

Spatial Misallocation and Labor Productivity

Sweden

Xin Tang

SIP/2026/076

IMF Selected Issues Papers are prepared by IMF staff as background documentation for periodic consultations with member countries. It is based on the information available at the time it was completed on June 29, 2026. This paper is also published separately as IMF Country Report No 26/183.

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Prepared by Xin Tang

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ABSTRACT: 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.

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Prepared by Xin Tang¹

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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 Malmö) and Västra Götaland (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 Västra Götaland was far smaller, at only 4 percent and 9 percent, respectively (Figure 1 right panel).⁵

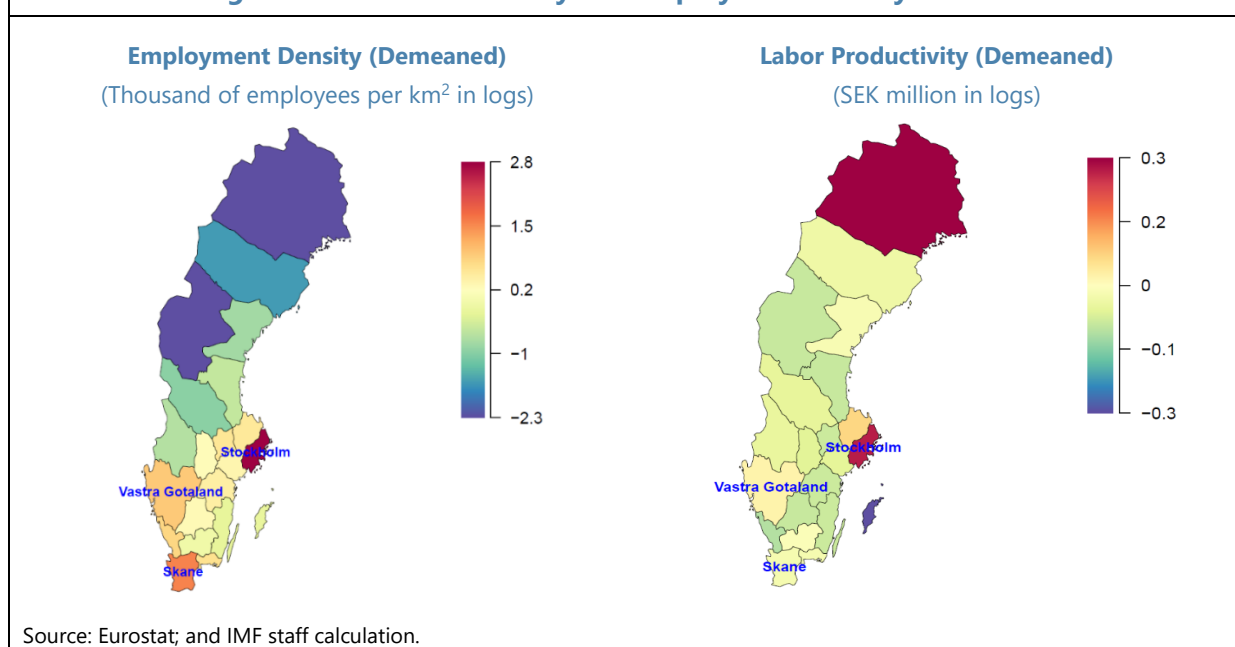
¹ The comparison excludes the most sparsely populated areas in the US (those with less than 10 employees/km²), where different economic forces are likely at play. In particular, labor productivity decreases in employment density for very sparsely populated counties in the US, with the structural break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

² Ahlfeldt and Piastrostefani (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.

