POLICY PAPER

CENTRE FOR ECONOMIC STRATEGY

Labour productivity in Ukraine in wartime: how to address labour shortages

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Skills Alliance for Ukraine

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MINISTRY OF ECONOMY OF UKRAINE

UkraineRecovery Conference

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EXECUTIVE SUMMARY

Labour productivity is a key and very simple indicator of economic efficiency. It measures output per unit of labour input, usually per worker or per hour worked. Higher productivity indicates that workers generate more value within the same time frame or with the same resources.

High-productivity countries have higher economic output and higher living standards for their citizens. Typically, productivity growth is boosted by a well-educated labour force, advanced technology, sustained infrastructure, strong innovation capacity, and robust investment.

During the first year of full-scale Russia's war against Ukraine, labour productivity in Ukraine declined significantly (to 80% of the 2021 level) due to supply chain disruptions, destroyed production capacity, and migration caused by the invasion. Since then, productivity has been gradually recovering (to 85% of the 2021 level), although the pace of recovery varies considerably across sectors, with weather conditions greatly affecting agriculture and high productivity in the public sector mainly resulting from wartime structural shifts.

Productivity growth is crucial for Ukrainian companies, especially given labour shortages caused by the full-scale war, with 5.6 million war refugees in 2026 and an estimated annual loss of at least 5.5% of pre-war GDP[1].

A key reason for Ukraine's lower productivity compared with peer countries (Poland, Hungary, Czechia, Romania, etc.) is its lower capital stock, resulting from low domestic and foreign investment in recent decades (~15% of GDP in Ukraine compared with 19-25% in peer countries on average in 2014–2021). This indicates that a significant way to improve labour productivity is to invest in physical capital, automation, digitalisation, and the robotisation of processes, with priority given to agriculture, food processing, machine building and manufacturing, construction and the production of building materials, miltech and defence, etc. Moreover, the post-war recovery needs to increase the role of private capital and expand public-private partnerships, assigning the government the primary role in creating favourable conditions for investment through supportive institutions and policies, including macroeconomic stability and the rule of law, and meeting the requirements for EU accession, rather than relying on direct government funding of the economy.

EU accession and deeper integration into EU value chains will increase productivity through technology transfer and compliance with EU standards, and will also attract investment through access to European cohesion funds and private capital inflows. Proper education, reskilling, and upskilling within lifelong learning will enhance labour productivity by meeting labour-market needs.

In addition, the government must implement the necessary reforms to Ukraine's education system and promote labour mobility and lifelong learning.

[1] CES, Ukrainian Refugees. Fifth Wave of Research

1. WHY PRODUCTIVITY MATTERS

Productivity indicates how efficiently an economy (or firm) converts labour and capital input into output. According to the World Bank,[2] productivity is measured by two main methods:

- Labour productivity measures the output or value added produced by workers per unit of labour input, such as per worker or per hour worked;
- Total factor productivity (TFP) measures how efficiently a firm or economy is able to transform all production inputs (such as labour, capital, materials, and energy) into its products.

Labour productivity is calculated as the ratio of output (the value of goods produced or services delivered) to labour input (hours worked or the number of employees), based on available statistical data:

$$Productivity = \frac{total\ output}{hours\ worked} \quad \text{or} \quad \frac{total\ output}{number\ of\ employees}.$$

Hours worked is a more accurate indicator of labour input than the number of workers, since it accounts for different work schedules and employment arrangements, such as part-time work. However, data on hours worked are usually less available than data on the number of employees.

TFP is defined as the part of output that cannot be explained by the contributions of capital, labour, energy, and other factors, and is usually measured using sophisticated econometric estimates. TFP is a better comparative indicator of a firm's or an economy's productivity, but it does not allow for distinguishing the effect of an increase in human capital from that of an increase in the quantity or quality of physical capital.

Therefore, with limited data, labour productivity could be the first-choice indicator to explore productivity trends within a particular country and in comparison with other countries.

