LIETUVOS BANKAS
EUROSISTEMA

Productivity drivers in Lithuania

Occasional Paper Series

No 64 / 2026

Occasional Paper series ISSN 2424-3213 (online)

No 64 / 2026

Productivity drivers in Lithuania

Darius Imbrasas, Jose Garcia-Louzao, Kasparas Vasiliauskas, Anup Mulay, Matas Gaigalas, Kipras Kalesninkas, Rokas Budrauskas

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Gedimino pr. 6, LT-01103 Vilnius

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The series is managed by the Applied Macroeconomic Research Division of the Economics Department and the Center for Excellence in Finance and Economic Research.

The views expressed are those of the author(s) and do not necessarily represent those of the Bank of Lithuania.

Abstract

This paper analyses the drivers of labour productivity growth in Lithuania and the factors behind its recent slowdown. Using macroeconomic, sectoral, and firm-level evidence, the paper shows that productivity growth has been driven primarily by within-sector efficiency gains, supported by capital deepening, technological upgrading, and strong performance in export-oriented sectors. Labour reallocation contributed positively but played a secondary role. The analysis identifies several emerging constraints on productivity, including persistent productivity dispersion between frontier and laggard firms, skill mismatches, labour shortages, and tightening financial conditions. It also shows that the 2021–2023 surge in intermediate consumption costs compressed firms' margins and weighed on real value added and measured productivity.

Keywords: labour productivity, total factor productivity, capital intensity, labour market dynamics, firm-level productivity dispersion, financial constraints, capacity utilisation

JEL: O47, E23, O11, D24, E32.

Executive summary

This paper provides a comprehensive assessment of the drivers of productivity and living standards in Lithuania, focusing on the interplay between labour market dynamics, firm behaviour, capital accumulation, structural transformation, and macroeconomic shocks. While Lithuania has experienced rapid income convergence toward the EU average since 2004, the analysis identifies emerging constraints that may slow future growth.

Over the past two decades, Lithuania's GDP per capita increased from around 50% to nearly 90% of the EU average, with approximately four-fifths of this convergence driven by labour productivity growth. The remaining contribution reflects improved utilisation of labour resources, primarily through rising employment rates and labour force participation. Despite strong performance in hours worked per capita, further gains are constrained by demographic ageing and comparatively low employment rates, indicating remaining labour market slack.

Productivity growth has been predominantly driven by within-sector efficiency improvements rather than labour reallocation across sectors. Gains have been concentrated in export-oriented industries and trade, supported by capital deepening, technological upgrading, and integration into global value chains. Labour reallocation has played a secondary but positive role, mainly through the gradual shift away from low-productivity agriculture toward higher-productivity services, particularly information and communication.

At the firm level, productivity dispersion in Lithuania is high by international standards and shows little sign of convergence. Large and persistent gaps between frontier and laggard firms suggest inefficient resource allocation and weak diffusion of technology and best practices. This is particularly pronounced in knowledge-intensive service sectors. The persistence of such gaps indicates structural barriers to firm growth, exit, and knowledge spillovers.

Sectoral evidence further highlights that productivity dynamics differ across industries. In manufacturing and ICT, both within-firm improvements and labour reallocation have contributed to productivity growth, whereas in construction and trade, gains have been driven mainly by within-firm adjustments. Labour shortages and skill mismatches have increasingly constrained efficient reallocation, particularly in tight labour market conditions.

Capital deepening has been a key contributor to productivity growth, accounting for roughly one-third of total gains since EU accession. However, capital intensity has stagnated in recent years due to strong growth in hours worked offsetting continued capital accumulation. Moreover, Lithuania's capital intensity remains significantly below the EU average, pointing to further scope for investment-driven productivity gains.

Total factor productivity (TFP) has been the primary long-term driver of productivity growth, especially during the early convergence period. However, TFP growth has moderated over time, reflecting diminishing returns from technology adoption and structural transformation. A decomposition of TFP drivers shows that innovation and infrastructure account for the largest share of productivity variation, while education, market efficiency, and institutional quality play smaller but still important roles. Despite improvements in innovation outputs, R&D investment remains low relative to advanced economies.

Recent productivity stagnation (2022–2024) is assessed as predominantly cyclical rather than structural. Unlike after the global financial crisis, where lasting damage to TFP occurred, the recent slowdown reflects labour hoarding and reduced capacity utilisation. As demand recovers, productivity growth is expected to return to trend. However, over the medium term, structural moderation in productivity growth is likely as Lithuania transitions from catch-up driven by imitation to growth driven by domestic innovation.

External cost shocks have also played a significant role in shaping productivity dynamics. The sharp increase in intermediate consumption prices during 2021–2023 led to margin compression and weaker real value-added

growth, particularly in sectors with limited pricing power. Incomplete cost pass-through reduced real productivity, highlighting the importance of cost structures and market power in small open economies.

Finally, tightening financial conditions have emerged as an additional constraint on productivity. Lithuania exhibits relatively high levels of firm-reported financial constraints, which are associated with lower productivity, reduced investment, and weaker capital intensity. Estimates suggest that recent tightening may have reduced productivity levels by up to 5% in the long run if persistent, particularly if high-productivity firms are disproportionately affected.

Overall, the findings suggest that Lithuania's past convergence has been driven primarily by within-sector productivity gains, capital accumulation, and improved labour utilisation. Looking ahead, sustaining growth will require a shift toward innovation-driven productivity, improved resource allocation across firms, deeper capital markets, and policies addressing labour shortages and skill mismatches. Without such adjustments, the pace of convergence toward EU living standards is likely to slow.

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1. Labour productivity developments in Lithuania

Prepared by Kasparas Vasiliauskas

Since 2000, labour productivity growth in Lithuania has been driven mainly by technological progress within individual sectors. Tradable sectors and wholesale and retail trade made the largest contribution to this growth, supported by increasing capital intensity, the modernisation of production processes and deeper integration into international markets. The contribution of labour reallocation towards more productive sectors was modest but positive, mainly reflecting the movement of labour from agriculture towards relatively more productive activities and the expansion of labour input in information and communication. Thus, the improvement in Lithuania's labour productivity was driven primarily by rapid developments within individual sectors rather than by significant changes in the structure of labour input and employment

Aggregate labour productivity growth reflects both productivity changes within sectors and changes in the allocation of labour across sectors with different productivity levels. Within-sector productivity gains may result from technological upgrading, capital deepening, organisational change, favourable cyclical conditions and shifts in the composition of activity within broad sectors. For example, aggregate productivity may increase when firms adopt more advanced technologies or move towards higher-value-added production, even if the sectoral structure of labour input remains unchanged.

By contrast, labour reallocation raises aggregate productivity when labour input shifts from lower-productivity sectors, such as traditional agriculture, towards higher-productivity activities. Aggregate productivity can therefore increase even if productivity within individual sectors remains unchanged.

To distinguish these two channels, the analysis applies a shift-share decomposition of labour productivity growth into the contribution of technological progress within individual sectors and the contribution of labour reallocation. Under this approach[1], aggregate labour productivity at time t, Z_t, can be expressed as a labour-input-share-weighted sum of sectoral labour productivity levels $Z_{i,t}$, where $L_{i,t}$ denotes total hours worked in sector i, L_t denotes total hours worked in the economy and $l_{i,t}$= $\frac{L_{i,t}}{L_t}$ is sector's i share of total labour input[2]:

$$Z_t = \sum_i \frac{L_{i,t}}{L_t} Z_{i,t} = \sum_i l_{i,t} Z_{i,t} \tag{1.1}$$

By taking growth rates of aggregate labour productivity and rearranging the previous equation, growth of aggregate labour productivity g_t can be expressed as follows:

[1] The decomposition follows the standard three-term shift-share framework used in IMF (2024, Annex I). See De Avillez (2012) for a discussion of alternative shift-share decomposition formulae. The decomposition uses Eurostat data for 16 NACE Rev. 2 sections over 2000–2024. Value added is measured as gross value added in chain-linked volumes, while labour input is measured by total hours worked.

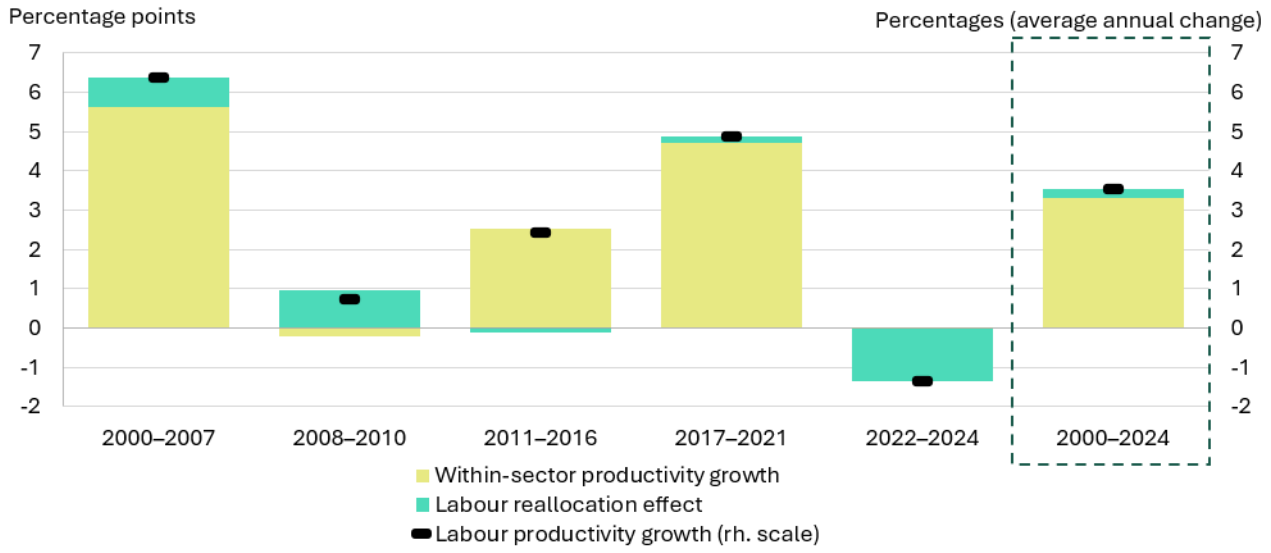
[2] Because labour input is measured by hours worked, changes in sectoral shares may reflect both worker movements and changes in average hours. A decomposition using persons employed did not materially change the main findings.

$$g_t = \underbrace{\sum_i \frac{\Delta Z_{i,t}}{Z_{t-1}} l_{i,t-1}}_{\text{Within-sector productivity effect}} + \underbrace{\sum_i \frac{Z_{i,t-1} - Z_{t-1}}{Z_{t-1}} \Delta l_{i,t}}_{\text{Reallocation effect}} + \underbrace{\sum_i \frac{\Delta Z_{i,t}}{Z_{t-1}} \Delta l_{i,t}}_{\text{Reallocation interaction effect}} \quad (1.2)$$

The first term in equation (1.2) captures the contribution of productivity changes within sectors, holding their labour-input shares at previous-period levels. The second term captures the effect of labour reallocation between sectors with different productivity levels and is positive when labour input shifts towards sectors with above-average productivity levels. The third term captures the interaction between the previous two effects. It is positive when labour input shifts towards sectors in which labour productivity grows faster than in the economy as a whole[3]. Following common practice, the second and third terms are combined into an overall labour-reallocation contribution.

Since 2000, within-sector gains accounted for the overwhelming majority of aggregate productivity growth (Figure 1.1)[4]. Labour reallocation made a small but positive contribution over the period as a whole.

Figure 1.1. Shift-share labour productivity decomposition



Sources: Eurostat and Bank of Lithuania calculations

The sectoral breakdown shows that within-sector productivity gains were concentrated in tradable sectors[5], which accounted for nearly half of the total within-sector contribution over 2000–2024 (Figure 1.2, left-hand panel). Productivity gains in these sectors reflected contributions from both capital deepening and overall efficiency growth. Capital deepening was supported by sustained investment in machinery and infrastructure,

[3] The interaction term captures a phenomenon similar to Baumol's cost disease (Baumol (1967) and Baumol, Blackman, and Wolff (1985)) – that is, the propensity of labour to move towards sectors where labour productivity is stagnant or declining.

[4] These results are broadly consistent with OECD (2025) and IMF (2024), which also find that most labour productivity growth was driven by technological progress within sectors, while the effect of labour reallocation was small.

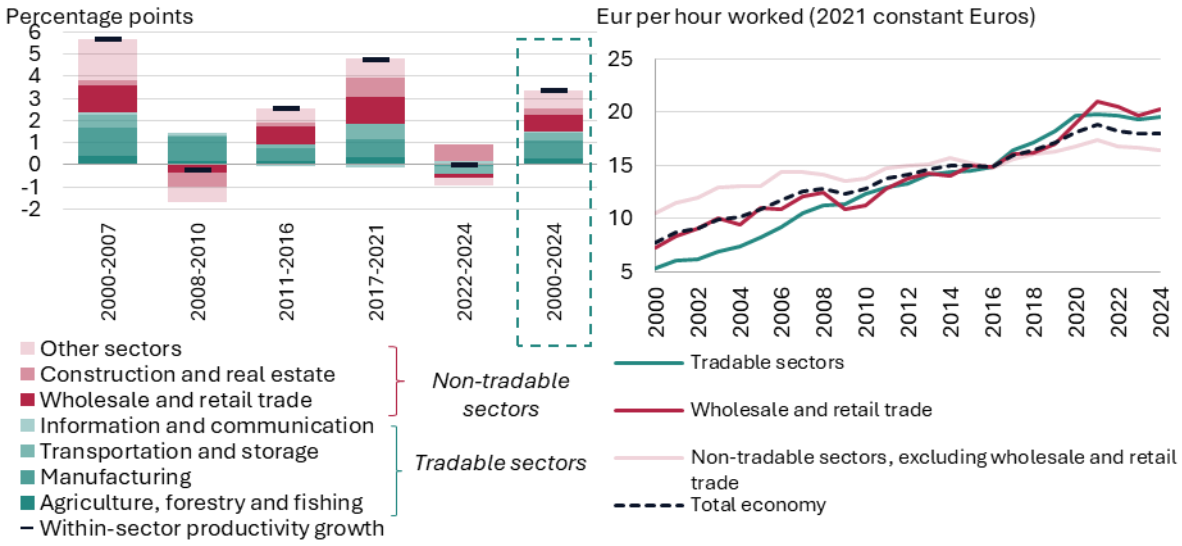
[5] Tradable sectors are defined as agriculture, forestry and fishing; manufacturing; information and communication; and transportation and storage. This grouping follows the convention used in Lithuanian macroeconomic analysis and captures activities with substantial exposure to international markets, either through exports or competition with foreign producers.

including through EU investment programmes and firms' own resources. Efficiency growth is consistent with technological upgrading, deeper integration into international value chains, improvements in management practices and movement towards higher-value-added production. Competition in international markets likely also strengthened incentives to continuously review, update and improve operating processes.

Beyond tradable sectors, wholesale and retail trade also made a substantial contribution, accounting for slightly more than one fifth of total within-sector productivity gains over 2000–2024. Productivity improvements in wholesale and retail trade were supported by increasing capital intensity, the modernisation of distribution and logistics networks, digitalisation of business activity and an increase in the scale of activity. Construction and real estate made a smaller contribution over the full period, but their impact was more cyclical. Their contribution was sharply negative during and after the global financial crisis, turned positive in 2017–2021 amid buoyant property-market activity, and remained positive in 2022–2024 as EU-funded investment, including in public infrastructure, increased.

Overall, the sectoral analysis shows that Lithuania's long-term technological progress was driven primarily by investment, technological upgrading and integration into international markets.

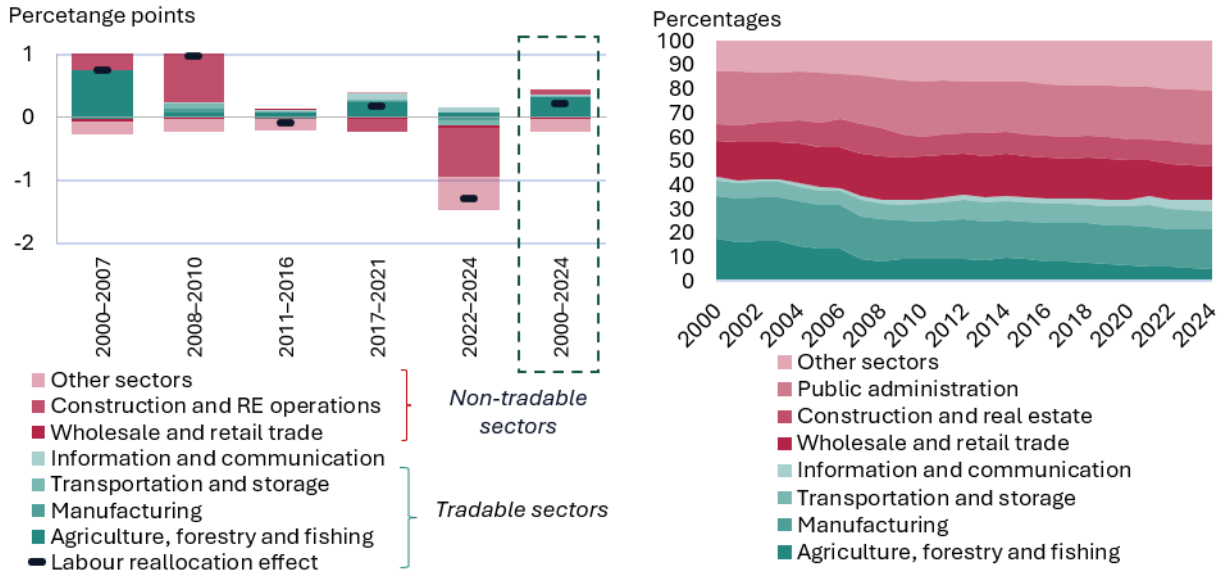
Figure 1.2. Contributions of within-sector productivity growth to aggregate labour productivity growth (left-hand panel) and labour productivity levels by broad sector group (right-hand panel)



Sources: Eurostat and Bank of Lithuania calculations

Labour reallocation played a positive but secondary role in Lithuania's productivity growth over 2000–2024 (Figure 1.3). Its contribution came mainly from two long-term structural changes: the decline in labour input in relatively low-productivity agriculture and the increase in labour input in information and communication. Reallocation effects in most other sectors were smaller and more closely linked to the business cycle.

Figure 1.3. Sectoral contributions of labour reallocation to labour productivity growth (left-hand panel) and sectoral shares of total hours worked (right-hand panel)



Sources: Eurostat and Bank of Lithuania calculations

Overall, aggregate labour productivity growth since 2000 has been driven mainly by technological progress within sectors. Technological progress in tradable sectors made the largest contribution. It was supported by increasing capital intensity, technological upgrading and a significant increase in overall efficiency. The effect of labour reallocation across sectors on labour productivity was limited but positive over 2000–2024, mainly owing to the movement of labour from agriculture towards relatively more productive activities and the increase in labour input in information and communication.

The results suggest that sustaining labour productivity growth will depend primarily on continued technological progress within individual sectors, supported by innovation, the adoption of new technologies and the development of workers' skills. At the same time, aggregate labour productivity can be further supported by measures that reduce barriers to labour mobility and make it easier for workers to move into expanding and more productive activities.

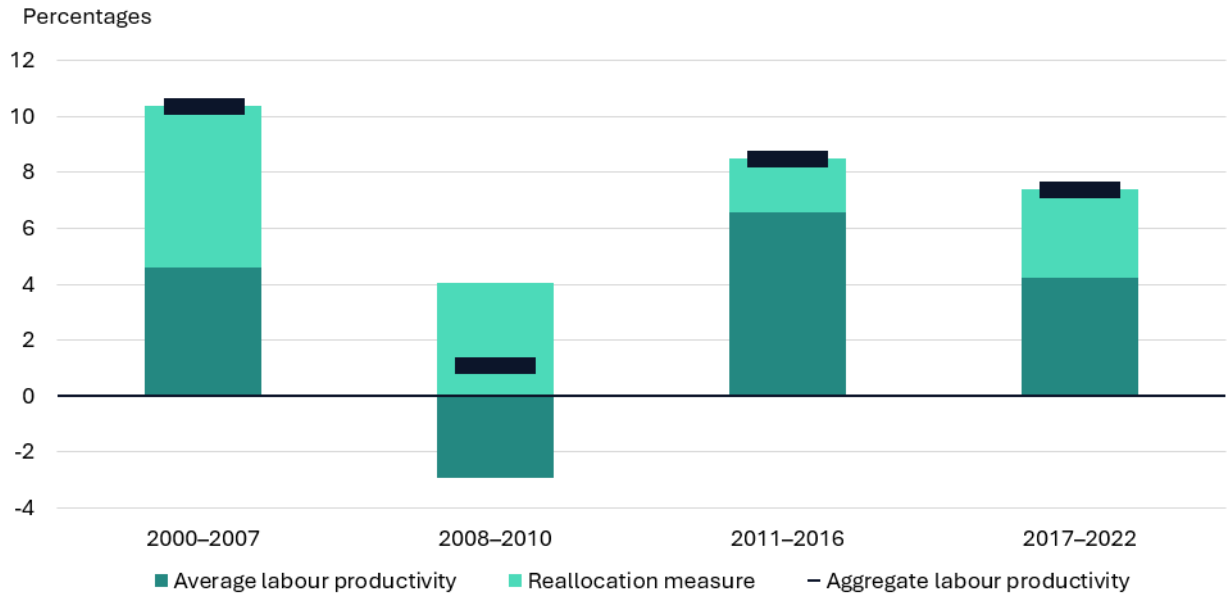
2. Sector-level labour reallocation and productivity developments

Prepared by Anup Mulay

In this section, we analyse the evolution of aggregate sectoral labour productivity over time using data from CompNet[6]. Specifically, we examine how aggregate labour productivity has changed across sectors, alongside the dynamics of its key components—the average labour productivity across firms (within-firm effect) and the reallocation measure between firms (between-firm effect)—and discuss some policy implications of these shifts.

The period 2008–2011 represented a severe productivity contraction, with aggregate labour productivity growth stabilising at approximately 1% annually during the recession itself. This reflected compressed margins and underutilised capital across firms. However, the post-2011 recovery reveals a critical distinction in the drivers of productivity improvement compared to the pre-crisis period (figure 2.1).

Figure 2.1. Labour Productivity Growth in Lithuania (2000-2022)



Source: CompNet and Bank of Lithuania calculations.

