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June 29, 2026

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European Department

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SPATIAL MISALLOCATION AND LABOR PRODUCTIVITY

Reviving productivity could strengthen Sweden's resilience to global shocks while helping accommodate new public spending priorities. Sweden's institutional framework remains a solid foundation for sustained productivity growth, and reform measures should focus on safeguarding and reinforcing its effectiveness. The reform measures proposed by the authorities' Productivity Commission and those from past IMF advice, such as simplifying regulations and improving housing market, can deliver sizable aggregate gains. Such reforms would allow Sweden to better harness agglomeration externalities and deepen regional specialization, with relatively higher yields from improving local conditions. To maximize synergies, the reform package should combine measures across different policy areas in a holistic manner. A concerted nationwide push of the agenda would help contain the widening of spatial disparity that could emerge from these reforms.

A. Introduction

1. Reviving labor productivity growth from its secular decline is a key medium-term policy objective for Sweden. Productivity growth is not only a central driver of economic growth, but also the cornerstone for addressing many of Sweden's most pressing policy challenges, including competitiveness, unemployment, and more recently, the rising spending pressure associated with higher defense spending needs. Stronger growth fundamentals could also enhance Sweden's resilience to global shocks by improving its capacity to absorb demand fluctuations while building buffers for more policy options.

2. Sweden's institutional framework continues to provide a solid foundation underpinning a dynamic economy conducive to sustained productivity growth (Productivity Commission, 2025). Its core pillars include a sound macroeconomic policy framework anchored in a credible fiscal policy framework and an independent central bank, a market-oriented economy where price signals guide resource allocation, deep integration with the global economy, and a consensus-based society which, among all, helps contain wage-inflation spirals. Performance of the Swedish economy over the history, from the rise and fall of the Swedish model (Lundberg, 1985), through the severe 1990–94 Swedish financial crisis, to the strong rebound thereafter, showcases the important role that these institutional features have played (Lindbeck and others, 1993; Lindbeck, 1997).

3. Reform efforts should focus on safeguarding and ensuring the effectiveness of Sweden's institutional architecture by closing existing gaps and adapting to the new economic environment. Domestic structural reforms priorities include simplifying and harmonizing regulations, improving housing and rental markets, maintaining transportation infrastructure, raising educational outcomes, addressing skill mismatches, aligning social benefits with incentives to work, deepening Sweden's R&D ecosystem, and ensuring adequate access to capital for firms (IMF, 2025a; Productivity Commission, 2024, 2025). These reforms would help remedy existing weaknesses and support the system's adaptation to a changing macroeconomic environment, shaped by rapid

technological advances including AI (see the next SIP), a renewed trend toward anti-globalization, and the growing importance of intangible capital.

4. These reforms can enhance resource allocation efficiency and raise productivity; however, their effects may unfold unevenly across regions. Measures such as simplifying regulations, improving local labor market matching efficiency, and ensuring firms' adequate access to capital can help existing businesses in a region to make better use of their production technology. At the same time, reducing housing market frictions and improving nationwide labor market matching would support cross-regional labor mobility, and raise productivity by enabling more efficient use of immobile factors, such as natural advantage. As a result, these reforms would induce a spatial reallocation of economic activity and generate heterogeneous impacts across regions.

5. This paper proposes a spatial misallocation framework to quantify the potential gains at aggregate and regional level from such reforms. The framework builds on Hsieh and Klenow (2009) by extending their approach to a spatial context, following Hsieh and Moretti (2019). Using the estimated model, the paper simulates three scenarios. Scenario 1 eliminates wedges within regions while restricting labor to remain in its original location. Scenario 2 subsequently relaxes labor mobility frictions. Scenario 3 further equalizes average wedges across regions. The results suggest that improving local conditions and allocating resources more efficiently across regions make approximately equal contributions to labor productivity gains. Productivity increases as the reforms allow resource allocation to better align with Sweden's economic fundamentals, including agglomeration externalities of its production hubs, and the deepening of regional specialization.

6. The framework can help inform the sequencing and targeting of reforms. Measures proposed by the Productivity Commission and the IMF can be grouped into those that improve local conditions (Scenario 1), facilitate inter-regional factor mobility (Scenario 2), and reduce the regional disparities in economic environment (Scenario 3). The results in this paper could shed light on the aggregate and spatial effects of these reforms, helping gauge their potential yields, directing reform efforts toward those that generate the highest gains, and supporting appropriate preparation in affected regions.

B. Under-Performance of Sweden's Production Hubs

7. The degree of labor productivity advantage in production hubs—regions with high employment density where firms and workers cluster—provides a lens to examine the allocative efficiency gaps both within and across regions. Production hubs typically have higher productivity than other regions. Across the EU between 2001 and 2022, NUTS3 regions in the top tercile of employment density distribution (measured in employment per square kilometer) recorded labor productivity levels that were, on average, 2.8 times higher than regions in the middle tercile and 4.6 times than those in the bottom tercile. They also dominate aggregate economic activity, accounting for 57 percent of total output and employing half of the labor force. The contrast is even sharper in the US: between 2011 and 2023, counties in the top density tercile had labor productivity

roughly 10 times that of middle tercile counties and 25 times that of the bottom tercile ones, while producing 81 percent of national output and employing nearly three-quarters of the workforce.[1]

8. Agglomeration externalities are a key driver of the productivity premium observed in densely populated production hubs. The positive relationship between a region's productivity and its employment density is well documented.[2] When many firms locate near one another, they gain from sharing pools of common resources, such as labor, supply chain, or infrastructure, enjoying economies of scale from larger market, and learning from each other which facilitates technology diffusion.[3] Leveraging these benefits requires locations to offer suitable local conditions, including adequate infrastructure, conducive regulatory environment, access to financing, and a well-integrated labor market. It also hinges on the ability of capital and labor to move to places where they can be used most effectively.

9. Although Sweden's production hubs also contribute disproportionately to the national economy, their labor productivity rises only mildly with employment density. The three most densely populated counties—Stockholm, Skane (hosting Malmo) and Vastra Gotaland (hosting Gothenburg)—together accounted for about 60 percent of total output and 56 percent of employment in 2023 (Figure 1 left panel).[4] While Stockholm's labor productivity exceeded the national average by 32 percent, the productivity advantage of Skane and Vastra Gotaland was far smaller, at only 4 percent and 9 percent, respectively (Figure 1 right panel).[5]

[1] The comparison excludes the most sparsely populated areas in the US (those with less than 10 employees/km2), where different economic forces are likely at play. In particular, labor productivity decreases in employment density for very sparsely populated counties in the US, with the structural break happening about 10 employees/km^2; Michaels, Rauch, and Redding (2012) documented a cut-off of 7 people/km^2 for the US in early years.

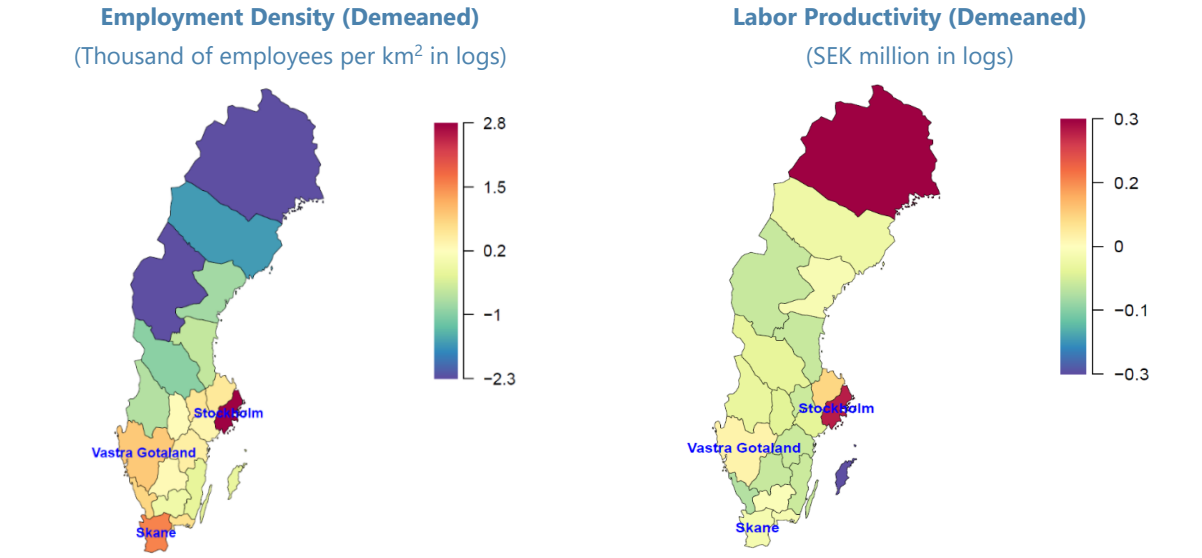
[2] Ahlfeldt and Piestrostefani (2019) offered a meta-analysis of the findings in the literature; see also Rosenthal and Strange (2004) for an earlier survey. Examples of country-level analyses include Ciccone and Hall (1996) for the United States, Combes and others (2012) for France, and Ahlfeldt and others (2015) for Germany.

[3] These benefits can happen both *generically*–for instance by increasing research and development intensity (Ramondo, Rodríguez-Clare, and Saborío-Rodríguez 2016), knowledge diffusion (Buera and Oberfield 2020), or providing a larger local demand–or through higher degree of *specialization*, which allows firms to exploit labor market or supplier pooling. This paper does not distinguish between the two mechanisms.

[4] Appendix B Tables 2 and 3 present all the results demonstrated geographically (Figures 1, 4, 5, 6 and 7) in numerical format.

[5] Two other counties, Uppsala and Norrbotten, also saw their labor productivity outperform national average by a wide margin, though they each account only for about 3 percent of the national output. The high labor productivity in Uppsala may come from its close proximity to Stockholm, while that of Norrbotten is due to the high share of energy sector (higher capital stock per worker).