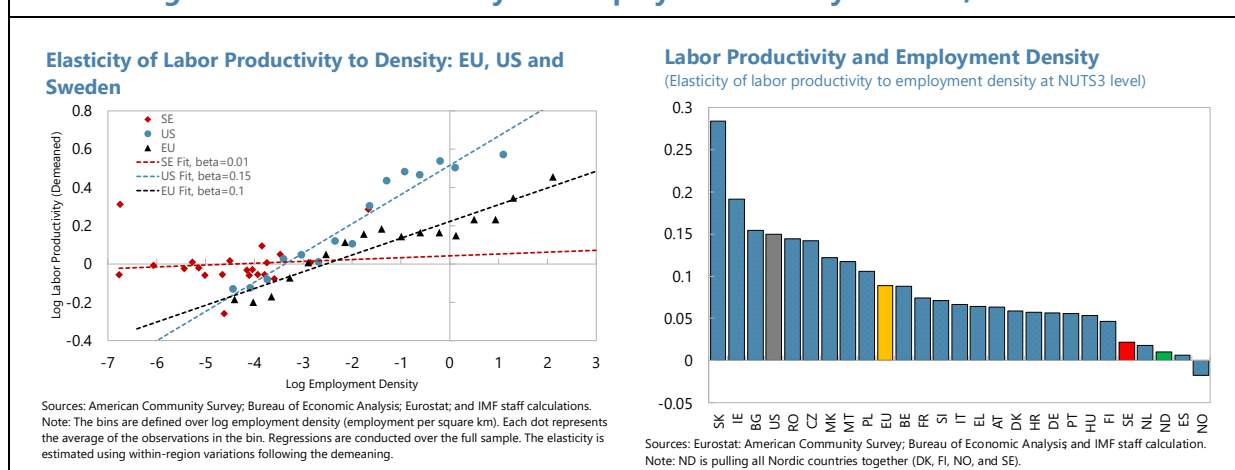
³ These benefits can happen both *generically*—for instance by increasing research and development intensity (Ramondo, Rodríguez-Clare, and Saborío-Rodríguez 2016), knowledge diffusion (Buera and Oberfield 2020), or providing a larger local demand—or through higher degree of *specialization*, which allows 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).

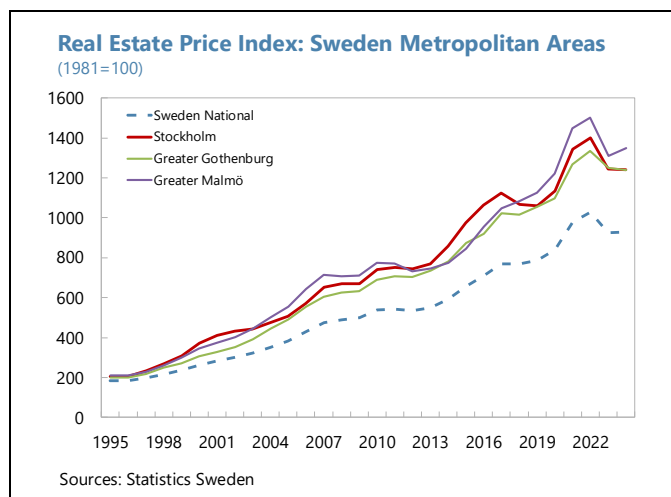
Figure 1. Labor Productivity and Employment Density in Sweden

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

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 Malmö—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

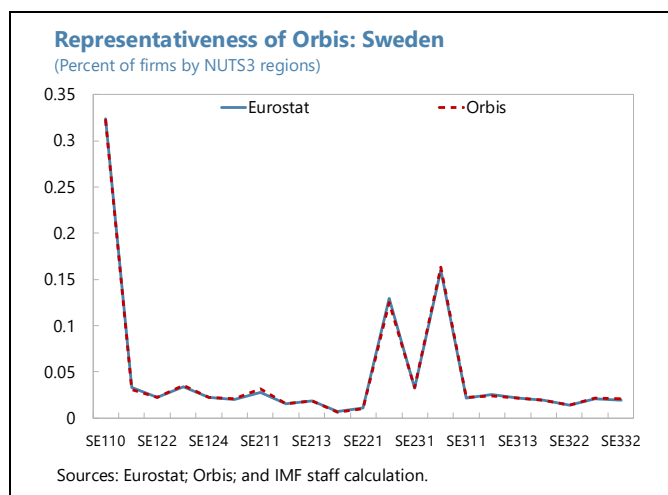
12. Dispersions in marginal labor productivity provide a basis for estimating the extent of misallocation. At its core, the key model assumption is that under diminishing marginal returns, all firms should equate the marginal productivity of labor. If this condition does not hold, reallocating labor 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 heterogeneous 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.