In the pre-2008 period, labour productivity growth in Lithuania was supported by both higher productivity within firms and positive labour reallocation across firms. This fits a period of very fast catch-up growth: Lithuania's economy grew by an average of 7.5% per year between 2000 and 2007. EU accession deepened integration with European markets, and credit to the economy expanded very rapidly in the run-up to the crisis. Strong employment growth and rising vacancies also helped reduce unemployment, while post-accession emigration

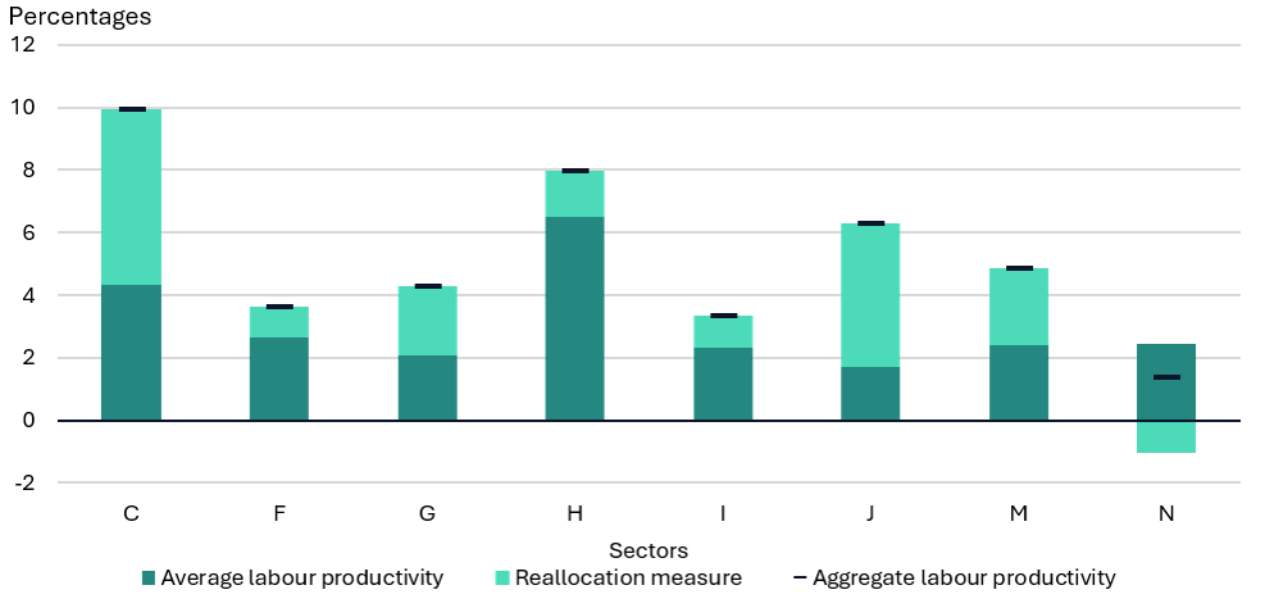
[6] CompNet is a cross-country, micro-aggregated firm database produced by the Competitiveness Research Network from harmonised national firm-level data. It contains indicators on productivity, labour, trade, finance and competition, and reports not only averages but also firm distributions, joint distributions and decomposition measures. This makes it useful for analysing productivity dispersion and resource reallocation across firms and sectors.

added to wage pressure and labour scarcity in some parts of the economy. It is, thus, reasonable to read this as a period in which both firm-level gains and labour movement supported aggregate productivity growth[7].

In the crisis period 2008–2010, Lithuania entered a deep recession after the reversal of the credit and housing boom, GDP fell by nearly 15% in 2009, unemployment peaked at around 18% in 2010, and many construction-related jobs disappeared, so weak or negative average productivity growth alongside a positive reallocation term is consistent with a harsh adjustment phase in which labour was pushed out of weaker firms and sectors.

In the post-crisis recovery, labour productivity growth appears to have been driven mainly by gains within firms, while labour reallocation made only a small contribution. Lithuania recovered quickly after the crisis, with average GDP growth of about 3.5% between 2010 and 2014, but investment as a share of GDP remained well below its pre-boom level. Structural unemployment remained high, at an estimated 10-12%, and firms continued to face skills shortages and mismatches, which likely limited the pace at which labour moved to the most productive firms. This is especially relevant in the middle of the decade, when recession in Russia and counter-sanctions hurt Lithuanian exports, negatively affecting transport and parts of food manufacturing, even as the wider economy continued to recover[8].

Figure 2.2. Sectoral Labour Productivity Growth in Lithuania (2000–2022)



Source: CompNet and Bank of Lithuania calculations. Sectors: C - Manufacturing, F - Construction, G – Wholesale and Retail Trade, H – Transportation and Storage, I – Accommodation and Food Service, J – Information and Communication, M - Professional, Scientific, Technical Activities, N - Administrative and Support Service Activities.

The return of a positive reallocation effect from 2017 suggests that labour movement again started to support aggregate productivity growth. This points to two significant developments in Lithuania. First, the economy enjoyed years of solid growth before the pandemic and recovered quickly from the COVID-19 shock. Second, manufacturing and other export-oriented activities performed strongly, and the labour market tightened sharply with vacancies rising sharply and wage growth close to 10% in 2021[9]. In that environment, scarce labour likely

[7] IMF Publication "Republic of Lithuania: Selected Issues"

[8] Ministry of Economy, Lithuania's Economic Review (May 2011)

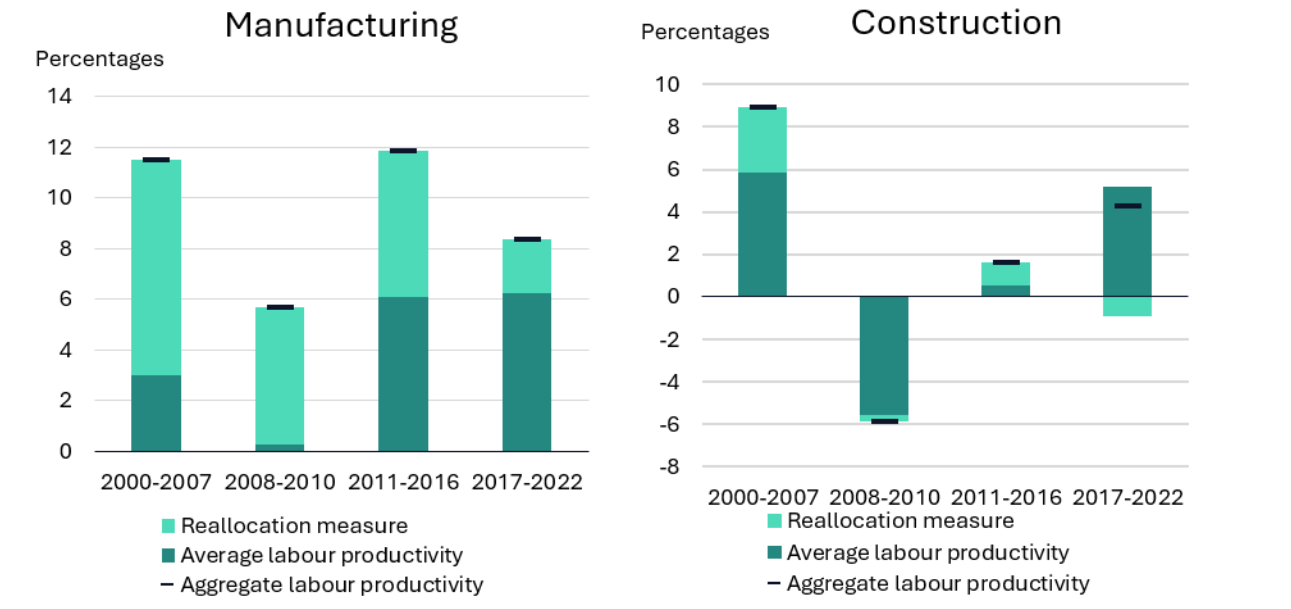
[9] OECD Reviews of Labour Markets and Social Policies: Lithuania

encouraged workers to move toward stronger firms and pushed firms to use labour more efficiently, although the energy shock and the effects of Russia's war against Ukraine weakened the outlook at the end of the period[10]. We can also break down the aggregate labour productivity growth according to sectors. Figure 2.2 shows the labour productivity growth according to sectors in Lithuania from 2000–2022. The aggregate picture hides important differences across sectors. The sectoral results show that labour productivity growth in Lithuania did not follow a single pattern, and that the roles of within-firm improvement and labour reallocation varied across activities.

In manufacturing, labour productivity growth in Lithuania was supported strongly by labour reallocation up to 2016, especially in the periods before and after the global financial crisis. This is consistent with the nature of the sector: manufacturing is export-oriented, more exposed to international competition than many domestic sectors, and was an important beneficiary of Lithuania's integration into European value chains. In that environment, stronger firms were better placed to expand while weaker firms were more likely to lose market share, reduce employment or exit, which would raise the contribution of reallocation to aggregate productivity growth.

The pattern also fits Lithuania's broader manufacturing development. During the recovery after the crisis, exports grew strongly and manufacturing became one of the main engines of growth, even while some domestically oriented sectors recovered more slowly. At the same time, the weak performance of Russian demand[11] after 2014 affected parts of Lithuanian industry, especially food products and transport-related activities, which likely added to restructuring pressures within tradable sectors.

Figure 2.3. Manufacturing and Construction Sectors Labour Productivity Growth in Lithuania (2000–2022)



Source: CompNet and Bank of Lithuania calculations.

After 2016, the contribution of reallocation in manufacturing appears to have weakened, while average productivity growth within firms remained the main driver. A cautious interpretation is that, as the labour market tightened, high-productivity firms may have found it harder to attract the workers needed to expand. This is

[10] OECD Economic Surveys: Lithuania 2022

[11] Russian embargo after annexation of Crimea

consistent with evidence that vacancies were rising, skill shortages were becoming more visible, and wage growth was increasingly outpacing productivity growth in Lithuania[12].

If productive manufacturing firms are being held back mainly by labour shortages, then policies that improve skills, support worker mobility and ease recruitment constraints could help productivity growth. This is consistent with OECD recommendations for Lithuania, which stress better matching of skills to labour market needs, stronger adult learning, and wider adoption of digital technologies to support productivity growth[13].

Construction was strong before the global financial crisis, then saw a sharp fall in productivity in 2008–2010 as the housing and credit boom reversed, and only a gradual recovery afterwards. Evidence for Lithuania shows that construction productivity fell heavily after the crisis, the number of firms and employment declined sharply, and residential permits remained below pre-crisis levels for several years, which is consistent with a sector that was highly exposed to boom-bust dynamics.

Construction shows a different pattern from manufacturing. In 2017–2022, labour productivity growth in the sector was positive, but the reallocation component appears slightly negative, which suggests that productivity gains came mainly from improvements within firms rather than from labour moving toward the most productive firms. Before the Russia's war in Ukraine, the housing market was booming, public investment was expanding, and construction activity was supported by both residential demand and infrastructure projects.

In such an environment, strong demand can attract labour into many firms across the sector, not only the most productive ones. That is a plausible explanation for a negative reallocation term in construction, especially in a labour-intensive sector where firms often expand quickly when demand is high and where productivity differences across projects can be large. Tight labour market conditions also matter here, because Lithuania's vacancy rate reached a record 2.0% in Q3 2021, skill shortages persisted, and nominal wage growth stayed close to 10%, which likely made hiring more difficult and may have weakened the contribution of labour reallocation to productivity growth[14]. Labour reallocation did not support productivity growth in this period and may have been weakened by demand pressures and labour shortages[15].

In construction, the recent pattern suggests that productivity growth was supported by firm-level improvements, but not by stronger labour reallocation. This points to the importance of skills, training and better use of productivity-enhancing technologies in a sector facing strong demand and persistent labour shortages.

In transport and storage, the change in the reallocation component after 2017 is one of the more notable results. In 2011–2016, labour productivity growth seems to have come mainly from gains within firms, while labour reallocation made a clearly negative contribution. From 2017 onward, this pattern reversed, with reallocation turning strongly positive even though average productivity growth within firms appears weaker. This suggests that, in the later period, aggregate productivity was supported more by labour moving toward stronger firms than by broad-based improvements inside firms.

Transport is a major sector in Lithuania, closely linked to international road freight and logistics. The earlier negative reallocation effect may reflect a period when the sector was still adjusting to weaker demand from

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[12] USDA Lithuania Exporter Guide

[13] See OECD, *OECD Skills Strategy Lithuania* (2021), which recommends stronger alignment between skills formation and labour market needs and higher participation in adult learning, and OECD, *Unleashing the productive potential of digitalisation in Lithuania* (2023), which stresses wider digital uptake and better digital skills to support productivity growth.

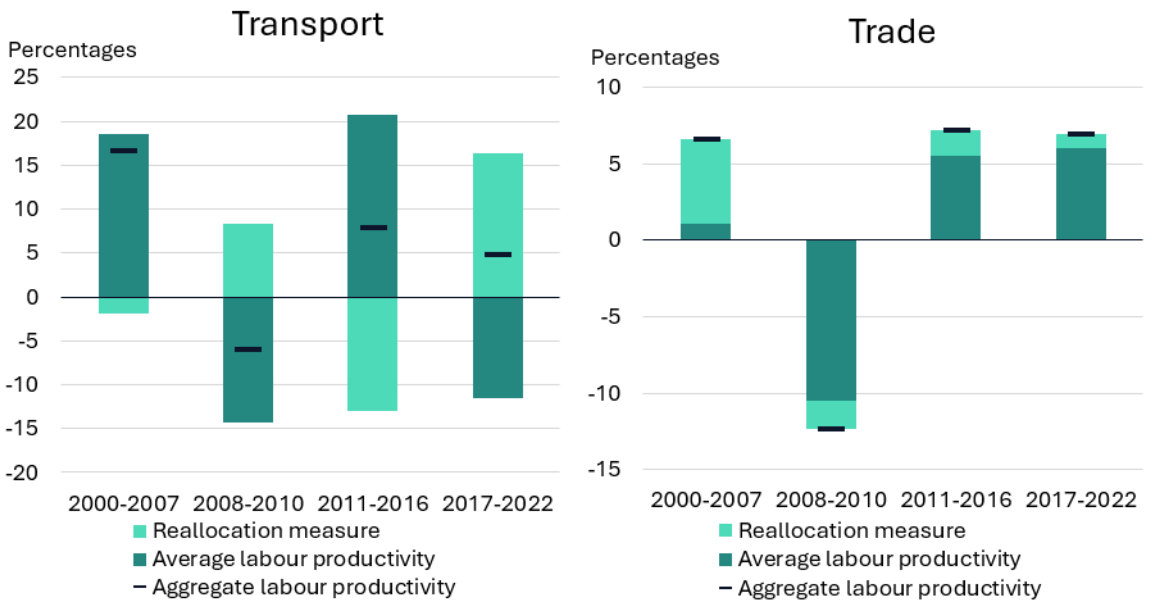
[14] European Commission: Lithuania 2022 Country Report

[15] Republic of Lithuania: 2022 Article IV Consultation-Press Release; and Staff Report

Russia and other eastern markets after 2014. In that setting, productivity could still rise within firms, but labour movement across firms did not necessarily support aggregate efficiency.

After 2017, a stronger positive reallocation effect is easier to link to sectoral restructuring, tight labour supply and rising wage pressure than to a pure technology adoption story. Lithuania's vacancy rate reached a record 2.0% in Q3 2021, skill shortages remained persistent, and nominal wage growth stayed close to 10%. In a transport sector already facing driver shortages and broader recruitment difficulties, this would tend to favour larger or more productive firms that were better able to attract workers, absorb higher labour costs and keep operating at scale[16].

Figure 2.4. Transport and Trade (Wholesale and Retail) Sectors Labour Productivity Growth in Lithuania (2000–2022)



Source: CompNet and Bank of Lithuania calculations.

Wholesale and retail trade is one of the largest employers in Lithuania, accounting for 20.3% of employees in 2022. Household incomes also rose strongly in recent years, with gross average monthly earnings increasing from EUR 1,286 in 2019 to EUR 1,951 in 2023, creating conditions for gradual efficiency gains within firms rather than sharp restructuring across firms[17]. Trade in Lithuania appears to have improved through incremental firm-level adjustment, including better organisation, adoption of digital tools, and changes in sales channels, while the reallocation channel remained secondary in the aggregate picture. Lithuania has made progress in digitalisation, but OECD also notes that digital uptake still lags in many firms, especially smaller ones[18].

The post-2017 period can also be linked to tighter labour market conditions. Vacancies rose sharply in 2021 and remained above pre-pandemic levels, while wages increased strongly, which likely pushed trade firms to raise output per worker through internal efficiency measures rather than through large-scale labour reshuffling across firms.

[16] Wiiw Forecast Report

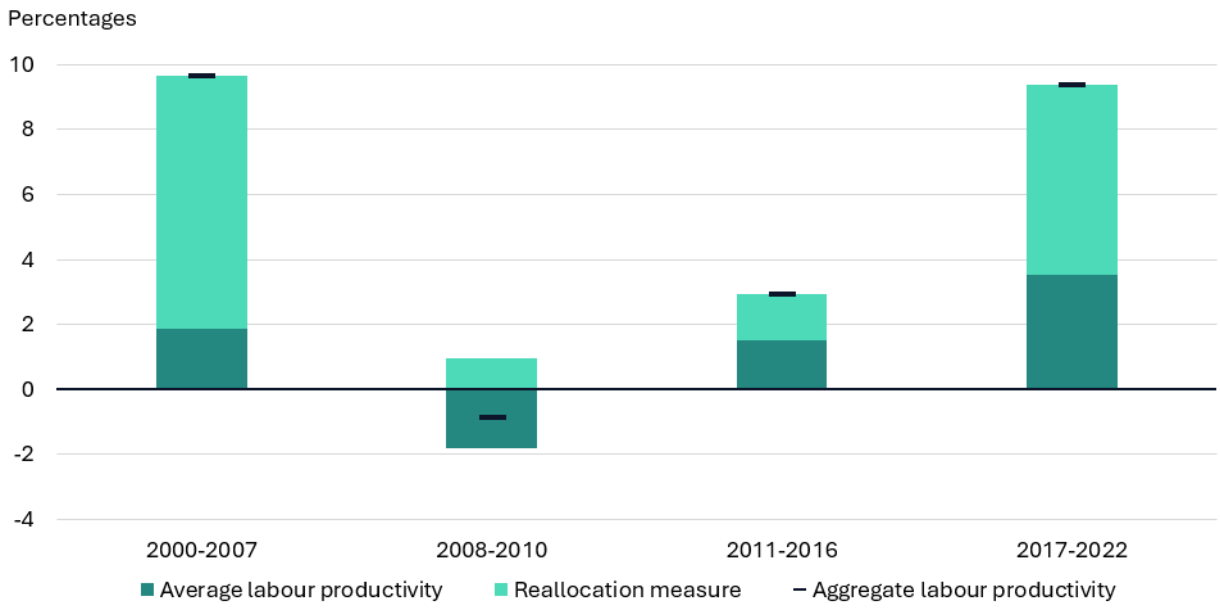
[17] Labour Market Information: Lithuania

[18] OECD Economic Surveys: Lithuania 2022

In trade, productivity growth since 2011 has come mainly from gains within firms rather than from labour reallocation, suggesting gradual efficiency improvements in a large domestic sector operating in a period of rising demand, tighter labour supply and ongoing, but uneven, digitalisation. The policy emphasis should be on supporting firm adaptation, skills and digital uptake rather than trying to force reallocation. This is consistent with broader OECD recommendations for Lithuania, which stress wider digital adoption, stronger adult learning, better use of skills in workplaces, and closer alignment between education and labour market needs[19].

In information and communication, labour productivity growth appears to have been supported more by positive labour reallocation, and to a smaller extent by firm-level improvements. This suggests that the sector was not only raising productivity within firms, but was also drawing labour toward stronger firms, which is consistent with a fast-growing, skill-intensive part of the Lithuanian economy[20]. The country has strengthened its position in digital activities over time, the share of ICT specialists in employment rose to 4.4% of employment[21] (slightly below the EU average of 4.6%, but converging quickly), and Lithuania's fintech ecosystem expanded rapidly, with the number of fintech firms increasing from 82 at the end of 2016 to 265 at the end of 2021[22]. In that setting, it is plausible that expanding and more productive firms were able to attract more workers, which would show up as a positive reallocation effect[23]. Information and communication is one of the sectors where productivity growth and labour reallocation seem to have worked together more successfully than in many other sectors.

Figure 2.5. Information and Communication Sector Labour Productivity Growth in Lithuania (2000–2022)



Source: CompNet and Bank of Lithuania calculations.

The results underline the importance of skills supply, worker mobility and business dynamism in high-productivity activities. Policies that improve digital skills, strengthen links between education and labour market

[19] OECD Working Paper: "Unleashing the productive potential of digitalization in Lithuania"

[20] European Union Digital Skills and Jobs Platform

[21] EU Digital Skills and Jobs Platform

[22] IMF

[23] To the extent that Fintech companies are assigned to the ICT sector. Depending on the activity, they can also be classified under "Finance and Insurance" sector.

needs, expand adult learning and ease the attraction of skilled workers would help Lithuania sustain this performance[24].

The CompNet results suggest a clear change around 2016–2017 in how labour reallocation contributed to productivity growth in Lithuania. In the aggregate results, and especially in transport, the reallocation term becomes less negative or turns positive after 2017. This fits a Lithuanian economy development trend in which labour market slack had largely diminished: unemployment had fallen to around 6.5% by 2019, vacancies rose thereafter, and wage growth became more closely linked to labour scarcity[25].

A sensible reading is that tighter labour markets improved reallocation by making it harder for weaker firms to retain workers, while stronger firms had more incentive to pay more, invest and expand. Earlier emigration also mattered, because labour supply had already been reduced by the large outflow peak in 2010, when around 80,000 people left Lithuania[26].

The sectoral results reflect this story, but not uniformly. Manufacturing and information and communication show stronger reallocation, which is consistent with greater exposure to competition and faster growth, while trade looks more stable and construction shows that strong demand alone does not guarantee efficient labour allocation. Digitalisation may have supported this process, especially in ICT, but the stronger Lithuania-specific evidence points to labour scarcity, skills mismatch and sectoral restructuring as the main drivers.

[24] OECD Skills Strategy Lithuania

[25] Wage Growth in Lithuania from 2008 to 2020: Observed Drivers and Underlying Shocks

[26] State Data Agency (Official Statistics Portal), International migration flows, Lithuania, 2010. The Net Migration in 2010 was 77,944.

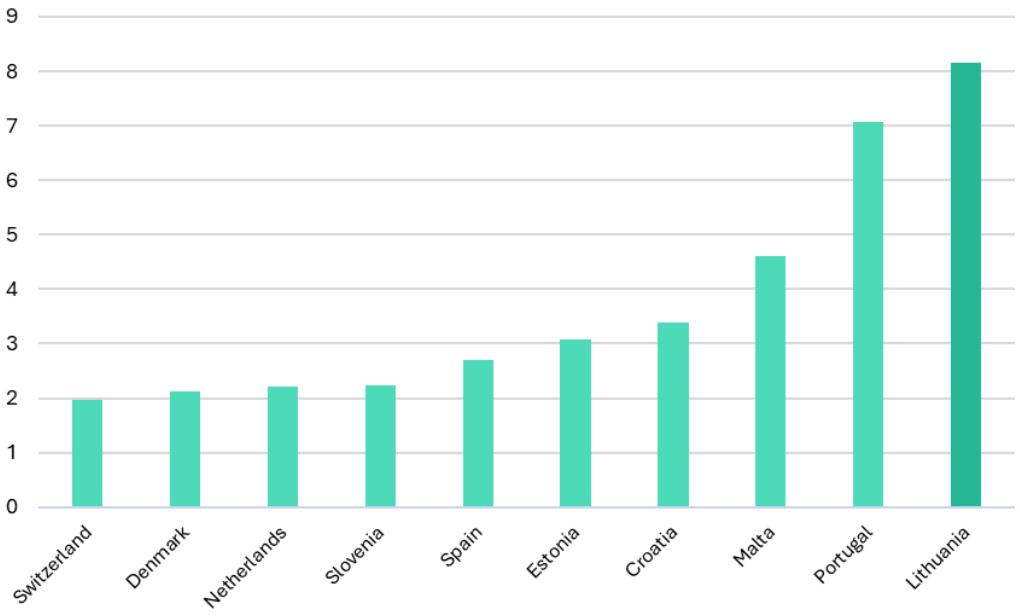
3. Company-level productivity developments in Lithuania

Prepared by Kipras Kalesninkas

This section looks at company level productivity developments in Lithuania. The focus is on how large the productivity differences between firms are and how they change over time. Large and persistent productivity gaps between frontier and laggard firms can indicate problems with how resources, such as labour and capital both tangible and intangible, are allocated in the economy.

In this section we analyse data from the Competitiveness Research Network (CompNet) to better understand productivity differences among Lithuania's firms. Using this data, Figure 3.1 depicts productivity dispersion across European countries in the CompNet sample. Dispersion is measured as the ratio of labour productivity between firms in the top and bottom deciles of the distribution, where productivity is defined as real value added per worker. The figure shows that Lithuania is among the countries with the largest productivity gaps. Bigger gaps may imply limited diffusion of performance improvements from leading firms to the rest of the economy.