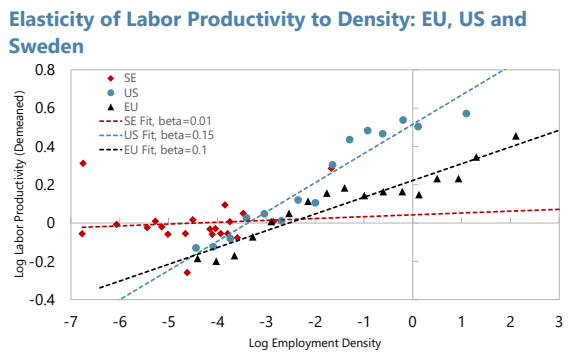
Figure 1. Labor Productivity and Employment Density in Sweden



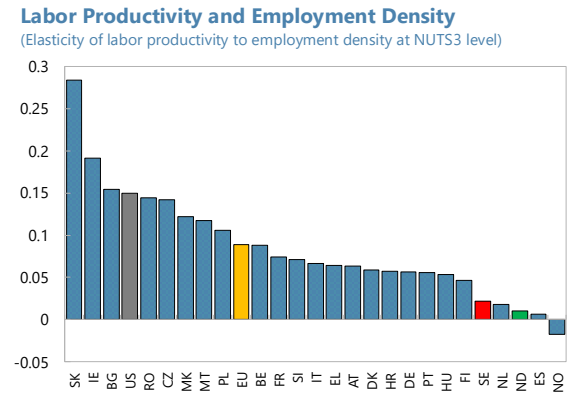
Source: Eurostat; and IMF staff calculation.

10. The productivity premium of Sweden's production hubs is among the lowest in Europe, indicating scope for targeted reforms in these regions. Across the EU, in 2021, labor productivity rose by about 0.1 percentage point for every one percentage point increase in employment density, whereas estimated elasticity for Sweden is only one-tenth of that (Figure 2 left panel). The contrast is even sharper when compared with the US, where the elasticity reaches 0.15. Although Sweden is, on average, more sparsely populated than many countries, the data show that regions with similar employment density in other countries exhibit higher productivity gains, suggesting possible inefficiencies that appropriate policies can help address. Estimating the elasticity at country level year by year and taking the average confirms that Sweden lies at the lower end of the European distribution (Figure 2 right panel).

Figure 2. Labor Productivity and Employment Density: Sweden, EU and US

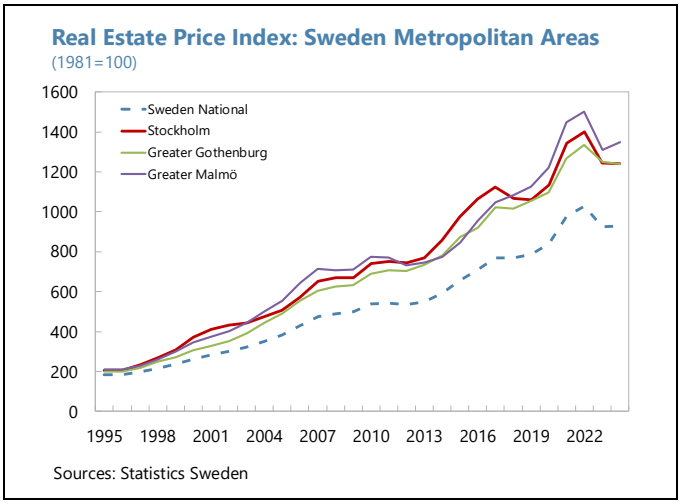


Sources: American Community Survey; Bureau of Economic Analysis; Eurostat; and IMF staff calculations.
Note: The bins are defined over log employment density (employment per square km). Each dot represents the average of the observations in the bin. Regressions are conducted over the full sample. The elasticity is estimated using within-region variations following the demeaning.



Sources: Eurostat: American Community Survey; Bureau of Economic Analysis and IMF staff calculation.
Note: ND is pulling all Nordic countries together (DK, FI, NO, and SE).

11. Meanwhile, the rising gap in housing prices between major production hubs and the national average points to the presence of mobility barriers. In the absence of such frictions, high productivity regions would attract labor from elsewhere, leading to rapid employment growth. When mobility is constrained, however, productivity increases primarily translate into higher prices for locally produced products, such as services, housing, and amenity, in line with the classic Balassa-Samuelson effects. This pattern can indeed be observed in Sweden: since the 1990–94 crisis, real estate prices in the three largest metropolitan areas—Stockholm, Gothenburg, and Malmo—all have risen far more rapidly than the national average (Text Figure). Higher local amenity prices can, in turn, reinforce barriers to mobility.



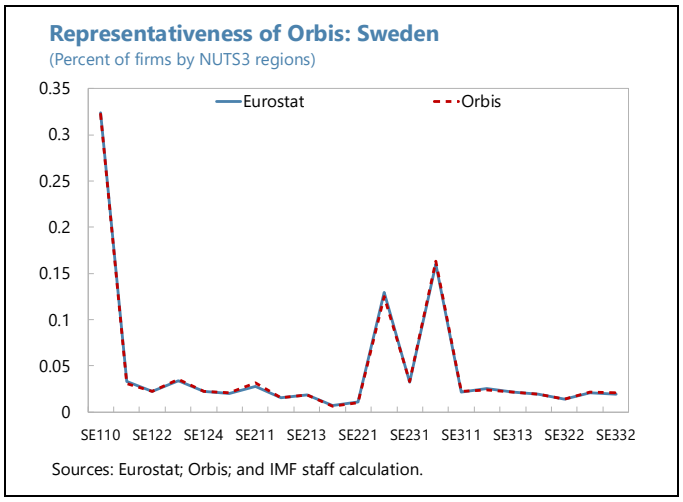
C. Measuring Spatial Misallocation

12. Dispersions in marginal labor productivity provide a basis for estimating the extent of misallocation. At its core, the key model assumption is that under diminishing marginal returns, all firms should equate the marginal productivity of labor. If this condition does not hold, reallocating labor from firms with lower marginal productivity to those with higher level would raise aggregate output. Under perfect competition, marginal labor productivity should equal labor cost, making the wedge between the two a measure of misallocation. When this wedge increases with firm-level productivity, which is the empirically relevant case, misallocation causes more productive firms to under-employ labor.[6]

13. The paper applies the intuition to a spatial setting following Hsieh and Moretti (2019) to quantify the role of local conditions and frictions to labor mobility in lowering Sweden's aggregate labor productivity. The model allows regions to differ in their average productivity and in distortions that apply uniformly to all firms in the same location. Within each region, firms are also heterogenous in their productivity and the distortions they face. The model can therefore capture misallocation both within and across regions, helping assess the relative importance of reforms aimed at improving local conditions versus those that facilitate labor reallocation. The model is estimated by sector, under the implicit assumption that labor is substitutable across the subsectors within each sector; Appendix B Table 1 shows the composition of each sector in the model.

[6] This is termed in the literature as "correlated distortions," and has been demonstrated to cause higher losses to aggregate productivity than uncorrelated distortions (Restuccia and Rogerson, 2017).

14. The model is estimated such that regional variations align with those in Eurostat, and within-region variations are disciplined by firm-level data from Orbis. The property of the model allows us to separately estimate average labor productivity and distortions for each region and the dispersions from these averages within each region. Though overall, Orbis data do a remarkable job in capturing the spatial distribution of firms in Sweden (text figure), because of the granularity of the sector-region combination of the analysis, to account for the possible sampling errors in Orbis at such level, the estimation does not use directly the raw firm-level data. Instead, we impose a parametric form on the joint distribution of firm-level labor productivity and distortions and estimate the underlying parameters. We then simulate a set of firms using the estimated distribution and compute the reform gains using the simulated data. Following the intuition in ¶12, output is used to infer productivity levels, while measured labor productivity helps identify the degree of distortions.



15. The estimated model is then used to simulate three reform scenarios and to compute the associated labor productivity and output gains. Scenario 1 removes the dispersions of wedges within each region and assumes no labor mobility. Scenario 2, on top of it, allows labor to move freely across locations. In these two scenarios, average distortions continue to differ across regions. Finally, Scenario 3 further eliminates the dispersion in distortions across the country, which leads to efficient allocation of resources across Sweden. From Scenario 1 to Scenario 3, reform intensity increases progressively, with later scenarios nesting the earlier ones.[7]

16. Comparing the three reform scenarios can shed light on the relative gains from improving local conditions and easing labor mobility constraints. A hypothetical example of environmental permitting process helps illustrate how these reforms are mapped to reality. Scenario 1 measures, for each location, how much productivity could rise by improving the permitting process. This would allow firms in each location to be more productive. In the meantime, it could be that, on average, Stockholm processes environmental permits more efficiently than Gothenburg, and thus allowing labor (and equivalently firms) to move from Gothenburg to Stockholm will raise aggregate labor productivity. Scenario 2 quantifies these additional gains attributable to removing mobility frictions. This can be achieved by improving housing and rental markets, as well as maintaining and expanding local commuting infrastructure (Ahlfeldt and others, 2015; Monte, Redding, and Rossi-Hansberg, 2018). Note that in Scenario 2, the move from Gothenburg to Stockholm is not driven entirely by each location's economic fundamentals, but also in part by the

[7] To clarify, our model does not feature agglomeration externality, thus the results are not supposed to be compared to Figure 2, which serves only as motivation.