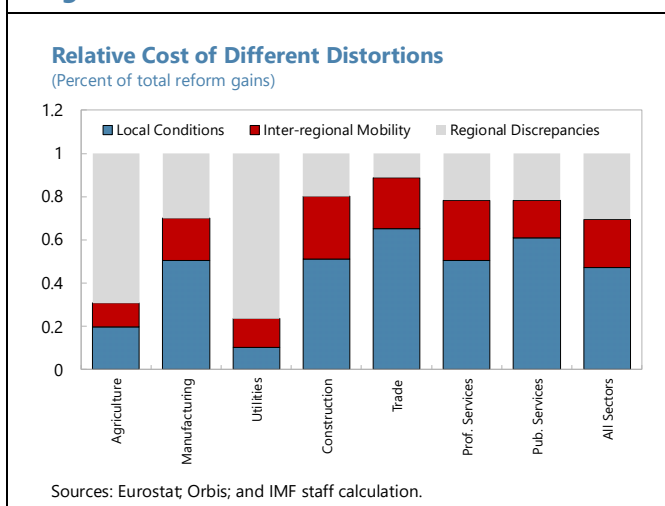
differential implementation of the same permitting process. Scenario 3 further eliminates inefficiencies stemming from such regional differences, aligning the distribution of economic activities fully with economic fundamentals. Smooth mobility of labor across regions is also a prerequisite to realize 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



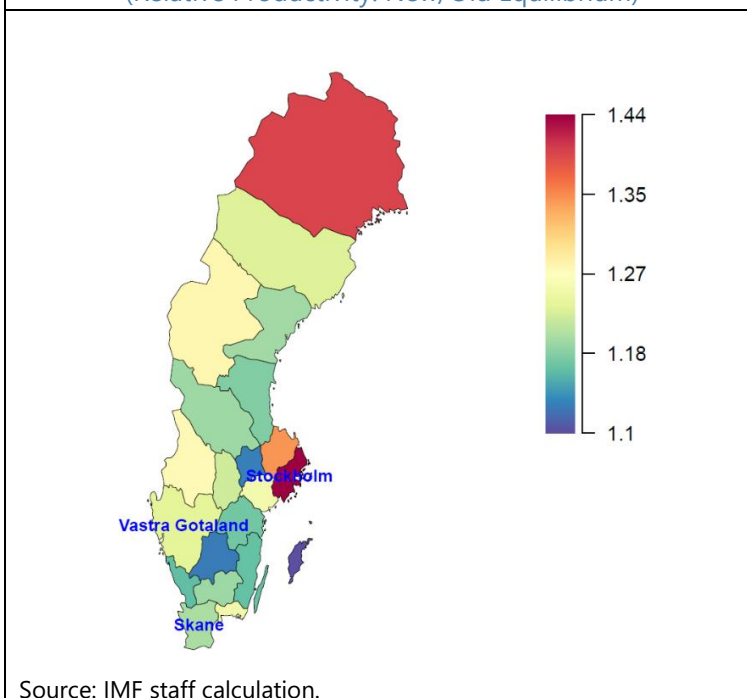
1).⁸ The substantial within region misallocation reflects the positive correlation between firm productivity and the distortions it faces, causing firms to lose about 15 to 20 percent of the benefits from higher productivity. Beyond local reforms, allowing labor to move freely to the most productive 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)