Figure 3.1. Labour productivity ratio between the most and least productive firms (2021)



Source: CompNet and Bank of Lithuania calculations.

Large productivity gaps often indicate inefficient reallocation of key resources across firms.[27] More productive firms are generally better positioned to access capital, adopt modern technologies, attract highly skilled workers, and implement stronger management practices.[28] By contrast, less productive firms often face tighter constraints, making it more difficult for them to close the gap and limiting overall economic growth potential. In effectively functioning markets, resources tend to shift towards more productive firms, while less productive ones either invest in technology and skills to improve their performance or exit the market. Persistently large

[27] See, e.g., Gopinath, G., Kalemli-Özcan S., Karabarbounis L. and Villegas-Sanchez C. (2017) *Capital Allocation and Productivity in South Europe.* NBER Working Paper No. 21453.

[28] CompNet, Firm Productivity Report 2025, April 2025.

productivity gaps suggest that this reallocation process is weak or slow, leaving important resources tied up in less productive firms for extended periods.

To better understand why productivity gaps are large, Table 3.1 examines differences in firm characteristics between frontier and laggard firms. In Lithuania, frontier firms are, on average, smaller than laggard firms in terms of employment. A similar pattern is observed in Estonia and the Netherlands. This suggests that the most productive firms in these countries are often relatively small and specialized, relying more on the effective use of skills, technology, and management than on scale.[29] Another feature worth mentioning is the average wage gap between laggard and frontier firms. Although Lithuania records one of the largest productivity gaps among the countries considered, real wage ratio is relatively small.

Table 3.1. Ratio of indicators for frontier and laggard firms by country, 2021

COUNTRY	LABOUR PRODUCTIVITY	VALUE ADDED	REAL WAGES	FIRM SIZE
CROATIA	3.38	79.54	2.43	3.75
DENMARK	2.13	30.99	3.72	1.82
ESTONIA	3.08	12.54	3.16	0.98
LITHUANIA	**8.15**	**16.82**	**1.94**	**0.81**
MALTA	4.61	56.82	3.88	1.81
NETHERLANDS	2.22	14.64	4.98	0.50
PORTUGAL	7.07	88.22	3.41	3.47
SLOVENIA	2.23	42.42	1.95	4.95
SPAIN	2.70	89.50	3.09	3.00
SWITZERLAND	1.97	40.90	3.78	2.46

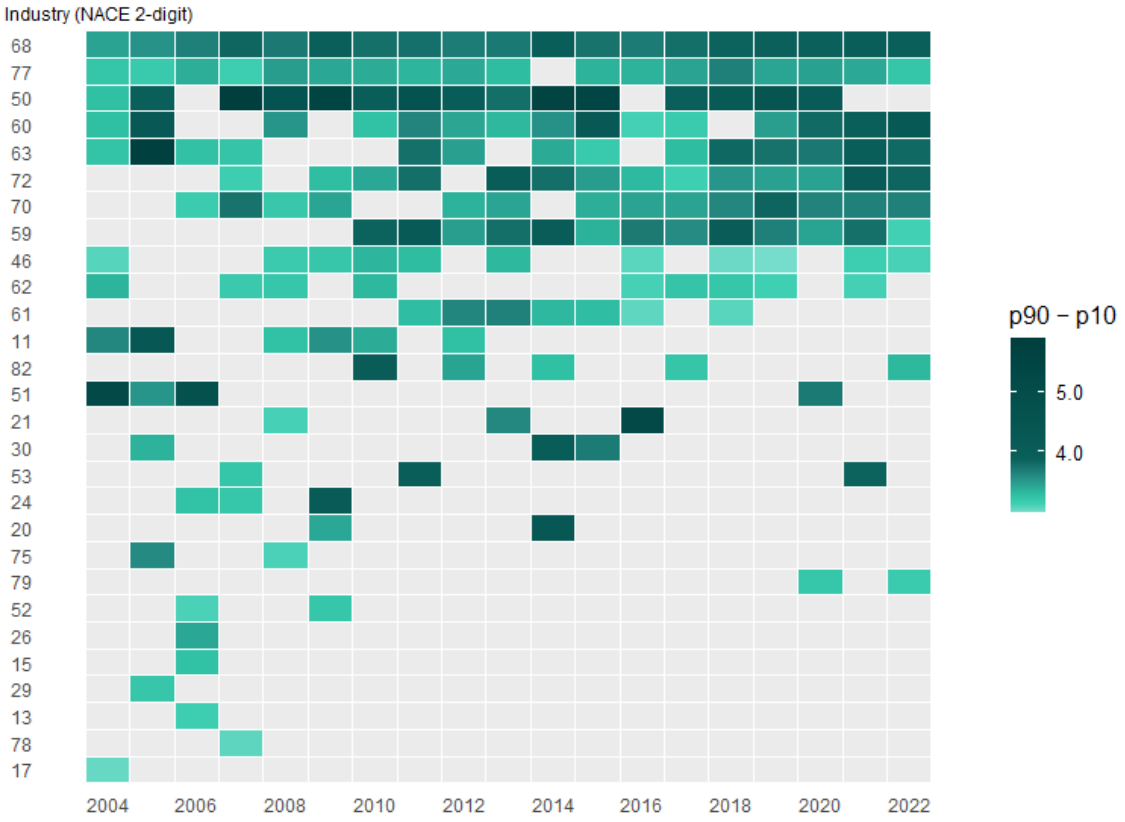
Source: CompNet and Bank of Lithuania calculations.

Figure 3.2 presents a heatmap of productivity gaps at NACE Rev. 2 sector level in Lithuania over the period 2004–2022. It highlights the sectors that most frequently exhibit the largest gaps and how these gaps evolve over time. The heatmap shows that productivity dispersion is concentrated in a relatively small group of sectors that consistently appear at the top of the ranking. Sector 68 (Real estate activities) stands out as the sector with biggest and most persistent dispersion in Lithuania. Most of the sectors with the largest gaps are service-oriented and relatively knowledge- or asset-intensive, such as real estate activities, leasing, information services, R&D, and consultancy. Similar patterns are documented in international evidence, where productivity divergence is particularly marked in service sectors and is linked to slower diffusion and weaker reallocation.[30] In these activities, differences between firms tend to be larger, as performance depends more on skills, know-how, and how firms are run, all factors which are not easy to replicate across firms.

[29] CompNet, Firm Productivity Report 2025, April 2025.

[30] Andrews, D., Criscuolo, C., and Gal, P. (2016), *The best versus the Rest,* OECD

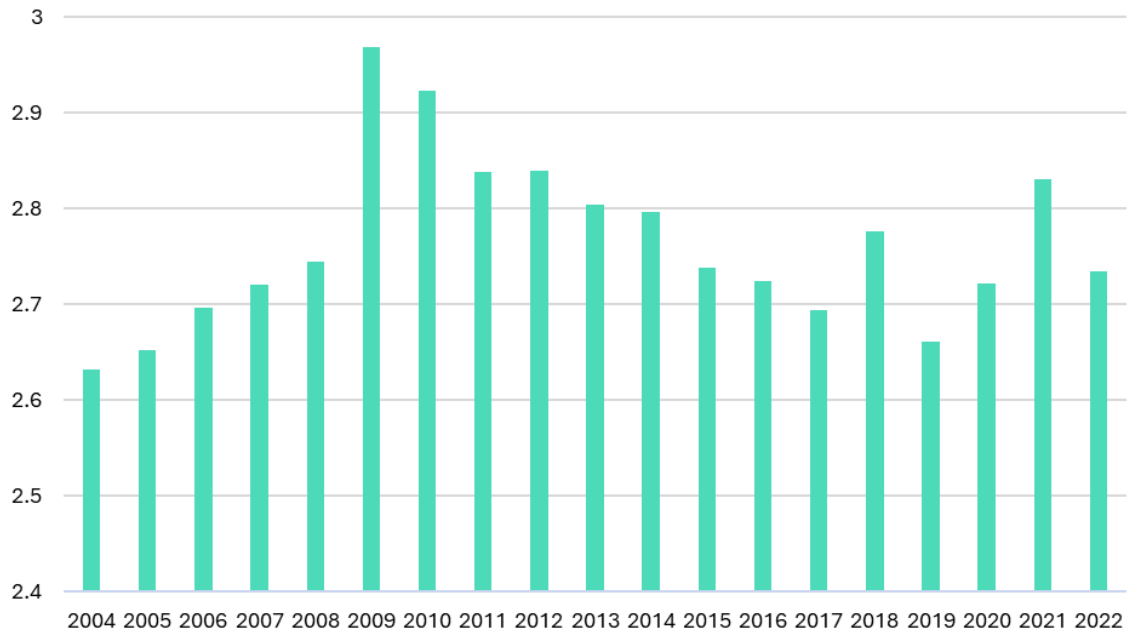
Figure 3.2. Sectors by productivity dispersion (p90-p10) (2004–2022)



Source: CompNet and Bank of Lithuania calculations.
Note: Productivity gaps are defined as the difference between the 90th and 10th percentiles of log productivity. Using log differences makes the gaps comparable over time and avoids distortions when productivity levels are very small or negative. The heatmap shows the 30 sectors that appeared most frequently among the top 10 sectors with the largest gaps in each year, and sectors are ordered by how often they were in this top 10 list (and by their average gap when frequencies were equal).
Detailed description of NACE classification can be found in NACE Rev. 2 - Statistical classification of economic activities.

When looking at the developments over time, the heatmap shows no clear sign that dispersion in the top sectors has been narrowing. Consistent dark shading suggests that large productivity differences between firms have remained persistent and that there is little evidence of convergence. However, similar patterns can be seen at the aggregate level. This shows that the persistence of productivity gaps is not limited to a specific sector but reflects broader developments in the Lithuanian economy. To examine this, the next step is to look at how productivity dispersion has evolved over time at the country level.

Figure 3.3. Evolution of the labour productivity gap between the most and least productive firms in Lithuania (2004–2022)



Source: CompNet and Bank of Lithuania calculations.

From Figure 3.3, there is no clear sign that the productivity gap has narrowed at the aggregate level over time. Sustainable narrowing of productivity gaps is only possible if laggard firms improve faster than frontier firms and gradually catch up. A gap could also shrink if frontier firms stopped improving, but this would not be beneficial for the overall economy. Therefore, it is important that low-productivity firms are able to learn and adopt best practices from more productive firms. This requires better diffusion of knowledge and technology across firms. In practice, this can be supported by investing in workers' skills, improving digital infrastructure so that smaller firms can use modern technologies, reducing financial constraints that limit firms' ability to do so, and making sure that inefficient firms can exit the market more easily so that resources are reallocated towards more productive uses. Otherwise, weak firms will continue to drag down productivity growth.

Large and persistent productivity gaps between frontier and laggard firms implies that technologies do not spread well and resources are not moving to the most productive firms. Evidence suggests that policies should focus on three areas: firm dynamism, skills and labour mobility. Lower regulation and entry barriers, together with better access to finance, especially for digital and intangible investments, can help more productive firms grow and adopt new technologies. At the same time, making it easier for inefficient firms to exit the market, including through simpler insolvency procedures, can free up resources for more productive uses. Also, vocational training and on-the-job learning can reduce skill gaps and help firms use these technologies more effectively. Finally, making it easier for workers to change jobs can help labour move to more productive firms and improve overall efficiency.[31] [32]

[31] OECD (2015), *The Future of Productivity*

[32] OECD (2023), *OECD Economics Department Working Papers No. 1819*

4. The role of capacity utilisation in productivity developments

Prepared by Kasparas Vasiliauskas

Since 2022, Lithuania's convergence towards the EU average in living standards has slowed owing to slower labour productivity growth. An important factor behind this slowdown was an adverse change in the utilisation of production factors. During 2022–2024, as demand weakened, capital was used less intensively, while labour utilisation did not decline. On the contrary, owing to labour shortages and expectations that the economic slowdown would be temporary, firms did not reduce employment and instead increased both employment and hours worked. Taken together, these developments mechanically reduced labour productivity. During the global financial crisis, labour productivity developed differently: as capital utilisation declined, firms also reduced labour utilisation, initially by shortening working hours and later by reducing employment. As a result, hours worked and labour input declined more sharply and adjusted more closely to the fall in output. The latest data indicate that the current slowdown in labour productivity growth so far resembles a cyclical deviation from the previous trend more than a structural break.

Capacity utilisation affects productivity through both cyclical and cumulative channels. In the short run, the effect depends on changes in the intensity with which capital and labour are used. As demand increases, firms use their existing capital more intensively and can therefore produce more with the same labour input, raising labour productivity. At the same time, however, employees may work longer hours. If hours worked increase faster than output, output per hour declines and labour productivity growth slows. The overall short-run effect therefore depends on changes in capital utilisation, hours worked and output.

Over the longer run, capacity utilisation matters not only for the current level of labour productivity but also for its growth potential. Strong and stable demand encourages firms to invest, specialise, accumulate knowledge and gain practical experience, whereas prolonged underutilisation suppresses these processes. A slowdown that is initially cyclical can therefore become persistent.

To quantify the short-run role of capacity utilisation and distinguish it from structural factors affecting labour productivity, the analysis decomposes labour productivity growth into the contributions of capital utilisation, labour utilisation on the intensive margin, capital per employee and measured TFP. The starting point is a constant-returns-to-scale Cobb–Douglas production function[33]:

$$Y_t = A_t(c_t K_t)^{\alpha}(h_t L_t)^{1-\alpha} \tag{4.1}$$

where Y_t denotes output in period t, A_t measures total factor productivity, c_t is time–varying capacity utilization of capital, K_t is capital stock, h_t is average number of hours worked per employee, L_t is total number of employees, α – capital income share. By dividing the previous equation by total number of hours

[33] The methodology follows Box 1, "Measuring TFP growth and its contribution to labour productivity growth: the importance of accounting for capacity utilisation," in ECB (2021), *Key Factors behind Productivity Trends in EU Countries*. The ECB framework adjusts conventional growth accounting for time-varying capital utilisation and assumes that changes in the utilisation of employment are captured by hours worked. The present analysis further decomposes total hours worked into employment and average hours per employee, making the intensive labour-utilisation margin explicit.

worked and taking logarithmic differentiation with respect to time, labour productivity growth can be expressed as follows:

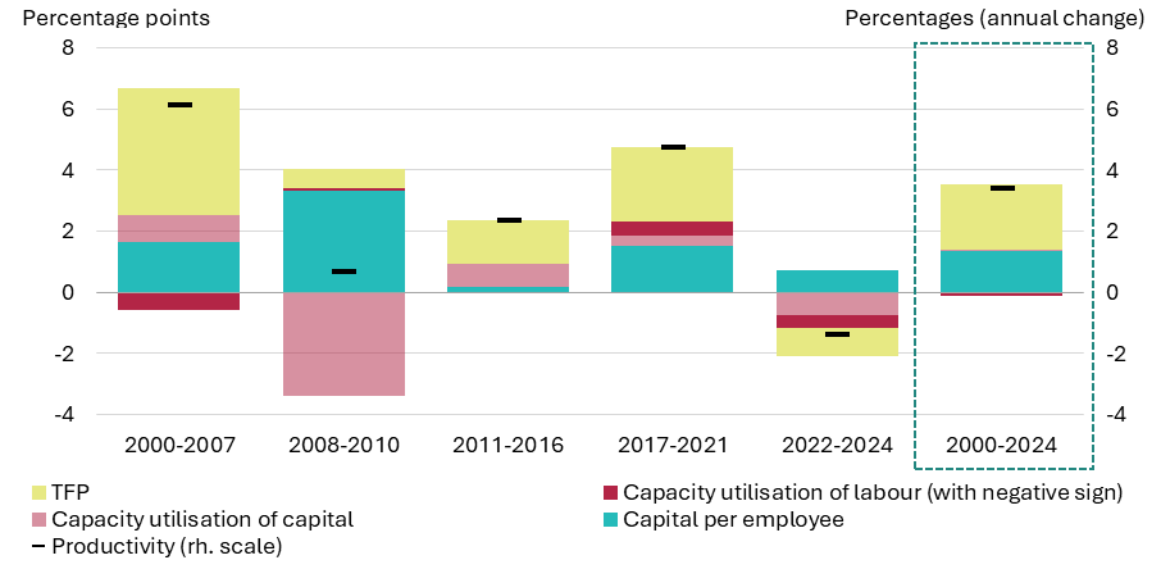
$$gy_t \approx gA_t + a_t k_t + a_t gc_t - a_t gh_t \quad (4.2)$$

Equation (4.2) decomposes labour productivity growth (gy_t) into measured TFP growth (gA_t)[34], capital deepening (capital per worker, $a_t k_t$), changes in capital utilisation ($a_t gc_t$) and changes in labour utilisation on the intensive margin ($a_t gh_t$). The decomposition therefore identifies the immediate contribution of changes in factor utilisation to labour productivity growth. Comparing the depth, duration and aftermath of these changes also makes it possible to assess whether a cyclical capacity-utilisation shock has begun to affect the economy's long-term labour productivity trajectory.

The decomposition results show that over the full 2000–2024 period, Lithuanian labour productivity growth was driven primarily by TFP growth and capital deepening, while capacity utilisation played a broadly neutral role on average (Figure 4.1). Higher utilisation during expansions broadly offset utilisation-related drags during downturns, although its contribution varied considerably across periods.

TFP was the largest contributor throughout the analysed period. In the early 2000s, TFP growth was exceptionally rapid, supported by technology adoption, structural transformation and institutional modernisation around Lithuania's accession to the EU. As Lithuania's income level approached the EU average, the scope for continuing to benefit relatively easily from the growth potential offered by convergence diminished, and TFP growth therefore slowed. Capital deepening also contributed positively, supported by investment, but generally played a complementary role to TFP growth.

Figure 4.1 Decomposition of labour productivity growth



Sources: Eurostat and Bank of Lithuania calculations.

[34] TFP is measured as a residual and should not be interpreted as a pure measure of technological or structural efficiency. It may also capture changes in labour quality and sectoral composition, unmeasured factor utilisation, variations in effort and measurement error.

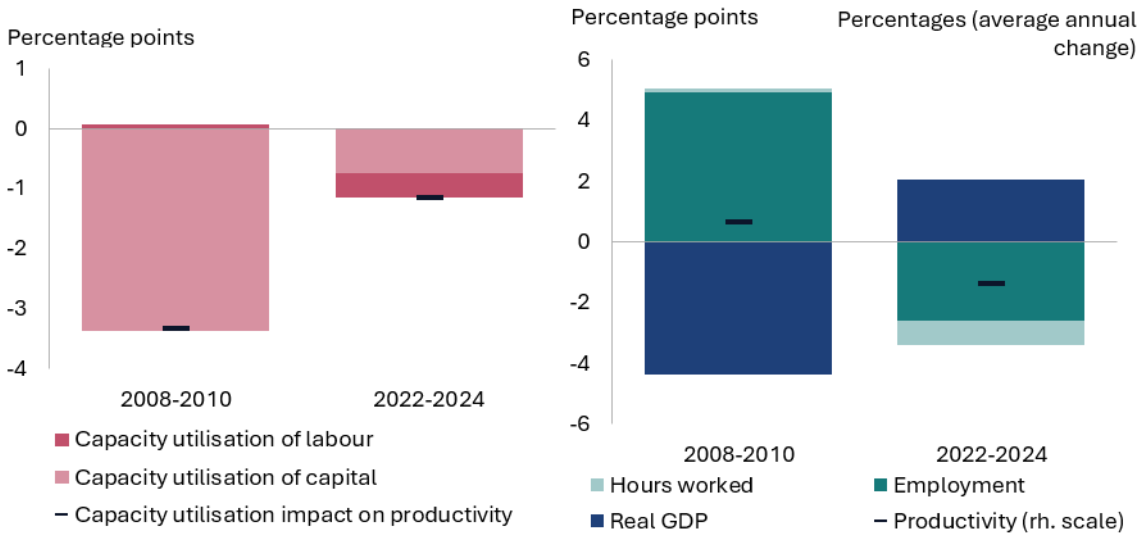
The role of capacity utilisation was most visible during Lithuania's two principal productivity slowdowns, in 2008–2010 and 2022–2024 (Figure 4.2). In both episodes, weaker demand reduced the intensity of capital utilisation, but labour utilisation responded very differently to the change in economic conditions. This largely explains the different effects of factor utilisation on labour productivity.

During the global financial crisis, as output and capital utilisation fell significantly, firms gradually reduced labour utilisation as well. They initially shortened working hours and, as the downturn persisted, also reduced employment. Labour input, measured by hours worked, therefore adjusted relatively quickly to the decline in output. Although lower capital utilisation weighed on labour productivity, declining labour utilisation partly offset this effect, and labour productivity changed relatively little over 2008–2010 as a whole.

The changes in labour utilisation were the opposite in 2022–2024. Persistent labour shortages made workers difficult to replace, while expectations that the slowdown would be temporary encouraged firms to retain them. Employment and average hours worked therefore continued to increase despite weaker activity. As output grew more slowly than hours worked, output per hour declined. Labour productivity growth was therefore adversely affected by both lower capital utilisation and relatively more intensive labour utilisation.

The key difference between the two periods lies in the labour-market response to weaker demand. During the global financial crisis, labour utilisation declined together with output, whereas in 2022–2024 firms retained employees and even increased labour utilisation. As a result, factor utilisation had a considerably more adverse effect on labour productivity in the latter period.

Figure 4.2. Factor-utilisation and labour-input adjustments during the 2008–2010 and 2022–2024 slowdowns



Sources: Eurostat and Bank of Lithuania calculations.

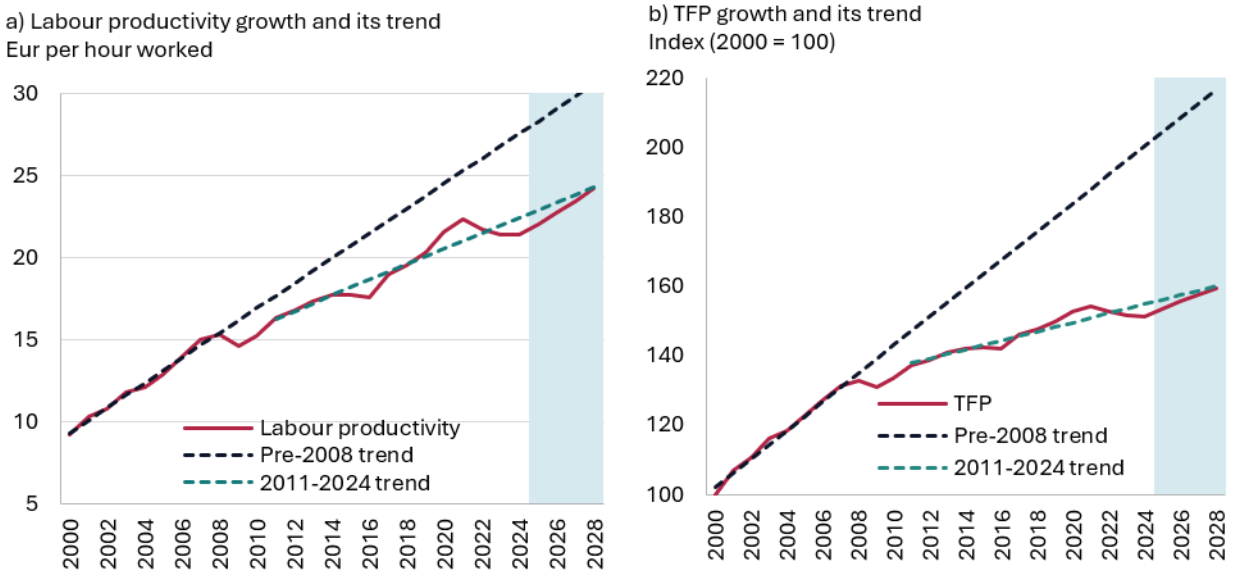
The different ways in which firms adjusted during the two periods of slower labour productivity growth also affected subsequent labour productivity growth. The global financial crisis was followed by a lasting slowdown in TFP and labour productivity growth, whereas the recent episode remains closer to a temporary deviation from the post-2010 trend (Figure 4.3).