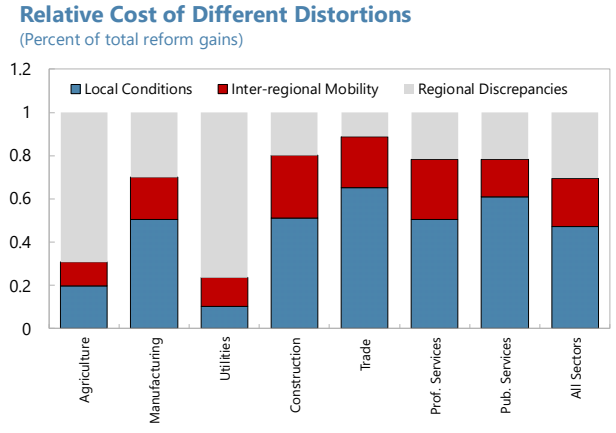
differential implementation of the same permitting process. Scenario 3 further eliminates inefficiencies stemming from such regional differences, aligning the distribution of economic activities fully with economic fundamentals. Smooth mobility of labor across regions is also a prerequisite to realize the gains from Scenario 3. Appendix A explains the key equations in the model that deliver these results; a forthcoming working paper covers the methodology in detail.

17. Misallocation measured in this way provides an upper-bound on the gains attainable through policy reforms. Environmental permitting process is only one example of the factors that can cause wedges in the model. At the regional level, these wedges may reflect factors such as more stringent enforcement of regulations, varying municipal efficiency in administration, weaker labor market matching, tighter housing market, or differences in natural amenity (for instance the cold climate in Norrbotten). Within each region, there are two types of wedges. Correlated wedges capture situations in which more productive firms face disproportionately higher costs in acquiring capital and labor, such as higher working capital requirement, or the phasing-out of support schemes once firms grow beyond to certain size threshold. Uncorrelated distortions, by contrast, represent factors like policy-related hiring and firing costs that may impact any firm adjusting its workforce; they may also reflect unobserved heterogeneity, such as different production function of firms, or simply measurement error (Bils and others, 2021); Scenarios 1 and 2 eliminate both wedges simultaneously and do not examine their effects separately. As these examples illustrate, not all sources of misallocation are easily reduced, and hence not all estimated gains can be fully realized in practice.

D. Effects of Structural Reforms

18. Improving local conditions and facilitating inter-regional labor mobility contribute roughly equally to aggregate labor productivity. Following the discussion in ¶17, the magnitude of the gains from complete reallocation is less informative, since not all wedges reflect frictions remediable by policies. Instead, this paper will focus on the relative importance of different sources of misallocation. For the Swedish economy as a whole, about half of the attainable improvements can be achieved by better utilizing the resources already present in each county (Figure 3 blue bars; Scenario

Figure 3. Relative Cost of Different Distortions

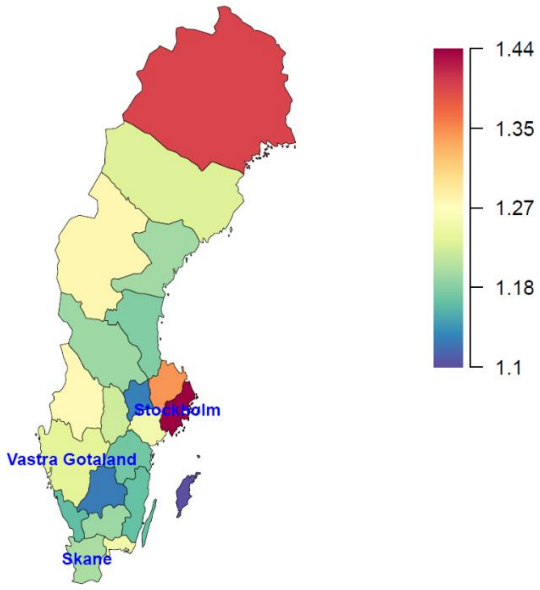


Sources: Eurostat; Orbis; and IMF staff calculation.

1).[8] The substantial within region misallocation reflects the positive correlation between firm productivity and the distortions it faces, causing firms to lose about 15 to 20 percent of the benefits from higher productivity. Beyond local reforms, allowing labor to move freely to the most productive locations, even if regional average distortions persist, an additional quarter of the gains can be realized (Figure 3 red bars; Scenario 2). Finally, the remaining gains are realized once the difference in average distortions is removed (Figure 3 gray bars; Scenario 3).

19. Most counties in Sweden allocate resources within their borders reasonably efficiently, while Stockholm and Uppsala counties stand out as having higher levels of internal misallocation than others (Figure 4).[9] Excluding these two counties, the average labor productivity gains attainable through within-region reform are half of the levels in Stockholm and Uppsala. The absolute size of the reform gains can appear large, reflecting the nature of the methodology. Therefore, it is the relative size of the gains across regions and scenarios that is more informative, rather than the absolute magnitude.[10] In both counties, misallocation in the professional services sector is large, while the trade sector also exhibits sizable gaps in Stockholm. The underlying driver in both cases is a stronger correlation between firm-level productivity and distortions they face than other counties. Given Stockholm's

Figure 4. Regional Labor Productivity Gains: Scenario 1
(Relative Productivity: New/Old Equilibrium)



Source: IMF staff calculation.

[8] The agriculture and utilities sectors behave somewhat differently compared to the other sectors because their productivity is heavily affected by natural endowment, for instance the Skane county as the primary agricultural hub and the Norrbotten county famous for their mining, steel, forestry and hydropower industries. The structure of our model will tend to over-estimate the reallocation gains as marginal labor productivity will tend to decrease more rapidly in these sectors than others. However, the relatively small share of these sectors in the Swedish economy (a total of 5 percent) indicates that their effects on aggregate labor productivity are small.

[9] Reform gains and therefore misallocation is also large in three other counties: Norrbotten, Jamtland, and Varmland, driven by those in the utilities sector. We drop them from the comparison in this paragraph.

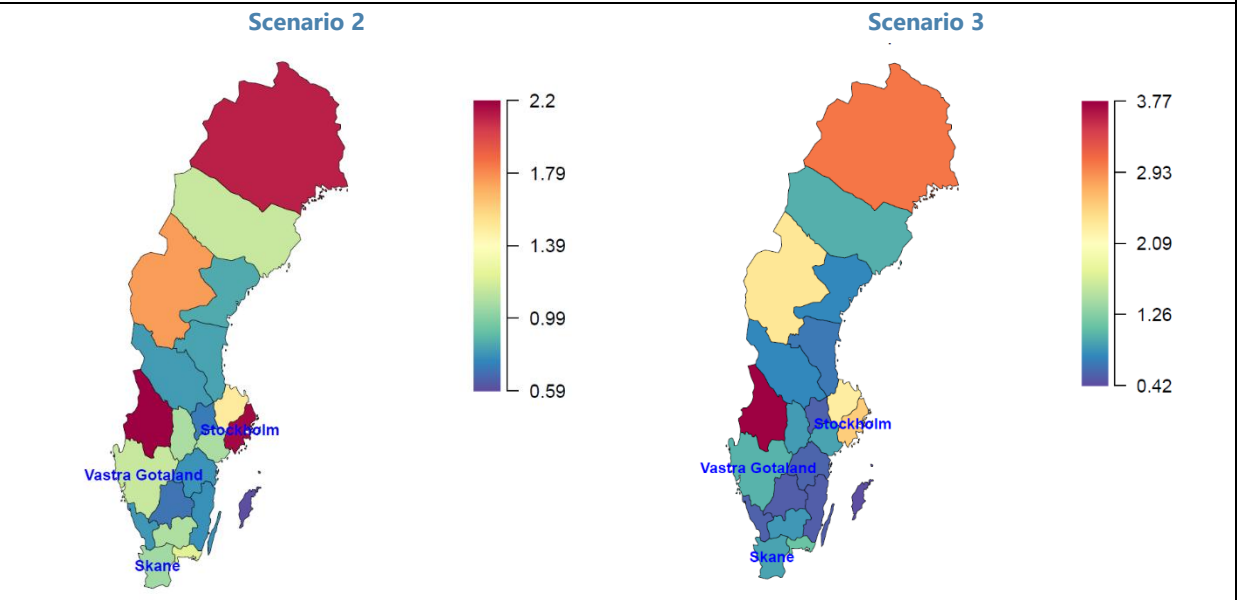
[10] A few examples from the literature can help illustrate the order of magnitude of reform gains usually found in this type of analysis. The original Hsieh and Klenow (2009) paper found TFP gains of about 30 to 50 percent in China and 40 to 60 percent in India, when reducing the dispersions of the wedges to US level. Bento and Restuccia (2017) show that reducing the elasticity of correlated distortions from Indian to US level will increase output by 53 percent. Qi, Tang, and Xi (2021) found that fully eliminating the wedges in the top-5 polluting industries in China can increase output by 30 percent. Reform gains in this paper are likely to be higher than those in the literature also because of coarser sector classification. The literature typically conducts the exercise at 4-digit level, while our more granular spatial treatment restricts us to 1-digit level. A coarser sectoral classification implies larger measured misallocation. However, these are not necessarily "real misallocation," as workers may not be movable across all 4-digit sectors within a one-digit sector (say, from paper mill to steel industry).

economic weight and dense population, enhancing the efficiency of resource allocation there should be a high reform priority. Notably, misallocation in Sweden's other two relatively densely populated counties, Skane and Vastra Gotaland, is considerably milder, at 20 percent and 23 percent, respectively.

20. Facilitating labor mobility would enable workers to relocate toward higher productivity regions (Figure 5). The left panel shows the results under Scenario 2, and the right panel shows those under Scenario 3. In both scenarios, labor moves toward regions with stronger productivity fundamentals.[11] Since average distortions also rise with average regional productivity in the baseline equilibrium, the qualitative pattern of output changes is similar across the two scenarios, although the magnitude is larger under the Scenario 3. The five counties with the largest within-region reform gains attract the most workers, while several central and southern counties (Ostergotland, Vastmanland, Jonkoping, Kalmar, and Gotland) experience the sharpest outflows. In Skane and Vatra Gotaland, inflows and outflows broadly offset one another, leaving their total force largely unchanged. Nevertheless, regardless of whether a county gains or loses workers, labor productivity of the remaining workforce always increases.