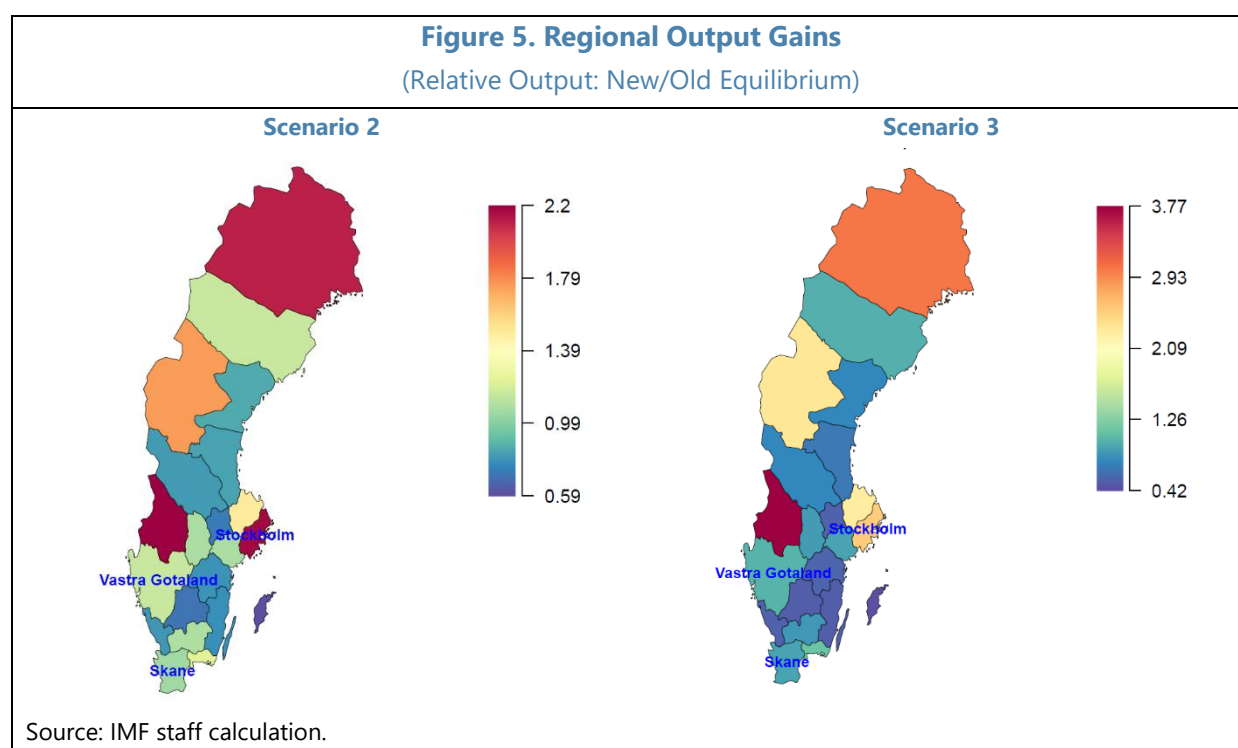
⁸ The agriculture and utilities sectors behave somewhat differently compared to the other sectors because their productivity is heavily affected by natural endowment, for instance the Skane county as the primary agricultural hub and the Norrbotten county famous for their mining, steel, forestry and hydropower 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 Vastr Gotaland, is considerably milder, at 20 percent and 23 percent, respectively.

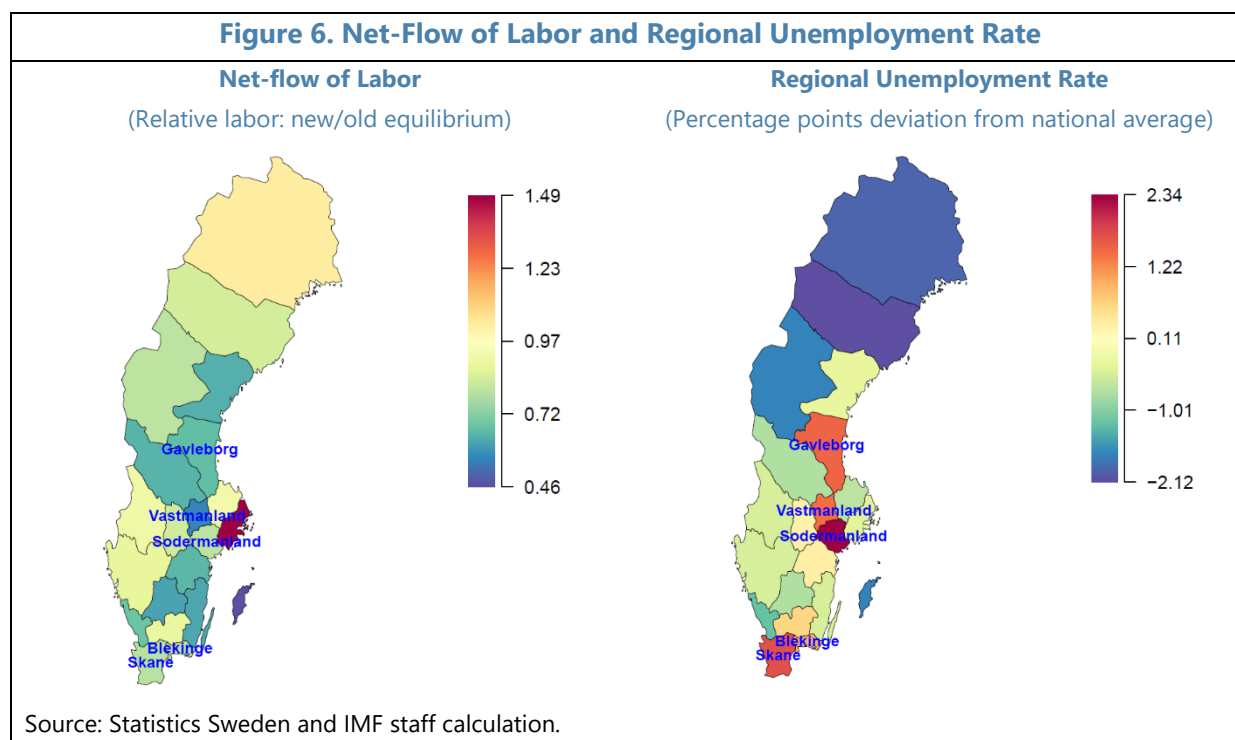
20. Facilitating labor mobility would enable workers to relocate toward higher productivity regions (Figure 5). The left panel shows the results under Scenario 2, and the right panel shows those under Scenario 3. In both scenarios, labor moves toward regions with stronger productivity fundamentals.¹¹ 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.