The post-2008 slowdown reflected both the correction of earlier imbalances and the persistent effects of the crisis. Before 2008, rapid credit expansion, buoyant domestic demand and strong investment supported exceptionally fast growth, but part of this activity was based on expectations that could not be sustained. The

crisis brought this unbalanced trajectory to an end. The prolonged period of weak capacity utilisation that followed then deepened the adjustment: low expected returns held back investment, emigration reduced the domestic supply of labour and skills, and weaker production interrupted organisational and technological learning. The slower post-2010 labour productivity path therefore reflected both a transition from unsustainably rapid pre-crisis growth to more moderate growth rates and the longer-lasting consequences of the crisis.

The slowdown in labour productivity growth in 2022–2024 has so far looked different. The slowdown was considerably smaller, investment continued to increase, and firms retained the employees and production capacity needed to expand activity as demand recovers. The latest data and Bank of Lithuania projections indicate that, following this temporary deviation, labour productivity and TFP should move back towards the trends established after 2010. The slowdown in labour productivity growth in 2022–2024 is therefore, for now, better regarded as cyclical rather than as a new structural break similar to that which emerged after the global financial crisis.

Figure 4.3. Labour productivity and TFP: actual levels and trends



Sources: Eurostat and Bank of Lithuania calculations.
Note: shaded areas in graphs refer to Bank of Lithuania projection periods.

Even if the cyclical recovery in labour productivity continues, labour productivity growth in Lithuania is likely to slow over the medium term. So far, its most important driver has been TFP, supported by technology adoption, structural change and institutional convergence. However, as Lithuania approaches EU income and technological-development levels, the importance of these relatively readily accessible sources of labour productivity growth is diminishing.

The experience of other countries supports the expectation that labour productivity growth will slow. Comparing Lithuania's labour productivity level with that of the founding EU members[35] and the Nordic countries[36] at the point when their labour productivity was similar to Lithuania's 1995 level reveals a similar labour productivity

[35] The founding EU members, also known as the 'Inner Six' of the European Communities, are the countries that established the European Economic Community, which was later succeeded by the European Union: West Germany (later Germany), France, Luxembourg, the Netherlands, Belgium and Italy. The analysis includes all of these countries except Luxembourg.

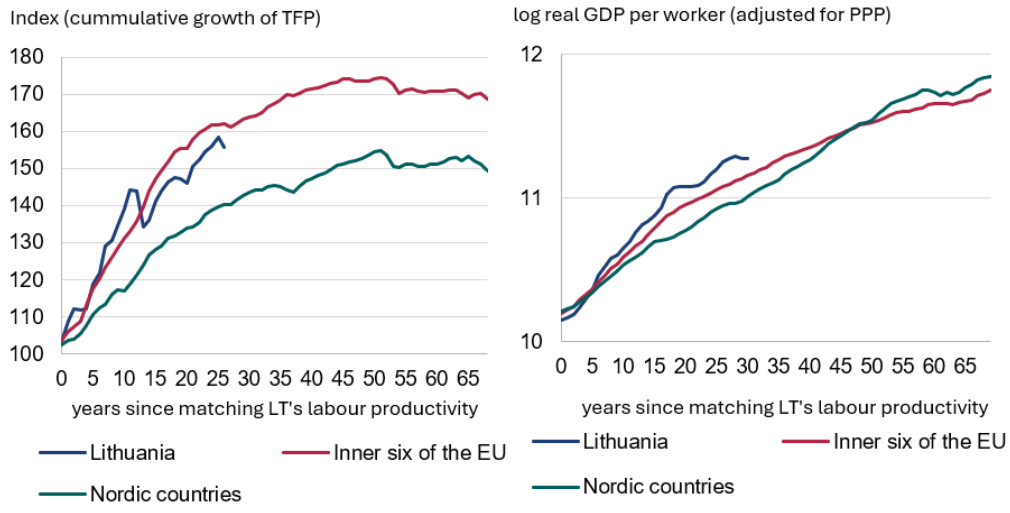
[36] Nordic countries in the analysis are Finland, Sweden, Denmark and Norway.

growth path[37]. During the first decades, rapid labour productivity growth in these countries was driven by particularly strong TFP growth, but as their economies matured, TFP growth slowed. Lithuania's development has so far followed a similar pattern: rapid TFP growth during the early stage of convergence has already slowed considerably, although labour productivity continues to increase. This suggests that Lithuania is moving into a more mature stage of economic development, in which future labour productivity growth is likely to be more moderate and increasingly less reliant on previously accessible sources of TFP growth.

At this stage, capacity utilisation also becomes increasingly important for long-term labour productivity growth. As it becomes more difficult to accelerate labour productivity growth simply by adopting technologies already used in other countries or by reallocating resources towards more productive activities, investment, innovation, workers' skills and the accumulation of knowledge within firms become increasingly important. Prolonged weak demand and insufficient capacity utilisation may hinder these processes by reducing incentives to invest, slowing the accumulation of workers' skills and limiting learning-by-doing.

At an earlier stage of Lithuania's convergence, such temporary slowdowns in labour productivity were less significant because there was still considerable scope to adopt the technologies and business models of more advanced economies. Once economic conditions normalised, it was easier to return to the previous labour productivity growth path. However, as Lithuania approaches the technological frontier, this "buffer" is diminishing: labour productivity growth increasingly depends on capabilities that are accumulated continuously and are specific to individual firms, and these are considerably more difficult to rebuild after a prolonged interruption. Prolonged cyclical weakness and insufficient capacity utilisation may therefore not only have a short-term effect on labour productivity but also weaken its future growth potential. As Lithuania moves into a more mature stage of convergence, what matters is not only how quickly demand and labour productivity recover, but also whether conditions for investment, innovation and human capital accumulation are maintained.

Figure 4.4. TFP and labour productivity developments from the point at which other countries' labour productivity levels matched Lithuania's 1995 labour productivity level[38]



Sources: University of Groningen, Eurostat and Bank of Lithuania calculations.

[37] The comparison of Lithuania's growth path to that of its comparables is inspired by Fernandez-Villaverde, Ohanian and Yao (2023) (available here.)

[38] Lithuania's 1995 labour productivity matching year for West Germany (later Germany) was 1962, France – 1959, Luxembourg – 1954, the Netherlands – 1954, Belgium – 1954, Italy – 1964, Finland – 1964, Sweden – 1954, Denmark – 1955 and Norway – 1954.

Capacity utilisation is an important factor affecting labour productivity developments. In the short run, lower capital utilisation weighs on labour productivity, although the overall effect also depends on how labour utilisation adjusts to changes in demand. This can be clearly seen by comparing the two periods of economic slowdown. During the global financial crisis, labour utilisation declined alongside capital utilisation, and labour productivity therefore remained broadly unchanged. In 2022–2024, by contrast, capital utilisation declined while employment and hours worked continued to increase, resulting in a considerably more adverse effect on labour productivity.

Over the longer run, capacity utilisation is also important for the economy's productivity growth potential. Prolonged underutilisation can discourage investment, innovation, specialisation and learning-by-doing, thereby reducing the scope for labour productivity growth over time. This risk becomes particularly important as Lithuania moves into a more mature stage of economic development, in which growth can rely less on technology adoption and increasingly on knowledge and capabilities accumulated domestically. High and stable capacity utilisation is therefore important not only for the current recovery in labour productivity, but also for its sustainable growth and Lithuania's further convergence towards the EU average.

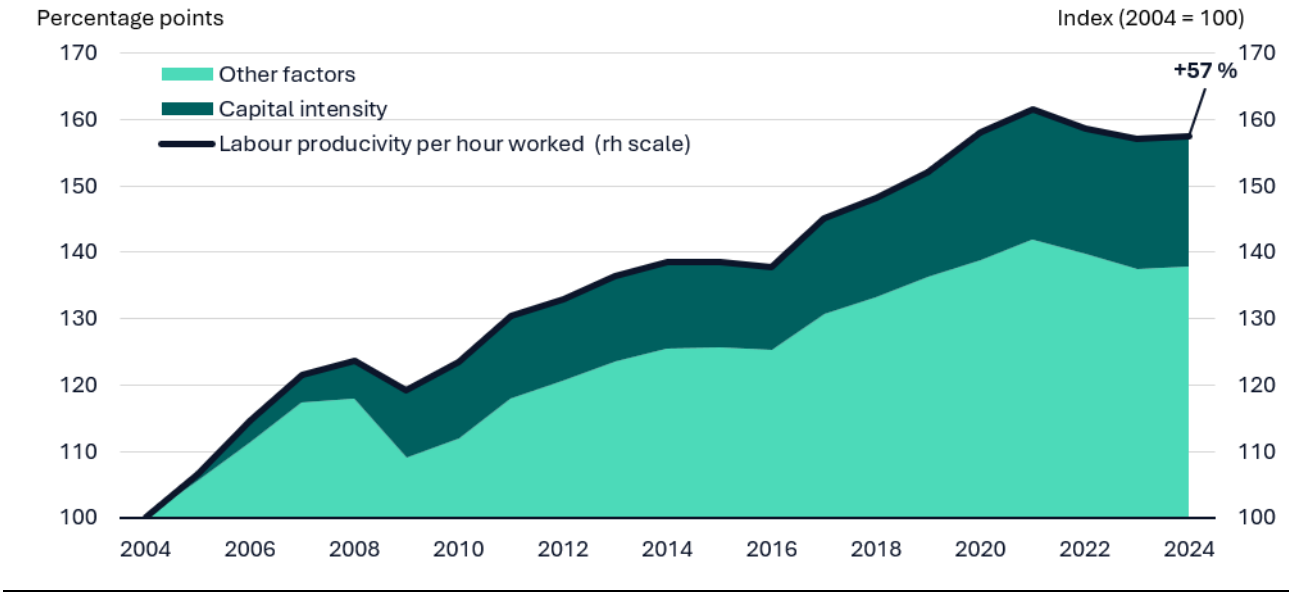
5. More capital, more productivity? Exploring Lithuania's capital intensity

Prepared by Darius Imbrasas

Capital intensity has been an important driver of labour productivity growth in Lithuania during the country's convergence period following EU accession. It captures the extent to which workers are supported by physical and intangible assets in the production process. Recent stagnation in labour productivity raises the question of whether weaker capital intensity has contributed to this slowdown. This section examines the evolution, drivers, and sectoral composition of capital intensity in Lithuania.

Capital intensity can be defined as the amount of capital, which includes various buildings, machinery, means of transport or intellectual property products, that a person works with on average per hour worked. This indicator is closely related to investment developments in the country, as growth of accumulated capital is one of the main contributors to increasing capital intensity.

Figure 5.1. Decomposition of labour productivity per hour worked in 2004–2024



Sources: Eurostat and Bank of Lithuania calculations.

As shown in Figure 5.1, capital intensity has been very important for the development of labour productivity in Lithuania. Since Lithuania's accession to the European Union (in 2004) until 2024, it has accounted for about one-third of the increase in labour productivity per hour worked. During this period labour productivity per hour worked in Lithuania increased on average by 2.9 %. Capital intensity contributed on average by 1.0 percentage point per year[39] to labour productivity growth, while the contribution of all other factors amounted to 1.9 percentage points. The gains in labour productivity per hour worked in recent years have stalled, after reaching the peak in 2021 labour productivity was on a slight downward path in 2022–2024. Although factors other than

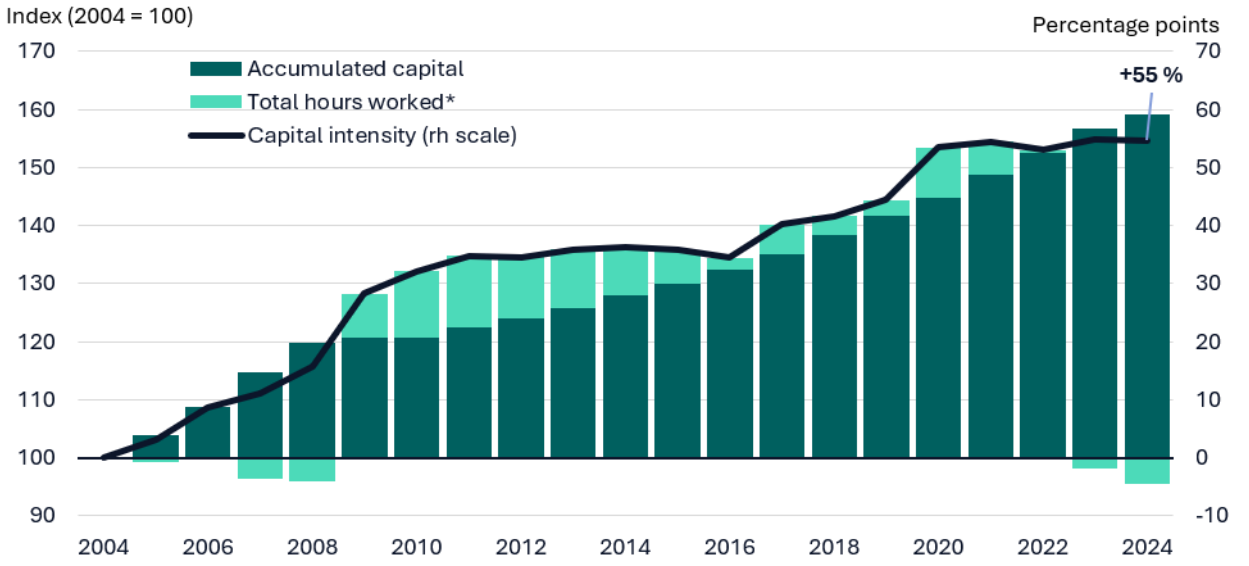
[39] Capital share in the economy was estimated using the approach provided in a box "Potential GDP development and outlook in the medium term" published in Lithuanian Economic Review (February 2013). Updated estimates suggest that capital share in Lithuania's economy stands at 0.36, while labour share stands at 0.64. One should note that larger capital share estimate would result in a higher capital intensity impact on labour productivity growth.

capital intensity accounted for most of the decline in labour productivity, the weakening of capital intensity also contributed to this decline. Capital intensity has essentially remained unchanged since 2021.

To understand the factors responsible for these developments in capital intensity, it is useful to examine the drivers of its change. As mentioned earlier, this indicator reflects the amount of capital an employee works with, on average, per hour worked. Therefore, to better understand the evolution of capital intensity, it is necessary to assess changes in two components: accumulated net fixed assets (hereinafter referred to as accumulated capital) and the number of hours worked by employed persons.

As can be seen from Figure 5.2, accumulated capital in Lithuania grew steadily over almost the entire period under review and made the largest contribution to the increase in capital intensity. The continued growth indicates that both the business sector and the public sector have continued to invest. New investment was significantly higher than the depreciation of previously accumulated capital in many sectors. Accumulation of capital in some sectors (industry, government sector activities, arts, entertainment and recreation activities) in 2021–2024 was more than twice as high as in the five-year period before the COVID-19 pandemic (2015–2019), while in most other sectors it was 40-70 per cent higher. Only in a few activities the level of annually accumulated capital remained similar or decreased, namely in agriculture, finance and insurance activities.

Figure 5.2. Decomposition of capital intensity in 2004–2024



Sources: Eurostat and Bank of Lithuania calculations.
* One should note that the number of hours worked affects capital intensity through an inverse relationship; an increase in hours worked reduces the growth of capital intensity.

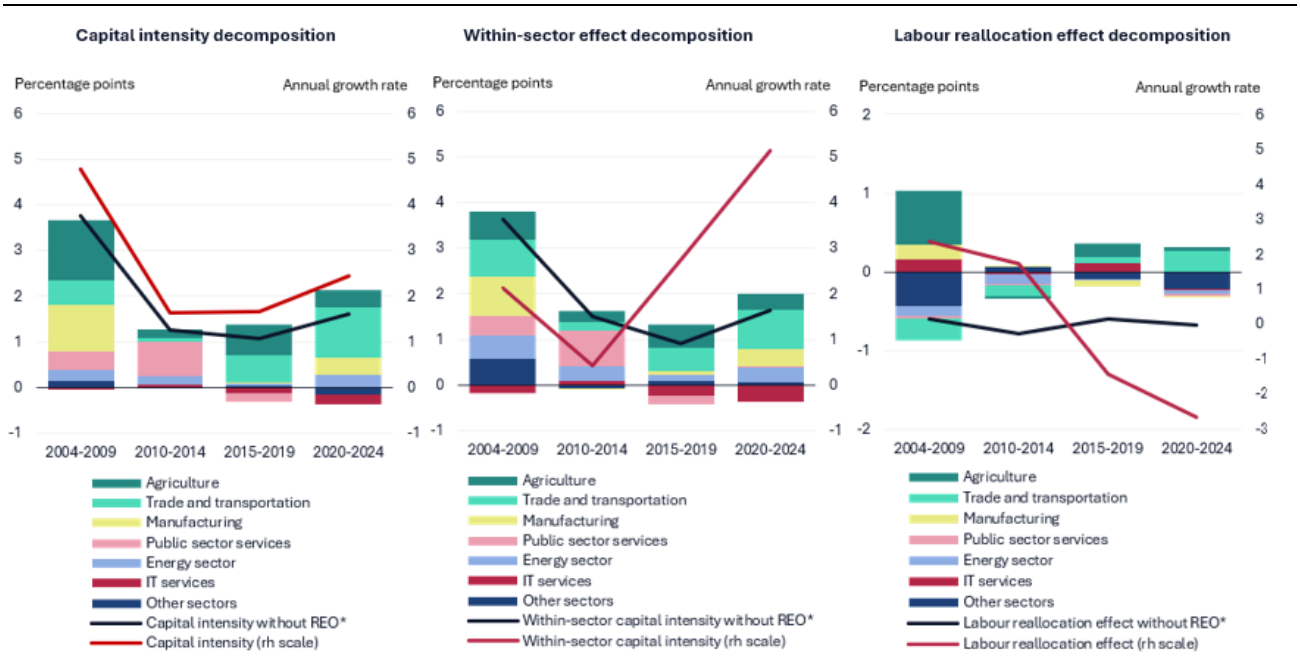
The development of the number of hours worked varied much more markedly. It was precisely the rapid growth in the number of hours worked by Lithuania's population that led to capital intensity not increasing significantly from its 2020 level, even despite a fairly substantial rise in accumulated capital. As shown in Figure 5.2, a particularly large adjustment in the number of hours worked occurred in 2020, when, due to the COVID-19 pandemic and the restrictions introduced, some companies in the country were completely closed for a certain period. As a result, some firms laid off part of their workforce or reduced employees' working hours.

Nevertheless, the economy did not remain in this stagnation for long; already the following year economic activity picked up, the demand for workers recovered and their working hours gradually began to increase again. It should be noted that, looking at the longer-term trend, the development of hours worked remained fairly

steady. In 2015–2019, the number of hours worked in Lithuania grew by an average of 1.2% per year, while in 2020–2024 it increased only slightly faster, at 1.5%. This modest acceleration is mainly attributable to the IT, professional and administrative services, public services and agriculture sectors.

Sectorial decomposition of capital intensity increase indicates that throughout 2004–2024, a majority of the gains were driven by only a few sectors – real estate operations, agriculture, trade and transportation and manufacturing (see Figure 5.3). The major gains were achieved through within-sector capital intensity increases, while labour reallocation effects were quite small, especially after the global financial crisis.

Figure 5.3. Shift-share decomposition of capital intensity



Sources: Eurostat and Bank of Lithuania calculations.
* Real estate operations.

The high contribution of real estate operations to economy-wide capital intensity is strongly influenced by statistical methodology, which classifies the majority of a country's housing stock under real estate operations activity. However, only a small share of this housing stock is used in the creation of value added (with majority being owned by households). As a result, the combination of a low number of hours worked and a large housing capital stock significantly inflates the sector's capital intensity indicators. Therefore, the subsequent analysis of sectoral capital intensity developments does not examine real estate activities in detail, although the results for this sector are still presented in Figure 5.3.

Regarding agriculture, trade and transportation, and manufacturing, these sectors were the main drivers of capital intensity gains throughout most of the 2004–2024 period. The only exception was 2010–2014, immediately following the global financial crisis, when the majority of capital intensity gains occurred in public sector services (public administration, defence, education, human health, and social work activities). In agriculture, the strongest gains were observed during 2004–2008, although capital intensity increased over the entire 2004–2024 period. Prior to the global financial crisis, these gains were driven mainly by labour resource optimisation, whereas in the subsequent period - partly due to the EU funding - increased investment also contributed to capital intensity growth. In manufacturing, the largest capital intensity gains were likewise recorded in 2004–2008. However, unlike agriculture, manufacturing capital intensity remained largely

unchanged for nearly a decade thereafter. Only after 2019 did capital intensity in manufacturing begin to rise again, as the sector started shifting from more labour-intensive to more capital-intensive production. Capital intensity gains were also observed in the trade and transportation sector throughout the 2004–2024 period. In contrast to agriculture and manufacturing, the strongest growth in this sector occurred in recent years and was driven mainly by increased investment and technological innovation, which enabled labour resource optimisation, particularly in the trade sector.

Among the largest economic activities, the IT sector[40] is the only one in which capital intensity has been on a downward trend for almost a decade. This development is particularly striking given that the IT sector has been one of the main drivers of Lithuania's economic growth since the COVID-19 pandemic. A deeper analysis of IT sector developments over the past decade indicates that the sector has undergone substantial structural change: previously dominated by telecommunications companies, it is now driven by IT, data, and gaming companies[41]. This shift may be the main factor behind the decline in capital deepening, as investment–and thus capital intensity–in the telecommunications sector (NACE code J61) is much higher than in computer programming, consultancy, and other information service activities (NACE codes J62–J63). Data show that during 2020–2024, the ratio of investment in tangible assets per hour worked in the telecommunications sector amounted to 11.6 euros, compared with only 0.7 euros in the other abovementioned sector (in chain-linked volumes).[42]

In 2020–2022, out of the main sectors contributing the most to capital intensity growth, only transportation was among the sectors with high level of capital intensity (see Figure 5.4). Agriculture and manufacturing capital intensity was close to the whole economy's level (without real estate operations) while in trade it was among the lowest among all the sectors. Sectorial comparison also shows that the energy sector[43] has by far the biggest capital intensity level in the economy, standing at 444 euros per hour worked, which is more than 11 times larger than country's average level (39 euros per hour worked). At the same time the lowest level of capital intensity is in arts and entertainment at 9 euros per hour worked. As can be seen from Figure 5.4, other sectors' capital intensity is between 17.5 and 62.3 euros per hour worked, indicating quite a significant difference between the most and least capital-intensive sectors.

Lithuania's capital intensity, including real estate operations, levels are still significantly lower than the EU average. Even though Lithuania's capital intensity grew quite strongly, in 2020–2022 its capital intensity level was the sixth lowest in the EU. During this period, in real terms it accounted to almost 80 euros per hour worked, compared to 150 euros per hour worked in the EU as a whole. When comparing the differences between sectorial capital intensity in Lithuania and in the whole EU, a quite similar picture emerges. As in Lithuania, the whole EU's energy sector has the largest capital intensity among sectors, with transportation, IT services and public sector also being among the most capital-intensive sectors. Sectors with the lowest capital intensity are also broadly the same in Lithuania and the EU overall, but in contrast to Lithuania, where arts and entertainment had the lowest level of capital intensity, in the EU overall it is accommodation and food service activities and trade. The comparison between Lithuania and the whole EU also shows that finance and insurance, manufacturing and arts and entertainment in Lithuania have markedly lower capital intensity than one would expect looking at solely EU-level data.