Figure 5. Regional Output Gains

(Relative Output: New/Old Equilibrium)



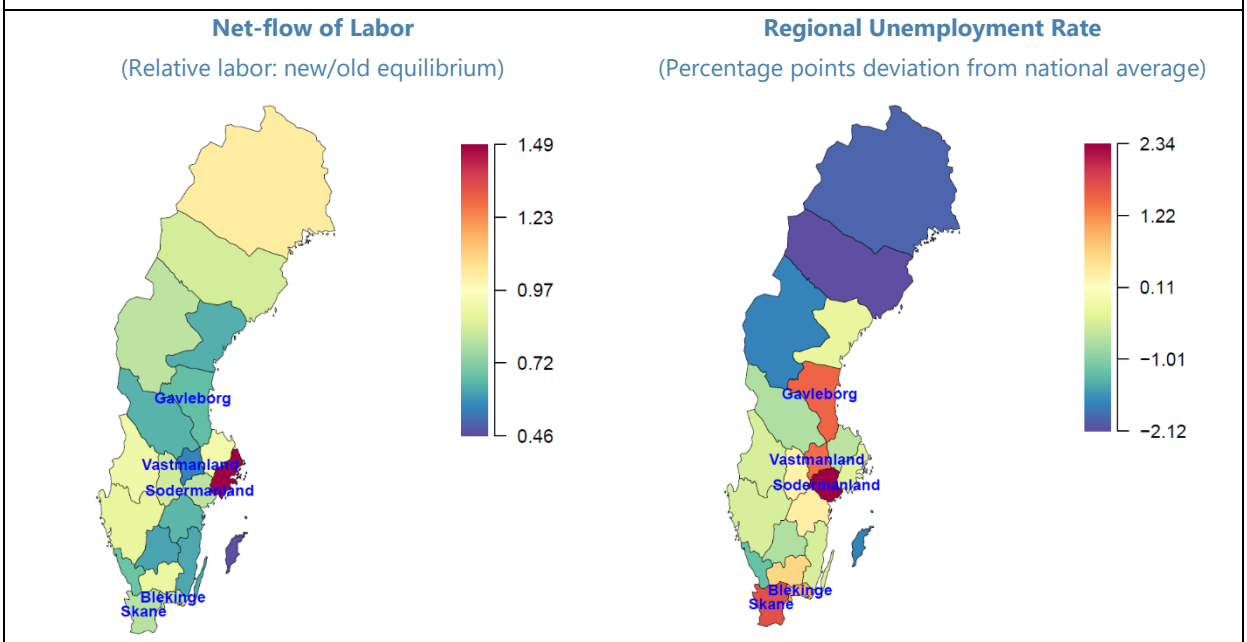
Source: IMF staff calculation.

21. Greater internal migration would deepen specialization across counties and help ease unemployment pressure. Even in counties where the total labor force remains broadly unchanged, such as Skane and Vastra Gotaland, the sectoral composition shifts markedly. In particular, Skane

[11] We do not run a simulation with the status quo regional level distortions and remove the mobility barrier, as the mechanism would be the same. Qualitatively, net inflow of labor will resemble the spatial distribution of labor productivity in the status quo (Figure 1 right panel).

further consolidates its role Sweden's primary agricultural production hub, while Vastra Gotaland increases its focus on manufacturing and trade sectors. At the sectoral level, the three sectors that together account for more than 60 percent of Sweden's national output—manufacturing, trade, and professional services—all become more concentrated geographically. Manufacturing activity agglomerates in Stockholm, Vastra Gotaland, Varmland, and Vasterbotten; the trade sector expands in Stockholm, Vastra Gotaland, and Dalarna; and professional services cluster more tightly in Stockholm, Uppsala, and Blekinge. Labor market pressures can also ease: counties with the highest unemployment rate (Sodermanland, Skane, Gavleborg, and Vastmanland) experience the largest outflows of workers (Figure 6). Increasing specialization, in turn, supports more efficient labor market matching.

Figure 6. Net-Flow of Labor and Regional Unemployment Rate



Source: Statistics Sweden and IMF staff calculation.

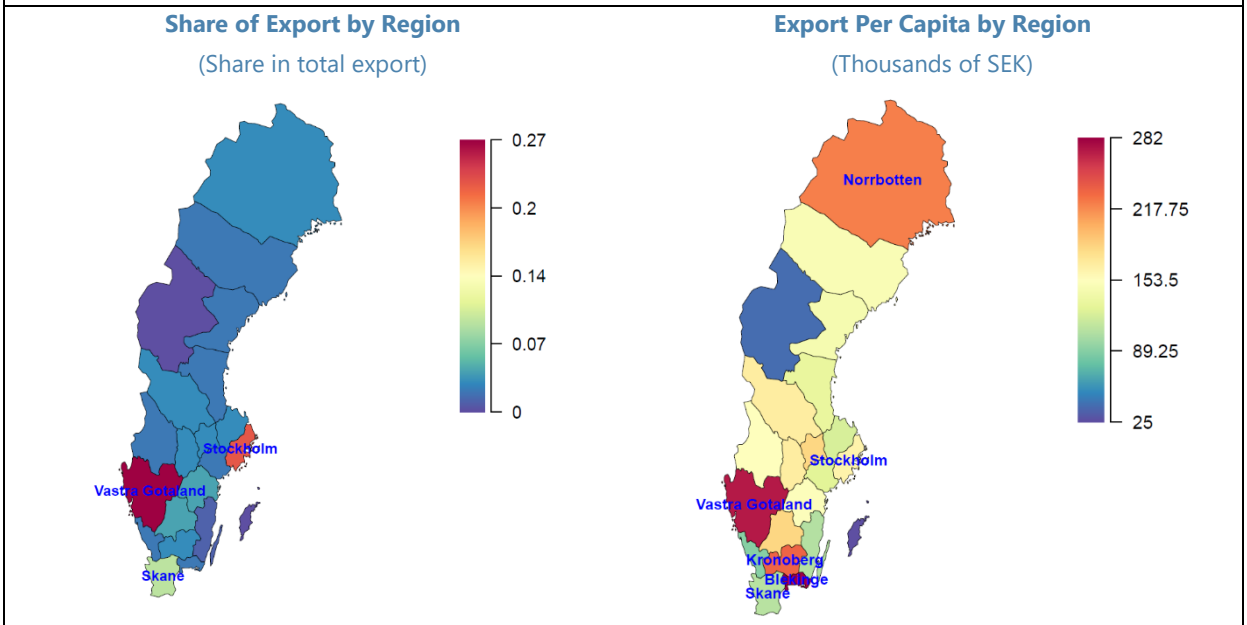
22. The results on labor mobility reflect only efficiency gains on the production side and do not speak to welfare. The model abstracts from several elements essential for a proper welfare analysis of migration, including migration cost, congestion forces, and local amenities.[12] It also assumes a fixed national labor force with no immigration or emigration. Taken together, the findings should therefore be interpreted as an upper bound on the reallocation that would occur if efficiency were the sole driver of migration decisions. In practice, only a fraction of these flows would materialize, once households weigh broader welfare consideration alongside income.

23. Advancing the EU single market and spillover from domestic structural reforms by other countries translate into higher average productivity for Swedish regions with large exports shares. In 2024, the three counties with major production hubs accounted for over

[12] See for example, Redding (2016), Caliendo and others (2021), and IMF (2025c).

50 percent of Sweden's total goods exports (Figure 7 left panel): Vastra Gotaland (SEK 482 billion, 24 percent), Stockholm (SEK 404 billion, 20 percent), and Skane (SEK 157 billion, 8 percent). Stronger external conditions can thus reinforce the economic performance of these hubs. In the meantime, several smaller and more sparely populated counties benefit more in per capita terms, with Blekinge, Vastra Gotaland, Kronoberg, and Norrbotten ranking highest (Figure 7 right panel). IMF (2025c), using a quantitative spatial model of Europe featuring trade and mobility costs, firms heterogeneous in productivity and distortions, and agglomeration forces, finds that an EU-wide reform package combining domestic structural reforms, lower trade barriers, and improved labor mobility generates productivity gains to all member states, including Sweden.

Figure 7. Export by Region



Source: Sweden National Board of Trade.

E. The Road Ahead

24. Deepening structural reforms to strengthen resource allocation within regions, especially in major production hubs such as Stockholm, Gothenburg and Malmo, can bring sizable gains to the national economy. The potential improvements are particularly large in the nation's capital, reflecting both its inefficiencies and central role in the Swedish economy. Stockholm's diversified economic structure suggests that broad, horizontal policies aimed at creating a conducive business environment would yield the greatest gains. Policies that enhance agglomeration forces, for instance those that improve local labor market, strengthen the R&D ecosystem, maintain high-quality infrastructure, can further amplify the gains in these hubs.

25. Facilitating internal labor mobility can deliver productivity gains comparable to those from structural reforms, notably by strengthening regional specialization within the Swedish economy. Sweden's longstanding frictions in the housing and rental markets remain a major

obstacle to efficient spatial allocation (Productivity Commission, 2024, 2025). Delaying reforms in this area could weaken the impact of other nationwide efforts, for instance those aimed at reducing regional discrepancies in regulations. A holistic reform package that addresses multiple bottlenecks simultaneously would maximize synergies and amplify overall gains. Sweden's regional economic development is relatively balanced compared with many European peers and the US. A concerted, nationwide push on the reform agenda would help prevent wider spatial disparities and ensure such balance is preserved.