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 Vastr 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.

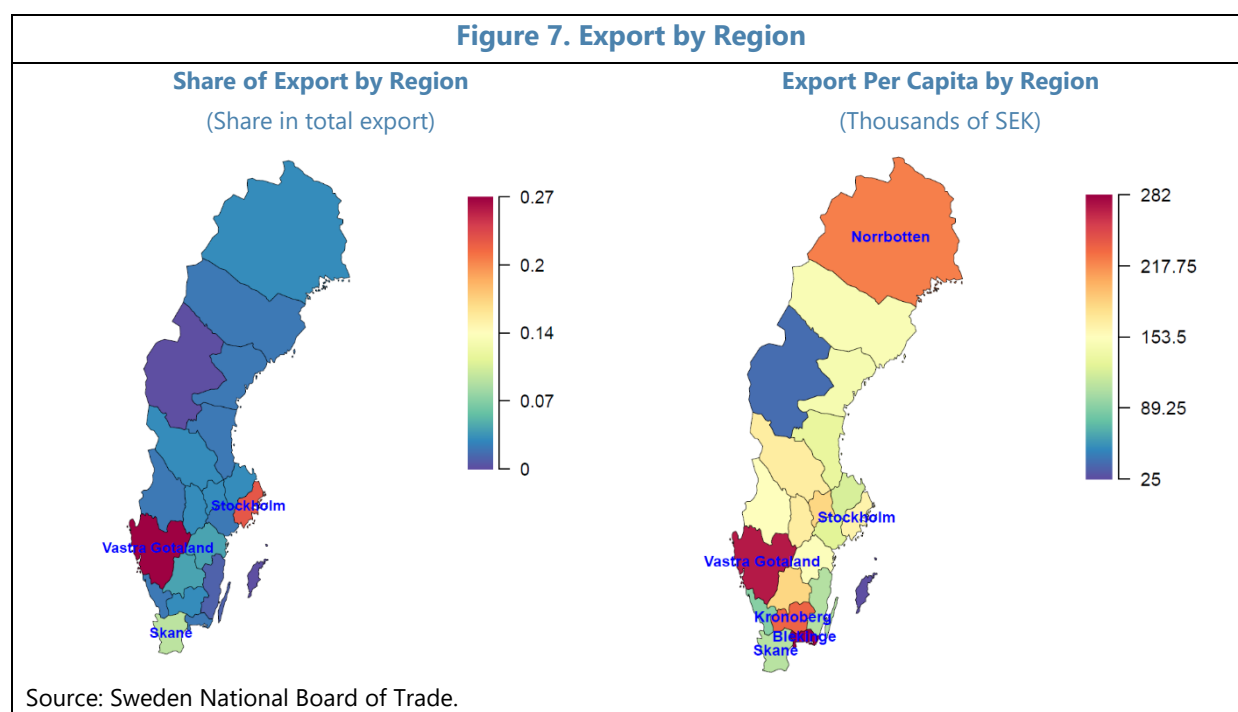


22. The results on labor mobility reflect only efficiency gains on the production side and do not speak to welfare. The model abstracts from several elements essential for a proper welfare analysis of migration, including migration cost, congestion forces, and local amenities.¹² It also assumes a fixed 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): Vstra 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 sparsely populated counties benefit more in per capita terms, with Blekinge, Vstra 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.



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	Norrboten	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	Net-flow of Labor		Unemployment Rate	Export Share	Export Per Capita
	Density	(%, Sce 2)	(%)	(%)	
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 National 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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