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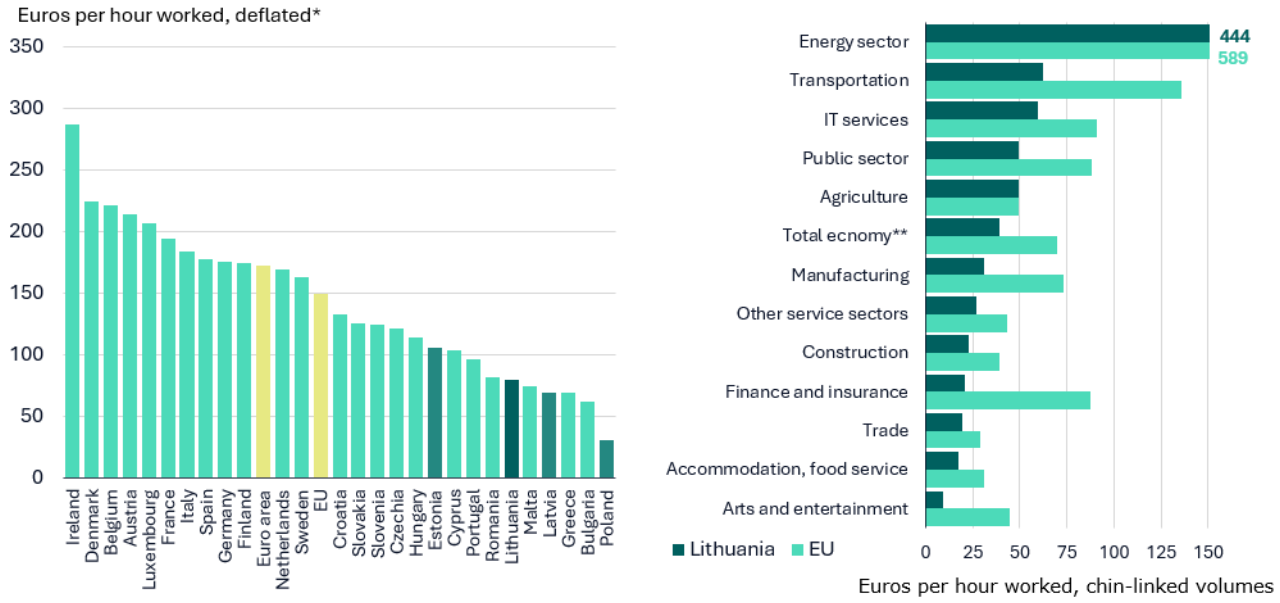
[40] Corresponds to NACE section I.

[41] For more details see box „Information and communication activity: trends and breakthrough drivers" published in Lithuanian Economic Review (September 2025).

[42] Similar findings were found for other EU countries, see Pianta, M. (2019). The Challenge of digitalization for firms in developing countries. Inclusive and Sustainable Industrial Development Working Paper Series WP 18 | 2019, United Nations Industrial Development Organization.

[43] Corresponds to NACE sections B, D and E.

Figure 5.4. Capital intensity levels among EU member states in 2020–2022 (left-hand graph) and capital intensity sectorial level comparison between Lithuania and EU average in 2020–2022 (right-hand graph)



Sources: Eurostat and Bank of Lithuania calculations.
* Capital intensity is calculated as the ratio between nominal total fixed assets (net) calculated at current replacement costs and total employment (domestic concept) in hours worked. Deflation is done using price level indices for gross fixed capital formation.
** Excluding real estate operations activity.

In conclusion, capital intensity has played a crucial role in Lithuania's labour productivity growth since joining the EU, accounting for roughly one-third of productivity growth. However, productivity gains have slowed in recent years. This slowdown is partly linked to stagnating capital intensity since 2021, which was driven by hours worked, offsetting observed gains in capital per worker. Accumulation of capital remained strong across most sectors, particularly after the COVID-19 pandemic, with notable contributions from manufacturing, trade, transportation, and agriculture. Despite observed gains, Lithuania still lags behind the EU average in terms of capital intensity levels. Overall, while investment continues to support economic development, further growth in capital intensity will be essential for sustaining long-term productivity improvements. Thus, policymakers should further encourage higher levels of investment, especially in high value-added generating industries. Empirical research[44] suggests that maintaining high levels of investment requires a stable and predictable macroeconomic environment. The strongest evidence supports policies that deepen financial and capital markets, maintain low inflation and macroeconomic stability, reduce policy uncertainty through credible and predictable rules, and expand productive public infrastructure and R&D investment that crowd in private capital. They also point to the importance of strong institutions and rule of law, effective competition policy that supports business dynamism, and improved financing conditions for startups and intangible investment.

[44] See, e.g., Dlugosch, D., M. Glanville, J. Hooley, F. Ozturk and B. Westmore (2025), *Understanding the weakness in business investment: A cross-country analysis*, OECD Economics Department Working Papers, No. 1836, OECD Publishing, Paris.

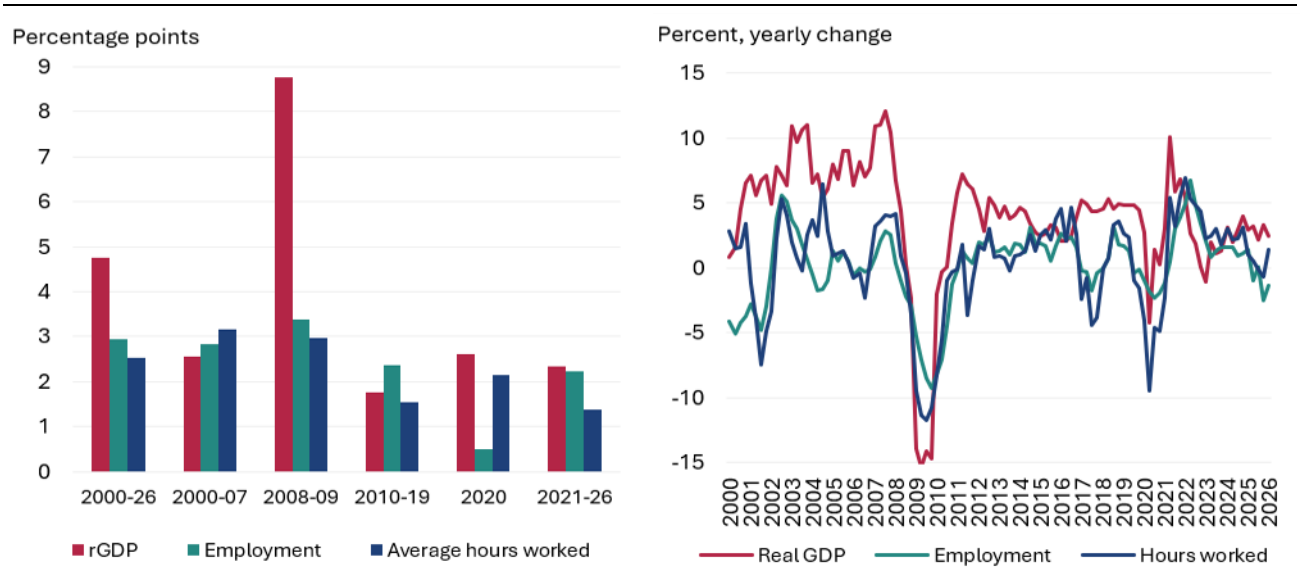
6. Labour hoarding as a cyclical productivity adjustment mechanism

Prepared by Rokas Budrauskas

Labour hoarding refers to firms' deliberate decision to retain more workers than required by the current level of output. Rather than adjusting employment immediately in response to demand fluctuations, firms underutilise labour, making employment less volatile than output over the business cycle and generating pro-cyclical labour productivity. This behaviour might reflect uncertainty about future demand, sunk investment in firm-specific skills, or the presence of hiring and firing costs. Importantly, labour hoarding should be distinguished from generic labour-market rigidity: while institutional constraints or matching frictions can also slow employment adjustment, labour hoarding emphasises firms' strategic choice to postpone separations in anticipation of recovery. In economies such as Lithuania, persistent demographic decline and population ageing further reinforce incentives to hoard labour. These structural trends raise expected hiring costs and vacancy durations, increasing the incentive to retain existing workers during downturns.[45]

As an initial assessment of labour hoarding, we compare the cyclical volatility of output and employment. If firms hoard labour, employment should adjust less than output during business cycle fluctuations, resulting in lower employment volatility. Over the past two and a half decades, the standard deviation of real GDP growth in Lithuania has been around 1.6 times higher than that of employment growth (Figure 6.1, left-hand graph). The difference primarily reflects the global recession when output contracted sharply and the COVID-19 pandemic shock when employment remained broadly unchanged. Both episodes show signs of labour hoarding behaviour by firms. However, the specific adjustment channels differed. Between the crisis episodes all three variables deviated similarly.

Figure 6.1. Standard deviation of employment, average hours and real GDP growth* (left-hand graph) and Employment, hours worked and real GDP (right-hand graph)



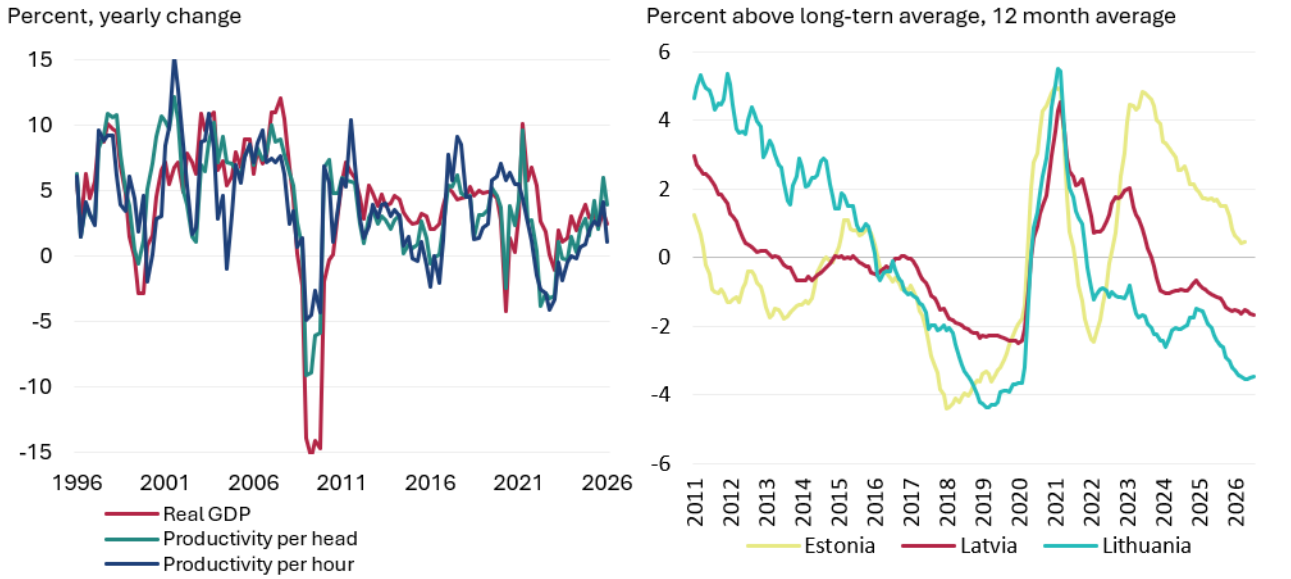
Sources: Eurostat and Bank of Lithuania calculations.
*Graphs use seasonally unadjusted data, unless specified otherwise.

[45] See, e.g., ECB (2003, July) Labour hoarding in the euro area. *Monthly Bulletin* (Box 4, p. 30-31).

During the financial crisis, real GDP declined more strongly than employment or hours worked. In 2020, by contrast, hours worked fell more than real GDP, as employment losses were limited by the widespread use of job-retention schemes and labour market adjustment occurred primarily through a reduction in average hours worked per worker. These differences in the adjustment of output and labour input are also reflected in the measured labour productivity (Figure 6.1, right-hand graph). During typical downturns, output adjusts more sharply than employment or hours worked, causing measured labour productivity to fall[46]. Recovery phases display the mirror image: GDP usually rebounds faster, while employment and hours recover more gradually, generating pro-cyclical productivity developments.

Both measures of labour productivity in Lithuania, per head and per hour, are pro-cyclical[47]. However, the correlation is stronger with productivity per head, suggesting that real output in Lithuania is more closely associated with changes in labour input than with improvements in hourly labour productivity. One possible explanation is the persistent labour market slack that followed the economic transformation of the early 1990s, when substantial structural change contributed to hysteresis in unemployment. Such conditions persisted until the Great Recession and provided scope for Lithuanian firms to expand output by increasing labour utilisation rather than relying on gains in productivity per hour. Another interesting dynamic is the breakdown in relationship between real GDP and productivity per hour post COVID-19. During the shock, productivity per hour continued to grow despite the output contraction, reflecting abrupt reductions in average hours worked while employment was largely maintained (Figure 6.2, left-hand graph). This productivity response highlights the exceptional nature of the pandemic rather than a structural change in the long-run relationship between real GDP and productivity per hour[48].

Figure 6.2. Labour productivity and real GDP (left-hand graph) and Labour hoarding based on EC business surveys (right-hand graph)



Sources: European Commission business and consumer survey database, Eurostat and Bank of Lithuania calculations.

[46] See, e.g., Fernald, J. G., Li, H., Ochse, M. (2021, August 16) Labor productivity in a pandemic. *FRBSF Economic Letter, 2021*(22)

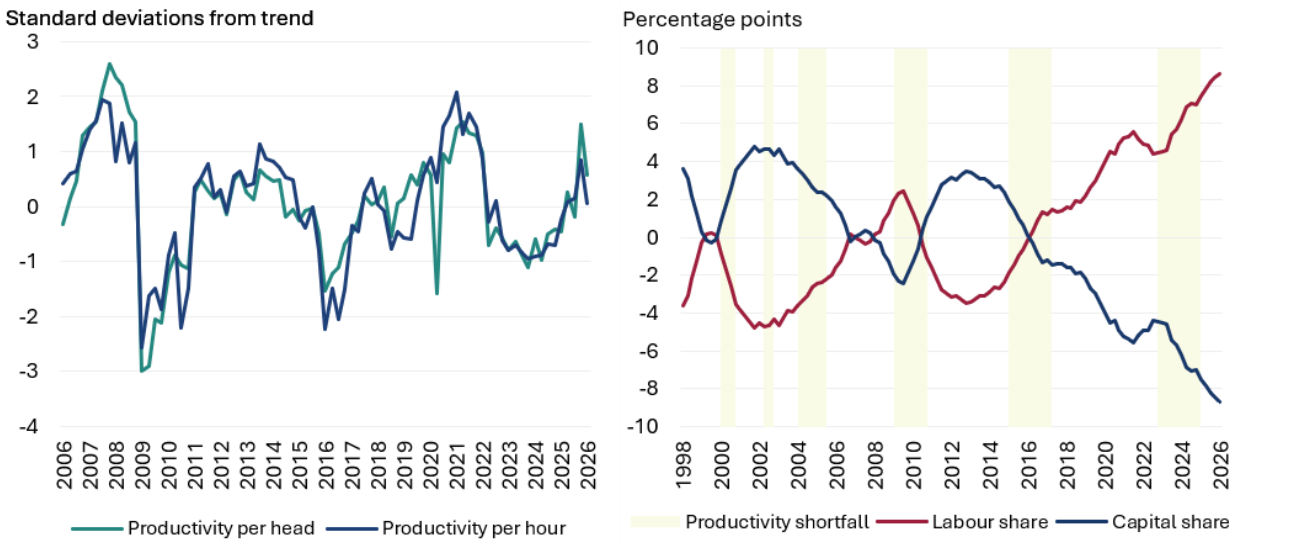
[47] See, e.g., Biddle, J. E. (2014) Retrospectives: The cyclical behavior of labor productivity and the emergence of the labor hoarding concept. *Journal of Economic Perspective*, 28(2), 197-212.

[48] See, e.g., Lalinsky et al. (2024) *The impact of the COVID-19 pandemic and policy support on productivity*, ECB Occasional Paper Series, N. 341.

An additional indicator of labour hoarding is the European Commission's Business and Consumer Survey[49]. Although the survey has been available for Lithuania only since 2010 and therefore does not cover the global financial crisis, it identifies a pronounced increase in labour hoarding from the start of the survey and during the COVID-19 pandemic (Figure 6.2, right-hand graph). The 2011-2016 period should be viewed not as a separate labour hoarding episode but rather as gradual normalisation following the sharp labour hoarding associated with the Great Recession and prolonged output weakness. In Estonia and, to a lesser extent, Latvia, the indicator also points to some labour hoarding following Russia's full-scale invasion of Ukraine in 2022. By contrast, in Lithuania the indicator remained below its long-run average during 2016–2020 and again after 2022, suggesting tighter labour market conditions and limited excess labour.

As the survey indicator is available only from 2010, we complement it by proxying labour hoarding through cyclical variations in labour utilization. We apply the HP filter (λ=1600) to quarterly real GDP and productivity data to isolate the cyclical component of each variable. This component was subsequently standardized by dividing it by its standard deviation, allowing cyclical fluctuations to be interpreted as the number of standard deviations above or below the long-run trend and facilitating comparisons across variables (Figure 6.3, left-hand graph). Because productivity per head incorporates changes in employment whereas productivity per hour controls for hours worked, differences between the two measures provide information about the margin along which firms adjust labour input. A larger deviation from trend in productivity per head than per hour suggests that firms are adjusting labour input through changes in hours worked more than employment, a behaviour consistent with labour hoarding. The clearest example occurred in the second quarter of 2020, with a similar though less pronounced pattern during the global financial crisis. When both productivity measures deviate from their trends to a similar extent, labour hoarding alone is unlikely to fully explain the decline in productivity. Instead, it points to a broader weakness in labour underutilisation and production efficiency, with workers producing less output per hour in addition to any adjustments in employment or hours worked (2015-17, 2022-25).

Figure 6.3. Productivity standardized deviations from trend (left-hand graph) and labour and capital share percentage point deviation from long-term average (right-hand graph)



Sources: Eurostat and Bank of Lithuania calculations.

[49] Labour Hoarding Indicator reports the (weighted) percentage of firms which expect (i) their output to decrease, but (ii) their employment to increase or remain unchanged.

Beyond shaping labour utilisation, labour hoarding may also influence how the economy will recover after an economic shock. Weaker labour market conditions coming from persistent wage restraint can weaken labour-productivity growth by reducing incentives for productivity-enhancing technological upgrading and, in wage-led economies, by dampening aggregate demand[50]. Developments of labour and capital share (Figure 6.3, right-hand graph) indicate that periods of productivity shortfall[51] often coincide with decreasing labour share. During the 1998 and 2008 financial crises, the labour income share initially increased, peaking around one year after the onset of each shock. Thereafter, negative labour productivity deviations coincided with a more persistent decline in the labour income share, which remained below its long-term average even after productivity began to recover[52]. This pattern reflects a delayed labour market adjustment, as persistent economic weakness contributed to wage restraint and increased unemployment. During the pandemic, by contrast, job-retention schemes and income support limited layoffs and helped sustain the wage bill while the decline in the labour income share was modest and short-lived.

The adjustment differed again in 2015-17 and 2023-25, when both productivity measures remained below trend but there was only partial evidence of labour hoarding. During the first episode, Lithuania faced a demand shock following Russia's 2014 embargo that put deflationary pressures on the economy. The labour income share increased above its long-term average and continued to rise, suggesting that employment and wages were resilient. Following the wide-scale Russian invasion of Ukraine, however, the capital income share initially rose, indicating that nominal wage growth lagged behind price and profit growth. Subsequently, as wages gradually adjusted, the decline of the labour income share started to recover. Unlike during the pandemic, this episode reflected a supply shock: higher energy costs and cost-push inflation weighed on real value added and labour productivity, while the initial adjustment occurred through delayed real wage growth rather than substantial employment reductions. Its initial decline therefore reflected a redistribution of income towards capital rather than large-scale layoffs[53]. Overall, the distributional consequences of productivity shortfalls depend on both the nature of the shock and the adjustment mechanism and may also influence the recovery and prospects for future productivity growth.

The extent to which labour hoarding can cushion the effects of a downturn depends critically on the duration of the negative shock and the government's policy response (Figure 6.4, left-hand graph). During the financial crisis, firms initially retained workers despite the sharp fall in output. However, persistent weak demand eventually led firms to unwind labour hoarding. Limited access to external financing constrained the scope for fiscal stimulus, while subsequent austerity further weakened domestic demand and delayed labour market recovery. Labour hoarding therefore absorbed only the initial impact of the downturn: once it was unwound, the adjustment shifted from lower measured productivity towards lower employment and wage restraint. Pre-crisis employment levels were restored only after more than a decade, and the adjustment was accompanied by elevated emigration. Real wages continued to decline even after productivity per head began to recover (Figure 6.4, right-hand graph). Thus, the global financial crisis shows that when aggregate demand remains weak and contractionary fiscal policy suppresses it further, labour hoarding cannot provide a lasting stabilising

[50] See, e.g., Lavoie, M., & Stockhammer, E. (Eds.). (2013). *Wage-led growth: An equitable strategy for economic recovery*. Palgrave Macmillan, International Labour Office.

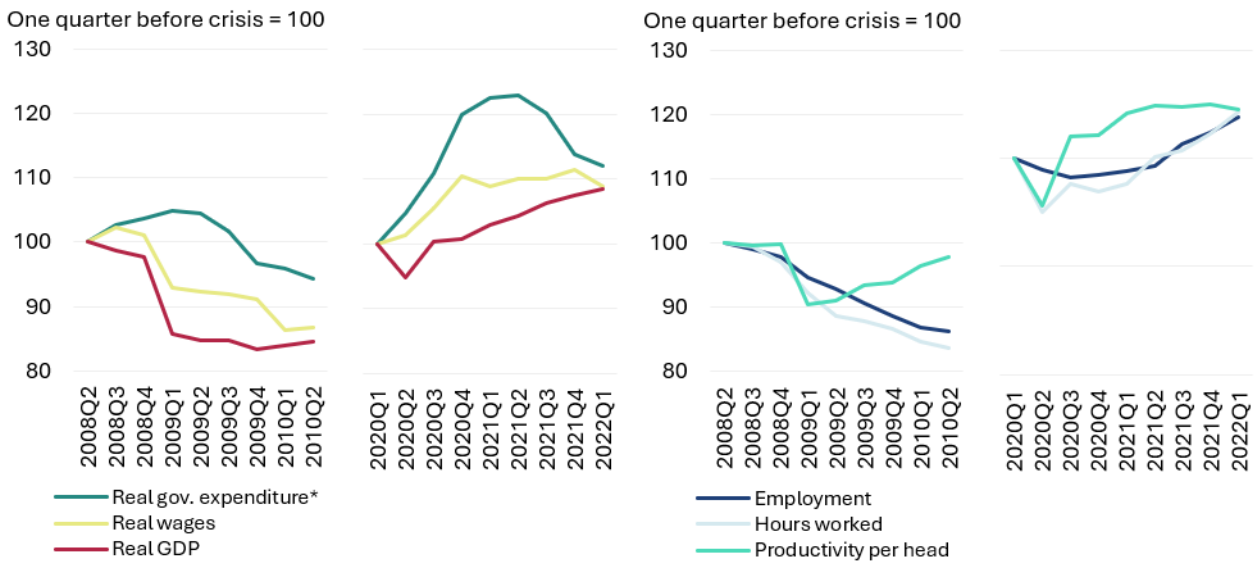
[51] Both measures of labour productivity are below trend for more than one quarter.