26. The state and local governments should anticipate the changes to local economy from structural reforms and prepare proactively. Expanding regions will need to ensure affordable housing by easing constraints on residential construction and scaling up key public services such as education and health. Importantly, the expansion of the energy system should be aligned with the projected spatial distribution of economic activities. In counties expected to contract, maintaining access to essential public services will be critical. Immigrants can also help offset the net labor outflows in such regions, and active labor market policy can support the integration of newcomers and reduce long-term unemployment.

27. Policies aimed at sharing aggregate gains must be carefully designed to avoid unintended consequences. Place-based policies, which are prevalent in many countries, can help ease adjustment costs on a temporal basis, but they should be conducted cautiously so as not to weaken reform incentives or impede capital and labor from moving to more productive regions (Gaubert, 2018; IMF 2019). Their often-high fiscal cost also calls for careful scrutiny, particularly given rising spending pressures in other priority areas (IMF 2025b). While maintaining stable central government grants to local authorities remains important for effective fiscal planning, linking this support to progress in local structural reforms can help mitigate adjustment costs in a more durable and efficiency-enhancing manner.

Appendix I. Technical Details

A. Key Analytical Results

The Swedish economy is modeled as 7 sectors and 21 counties, with each sector-county pair hosting a continuum of firms heterogenous in their labor productivity and distortions. County-level output is aggregated linearly into national output, while within each county, sectoral output is aggregated by a Cobb-Douglas production function:

$$Y = \prod_{s \in S} Y_s^{\theta_s}.$$

Within each sector, a sectoral final good producer produces by combining intermediate goods following a Constant Elasticity of Substitution function:

$$Y_s = \left(\sum_{n \in N}^{M_n} y_i^{\frac{\sigma-1}{\sigma} di} \right)^{\frac{\sigma}{\sigma-1}}.$$

Each intermediate good producer produces a unique variety, with the profit function given by

$$\pi_i = (1 - \tau_i) p_i z_i l_i - w l_i,$$

where

$$ln(1 - \tau_i) = \tau^n + \rho \, ln \, z_i + \varepsilon_i.$$

Firm-level distortions is comprised of three factors: regional level average τ^n, correlated distortions $\rho \, ln \, z_i$, and idiosyncratic distortions ε_i.

It can be shown that aggregate productivity depends on the joint distribution of (z_i, τ_i), in that

$$Z = \left[\sum_{n \in N} \int_0^{M_n} \left(z_i \cdot \frac{\overline{\text{LPR}}}{\text{LPR}_i} \right)^{\sigma-1} di \right]^{\frac{1}{\sigma-1}}.$$

For Scenario 1, since $\text{LPR}_i \propto \tau_i$, we can see that correlated distortion reduces the weight of high productivity firms in the aggregation. Meanwhile, idiosyncratic distortions reduces Z due to the convexity of the aggregation.

The model implies that if aggregate productivity takes the form of CES aggregation

$$Z = \left(\int_0^{M_n} z_i^{\sigma-1} di \right)^{\frac{1}{\sigma-1}},$$

then the density function of optimal labor allocation follows a harmonic average

$$\omega_i = \frac{z_i^{\sigma-1}}{\int_{i\in\Omega} z_i^{\sigma-1} di}.$$

For Scenario 2, since the spatial distribution of labor in the status quo differs from ω_i, allowing inter-regional labor mobility can bring additional gains in productivity and output.

Finally, aggregate productivity with disparities in regional-level distortions is given by

$$Z = \left[\sum_{n\in N} (\xi_n^{\tau})^{\sigma-1} \int_0^{M_n} z_i^{\sigma-1} di \right]^{\frac{1}{\sigma-1}},$$

where

$$\xi_n^{\tau} = \frac{1-\tau^n}{\sum_{n\in N} \omega_n^y (1-\tau^n)}.$$

For Scenario 3, higher regional distortion implies lower ξ_n^{τ}, and thus lower weight in the aggregation. Convexity of the aggregation again implies productivity losses from non-uniform ξ_n^{τ}.

B. Additional Details

The sectors are defined as in Table 1.

Table 1. Sweden: Definition of Consolidated Sectors

Consolidated Sector	NACE1 Code	NACE1 Name
Agriculture	1	Agriculture
Manufacturing	3	Manufacturing
Utilities	2	Mining and quarrying
	4	Electricity and gas
	5	Water supply and waste management
Construction	6	Construction
Trade	7	Wholesale and retail trade
	8	Transportation and storage
	9	Accommodation and food services
Professional services	10	Information and communication
	11	Finance
	12	Real estates
	13	Professional, scientific and technical activities
	14	Administrative and supportive activities
Public	15	Public administration
	16	Education
	17	Health
	18	Arts and entertainment
	19	Other services
	20	Home production
	21	Extra-territorial organization activities

Table 2 includes the data for Figures 1, 4 and 5, while Table 3 contains those for Figures 6 and 7.

Table 2. Sweden: Data Underlying Geographic Figures 1, 4 and 5

NUTS3	Region	Density	Labor Productivity	Labor Productivity Gains (Sce 1, %)	Output Gains (Sce 2, %)	Output Gains (Sce 3, %)
SE110	Stockholm	188.8	80408.9	43.5	117.5	155.7
SE121	Uppsala	21.4	67743.1	34.6	50.1	129.0
SE122	Sodermanland	17.6	63093.7	25.1	7.5	-8.0
SE123	Ostergotland	19.6	59802.6	17.1	-21.7	-42.4
SE124	Orebro	15.7	59807.6	22.0	7.6	-11.9
SE125	Vastmanland	22.6	58815.3	12.6	-28.4	-44.8
SE211	Jonkoping	16.4	56964.9	12.3	-29.6	-47.4
SE212	Kronoberg	11.1	61297.9	19.2	8.5	-13.3
SE213	Kalmar	9.5	57142.5	16.5	-22.1	-46.5
SE214	Gotland	9.9	44737.7	9.5	-41.4	-57.6
SE221	Blekinge	23.7	57751.0	24.8	23.3	12.0
SE224	Skane	57.6	63014.2	20.0	5.7	-7.3
SE231	Halland	27.5	55368.0	16.2	-20.3	-45.5
SE232	Vastra Gotaland	31.0	65783.9	23.3	15.7	2.9
SE311	Varmland	5.9	63606.7	27.1	119.6	276.6
SE312	Dalarna	4.4	52144.0	19.2	-19.6	-22.2
SE313	Gavleborg	6.7	49196.8	17.8	-16.6	-31.2
SE321	Vasternorrland	5.1	64919.0	19.4	-15.0	-22.4
SE322	Jamtland	1.1	56455.6	27.5	75.9	137.2
SE331	Vasterbotten	2.3	59477.6	22.8	14.9	0.7
SE332	Norrbotten	1.2	72869.0	39.9	111.9	206.2

Sources: Eurostat; and IMF staff calculation.

Notes: Density is in persons per square kilometer; labor productivity is in SEK per employment.

Table 3. Sweden: Data Underlying Geographic Figures 6 and 7

NUTS3	Region	Density	Net-flow of Labor (%, Sce 2)	Unemployment Rate (%)	Export Share (%)	Export Per Capita
SE110	Stockholm	188.8	49.2	5.2	23.0	163
SE121	Uppsala	21.4	-7.4	4.9	3.0	123
SE122	Sodermanland	17.6	-19.7	7.8	2.0	127
SE123	Ostergotland	19.6	-35.5	5.8	4.0	151
SE124	Orebro	15.7	-16.1	5.8	3.0	169
SE125	Vastmanland	22.6	-44.4	7.0	3.0	185
SE211	Jonkoping	16.4	-39.0	4.8	4.0	184
SE212	Kronoberg	11.1	-10.3	6.2	3.0	236
SE213	Kalmar	9.5	-38.0	5.1	1.0	107
SE214	Gotland	9.9	-54.3	3.8	0.0	25
SE221	Blekinge	23.7	-18.9	6.5	2.0	282
SE224	Skane	57.6	-20.3	7.2	9.0	109
SE231	Halland	27.5	-32.6	4.3	2.0	89
SE232	Vastra Gotaland	31.0	-10.8	5.1	27.0	272
SE311	Varmland	5.9	-8.9	5.1	2.0	154
SE312	Dalarna	4.4	-35.7	4.8	3.0	169
SE313	Gavleborg	6.7	-33.8	7.1	2.0	133
SE321	Vasternorrland	5.1	-36.6	5.2	2.0	145
SE322	Jamtland	1.1	-19.9	3.8	0.0	40
SE331	Vasterbotten	2.3	-15.6	3.4	2.0	148
SE332	Norrbotten	1.2	3.7	3.6	3.0	224

Sources: Eurostat, Statistics Sweden, Swedish Nathional Board of Trade; and IMF staff calculation.

Notes: Density is in persons per square kilometer; labor productivity is in SEK per employment; export per capital is in thousands of SEK; unemployment rate is average between 2020-24.

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LABOR MARKET IMPLICATIONS OF ARTIFICIAL INTELLIGENCE

The rapid uptake of Artificial Intelligence by Swedish enterprises is poised to reshape the country's occupational landscape. While the technology offers substantial potential gains for Sweden's workforce, more so than the EU on average, the associated labor displacement costs are likely to fall unevenly; Information Communication Technology professionals, less-educated workers, young people, and immigrants tend to face the greatest threat. Policies that facilitate labor mobility across regions and sectors, and better align the education system and labor market needs can help smooth the adjustment.