Higher productivity indicates that workers generate more value within the same time frame or with the same resources. However, high labour productivity does not necessarily mean workers are “working harder” or longer. It instead reflects how effectively labour is combined with other inputs, such as machinery, technology, knowledge, and infrastructure. Labour productivity increases when workers have better tools, skills, and processes that enable them to produce more output within the same time frame.

Productivity is a crucial driver of economic growth and higher incomes. Countries with higher productivity can afford to pay better wages, invest more in public services, and remain competitive in global markets. For Ukraine, productivity is especially vital, as it shapes the country’s capacity to recover from the war, raise incomes, and close the gap with EU economies amid the consequences of the full-scale russia war against Ukraine: destruction of the production capacities and infrastructure and deepening labour shortages.

[2] The World bank, Improving Productivity Measurement in World Bank Group Interventions.

Higher productivity also enables the economy to do more with a smaller, ageing workforce, which is particularly significant for Ukraine, given the loss of around 5,6 million Ukrainian citizens due to external migration outflow since the start of the full-scale invasion, as of January 2026[3].

2. HOW TO INCREASE LABOUR PRODUCTIVITY

The literature on developing and transition economies links labour productivity to capital deepening, human capital, technology adoption, structural change, openness, infrastructure, institutions, and the efficient reallocation of labour and capital across firms and sectors.

Isaksson, Ng and Robyn (2005)[4] argue that productivity in developing countries depends on both technological progress and the efficient use of existing technologies. They stress a policy mix of technology diffusion, skills, infrastructure, macroeconomic stability, market development and institutional quality, with less advanced economies benefiting most from adoption and diffusion rather than frontier R&D. Loko and Diouf (2009)[5] find that productivity growth is driven by FDI, trade openness, human capital, the business environment, sectoral composition and female labour-force participation, linking gains to external integration, domestic reform and resource shifts toward higher-productivity sectors. Dua and Garg (2019)[6] find that labour productivity is shaped by capital deepening, human capital, technology, institutional quality and openness, with sectoral structure and FDI playing a stronger role in developing economies.

Kim and Loayza (2019)[7] group productivity drivers into five pillars (innovation, education, market efficiency, infrastructure and institutions) and find that education matters especially in developing countries, while market efficiency is more important in OECD economies. Ahn and Hemmings (2000)[8] emphasise that productivity depends on the so-called “framework conditions” – physical and human capital, R&D, macroeconomic stability, finance, trade, competition and social capital – that enable firms to invest, innovate, compete and scale.

Bassanini, Nunziata and Venn (2009)[9] show for OECD countries that mandatory dismissal regulations depress productivity growth in industries where layoff restrictions are more binding. However, Campos

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[3] Centre for Economic Strategy, Ukrainian Refugees After Four Years Abroad. Fifth wave of research.

[4] Isaksson, A., Ng, T.H. and Robyn, G. (2005) Productivity in Developing Countries: Trends and Policies. Vienna: United Nations Industrial Development Organization. Available at: UNIDO / UN Digital Library.

[5] Loko, B. and Diouf, M.A. (2009) Revisiting the Determinants of Productivity Growth: What’s New? IMF Working Paper WP/09/225. Washington, DC: International Monetary Fund. Available at: IMF.

[6] Dua, P. and Garg, N.K. (2019) Determinants of labour productivity: comparison between developing and developed countries of Asia-Pacific , *Pacific Economic Review*, 24(5), pp. 686–704. doi: 10.1111/1468-0106.12294.

[7] Kim, Y.E. and Loayza, N.V. (2019) Productivity Growth: Patterns and Determinants across the World, *Economía*, 42(84), pp. 36–93.

[8] Ahn, S. and Hemmings, P. (2000) Policy Influences on Economic Growth in OECD Countries: An Evaluation of the Evidence. OECD Economics Department Working Papers No. 246. Paris: OECD Publishing.