[52] See, e.g., Amendola, M., Ruggeri, F. (2025) *Wage share and labor productivity: empirical evidence from OECD countries* (Quaderni DEPS N. 935), Department of Economics and Statistics, University of Siena.

[53] See, e.g., Hansen, N. J., Toscani, F., Zhou, J. (2023) *Euro Area Inflation after the Pandemic and Energy Shock: Import Prices, Profits and Wages* (IMF Working Paper N. 23/131). International Monetary Fund.

mechanism. As the downturn persisted, the initial retention of workers gave way to adjustment through employment and real wages, consistent with the internal devaluation strategy pursued during the crisis.[54]

Figure 6.4. Real GDP, wages and government expenditure after 2008 and 2020 shocks (left-hand graph) and Employment, total hours worked and productivity per head after 2008 and 2020 shocks (right-hand graph)



Sources: Eurostat and Bank of Lithuania calculations.
*Four quarter average

Following the Covid-19 shock, real GDP fell sharply but recovered after one quarter. Employment adjusted more slowly, reaching its pre-crisis level five quarters after the shock. This outcome reflects a combination of the temporary nature of the pandemic shock and an exceptionally supportive policy environment. Accommodative monetary policy, EU-level support measures, and the subsequent recovery in external demand facilitated a rapid rebound in activity. At the same time, extensive fiscal measures helped preserve employment relationships and reduced firms' incentives to unwind labour hoarding. As a result, firms were able to retain workers during the temporary downturn, while real wages were maintained as public wage subsidies and job-retention schemes effectively socialised part of the costs of labour hoarding.[55] Taken together, the evidence suggests that labour hoarding can serve as a stabilisation mechanism when temporary negative shocks are met with policies that directly or indirectly support aggregate demand. Under these conditions, firms can retain firm-specific human capital and restore productivity as existing workers are reutilised more intensively during the recovery. By contrast, when demand remains persistently weak, labour hoarding becomes difficult to sustain.

At the national level, Lithuania can support productivity by ensuring the ability to deploy countercyclical fiscal policy, using temporary wage-support mechanisms, and maintaining predictable public investment programmes. Well-designed stabilisers can shorten economic downturns and prevent labour underutilisation. At the EU level, fiscal risk-sharing instruments, such as SURE-type[56] employment support, can further enhance

[54] See, e,g,, Razgūnė, A., Lazutka, R. (2017) Labor share in national income: implications in the Baltic countries *Review of Economic Perspective*, 17(2), 121-139.

[55] See, e.g., Giupponi, G., Landais, C. (2023) Subsidizing Labour Hoarding in Recessions: The Employment and Welfare Effects of Short-time Work. *The Review of Economic Studies*, 90(4), 1963-2005.

[56] Support to mitigate Unemployment Risks in an Emergency (Active 2020 May – 2022 December).

national mechanisms by smoothing the demand across member states and reducing pressure for pro-cyclical employment adjustment.

7. TFP developments and drivers in Lithuania

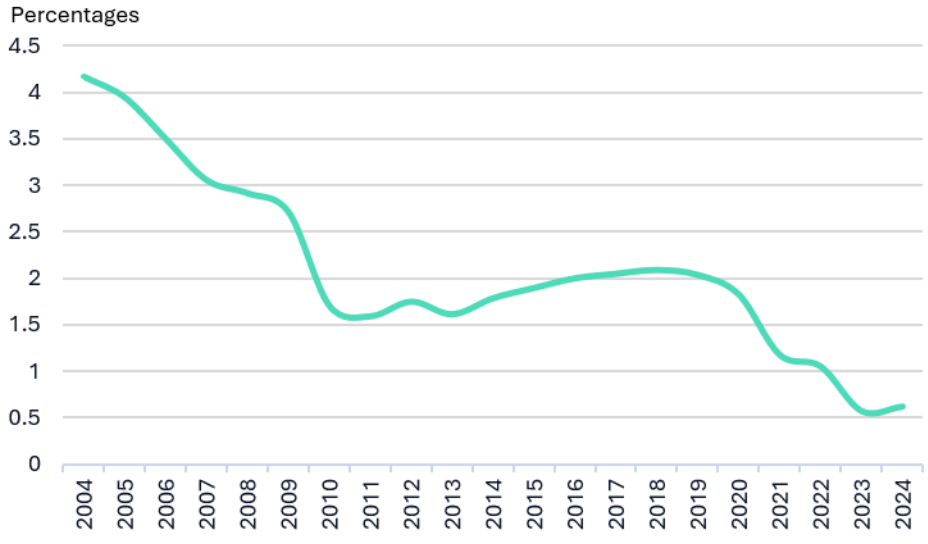
Prepared by Matas Gaigalas

Total factor productivity (TFP) is an important metric for long-term economic growth, as it captures efficiency of how labour and capital are used. We analyse the determinants of TFP growth in Lithuania and identify which structural factors have contributed most to TFP developments over the period 2004–2023. The results of TFP variance decomposition highlight the importance of innovation and infrastructure in shaping productivity outcomes.

Figure 7.1 illustrates the evolution of total factor productivity (TFP) growth in Lithuania over the period 2004–2023. Following EU accession, Lithuania experienced a period of robust TFP growth, consistent with rapid convergence and structural transformation. This momentum weakened sharply during the global financial crisis, after which productivity growth stabilized at more moderate levels throughout much of the 2010s. After 2020, TFP growth weakened further, likely reflecting pandemic related disruptions and elevated uncertainty, before showing only a modest recovery toward the end of the sample period.

This pattern is highlighted in recent analysis (Armendariz and Musso, 2025) which documents that Lithuania's post-independence income convergence has increasingly stalled due to subdued productivity growth, with limited contributions from both capital deepening and TFP. The paper emphasizes that firm-level constraints–including restricted access to finance, low research and development intensity, and skill mismatches–have constrained investment, innovation, and productivity growth. In comparison with other EU economies, Lithuania's experience mirrors broader trends observed across both Central and Eastern Europe and the EU as a whole, where productivity growth has slowed markedly since the global financial crisis.

Figure 7.1. TFP growth in Lithuania



Sources: TFP was estimated using approach provided in a box "Potential GDP development and outlook in the medium term" published in Lithuanian Economic Review (February 2013).

To understand what is driving TFP developments we conduct Lithuania's TFP variance decomposition. Our analysis adopts the framework developed by Kim & Loayza (2019). While the original study utilizes a large cross-

country panel to identify global drivers of TFP, this analysis adapts the methodology for a single-country time-series analysis of Lithuania for the period of 2004–2023.

We classify the structural drivers of TFP into five main pillars and construct indexes from indicators that are relevant to Lithuanian economy:

1. Innovation index is measured using indicators that capture both the inputs and outputs of knowledge creation. These include public and private expenditure on research and development as a percentage of GDP, which reflects the effort devoted to generating new technologies, as well as the number of patent applications by residents and non-residents and the number of scientific and technical journal articles, which serve as indicators of the outcomes of R&D activities.[57]
2. Education index is proxied by government expenditure on education as a percentage of GDP, representing public investment in foundational human capital, and by a standardized international test score derived from the Programme for International Student Assessment (PISA), which averages performance in mathematics, science, and reading and serves as a measure of educational quality.
3. Market efficiency index is captured through the business freedom index from the Fraser Institute, the financial development index from the International Monetary Fund, and the annual job reallocation rate, which reflects market fluidity and the extent to which labour resources are efficiently reallocated across firms and sectors.
4. Infrastructure index is measured using indicators of both investment and physical capacity, including government investment in transport and communications, the length of paved roads per 100 people, and renewable electricity production per 100 people.
5. Institutional quality index is assessed using the World Bank's Worldwide Governance Indicators, specifically voice and accountability, control of corruption, government effectiveness, regulatory quality, and the rule of law.

To construct composite indexes for each pillar, factor analysis is applied, while principal component analysis is used for the education index due to the inclusion of only two underlying variables.

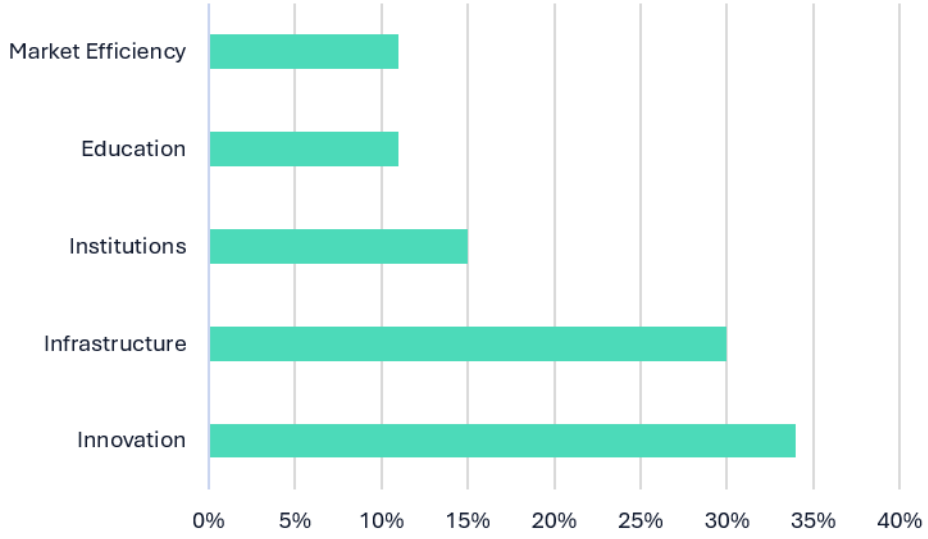
To quantify the relative influence of each structural determinant on TFP growth, this study employs Dominance Analysis (based on the Shapley Value decomposition), consistent with the framework used by Kim & Loayza (2019). This analytical approach allows us to decompose the total variance of TFP growth and assign a specific percentage contribution to each determinant–Innovation, Education, Market Efficiency, Infrastructure, and Institutions. Dominance analysis provides a robust ranking of relative importance, enabling us to identify which structural drivers have played the most significant role in shaping Lithuania's productivity dynamics over the 2004–2023 period.

Innovation emerges as the most important determinant, accounting for 34 percent of TFP variance, followed by infrastructure at around 30 percent. Institutional quality explains 15 percent, while market efficiency and education each account for approximately 11 percent.

To place Lithuania's results in an international context, the drivers could be compared with the benchmarks established by Kim and Loayza (2019), although such comparisons should be interpreted with caution given differences in the construction of indexes between the World Bank framework and our study. That study documents a clear evolutionary pattern in the drivers of TFP volatility as countries progress toward the technological frontier. In particular, the World Bank results show that the sources of productivity fluctuations in high-income OECD countries have shifted fundamentally over the past three decades, reflecting changes in the nature of growth as economies mature.

[57] The Innovation index is constructed with same indicators as in a World Bank study.

Figure 7.2. Variance decomposition of TFP growth for Lithuania (2004–2023)



Sources: WorldBank, IMF, OECD, State Data Agency of Lithuania, Fraser Institute and own calculations.

In Lithuania, market efficiency explains a relatively small share of TFP variance–around 11 percent. This result should be interpreted with caution, as the market efficiency index used in Kim and Loayza (2019) places greater emphasis on regulations and institutions affecting firms' ability to operate in product, financial, and labor markets, whereas the index used for Lithuania focuses more on market flexibility and the reallocation of resources across firms. By comparison, cross-country evidence from Kim and Loayza (2019) suggests a larger role for market efficiency. In their sample, infrastructure accounted for about 37 percent of TFP volatility in 1994–2004, but its importance declined to 8 percent in 2004–2014. Over the same period, market efficiency emerged as the dominant driver, explaining around 45 percent of TFP variance. The smaller role of market efficiency in Lithuania likely reflects earlier market reforms and relatively flexible markets following EU accession. As a result, market efficiency plays a more limited role in explaining TFP fluctuations than in the broader set of countries.

Education explains a slightly smaller share of TFP variance in Lithuania (11 percent) than in the Kim and Loayza (2019) OECD results (16 percent), which likely reflects differences in index construction and country-specific dynamics. The relatively small variance contribution reflects limited changes in education indicators over time rather than low importance for long-term productivity. Despite its relatively modest contribution to explaining TFP variation, education remains a high-priority area for enhancing productivity growth in Lithuania. Armendariz and Musso (2025) identify education and skills development as high-priority structural reforms to enhance productivity growth, pointing to persistent skill mismatches and shortages of workers with adequate digital competencies. In this context, reforms aimed at better aligning vocational training, public employment services, and university curriculum with labor-market needs, together with stronger collaboration between educational institutions and firms, are critical.

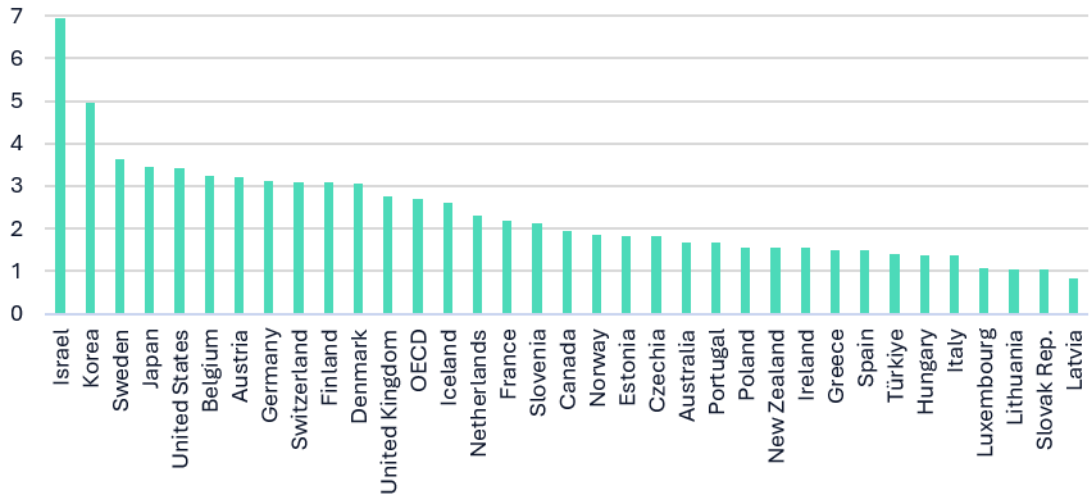
Moreover, while infrastructure in the World Bank study was a relatively minor source of productivity variation in the average OECD economy, it is a major driver in Lithuania, accounting for roughly 30 percent of TFP variance. However, this finding must be interpreted in light of the specific data composition used in this study. The World Bank infrastructure index relies on basic development indicators, such as water access, sanitation, fixed telephone lines, and road stocks, which are largely static in developed economies. In contrast, to ensure relevance for Lithuania, our index focuses specifically on renewable energy production, paved roads and

government investment flows into transport and communications. The results suggest that Lithuania remained in an infrastructure expansion phase over the period analysed, with road infrastructure and renewable energy production contributing most to the infrastructure index.

The Innovation index plays an even more prominent role in Lithuania's productivity dynamics. Whereas innovation explains roughly one-fifth of TFP variance in the World Bank analysis of OECD countries, it emerges as the most important driver in Lithuania, accounting for 34 percent of total variance. Given that innovation explains the largest share of TFP variance in Lithuania and considering the remaining gaps in innovation-related policies, the following discussion focuses primarily on innovation-related determinants of productivity growth.

The Innovation index consists of R&D expenditure as an input and patents with scientific articles as an output. In terms of financial input, Lithuania's performance has been relatively modest. Gross domestic spending on R&D grew by approximately 40% between 2004 and 2023 but it still stands at approximately 1% of GDP. Figure 7.3 shows that this level remains significantly below the technological frontier. As of 2023, global innovation leaders such as Israel (6.3% of GDP) and Korea (4.9% of GDP) invest considerably more in R&D.

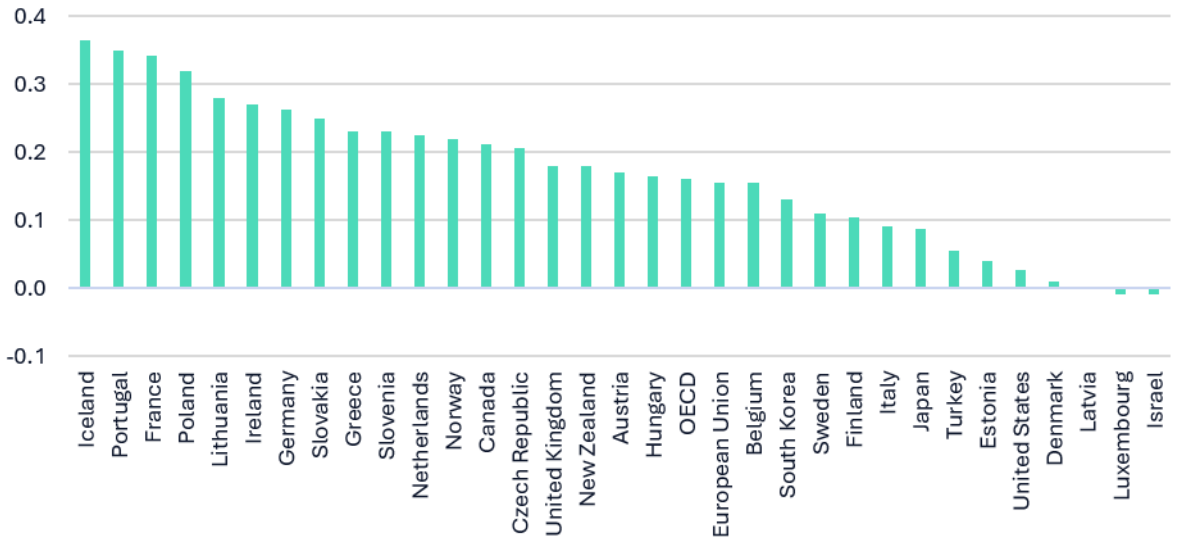
Figure 7.3. Spending on R&D in OECD countries in 2023, percentages of GDP



Sources: OECD.

According to OECD estimates, shown in Figure 7.4, Lithuania's average effective tax subsidy index rate for R&D expenditures across large firms and SMEs stood at around 0.28 in 2024 (nearly double the OECD and EU averages). Lithuania remains more competitive than regional peers such as Latvia and Estonia and than innovation leaders such as Israel. In Israel's case, public support goes beyond tax policy and relies on a co-investment model, whereby the state shares the financial risk of innovation through non-dilutive grants that are repaid only if projects succeed commercially. From a policy perspective, these comparisons suggest scope to improve the implementation and administration of existing R&D tax incentives, including how effectively the available support instruments are delivered to firms. In addition, these could be complemented with structural measures highlighted by the International Monetary Fund, including consolidating research institutions and simplifying access to public R&D support.

Figure 7.4. Estimates of tax subsidy index rates on R&D expenditure in OECD countries in 2024[58]



Sources: OECD.

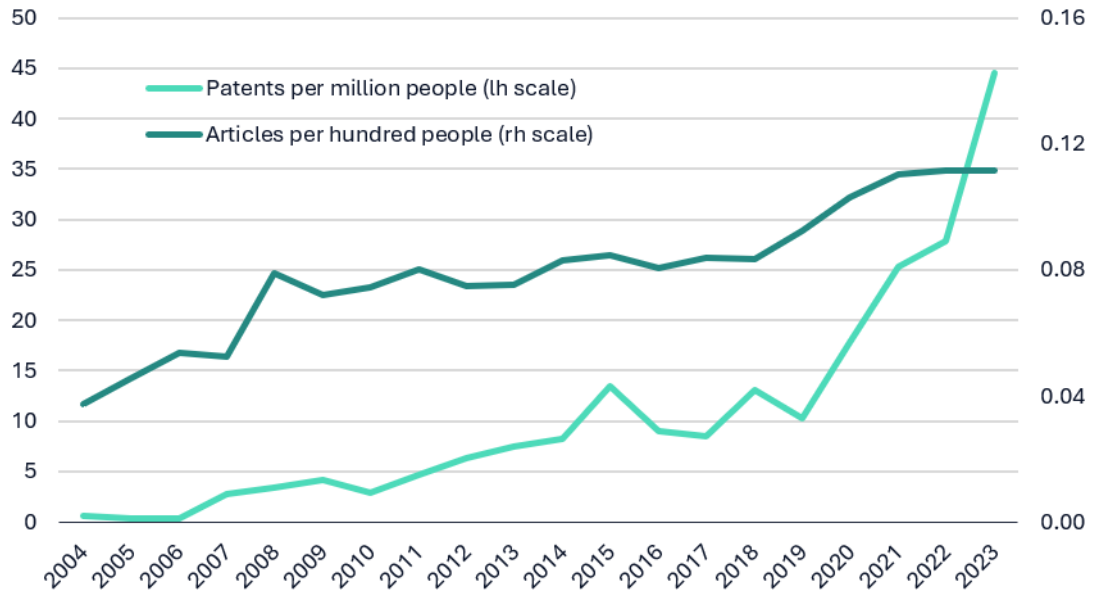
The explanatory power of the innovation index reflects both the evolution of innovation inputs and the expansion of innovation outputs. Patent applications per million inhabitants increased sharply from 0.6 in 2004 to 44.5 in 2023, indicating a substantial improvement in the economy's capacity to generate and protect commercially viable knowledge. Over the same period, the number of scientific and technical journal articles rose by approximately 200 percent, pointing to the growing of Lithuanian research institutions. While financial resources devoted to R&D remained limited, the effectiveness of the innovation system appears to have improved substantially over time.

The stronger role of innovation in explaining TFP variation in Lithuania compared with the OECD results reported by the World Bank reflects differences in development stage. In advanced OECD economies, innovation activity is a persistent and relatively stable feature. By contrast, Lithuania experienced a strong increase in innovation activity during the sample period, moving from very low levels of patenting and scientific output toward greater participation in international knowledge networks. These rapid changes create substantial variation in innovation indicators, which dominance analysis identifies as an important driver of TFP dynamics. The results therefore suggest that innovation has been a key channel of productivity adjustment in a catching-up economy, rather than implying that innovation is less important for productivity growth in advanced OECD countries.

In Lithuania, innovation should be viewed not only as a direct source of technological progress, but also as an important factor supporting economic convergence with more advanced economies. However, the effectiveness of innovation-driven growth ultimately depends on the broader institutional and market environment in which firms operate. Even strong innovation dynamics may generate only limited productivity gains if firms face constraints related to financing, competition, or resource allocation. This highlights the importance of examining market efficiency as a complementary determinant of Lithuania's long-term productivity performance.

[58] Calculated by taking average rates of large, SME, profitable and loss-making firms

Figure 7.5. Patent applications and published scientific articles in Lithuania



Source: World Bank, Eurostat.

Market efficiency accounts for the largest share of TFP variance across developed OECD economies in the World Bank study, making it a critical lever for Lithuania's long-term productivity growth. Within this dimension, Lithuania shows notable weaknesses: financial markets remain shallow, with the ratio of bank loans to GDP among the lowest in the euro area. Limited access to finance may also constrain firms' capacity to undertake productivity-enhancing investments, including research and development activities, with R&D spending in Lithuania approximately 2.5 times lower than the OECD average, signalling untapped innovation potential. These gaps suggest that financial deepening and improvements in the implementation and delivery of existing support for corporate R&D spending may represent one of the most impactful areas for closing Lithuania's productivity gap with OECD peers.