A. Introduction

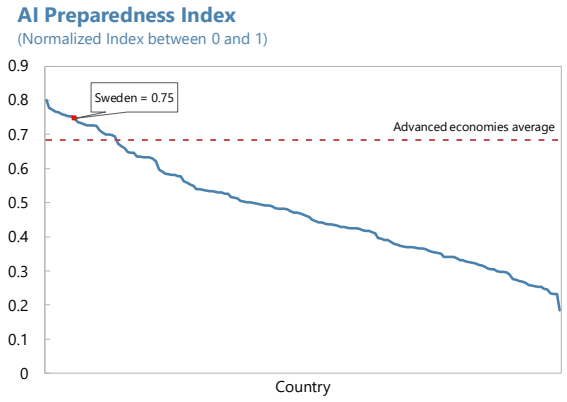
1. Artificial Intelligence (AI), like earlier waves of major technological breakthrough, bring substantial long-term benefits, but can create uneven short-term outcomes across society. It has the potential to transform daily life in many dimensions, from raising productivity, relieving workers from repetitive tasks, stimulating innovation, improving everyday convenience, and so on. These gains, however, do not accrue uniformly and may even lead some groups worse off, such as senior people with limited digital knowledge, or workers whose jobs are directly substituted by AI. Conscious policy efforts are therefore needed to maximize the opportunities while managing the associate challenges.

2. The Roadmap for Sweden produced by the AI Commission argues that Sweden is well positioned to benefit from AI, though some gaps remain.[1] Sweden has strong foundations across key building blocks of the AI ecosystem (Figure 1). Sweden's geographic location grants it strong comparative advantage in fossil-free energy generation, and its cold climate is attractive for hosting data centers. The labor force is relatively skilled and adaptable, and Sweden hosts one of Europe's deepest venture capital markets. Moreover, Sweden has extensive high-quality long time-series of data—a critical input for AI development. Despite these advantages, AI adoption in Sweden lags peer countries, as reflected in Sweden's modest standing in several global benchmarks.[2] Key policy gaps include non-uniform implementation of EU regulations across member states, insufficient reskilling and retraining opportunities, a persistent mismatch between private sector skill demand and educational outcome, and obstacles to attracting and retaining international talent. Closing these gaps would require a holistic strategy backed by strong political leadership.

[1] The AI Commission is an independent state inquiry established by the Government.

[2] For example, in the Global AI Index from Tortoise Media, the overall ranking for Sweden has fallen from 17th in 2023 to 25th in 2024, out of 83 countries included. Sweden ranks particularly low at 57th in the area of government strategy; the recent published AI Strategy may elevate Sweden's position in this regard.

Figure 1. AI Preparedness



Sources: Cazzaniga and others (2024); and IMF staff calculation.

Sources: Cazzaniga and others (2024); and IMF staff calculation.

3. As part of ongoing efforts, Sweden's Digitalization Strategy 2025–2030 sets out clear objectives and concrete measures to support the country's digital transition. The strategy aims to fulfill both Sweden's national objective and EU-level commitments.[3] The strategy is structured around five strategic domains: digital competence, business digitalization, public administration, welfare services, and finally connectivity. It also identifies three cross-cutting areas—AI, access to data, and security—which would reinforce progress in the five strategic domains.

4. In parallel, the authorities have published a dedicated AI Strategy. The strategy outlines measures to enhance the efficiency and quality of public services, clarify regulatory framework for businesses and the public sector, and strengthen conditions for research, with the objective of positioning Sweden among the world's top 10 countries in AI. An accompanying action plan organizes proposed policy measures around three pillars: AI for societal benefit, sustainable development, and AI for competitiveness and innovation.

- *AI for societal benefit*: the measures seek to streamline legal and regulatory frameworks, expand data access and use, advance standardization, enhance security and defense, lead AI adoption in the public sector.

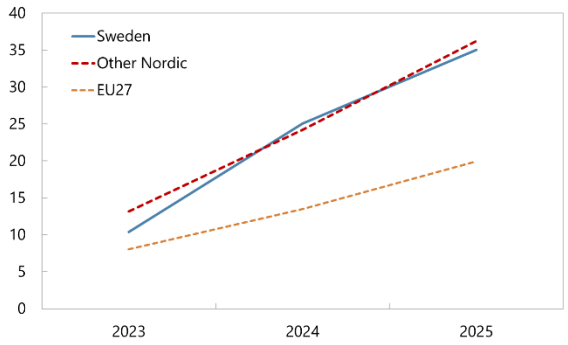
- *Sustainable development*: the measures aim to promote human-centric AI, develop national language models, support climate and energy objectives, and facilitate labor market adjustment and skills development.

- *AI for competitiveness and innovation*: the measures focus on strengthening the AI ecosystem, fostering business and entrepreneurship, scaling up digital infrastructure and computing capacity, and deepening research and expertise.

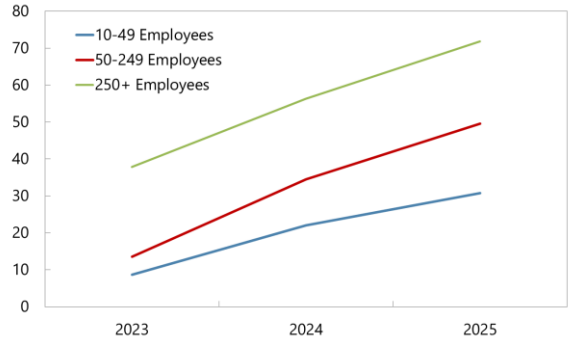
[3] Sweden's national goal, set by the Riksdag, is for Sweden to be the best in the world at using the opportunities offered by digitalization. Common EU-level goals, as established in the Digital Decade 2030 Program, span across the areas of digital skills, digital infrastructure, digital transformation of companies, and digitalization of public services.

5. Swedish enterprises adopt AI at a rapid pace. Among enterprises with more than 10 employees, the share of AI usage has risen from 10 percent in 2023 to about 35 percent in 2025, similar to other Nordic countries and well above the EU average of 15 percent. Large companies are at the forefront of this trend, given their business needs and the fixed cost associated with adopting AI (Figure 2 upper panels). At the NACE 1-digit level, Information Communication Technology (ICT) and Professional Services sectors record the highest uptake, consistent with the substantial scope for integrating AI into tasks in these industries, a concept referred to as exposure to AI henceforth (Figure 2 bottom left panel). Among enterprises using AI, nearly three-quarters of them deploy it for automating machine movement and close to 60 percent for image processing (Figure 2 bottom right panel), reflecting the prominent role of manufacturing, information technology, and life sciences in the Swedish economy.

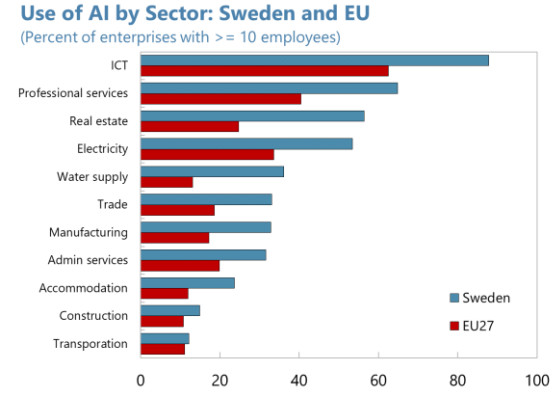
Figure 2. Swedish Enterprises Use AI Extensively



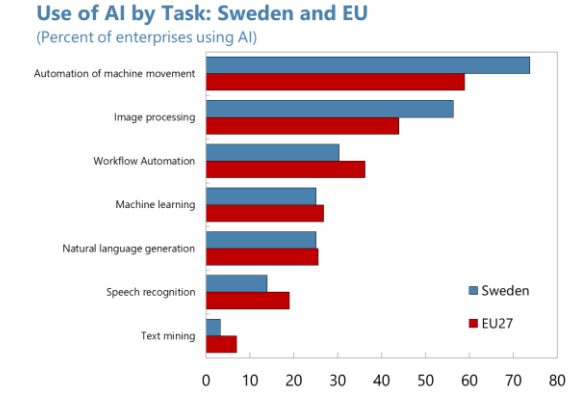
Sources: Eurostat; and IMF staff calculation.



Sources: Eurostat; and IMF staff calculation.



Sources: Eurostat; and IMF staff calculation.



Sources: Eurostat; and IMF staff calculation.

B. Labor Market Implications of AI

6. AI can either be complementary or substitutable to labor depending on the task content of work, and therefore its rapid deployment is expected to have significant short-term labor market effects. The task content literature establishes that technological change affects

labor market primarily at occupational level through the nature of tasks performed.[4] In this regard, Felten, Raj and Seamans (2021) developed an index of occupational exposure to AI (AIOE), which measures the overlap between key AI applications and the abilities required in each occupation. The index is extended by Pizzinelli and others (2023) to distinguish whether AI complements or substitutes labor in an occupation (Complementary-AIOE, C-AIOE). Workers in occupations with high exposure and high complementarity (HEHC) are likely to benefit from AI adoption, whereas those in high-exposure but low-complementarity (HELC) roles would face challenges. Occupations with low exposure (LE) are less affected directly.[5]

7. The C-AIOE index is applied to the 2023 EU Labor Force Survey (EU-LFS) at the 3-digit occupational level across various socio-demographic groups to assess AI-related labor market implications for Sweden. Occupations with AIOE value above the 3-digit median are classified as high-exposure, and those with complementary scores above the median, also at 3-digit level, are categorized as having high complementarity. The three mutually exclusive groups—HEHC, HELC, and LE—are defined by combining these two dimensions.

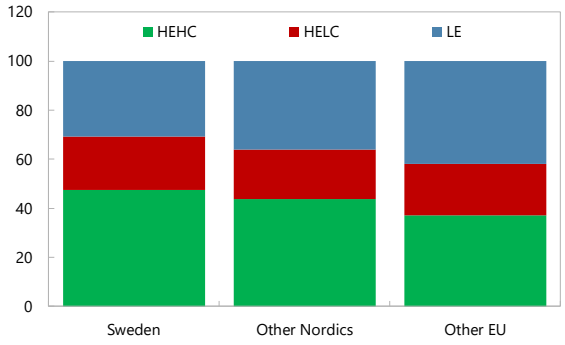
8. The considerable uncertainty surrounding the impacts of AI implies that findings from available evidence are far from conclusive. Empirical evidence on actual labor market effects is still tentative, even in the US, where AI is most extensively used, and studies using different methodologies often reach divergent conclusions (Kolko, 2026). The results in this note are based on the task content of occupations under current conditions. These task contents may evolve as AI technologies continue to develop, especially as Europe accelerates investment in data centers.