[9] Bassanini, A., Nunziata, L. and Venn, D. (2009) Job protection legislation and productivity growth in OECD countries, *Economic Policy*, 24(58), pp. 349–402. doi: 10.1111/j.1468-0327.2009.00221.x.

and Nugent (2012)[10] caution against treating labour-market deregulation as a productivity tool, finding that changes in employment protection do not systematically affect growth, though they may reduce inequality. Overall, the evidence is mixed: excessive rigidity may weaken reallocation and productivity, but some employment security can encourage firm-specific investment and innovation.

Overall, the literature shows that labour productivity requires a broad policy mix: capital, skills, technology, infrastructure, institutions and efficient reallocation. Human capital matters most when linked to firm demand and technology diffusion, while openness and FDI raise productivity only if domestic firms and workers can absorb new technologies and standards.

Ukraine's productivity challenge is shaped by war-related capital destruction, labour loss and displacement, interrupted education, regional mismatches, infrastructure damage and uncertainty. Ukraine-specific literature therefore focuses on human-capital recovery, labour-market adaptation, digitalisation, and innovation capacity.

Gorodnichenko, Kudlyak and Şahin (2022)[11] show that war has eroded Ukraine's human capital through deaths, injuries, mobilisation, displacement, interrupted schooling, health deterioration and lost work experience. Recovery should prioritise education, adult retraining, disability inclusion, veteran reintegration and incentives to invest in skills. Novikova, Zaloznova and Azmuk (2022)[12] emphasise digitalisation as a tool for human capital recovery, highlighting digital infrastructure, remote work, digital public services, and new skills as ways to reduce displacement costs and expand access to work and training.

Anastasia, Boeri and Zholud (2026)[13] mention that wage flexibility, firm adaptation and remote work helped sustain labour-market functioning, but long-term human-capital losses remain a major reconstruction risk for Ukraine.

Bezvershenko et al. (2025)[14] link productivity to science and innovation, arguing that Ukraine's recovery depends on preserving researchers, universities, R&D infrastructure and international scientific networks, while commercialising wartime expertise in military and health technologies.

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[10] Campos, N.F. and Nugent, J.B. (2018) The dynamics of the regulation of labour in developing and developed countries since 1960, in Campos, N.F., De Grauwe, P. and Ji, Y. (eds.) The Political Economy of Structural Reforms in Europe. Oxford: Oxford University Press, pp. 75–88.

[11] Gorodnichenko, Y., Kudlyak, M. and Şahin, A. (2022) *The Effect of the War on Human Capital in Ukraine and the Path for Rebuilding*. CEPR Policy Insight June 2022. London: Centre for Economic Policy Research.

[12] Novikova, O., Zaloznova, Y. and Azmuk, N. (2022) Human capital recovery in Ukraine in the post-war period using the advantages of digitalization, *Journal of European Economy*, 21(4), pp. 399–419. doi: 10.35774/jee2022.04.399.

[13] Anastasia, G.M., Boeri, T. and Zholud, O. (2026) *A Wartime Labour Market: The Case of Ukraine*. IZA Discussion Paper No. 18363. Bonn: IZA.

[14] Bezvershenko, Y., Ganguli, I., Talavera, O. and Gorodnichenko, Y. (2025) Innovation for Economic Resilience: Strengthening Ukraine's Human Capital and Science Sector. CEPR Policy Insight No. 138. London: Centre for Economic Policy Research.

Khandii et al. (2025)[15] review EU workforce development policies relevant to Ukraine, including dual education, vocational training, lifelong learning, skilled immigration, diaspora reintegration, digital skills, and gender-inclusive labour policies. The most relevant instruments are sector-specific training, flexible certification for displaced workers and public–private partnerships aligned with industry needs.

Therefore, Ukraine's productivity policy should not be reduced to labour-market deregulation or isolated reskilling programmes. It should be treated as a core part of reconstruction: restoring human capital, improving labour-market matching, supporting firms' technology adoption, investing in resilient infrastructure and production capacity, and enabling labour and capital to move into higher-productivity sectors. The aim should not be only to replace wartime losses, but to rebuild the economy on a more productive basis.