8. Financial constraints and productivity

Prepared by Jose Garcia-Louzao

Financial constraints play an important role in shaping productivity. Evidence shows that firms facing financial constraints, as well as sectors with a higher proportion of these firms, tend to have lower labour productivity. When access to external financing is limited, firms may be unable to invest in productivity-enhancing technologies or adjust their inputs efficiently. These mechanisms are consistent with weaker investment within firms and distortions in the allocation of capital because credit constraints can hinder the expansion of more productive firms. Together, these factors can negatively impact productivity growth and, consequently, economic development (Restuccia, 2025).[59]

Credit conditions for firms in Lithuania are among the most restrictive in Europe and seem to have tightened further in recent years (see Figure 8.1).[60] According to the European Commission Business Survey, the proportion of firms citing financial constraints as a limiting factor has increased by around 10 percentage points, rising from an average of 7.6% between 2016 and 2021 to 17.7% between 2022 and 2025. This points to a notable deterioration in perceived financing conditions since 2021, with potential implications for firms' investment and financing decisions. Other indicators convey a consistent, albeit more moderate, message. The EIB Investment Survey shows a gradual rise in the proportion of firms facing financing difficulties over the same period, while the CompNet balance sheet-based indicator, as defined by Ferrando and Ruggieri (2018), records an increase around 2022 in the share of firms with both high leverage and weak liquidity.[61] Taken together, these measures indicate that financing conditions for Lithuanian firms have tightened and that financing needs remain elevated.

Together with the observed slowdown in productivity, these developments in financial constraints raise the question of whether tighter access to credit contributed to weaker productivity growth. To explore this issue, this section uses CompNet data, which is a micro-founded, harmonized dataset covering the period from 2004 to 2022 and including Lithuania.[62] The dataset provides firm-level information on labour productivity, employment, capital intensity, and other key characteristics. Our preferred measure of credit constraints is based on survey responses from the European Commission Business Survey, which capture firms' perceived financing conditions when decisions are made. These perceptions are particularly relevant to productivity outcomes because expectations about access to financing influence firms' investment, hiring, and technology adoption decisions before financing constraints are reflected in balance sheet indicators.

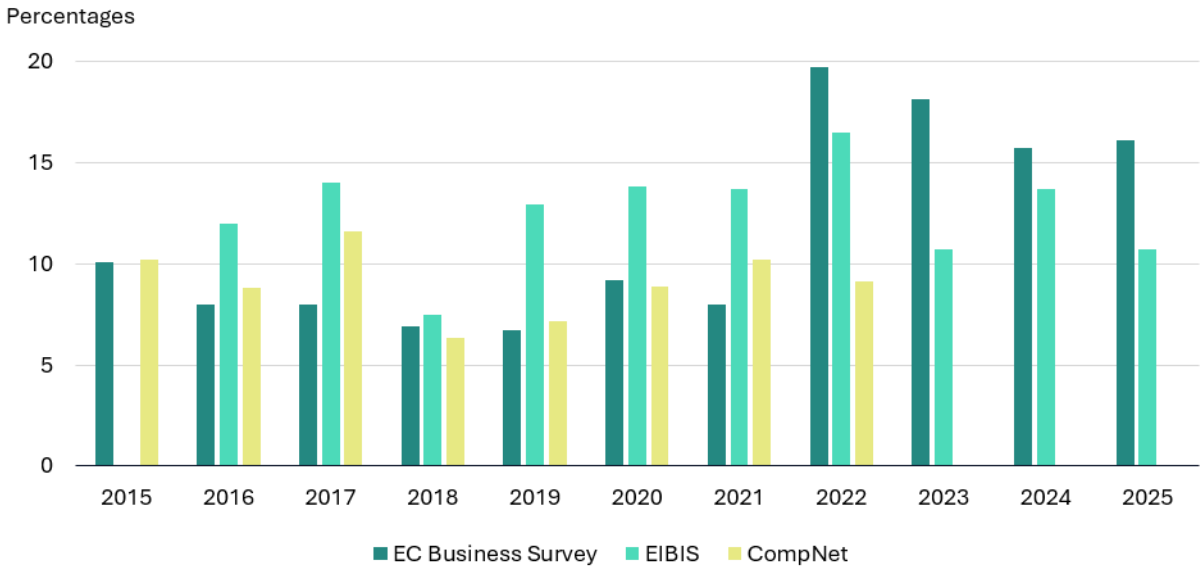
[59] Restuccia, D. (2025). *On Productivity and Distortions across Countries* (No. w34573). National Bureau of Economic Research.

[60] See EIB Investment Survey for cross-country comparisons in access to finance: https://data.eib.org/eibis/graph

[61] Ferrando, A., & Ruggieri, A. (2018). Financial constraints and productivity: Evidence from euro area companies. *International Journal of Finance & Economics*, *23*(3), 257-282.

[62] https://www.comp-net.org/

Figure 8.1. Financial constraints in Lithuania



Sources: CompNet, European Commission (EC) Business Survey, European Investment Bank (EIBIS), CompNet, and own calculations.
Notes: EC financial constraints definition is calculated as the percentage of firms that report financial constraints as a factor limiting production. EIBIS defines constrained firms as those dissatisfied with the amount of finance obtained (received less), firms that sought external finance but did not receive it (rejected), and those who did not seek external finance because they thought borrowing costs would be too high (too expensive) or they would be turned down (discouraged). CompNet financial constraints are a balance sheet-based indicator that identifies absolutely constrained firms, i.e., firms that show simultaneously high leverage and weak liquidity.

We explore how financial constraints correlate with productivity, employment, and capital intensity by exploiting variation over time, across countries, and across 2-digit sectors. ***Error! Reference source not found.*** reports OLS estimates from alternative specifications that relate two indicators of financial constraints, included with a one-year lag, to firm performance outcomes. Column (1) reports the results for log value added per employee; column (2), for log employment; column (3), for log *tangible* fixed assets; and column (4), for log fixed assets per worker. All specifications include fixed effects for country, sector, and year, as well as controls for productivity determinants, i.e., one-year lagged employment, capital, and capital intensity. We also present the estimates using the balance sheet-based indicator of absolutely constraint firms to assess the robustness of the estimates.

Consistent with existing literature, financial constraints are associated with lower productivity. The estimated coefficients in **Error! Reference source not found.**, Column (1), indicate that a one-percentage-point increase in the proportion of firms facing financial constraints is associated with a 0.18- to 0.20-percent reduction in value added per worker, depending on the employed measure of financial constraints.[63] While these estimates should be interpreted as correlations rather than causal effects, they illustrate the potential significance of the increase in perceived financing constraints observed in recent years. Specifically, the approximately 10 percentage point increase in firms reporting financial constraints, as observed in the EC Business Survey, implies a 1.8 percent decline in productivity relative to a scenario without tightening in perceived credit conditions. In a dynamic specification that accounts for the persistence of productivity, this effect accumulates over time. This implies that the long-run productivity level if the increase in firms facing credit constraints were

[63] The estimate is comparable to the findings in CompNet's Flagship Firm Productivity Report (2020) based on a similar model estimated on euro area countries (0.153). However, our estimate is higher compared to ComNet's report using more countries (0.075) or relative to the evidence in Foda et al. (2022) who estimate firm fixed-effects regressions for the period 2000-2018 in Lithuania and find an elasticity of 0.059. Results from our dynamic equation are closer to this latter estimate (0.047).

permanent would be around 4.3 percent lower than in a scenario where the proportion of firms facing financial constraints remained at its pre-2021 average of 7.5 percent. Given the reduced-form nature of the estimates and the endogenous relationship between credit conditions and economic activity, this long-run effect is likely to be an upper bound of the productivity cost due to tighter financing conditions.

Table 8.1. Correlation between financial constraints and productivity across Europe between 2004 and 2022

	(1) **Value added per employee**	(2) **Number of employees**	(3) **Capital stock**	(4) **Capital stock per employee**
A. **Share of firms reporting financial constraints as a limit to production**	-0.186*** (0 .063)	-0 .015 (0 .012)	-0.075*** (0.024)	-0.064** (0.027)
Obs.	7,096	7,103	7,068	7,108
R-squared	0.89	0.98	0.98	0.94
B. **Share of absolutely credit-constrained firms**	-0.200*** (0.058)	-0.047* (0.025)	-0.105*** (0.040)	-0.113** (0.049)
Obs.	11,303	11,293	11,246	11,311
R-squared	0.91	0.98	0.98	0.94

Source: CompNet, European Commission Business Survey, and own calculations.
Notes: The model is estimated in an unbalanced panel of countries between 2004 and 2022. Countries include Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, Hungary, Italy, Latvia, Lithuania, Malta, Netherlands, Portugal, Slovenia, Spain, and Sweden. Model A uses responses from the European Commission Business Survey to define the (one-year lag) share of firms that report financial constraints as a factor limiting production. Model B uses the one-year lag of "absolute credit constraint" variable in CompNet to define the share of firms facing financial constraints. A firm is absolutely credit-constrained if it shows simultaneously high leverage and weak liquidity, based on balance-sheet indicators following Ferrando and Ruggieri (2018). Both Models use as controls the one-year lag of (log) employment, capital, and capital per worker as well as country, 2-digit sector, and year fixed effects. Standard errors are clustered at the country-sector level.

Financial constraints are also associated with lower levels of tangible fixed assets and reduced capital intensity. Taking the figures at face value, the roughly 10 percentage point increase in perceived financial constraints since 2021 implies a capital stock that is about 0.75 percent lower and a capital intensity around 0.64 percent lower, relative to a counterfactual in which financing conditions remained unchanged. These effects are particularly pronounced when financial constraints are measured using a balance-sheet-based indicator constructed from firms' leverage and liquidity positions, pointing to the investment margin as a key transmission channel. The literature highlights this mechanism as an important pathway through which credit constraints affect firm-level productivity in Lithuania (Foda et al., 2022).

Financial constraints affect productivity in two ways: directly, by limiting firms' ability to adjust and upgrade production; and indirectly, by impacting capital accumulation and deepening. Due to the close link between

financing conditions and investment, the overall cost to productivity of tighter credit is likely to exceed the direct effect estimated above. To quantify this broader impact, we calculate the total effect as the sum of the direct cost of financial constraints on productivity and the indirect effects operating through capital and capital intensity. We obtain this sum by combining the estimated cost of financial constraints on these inputs with their respective productivity correlations. In a static framework, the roughly 10 percentage point increase in the share of firms reporting financial constraints since 2021 is associated with a total productivity loss of about 2 percent. In a dynamic model, these effects accumulate over time. This implies that the long-run productivity level would be around 5 percent lower than if financing conditions do not return to their pre-2022 average.

These results highlight two channels through which tighter financing conditions may be associated with weaker productivity: 1) a direct negative association with value added per worker and 2) indirect effects through lower tangible fixed assets and reduced capital intensity. Taken together, these results indicate that tighter financing conditions are linked to lower productivity on average. In the Lithuanian context, however, whether this relationship translates into a reduction in realized productivity or mainly constrains future productivity potential depends on which firms are most affected by tighter credit conditions. If financing constraints disproportionately affect firms with higher productivity or strong growth potential, easing investment-related financing constraints for these firms can help prevent temporary tightening from translating into persistent productivity losses. By contrast, if tighter conditions mainly affect persistently low-productivity firms, the aggregate productivity impact is likely to be more limited.

Given the persistence of capital accumulation and productivity, preventing temporary tightening in financing conditions following adverse shocks from becoming permanent is therefore particularly relevant when credit constraints bind for productive firms. In Lithuania's predominantly bank-based financial system, where collateral constraints tend to be more binding for micro and small firms than in many other EU countries, improving collateral recovery and insolvency outcomes can reduce lenders' ex-ante risk and ease investment financing by lowering collateral coverage requirements and interest rate spreads on investment loans, without weakening credit discipline.

9. The role of intermediate consumption costs in shaping GDP and productivity developments: evidence from Lithuania

Prepared by Darius Imbrasas

The surge of goods prices in 2021–2023 constituted one of the most significant external cost shocks to the Lithuanian economy in recent decades. Pandemic-related supply disruptions and strong demand initially pushed up goods prices, followed by a sharp rise in energy and food prices after Russia's invasion of Ukraine. Although supply constraints later eased, elevated wage growth and persistent services inflation maintained domestic price pressures. While the impact on inflation has been widely documented, the implications for productivity developments are less understood. In particular, it remains unclear to what extent the rise in intermediate consumption costs, and firms' ability (or inability) to pass these costs on to final prices, shaped value added and productivity dynamics.

In macroeconomic analysis, productivity is typically defined as value added generated per hour worked or per person employed. Under the production approach, value added is calculated as the difference between total output and total intermediate consumption. More specifically, it corresponds to the sum of compensation of employees, gross operating surplus[64], and other taxes on production and imports less subsidies. Consequently, developments in value added depend not only on output volumes, but also on the relative movements of output and intermediate consumption prices.

For a small and highly open economy such as Lithuania, external price shocks can substantially alter these relative price dynamics. If intermediate consumption prices – for instance, for energy or imported food commodities – increase sharply while output prices adjust more slowly or to a lesser extent, nominal value added (the difference between nominal output and nominal intermediate consumption) declines. All else equal, this mechanically reduces nominal productivity. The magnitude and persistence of this effect depend on sectoral cost structures and the degree of price-setting power across economic activities.

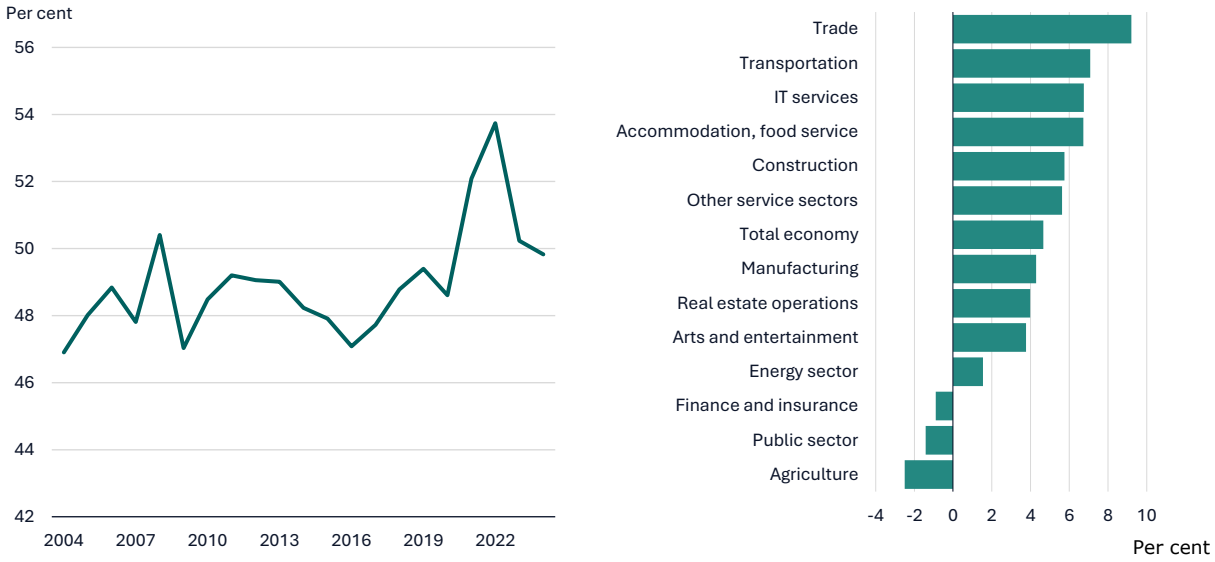
The inflation surge observed in 2021–2023 was driven by a sequence of overlapping shocks. In 2021, price pressures initially stemmed from pandemic-related supply chain disruptions and a strong rebound in consumer demand supported by accommodative fiscal and monetary policies. In 2022, inflation accelerated markedly following the energy and commodity shock triggered by Russia's invasion of Ukraine, which led to sharp increases in oil, gas and food prices, particularly in Europe. In 2023, although global supply bottlenecks eased and energy prices stabilized, inflation remained elevated as earlier cost shocks continued to pass through to services and wages, while tight labour market conditions sustained domestic price pressures despite monetary policy tightening in the euro area.

These global developments were clearly reflected in Lithuania's national accounts data. Between 2004 and 2020, the share of intermediate consumption in total output fluctuated within a relatively narrow range of 47–49%. However, in 2021–2022 this share rose markedly to 53% and still remained elevated at around 50% in 2023–2024 (see fig. 9.1). This implies that, for each unit of output produced, a smaller share corresponded to value added. In other words, the cost intensity of production increased significantly during the inflationary episode. Sectoral differences were also substantial. The largest increases in the share of intermediate consumption in total output were observed in wholesale and retail trade, professional, scientific and technical

[64] In this section gross operating surplus corresponds to national accounts item "Gross operating surplus and mixed income".

activities, and transportation and storage, the increase in these sectors exceeded 7 percentage points. By contrast, in agriculture, public administration and defence, and financial and insurance activities, the share of intermediate consumption declined. These differences largely reflect variations in cost structures and pricing power. Sectors with stronger price-setting power (for example, construction) were better able to increase output prices in line with rising input costs, thereby limiting the increase in the intermediate consumption share. In sectors with regulated pricing or facing stronger competition (for example, manufacturing), higher input costs were only partially transmitted to final prices, compressing value added.

Figure 9.1. Lithuania's intermediate consumption to total output ratio (left-hand chart) and sectoral intermediate consumption to total output ratio changes between 2015-2019 and 2021-2022 (right-hand chart)



Sources: Eurostat, Statistics Lithuania and Bank of Lithuania calculations.

Despite the decline in the value-added share, nominal value added and nominal productivity continued to increase. In Lithuania, nominal value added grew by 12.5 per cent in 2021, 20.2 in 2022 and 10.4 in 2023. Productivity per person employed rose by 11.1, 14.5 and 8.9 per cent respectively. However, these nominal developments largely reflected strong price increases. In real terms, the picture was considerably more subdued. Real GDP expanded by 6.4 per cent in 2021, 2.5 in 2022 and 0.7 in 2023, while real productivity grew by 5.0 per cent in 2021 but declined by 2.4 per cent in 2022 and 0.7 per cent in 2023. Thus, in volume terms, economic growth slowed markedly after 2021, and real productivity – measured as value added per worker at constant prices – decreased during the peak of the energy shock.

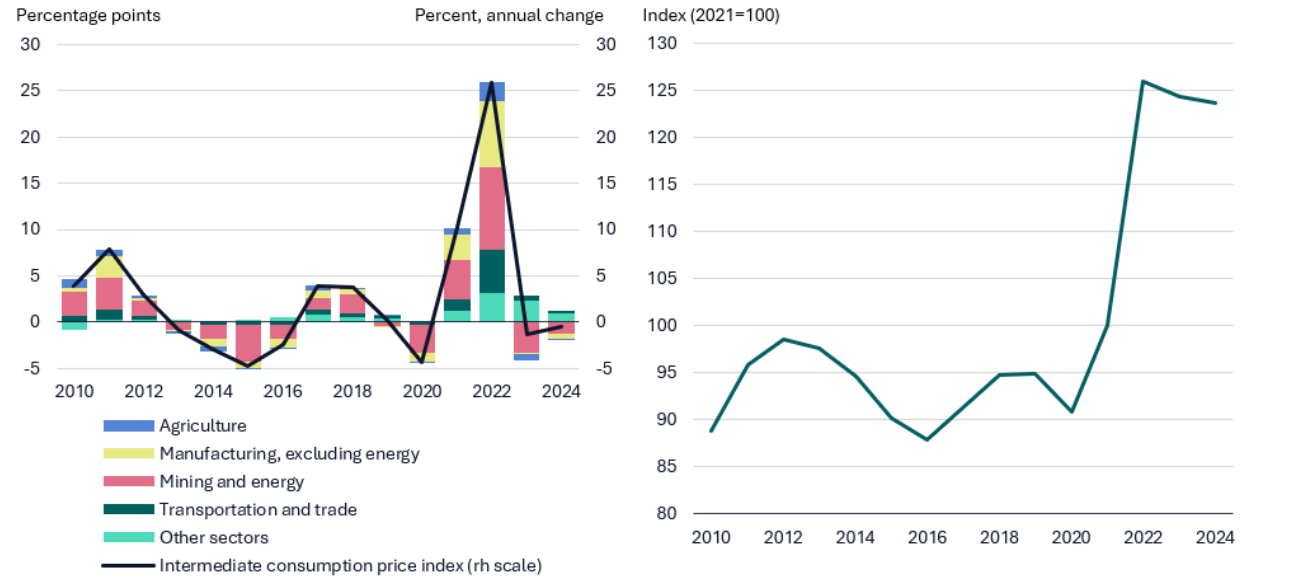
To better understand these dynamics, it is necessary to examine the behaviour of the GDP deflator. While commonly interpreted as a broad measure of price changes in final goods and services produced domestically, the GDP deflator can also be viewed, *ceteris paribus*, as reflecting the difference between output price growth and intermediate consumption price growth. When intermediate consumption prices increase faster than output prices, the GDP deflator rises more slowly than other price indices, signalling a potential compression of margins and a reduction in real value added.

According to national accounts methodology, the preferred approach for estimating real GDP is the double deflation method[65]. Under this approach, nominal value added is divided by the difference between real output (nominal output deflated by the output price index) and real intermediate consumption (nominal intermediate consumption deflated by the intermediate consumption price index). From this identity GDP deflator could be derived as shown in (eq. 9.1).

$$GDP\ deflator = \frac{Nominal\ GDP}{\frac{Nominal\ output}{Output\ price\ index} - \frac{Nominal\ intermediate\ consumption}{Intermediate\ consumption\ price\ index}} \qquad \text{eq. 9.1}$$

Although Statistics Lithuania publishes the GDP deflator, detailed output and intermediate consumption price indices are not publicly available. Therefore, in this analysis, an estimate for Lithuania's intermediate consumption price index is constructed[66]. The results indicate that intermediate consumption prices increased sharply in 2021–2022 (see fig. 9.2). In 2021, they rose by 10.2 per cent, accelerating further to 25.9 per cent in 2022. In 2023–2024, price growth moderated, though the level remained elevated. Energy products were the main contributors, accounting for around two-fifths of the total increase in intermediate consumption prices in 2021 and one-third in 2022. Manufacturing (excluding refined petroleum products and pharmaceuticals[67]) contributed about 30 per cent of the increase, while transportation and storage accounted for roughly one-sixth. The contribution of other sectors was comparatively modest – 1.9 percentage points in 2021 and 5.1 percentage points in 2022.

Figure 9.2. Estimated Lithuania's intermediate consumption-implied deflator (right-hand chart) and contribution factors (left-hand chart)



Sources: Eurostat, Statistics Lithuania and Bank of Lithuania calculations.

[65] For more detailed information look at Eurostat, Handbook on prices and volume measures in national accounts (2016 edition).

[66] The estimation relies on the most recent input–output tables (for 2020), assuming that the real production structure remained broadly unchanged over the analysed period. Weights for domestic and imported goods and services were calculated separately based on their shares in intermediate consumption. Each component was then indexed using the corresponding price index (e.g. producer price indices for industrial goods, import price indices for imported goods, and ratios between nominal and real services turnover for services price indices). Aggregation of these components yielded an estimate of the intermediate consumption price index.

