further training to cope well with my duties" to "Which of the following statements would best describe your skills in your own work?"	Based on European Working Conditions Survey data (Eurofound) using indicator y15_Q64
			Employee undereducation (+)	Share of undereducated employees under the normative approach (i.e. comparing the employee's level of education with standard educational requirements set out for their particular occupational group)	Based on Ilostat indicator EMP_NORM_SEX_SKL_ECO_NB_A

Variables in Table A.1. are aggregated into the European Skills Deficiencies Index (ESDI) following the methodology below:

- ✓ **Rescaling method:** 0-100 min-max normalisation over 2015-2024 values.
- ✓ **Direction:** according to the sign in **Table A.1.**, col. Indicator: a (+) sign symbolises a positive direction; a (-) sign symbolises a negative direction.
- ✓ **Weighting and aggregation:** equal-weight arithmetic mean at all levels.

Table A.2. Context composite indicators - variables and data sources

Index	Pillar	Dimension	Indicator	Description	Source
Structural Labour Market Pressure Index	Technological shifts	Internal innovation	Patent applications (+)	Already computed in Eurostat data portal: Applicants per million inhabitants	Eurostat indicator pat_ep_tot
		Technology adoption - enterprises	AI adoption in enterprises (+)	Share of enterprises with 10 or more employees using at least one AI technology.	Based on Eurostat data using indicator isoc_eb_ain2
			Rise of technical skills in digital occupations (+)	4-yearly rate of change in number of technical skills required in ICT jobs.	Based on Lightcast data
	Labour market trends		Employment growth (+)	Yearly employment growth rate for people aged 20-64	Based on Eurostat data using indicator lfsa_eisn2
			Working hours growth (+)	Yearly weekly working hours growth rate for people aged 20-64	Based on Eurostat data using indicator lfsa_ewhuis
			Working age population growth (-)	10-yearly working population growth rate	Based on Eurostat data using indicator demo_pjan
Mitigating Factors Index	Formal education outcomes		Tertiary education graduates (+)	Already computed in Eurostat data portal.	Eurostat indicator edat_lfse_03
			STEM graduates from tertiary education (+)	Share of STEM tertiary education graduates in all tertiary education graduates	Based on Eurostat data using indicator educ_uoe_grad02
			VET graduates from upper and post-secondary education (+)	Share of vocational graduates in all upper-secondary and post-secondary education graduates	Based on Eurostat data using indicator educ_uoe_grad02
	Lifelong learning		Participation in lifelong learning (+)	Already computed in Eurostat data portal.	Eurostat indicator trng_lfs_11

Variables in Table A.2. are aggregated into the Structural Labour Market Pressure Index, or into the Mitigating Factors Index following the methodology below:

- ✓ **Rescaling method:** 0-100 min-max normalisation over 2015-2024 values.
- ✓ **Direction:** according to the sign in **Table A.2.**, col. Indicator: a (+) sign symbolises a positive direction; a (-) sign symbolises a negative direction.
- ✓ **Weighting and aggregation:** equal-weight arithmetic mean at all levels.