9. The Swedish labor force is more exposed to AI than most European countries, with a large share of workers positioned to benefit from AI adoption because their tasks tend to complement AI. Overall, about 70 percent of the Swedish labor force falls into high-exposure occupations, similar to other Nordic countries. Among these workers, roughly 70 percent are in occupations where AI is largely complementary, slightly higher than in the rest of the Nordic region. Sweden, together its Nordic peers, thus outranks other EU countries on both measures. HEHC occupations mostly consist of professionals across a range of fields, including business, education, science and engineering, and sales.

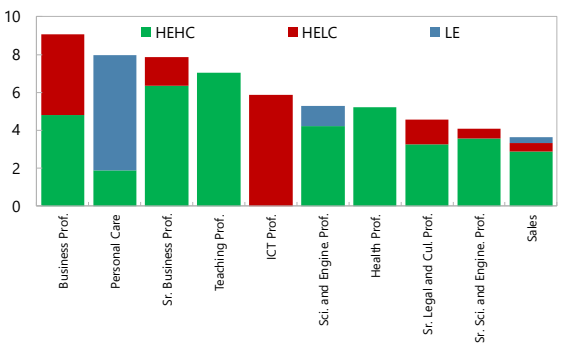
[4] Notable papers include Autor, Levy and Murnane (2003), Autor (2015), Acemoglu and Restrepo (2019), and Autor and others (2024); see Acemoglu, Kong and Restrepo (2025) for a recent survey.

[5] Nevertheless, workers in these occupations can be affected indirectly through spillover from the HE occupations, for instance from the complementarity in production or higher demand to the services they provide; see for example, Autor and Dorn (2013), Eeckhout, Pinheiro and Schmidheiny (2014), and Jaumotte and others (2026).

Figure 3. Exposure to AI of Swedish Labor Force by Occupation



Sources: EU-LFS; and IMF staff calculation.



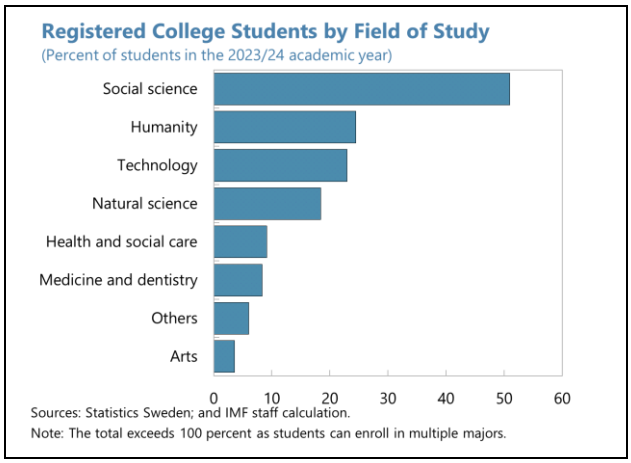
Sources: EU-LFS; and IMF staff calculation.

10. Nevertheless, ICT professionals in Sweden appear particularly vulnerable to labor market disruption from AI adoption. According to the C-AIOE index, all ICT professionals in Sweden belong to HELC occupations, and face greater displacement risk. These professionals, at the 3-digit level, correspond to software and applications developers, and database and network professionals (ISCO-08 codes 251 and 252). Among all 127 three-digit occupations, these two rank only in the 26th and 29th percentiles, respectively, which is well below the median in terms of complementarity, confirming that the concern reflects their underlying task content rather than a classification artifact.[6] This finding echoes recent Swedish evidence showing slower employment growth among young workers in AI-exposed occupations compared to other groups of workers (Lodefalk and others, 2026). In ICT industry, Swedish employers increasingly prioritize experienced, specialist profiles as routine programming tasks become automated, leaving new graduates at a disadvantage; nearly one-third of ICT graduates now have to work outside their field of training.[7]

[6] HELC business professionals (code 33) at 3-digit level include financial professionals (code 331), administrative secretaries (code 334), and government regulatory professionals (code 335), with their respective percentiles in AI complementarity being 35th, 21st, and 48th.

[7] The observation comes from the news release from Sweden's National Agency for Higher Vocational Education on December 17, 2025 (in Swedish).

11. Beyond ICT occupations, Sweden faces a broader challenge of skill imbalance, reflecting the labor market's difficulty in keeping pace with firms' demand for new competences. Jaumotte and others (2026, Figure 12.4) construct a new Skill Imbalance index comparing each country's degree of skill imbalance to that of the US. According to this measure, Sweden exhibits one of the highest degrees of excess demand among the 36 countries covered, second only to Luxembourg. The imbalance stems largely from the education system's limited capacity to equip students with emerging skills, as reflected in the Skill Readiness index developed in the same study, where Sweden ranks 11th out of 24. The Skill Readiness index has three components, capturing, respectively, a country's capacity to (1) supply graduates with new skills, (2) provide adults with opportunities in job-related training, and (3) the proficiency of the current workforce. Sweden's lukewarm performance is mainly driven by its weak capacity in (1), while it maintains leading positions in (2) and (3). One illustration is that in the 2023/24 academic year, 75 percent of the registered students enrolled in humanity and social sciences programs, while only about 40 percent in science and engineering fields (text figure).[8]

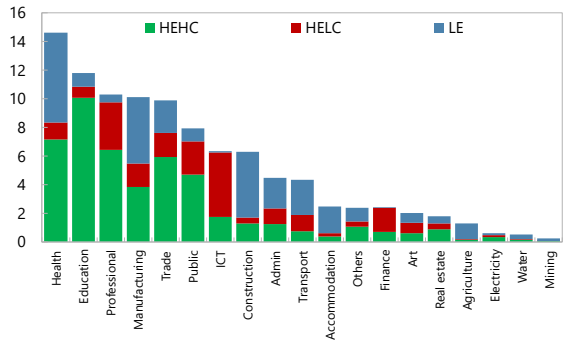


12. The public sector in Sweden has considerable potential to benefit from AI (Figure 4). The public sector is proxied by the public administration, education, and health care sectors (NACE 1-digit sectors O, P, and Q), which together employ about one-third of the workforce. Professionals in these sectors generally see strong complementarity between their jobs and AI, a pattern observed across almost all teaching, health care, and business professionals. By contrast, the higher vulnerability in the private sector mainly reflects ICT professionals and clerical occupations. Overall, close to two-thirds of public sector workers could experience productivity gains from AI adoption, compared with less than 40 percent of workers in the private sector. The pattern mirrors that in other Nordic countries and is more favorable than in the rest of Europe.

[8] The total exceeds 100 percent because students can enroll in multiple majors. In the 2023/24 academic year, about 40 percent of students choose double major.

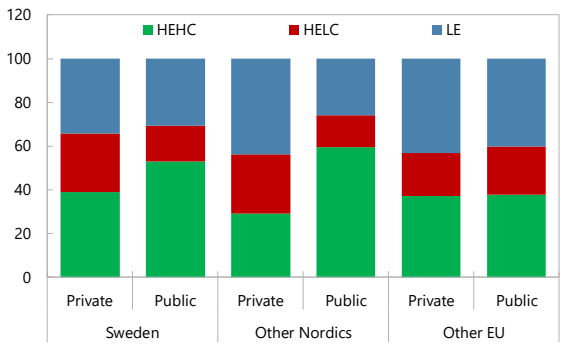
Figure 4. Exposure to AI of Swedish Labor Force by Sector

Exposure to AI by Industry: Sweden
(Percent of total employment)



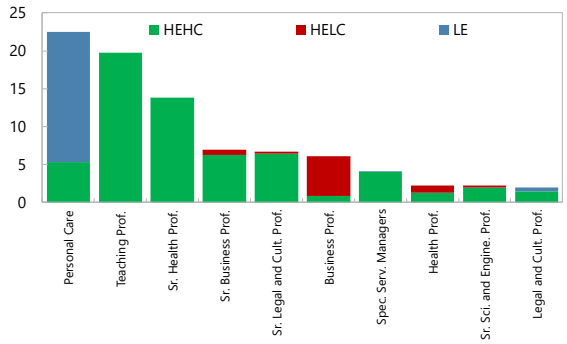
Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Broad Sector: Sweden
(Percent of employment by broad sector)



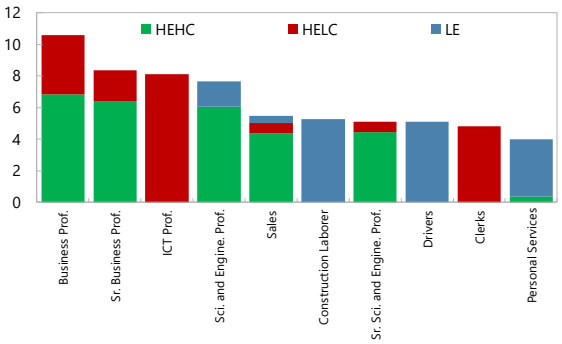
Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Occupation in Public Sector: Sweden
(Percent of public sector employment)



Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Occupation in Private Sector: Sweden
(Percent of private sector employment)

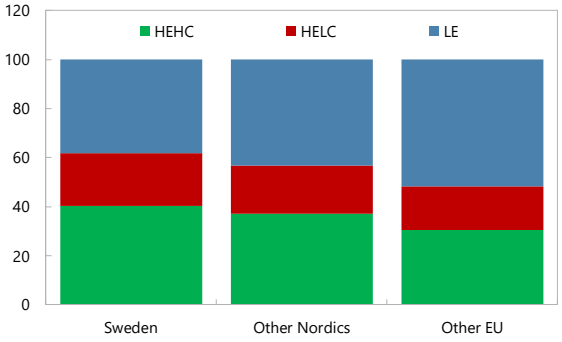


Sources: EU-LFS; and IMF staff calculation.