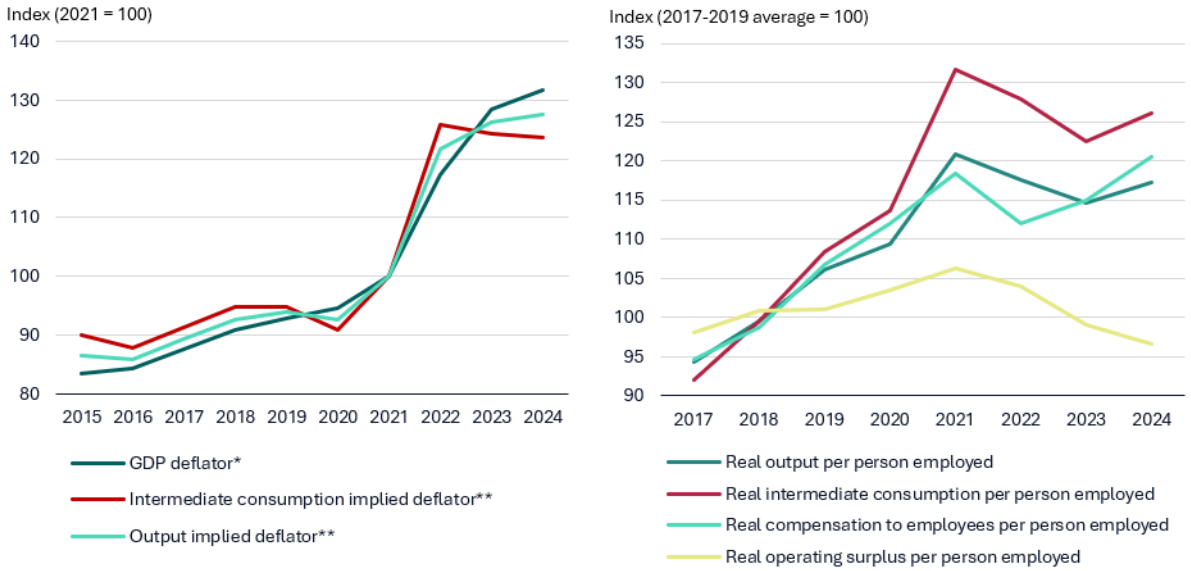
[67] Data on manufacture of coke and refined petroleum products (NACE C19) and manufacture of basic pharmaceutical products and pharmaceutical preparations (Nace C21) are confidential. In this analysis, indicators of these activities are combined and classified as energy products.

Although intermediate consumption price growth subsided in 2023–2024, the price level remained significantly higher than before the pandemic. In 2024, intermediate consumption prices were 30.2 per cent above their 2019 level (see fig. 9.2). This persistent level effect continued to weigh on cost structures, even in the absence of further strong price increases.

Combining the estimated intermediate consumption deflator with the double deflation framework allows the derivation of an implied output deflator (see fig. 9.3.). The estimates suggest that in 2021–2022, intermediate consumption prices grew faster than output prices. As a result, the GDP deflator increase was smaller than output or intermediate consumption deflators, which is consistent with a compression of profit margins. In 2023–2024, as energy prices stabilised and domestic demand conditions remained relatively robust, intermediate consumption prices declined while output prices continued to rise, albeit at a much slower pace. As a result, the output deflator outpaced the intermediate consumption deflator, widening the gap between the two. This reopening wedge lifted the value-added (GDP) deflator relative to input prices, supporting a gradual recovery in nominal value added per unit of output.

The estimated data series also allows analysis of real developments in output components per person employed – namely, intermediate consumption, compensation to employees and gross operating surplus (see fig. 9.3). Comparing 2024 levels with the 2017–2019 average shows that, in real terms, intermediate consumption per person employed increased the most, rising by nearly 27 per cent. By contrast, real gross operating surplus per person employed recorded a slight decrease, indicating no improvement in returns on invested capital. Real compensation per person employed increased by almost 21 per cent, while real output per person employed rose by more than 17 per cent. This implies that higher input costs were not fully transmitted to output prices, resulting in subdued real operating surplus growth and, consequently, weaker real value added and productivity dynamics.

Figure 9.3. Lithuania's GDP deflator and estimated intermediate consumption and output implied deflators (left-hand chart) and contributions to real output per employee developments in 2020-2024 (right-hand chart)



Sources: Eurostat, Statistics Lithuania and Bank of Lithuania calculations.
* Official Statistics Lithuania data.
** Estimates.

To quantify the impact of incomplete cost pass-through on productivity, a counterfactual scenario is constructed. Under this scenario, it is assumed that firms are able to fully pass higher intermediate

consumption costs on to output prices, keeping real profit margins – measured as the ratio of real gross operating surplus to real output – at their 2019–2020 average level of 24.9 per cent. Real intermediate consumption, real compensation of employees, and net taxes on production follow their actual observed development. Under these assumptions, Lithuania's real GDP in 2024 could have been 8.7 per cent higher than observed (see fig. 9.4.). Average annual growth over 2021–2024 would have been approximately 5.4 per cent, compared to the actual growth rate of 3.2 per cent, a difference of 2.2 percentage points per year. The counterfactual scenario gains accumulate across the whole 2021-2024 period, with a substantial share arising in 2021 when the profit margins first came under pressure. This initial margin compression was driven by the first wave of the supply-side shocks – pandemic-related supply-chain disruptions and a demand-led surge in input costs – and deepened further as energy and commodity shocks hit in 2022. Given unchanged employment, similar gains would have been reflected in real productivity as well.

Figure 9.4. Actual and counterfactual estimates of Lithuania's GDP (left-hand chart) and GDP deflator (right-hand chart) developments



Sources: Bank of Lithuania calculations.

Overall, the analysis indicates that the intermediate consumption price shocks affected productivity not only through their impact on economic activity, but also through relative price movements and margin compression. The sharp increase in intermediate consumption prices, combined with limited pass-through in several sectors, weighed on productivity developments during 2022–2023. As cost pressures have eased and price-setting conditions normalised, part of this effect has begun to unwind. The counterfactual analysis suggests that, had firms been able to maintain their pre-shock real margins, real productivity could have been noticeably higher – underscoring the importance of cost structures, pricing power and external vulnerabilities for productivity dynamics in a small open economy. The findings suggest that productivity outcomes during cost-driven inflationary episodes depend not only on the magnitude of cost shocks but also on firms' ability to adjust prices and production structures. Policies that reduce exposure to input-cost shocks – for example through energy diversification – and that support price adjustment in the most affected sectors would help sustain productivity growth in the face of future external shocks.

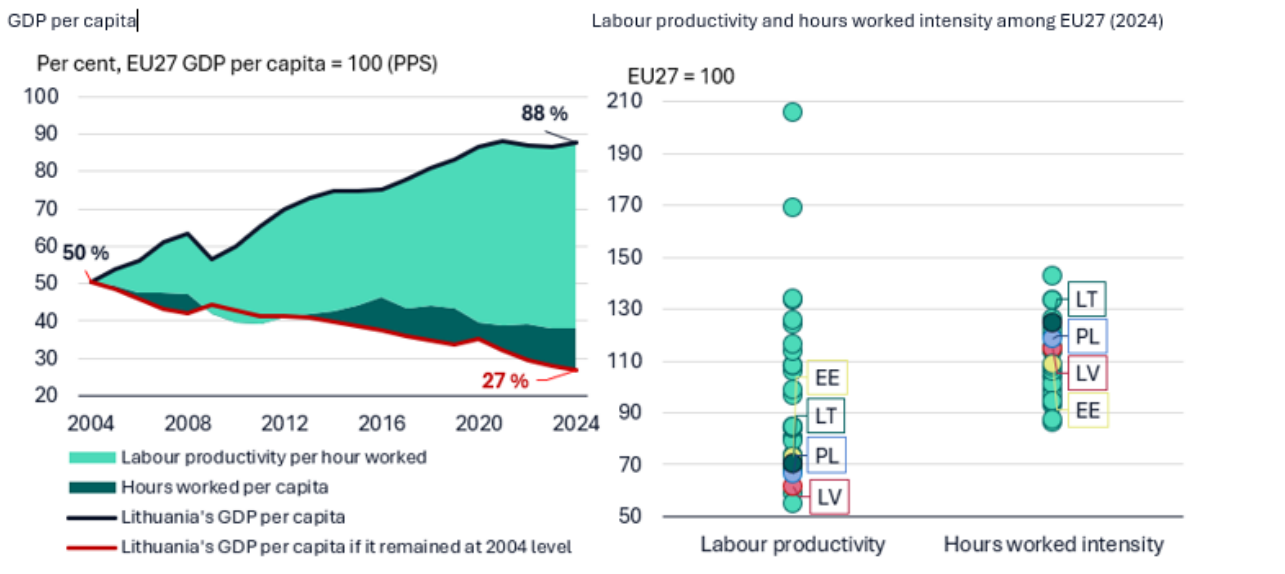
10. Every hero needs a sidekick: How demographic and labour force structure developments complement productivity driven increases in standard of living

Prepared by Darius Imbrasas

Over the past twenty years, the standard of living in Lithuania has risen rapidly and in 2024 reached almost 90 per cent of the EU average. Most of this increase was driven by higher labour productivity, but more efficient use of the country's demographic and labour resources also had a significant impact. Although Lithuania is among the leading EU countries in terms of the number of hours worked per capita, a more detailed analysis shows that there is still untapped labour market potential in the country, the utilisation of which could lead to additional meaningful increases in the standard of living.

The gross domestic product (GDP) per capita, defined as how much of a country's total production, earned income, or expenditure can be attributed to the average resident, is often used as a measure for standard-of-living comparisons across countries. From Lithuania's accession to the European Union (EU) in 2004 through 2024, the country's standard of living underwent substantial improvement. In 2004, Lithuania's GDP per capita stood at roughly 50 per cent of the EU average; by 2024, this ratio had increased to nearly 88 per cent. This represents one of the fastest convergence episodes in the EU, with only Bulgaria and Romania recording more rapid gains.

Figure 10.1. GDP per capita decomposition to labour productivity and hours worked intensity



Sources: Eurostat and Bank of Lithuania calculations.

While this improvement in living standards is encouraging, a better understanding of the underlying drivers is essential for shaping future policies. One useful approach is to decompose the evolution of GDP per capita into two elements: labour productivity per hour worked and the number of hours worked per capita. As illustrated in Figure 10.1, both factors contributed to Lithuania's rising living standards. Over the 2004–2024 period, improvements in labour productivity accounted for approximately four-fifths of the overall gain, while the increase in hours worked per capita contributed the remaining fifth. Notably, Lithuania currently surpasses only

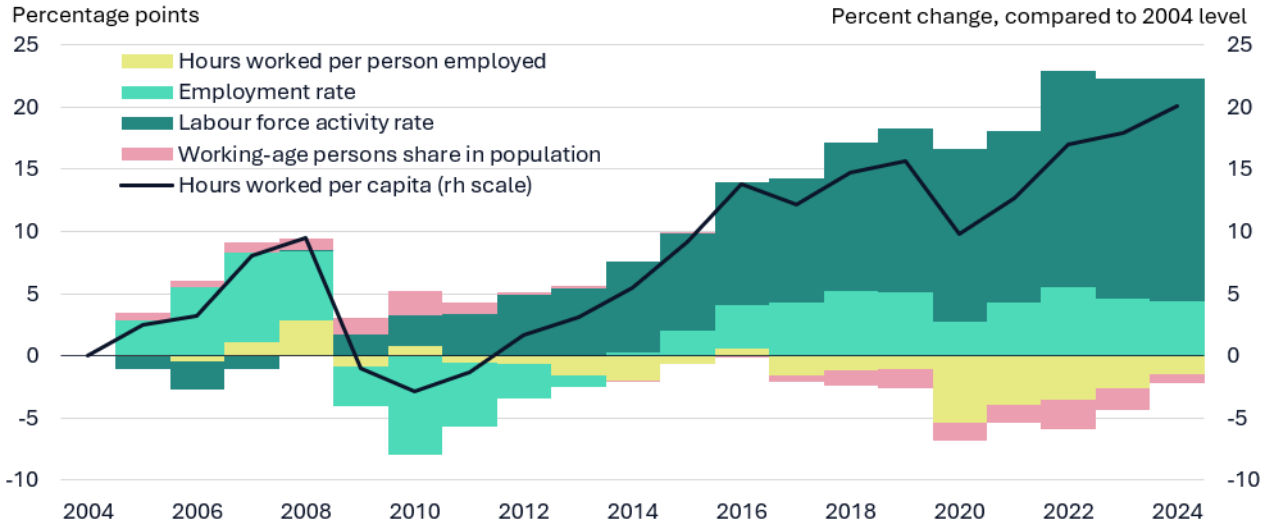
about one-third of EU member states in labour productivity, yet it ranks among the leaders in hours worked per capita.

As is shown in equation 10.1, a more granular decomposition of hours worked per capita reveals four underlying determinants: (i) hours worked per employed person; (ii) employment rate, capturing the share of individuals willing and able to work who hold a job; (iii) labour force[68] participation rate of the working-age population[69]; and (iv) share of working-age persons in the total population.

$$\frac{Hours\ worked}{Population} = \frac{Hours\ worked}{Employment} \times \frac{Employment}{Labour\ force} \times \frac{Lobour\ force}{Working{-}age\ population} \times \frac{Working{-}age\ population}{Total\ Population} \quad (10.1.)$$

Since Lithuania's entry into the EU, the entire increase in hours worked per capita has been driven by higher employment rates and rising labour force participation among working-age residents (see Figure 10.2). These developments indicate progressively more effective utilization of the country's labour resources. The remaining components have exerted a negative impact. The declining share of the working-age population reflects demographic ageing, implying that a shrinking proportion of the population must support a growing number of dependents. Meanwhile, the deterioration in hours worked per employed person in 2020 reflects employers' decisions during the post-COVID-19 period to retain workers despite temporary stagnation in economic activity. As the economy recovered and firms once again started to utilize their workforce more efficiently, this indicator has begun to improve.

Figure 10.2. Decomposition of hours worked intensity developments



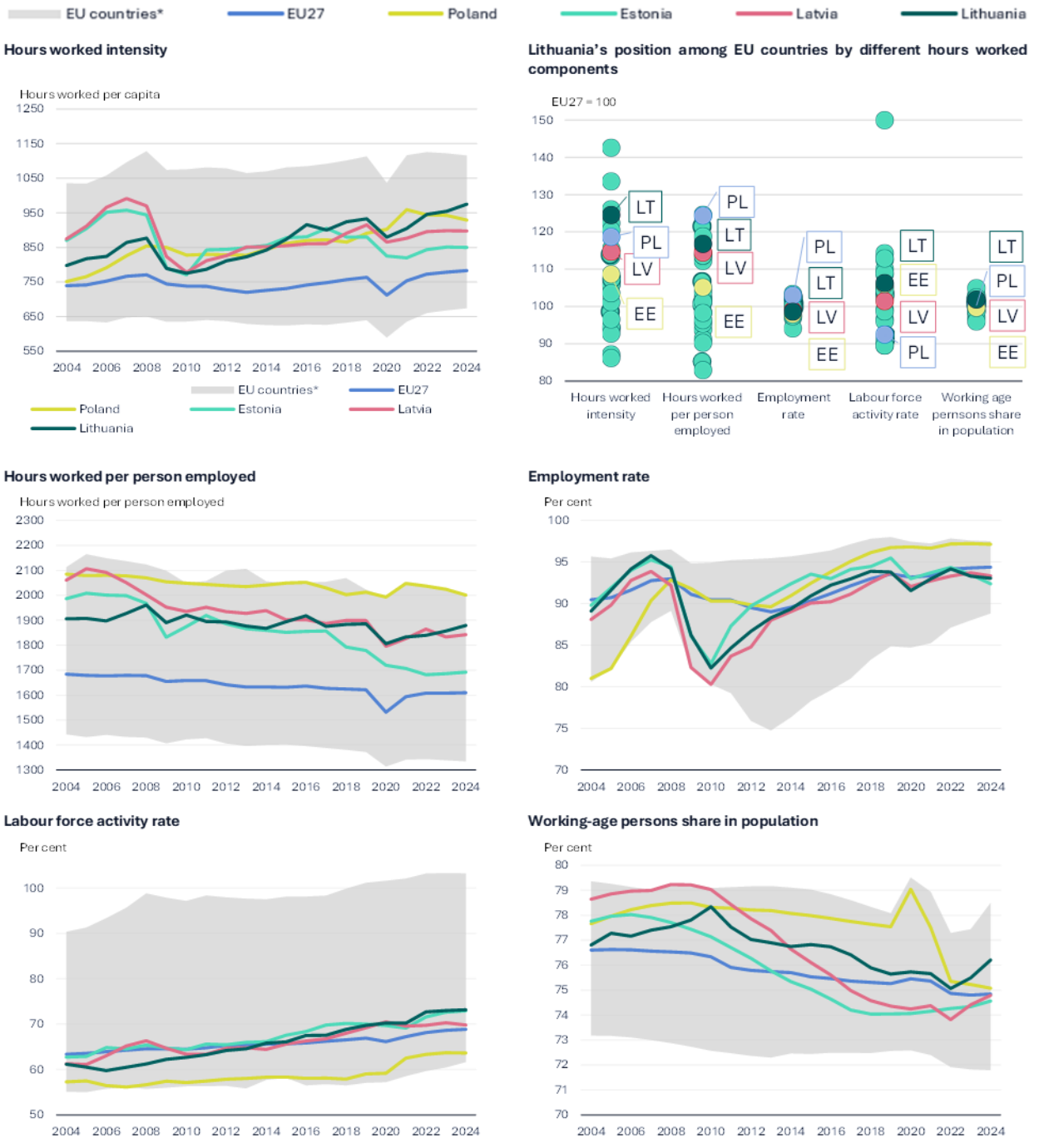
Sources: Eurostat and Bank of Lithuania calculations.

The use of labour resources improved in Lithuania markedly faster than in other EU economies (see Figure 10.3). Prior to accession to the EU, Lithuania's hours worked per capita were among the bottom third of EU countries. However, by the time of the global financial crisis, Lithuania had managed to improve its position, becoming one of the ten best performers. Over the past decade, the country has consistently ranked among the five best performers. In 2024, Lithuania's hours worked per capita amounted to almost 975, the fourth-highest figure in the EU. It was surpassed only by Greece (987), Malta (1,045), and Luxembourg (1,116).

[68] Labour force is calculated as a sum of total employment (national accounts statistics) and 15-74 age unemployed persons (labour force survey data).

[69] Age group of 15-74 is used to calculate labour force and working age individuals.

Figure 10.3. Hours worked intensity and its component development in the EU countries



Sources: Eurostat and Bank of Lithuania calculations.
*Grey area shows the difference between highest and lowest indicator among EU countries.

Lithuania's strong position among EU countries in terms of hours worked per capita stems largely from the high number of hours worked per person employed. In 2024, the average employed person in Lithuania worked 1,879 hours. This indicator has been relatively stable since EU accession, fluctuating between 1,830 and 1,910 hours

in most years, and for a decade placing Lithuania among the top seven performers in the EU. In 2024, the highest values were recorded in Greece (2,005), Poland (2,001), and Croatia (1,955).

Other factors that positively influenced hours worked per capita in Lithuania include the labour force participation rate and the share of the working-age population in total population. For both indicators, Lithuania ranked eighth among EU member states in 2024. As mentioned earlier, improvements in the labour force participation rate were the main driver of the increase in hours worked per capita in Lithuania. Similar to hours worked per capita, the participation rate rose from being in the bottom third in the EU to its current position.

Nonetheless, the high share of working-age individuals in the total population suggests relatively low life expectancy in Lithuania. In particular, the number of years a person can expect to live after reaching the age of 75 remains comparatively low. In 2024, Lithuania's life expectancy at birth was 77.6 years, the fifth lowest in the EU. Only Bulgaria (75.9), Romania (76.6), Latvia (76.7), and Hungary (77.0) recorded lower life expectancy at birth.

Among the four determinants of hours worked per capita, Lithuania ranks lowest in terms of the employment rate. In 2024, Lithuania's employment rate stood at 93.0%, the seventh lowest among EU countries, while in the best performing countries – Czechia, Malta and Poland – employment rate was close to or surpassed 97.0 %. It is worth noting that throughout most of the 2004–2024 period, Lithuania's employment rate remained in the bottom third of EU countries. The main exception was the period 2006–2008, when the economy showed strong signs of overheating, and the unemployment rate fell to around 5%, while employment rate increased to around 95.0 %.

Lithuania's relative position in the EU in analysed indicators highlight priority areas in which Lithuania's institutions could focus efforts to strengthen labour-market performance. In Lithuania's case, policy attention should concentrate primarily on increasing employment among individuals willing and able to work and on reducing unemployment. Moderate gains could also be achieved by further raising labour force participation among the working-age population. Improvements in the remaining indicators appear more constrained: Lithuania already performs strongly in hours worked per employed person, while demographic trends are difficult to influence in the short term, unless the state were to pursue a migration policy that would attract many working-age residents to Lithuania.

Nevertheless, if Lithuania were to lift each of these indicators – hours worked per person employed, employment rate and labour force activity rate – to the average level of the five best-performing EU member states[70], while at the same time maintaining productivity differences, the standard of living could increase by an additional 13.8 percentage points. This would allow Lithuania to almost reach the EU average standard of living measured in GDP per capita in purchasing power parity terms. Achieving such an outcome would require reducing the unemployment rate (increasing the employment rate) by 4 percentage points, bringing an additional nearly 4 per cent of currently inactive working-age residents into the labour market and increasing average hours worked per person employed by around 70 hours a year or around 1.5 hours per week.

[70] Regarding the labour force activity rate, Luxembourg is excluded from the list of the five best-performing EU member states due to the country's strong reliance on cross-border work, which significantly inflates number of persons employed but does not affect the number of working-age persons living in Luxembourg. For more information about cross-border work in the EU, see Gasperini M. and Geraci M. (2024). *Cross-border work in EU and EFTA countries*. European Commission, Network of Experts on Free Movement of Workers and Social Security Coordination.

Conclusion and policy recommendations

Lithuania has achieved rapid convergence towards the EU average in living standards over the past two decades, driven primarily by strong labour productivity growth and improved utilisation of labour resources. However, recent developments suggest that the easy gains from catch-up growth are diminishing. Although the recent slowdown in productivity growth appears to be driven primarily by cyclical factors – such as reduced capacity utilisation and labour hoarding during 2022–2024 – there is also evidence of underlying structural constraints, including weak technology diffusion, skill mismatches, and limited investment in innovation.

Our analysis shows that productivity gains have been driven mainly by improvements within sectors and firms, rather than by the large-scale reallocation of resources across industries. At the same time, persistent productivity gaps between frontier and laggard firms point to inefficiencies in resource allocation and barriers to the diffusion of knowledge and technology. While capital deepening has supported growth, capital intensity remains below the EU average, and recent stagnation highlights the need to sustain investment. In addition, tightening financial conditions poses a risk of constraining investment and productivity, particularly if high-potential firms are disproportionately affected.

Looking ahead, Lithuania is entering a more mature phase of convergence in which further gains will depend less on imitation and more on domestic innovation, human capital, and efficient allocation of resources. Thus, over the medium term, structural reforms aimed at innovation, skills, and resource allocation will be essential to sustain productivity growth and ensure continued convergence toward advanced European economies.

In such an environment, policy priority should focus on four broad areas:

First, strengthening innovation and investment. Strong evidence suggests that sustaining high levels of investment requires a stable and predictable macroeconomic environment, underpinned by credible, rules-based policymaking that reduces policy uncertainty for investors. Increasing R&D investment and improving the effectiveness of public support schemes would help raise total factor productivity while crowding in private capital. Enhancing incentives for private investment – particularly in intangible assets and digital technologies – can foster capital deepening and spur productivity growth. Deepening financial and capital markets and improving financial conditions, especially for productive and high-growth firms, would further support long-term productivity growth.

Second, enhancing resource allocation and firm dynamism. Reducing barriers to firm entry and exit, improving insolvency frameworks, and fostering competition would support the reallocation of resources toward more productive firms. Policies that promote technology diffusion – such as support for digital adoption, stronger links between firms and research institutions, and improved managerial practices – can help narrow productivity gaps. Strengthening labour mobility would further support efficient matching between workers and firms.

Third, improving labour market functioning and human capital. Beyond spurring labour mobility, policies addressing skill mismatches are critical. For example, improving the alignment between education systems and labour market needs, expanding vocational training and lifelong learning, and promoting digital skills are essential to reduce mismatches and support productivity growth. Policies that encourage higher employment rates and labour force participation, particularly among underutilised groups, would further strengthen labour supply. Facilitating targeted labour migration could help alleviate structural labour shortages.

Fourth and finally, policies aiming at strengthening resilience to input cost shocks and improving the flexibility of economic adjustment mechanisms would be beneficial for maintaining productivity growth in the face of future external disturbances.