3. EDUCATION, SKILLS AND LABOUR PRODUCTIVITY: IMPLICATIONS FOR WARTIME UKRAINE

Human capital is one of the central drivers of labour productivity, alongside investment, technology adoption and the quality of institutions. For Ukraine, this link has become even more important under wartime conditions. Learning losses, displacement, emigration, mobilisation, regional labour market disruption, and shortages of workers in reconstruction-related sectors all weaken the country's productive capacity. In this context, education and skills policy should be treated not only as social policy but also as a core element of Ukraine's productivity and recovery agenda.

The formal educational attainment is insufficient unless it translates into practical skills. Long-term growth is more closely associated with cognitive skills and knowledge capital than with years of schooling alone (Hanushek and Woessmann, 2020[16]). At the same time, productivity-enhancing skills are multidimensional. They include foundational cognitive skills, which encompass functional literacy, numeracy, and the ability to understand complex ideas, engage in various forms of reasoning, and solve abstract problems (Almeida et al., 2012[17]; Arias et al., 2019[18]; Hanushek and Woessmann, 2020[19]). Socio-emotional skills (often referred to as "soft" or behavioural skills), such as self-regulation,

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[15] Khandii, O., Zelenko, O., Burko, I. and Bilous, Y. (2025) Sustainable Workforce Development: Lessons from EU Industrial Policies for Postwar Ukraine, *European Journal of Sustainable Development*, 14(4), pp. 627-645. DOI: 10.14207/ejsd.2025.v14n4p627

[16] Hanushek, E.A. and Woessmann, L. (2020) Education, knowledge capital, and economic growth, in *The Economics of Education*. 2nd edn. Elsevier Ltd, pp. 171–182

[17] Almeida, R., Behrman, J. and Robalino, D. (eds) (2012) *The Right Skills for the Job? Rethinking Training Policies for Workers*. Washington, DC: World Bank.

[18] Arias, O., Evans, D.K. and Santos, I. (2019) *The Skills Balancing Act in Sub-Saharan Africa: Investing in Skills for Productivity, Inclusivity, and Adaptability*. Washington, DC: World Bank.

[19] Hanushek, E.A. and Woessmann, L. (2020) Education, knowledge capital, and economic growth, in *The Economics of Education*. 2nd edn. Elsevier Ltd, pp. 171–182

perseverance (grit), teamwork, and interpersonal communication, are increasingly critical for job retention, earnings growth, and the overall "readiness to learn" (Arias et al., 2019[20]; Barrera-Osorio et al., 2020[21]). Digital literacy has emerged as a new foundational skill, involving the effective use of ICT devices and software to manage information and navigate the opportunities of a digital global economy (Arias et al., 2019[22]). Technical or job-specific skills provide the specialised vocational knowledge and professional qualifications required to perform specific tasks in particular occupations, ranging from engineering to service trades (Almeida et al., 2012[23]; Arias et al., 2019[24]). Finally, higher-order skills like critical thinking, problem-solving, and metacognition ("learning to learn") enable workers to tackle open-ended problems in novel situations and remain adaptable in a rapidly changing world of work (Almeida et al., 2012[25]; Arias et al., 2019[26]).

The evidence from developing and middle-income countries also suggests that skill shortages can constrain firm productivity. Studies of enterprise skills show that firms are more productive when they employ workers with stronger education and relevant skills, while deficits in IT, language and job-specific competences can limit upgrading (Tan et al., 2016[27]).

However, training programmes are effective only when they are linked to labour demand. Supply-driven vocational or adult training often has limited impact if curricula are disconnected from firms' needs or if workers are trained for jobs that do not exist. Demand-driven programmes, employer involvement, certification and results-based contracting can improve the match between workers and firms and raise the productivity impact of training (World Bank, 2020[28]; Almeida, Behrman and Robalino, 2012[29]).

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[20] Arias, O., Evans, D.K. and Santos, I. (2019) *The Skills Balancing Act in Sub-Saharan Africa: Investing in Skills for Productivity, Inclusivity, and Adaptability*. Washington, DC: World Bank.

[21] Barrera-Osorio, F., Kugler, A.D. and Silliman, M.I. (2020) *Hard and Soft Skills in Vocational Training: Experimental Evidence from Colombia*. NBER Working Paper 27548. Cambridge, MA: National Bureau of Economic Research.