13. Female workers in Sweden are generally more exposed to AI and also display higher complementarity (Figure 5). Nearly 70 percent of women work high-exposure occupations, and more than two-thirds of these jobs also exhibit strong complementarity. For men, the corresponding shares are slightly lower, at 62 percent and 65 percent, respectively. Among vulnerable female workers, the main groups are financial professionals, administrative secretaries, government regulatory professionals, and general clerks, whereas vulnerable male workers are predominantly ICT professionals. At the same time, about 13 percent of female personal care and personal services workers, and 17 percent of male construction laborers, drivers, and machine operators are largely shielded from AI-related disruptions.

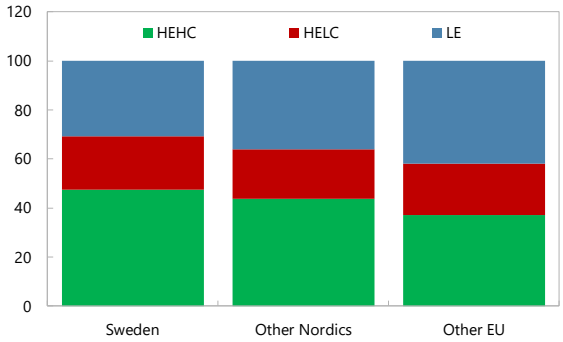
Figure 5. Exposure to AI of Swedish Labor Force by Gender

Exposure to AI for Men: Sweden and EU Countries
(Percent of male employment)



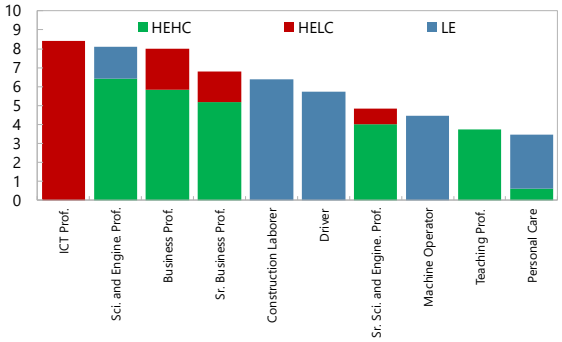
Sources: EU-LFS; and IMF staff calculation.

Exposure to AI for Women: Sweden and EU Countries
(Percent of female employment)



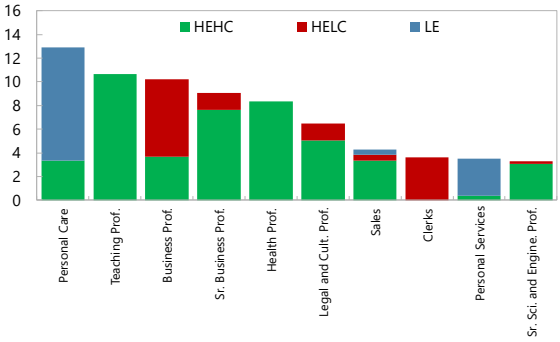
Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Occupation for Men: Sweden
(Percent of male employment)



Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Occupation for Women: Sweden
(Percent of female employment)

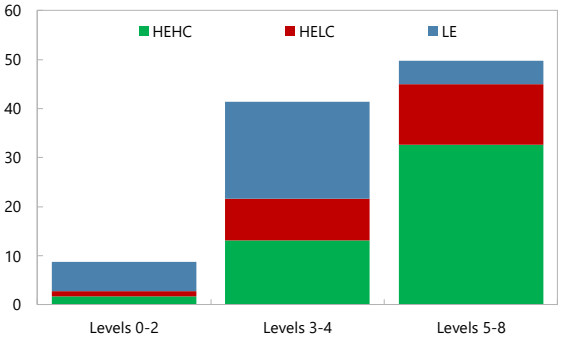


Sources: EU-LFS; and IMF staff calculation.

14. Less educated, low-income, young and immigrant workers may need additional support to navigate the labor market challenges (Figure 6). These groups often overlap, and given Sweden's generally skilled workforce, they make up only a relatively small share of workers; for example, fewer than 10 percent of workers have less than lower secondary education. Nevertheless, individuals in these socio-demographic groups are disproportionately unlikely to benefit from AI, either because their jobs have low exposure or low complementarity. Their limited financial buffers also make it harder for them to adjust to the transition without targeted assistance.

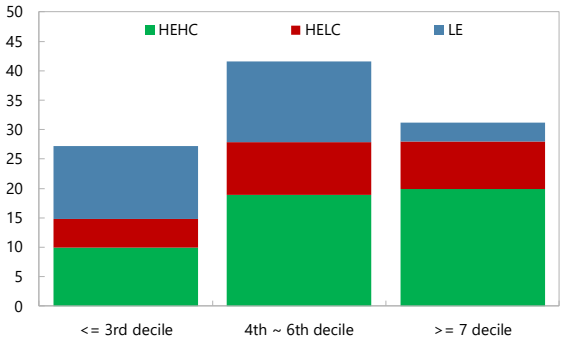
Figure 6. Exposure to AI of Swedish Labor Force by Other Standards

Exposure to AI by Education: Sweden
(Percent of total employment)



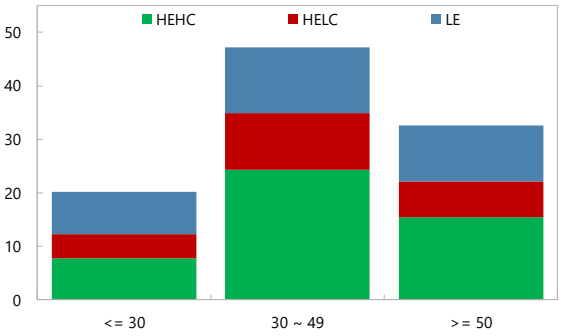
Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Income Group: Sweden
(Percent of total employment)



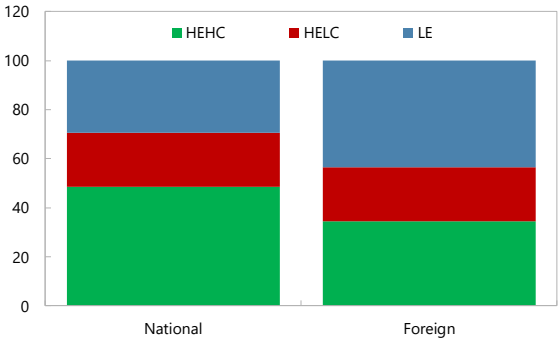
Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Age: Sweden
(Percent of total employment)



Sources: EU-LFS; and IMF staff calculation.

Exposure to AI by Immigration Status: Sweden
(Percent of employment by immigration status)

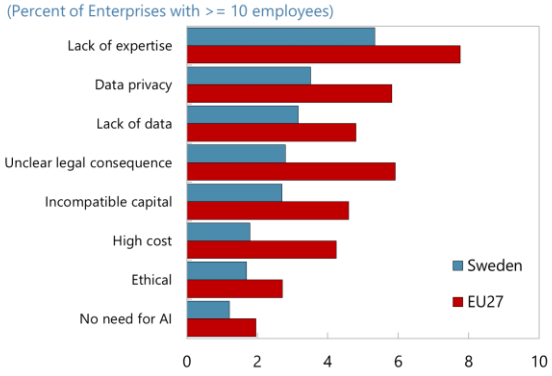


Sources: EU-LFS; and IMF staff calculation.

C. The Road Ahead

15. Sweden should continue to encourage AI adoption among enterprises, as nearly half of its labor force is well-positioned to receive a productivity boost. Swedish enterprises, on average, face fewer obstacles to deploying AI than their European peers. Nonetheless, difficulties in recruiting workers with the right skills, limited access to data, and legal uncertainties including around privacy protection, are among the most binding constraints (Text Figure). Given that Sweden's abundance of data is one of its key strengths in the AI ecosystem, clearer and more harmonized regulation, particularly the alignment with EU frameworks, is essential to easing the latter two barriers. Implementing relevant measures outlined in the Roadmap, Digitalization Strategy, and AI Strategy would substantially advance this agenda. Horizontal policies that promote

Barriers to Use AI: Sweden and EU
(Percent of Enterprises with >= 10 employees)



Sources: Eurostat; and IMF staff calculation.

technology diffusion and improve resource allocation (IMF, 2025; Productivity Commission, 2024, 2025) are equally relevant in supporting effective AI uptake.

16. Adapting the education system offers a fundamental solution to addressing skill imbalances in the labor market. Expanding the share of students choosing science or technology fields provides the most durable solution to evolving skill needs driven by technological changes. Key measures include raising the quality of pre-college education, improving guidance and information provided to students on choosing their fields of study, and strengthening linkages between universities and industry. Closer university-industry collaboration could enhance the employment and earning prospects of graduates in science and technology programs, while helping to alleviate the elevated unemployment pressures faced by labor market entrants.

17. Active labor market policies with targeted support for highly vulnerable groups can smooth their adjustment cost. Sweden already has strong capacity in upskilling and reskilling the workforce, but this can be further enhanced by expanding opportunities in adult education, vocational education and training, and on-the-job learning closely aligned with firms' skill needs. The social safety net should strike an appropriate balance between cushioning transition costs and maintaining incentives for retraining (Ljungqvist and Sargent, 1998). Labor market programs also need to be better tailored to individuals outside the labor force, particularly those with low educational attainment and immigrants.

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