[22] Arias, O., Evans, D.K. and Santos, I. (2019) *The Skills Balancing Act in Sub-Saharan Africa: Investing in Skills for Productivity, Inclusivity, and Adaptability*. Washington, DC: World Bank.

[23] Almeida, R., Behrman, J. and Robalino, D. (eds) (2012) *The Right Skills for the Job? Rethinking Training Policies for Workers*. Washington, DC: World Bank.

[24] Arias, O., Evans, D.K. and Santos, I. (2019) *The Skills Balancing Act in Sub-Saharan Africa: Investing in Skills for Productivity, Inclusivity, and Adaptability*. Washington, DC: World Bank.

[25] Almeida, R., Behrman, J. and Robalino, D. (eds) (2012) *The Right Skills for the Job? Rethinking Training Policies for Workers*. Washington, DC: World Bank.

[26] Arias, O., Evans, D.K. and Santos, I. (2019) *The Skills Balancing Act in Sub-Saharan Africa: Investing in Skills for Productivity, Inclusivity, and Adaptability*. Washington, DC: World Bank.

[27] Tan, H., Bashir, S. and Tanaka, N. (2016) *Skill Use, Skill Deficits, and Firm Performance in Formal Sector Enterprises: Evidence from the Tanzania Enterprise Skills Survey*, 2015. World Bank Policy Research Working Paper No. 7672. Washington, DC: World Bank.

[28] World Bank (2020) *Demand-Driven Skills Training and Results-Based Contracting: Lessons for Youth Employment Programs*. Washington, DC: World Bank.

[29] Almeida, R., Behrman, J. and Robalino, D. (eds) (2012) *The Right Skills for the Job? Rethinking Training Policies for Workers*. Washington, DC: World Bank.

Firm-based training is also important, but SMEs tend to underinvest in it due to financial constraints, information gaps, and the risk of trained workers leaving (Almeida and Aterido, 2010[30]; Saraf, 2017[31]). Public support for SME training (through co-financing, vouchers, shared training centres or sectoral training funds) can therefore be understood as an investment in aggregate productivity, by helping smaller firms overcome the financial and organisational barriers that limit upskilling.

Overall, there should be three priorities for Ukraine. First, it should restore foundational cognitive skills (literacy and numeracy) and digital literacy weakened by the war. These foundational skills are essential because "skills beget skills", determining an individual's readiness to learn and their ability to acquire more complex technical competencies throughout their life. Digital literacy must now be treated as a new foundational skill, as the effective use of ICT devices and software is critical for navigating the opportunities of a digital global economy.

At the same time, this agenda should not be limited to children and young people in formal education. Adult learning is essential for workers who have already entered the labour market, especially those who need to reskill or upskill in response to displacement, technological change, reconstruction needs, or shifts in sectoral demand.

Second, vocational and adult training should be demand-driven, with employers involved in curricula, certification and job placement. To ensure long-term productivity, curricula must move beyond narrow technical training to include socio-emotional skills (such as self-regulation, perseverance, and teamwork), which are critical for job retention and long-term earnings growth. Training programs should also integrate higher-order skills like critical thinking and metacognition ("learning to learn"), enabling workers to tackle non-routine tasks and solve open-ended problems in modernising sectors.

Third, firm-based training, especially for SMEs, should be supported through co-financing, vouchers or shared training centres. Public support should focus on overcoming management capability gaps and information failures that often lead smaller firms to underinvest in upskilling. Support for SMEs should also emphasise entrepreneurship and business skills, such as financial management and marketing, which are vital for self-employment and the growth of household enterprises.

Skills policy should therefore be linked to reconstruction, technology adoption and EU integration, so that education translates into higher productivity rather than only higher formal attainment.

[30] Almeida, R.K. and Aterido, R. (2010) *Investment in Job Training: Why Are SMEs Lagging So Much Behind?* World Bank Policy Research Working Paper 5358. Washington, DC: World Bank.

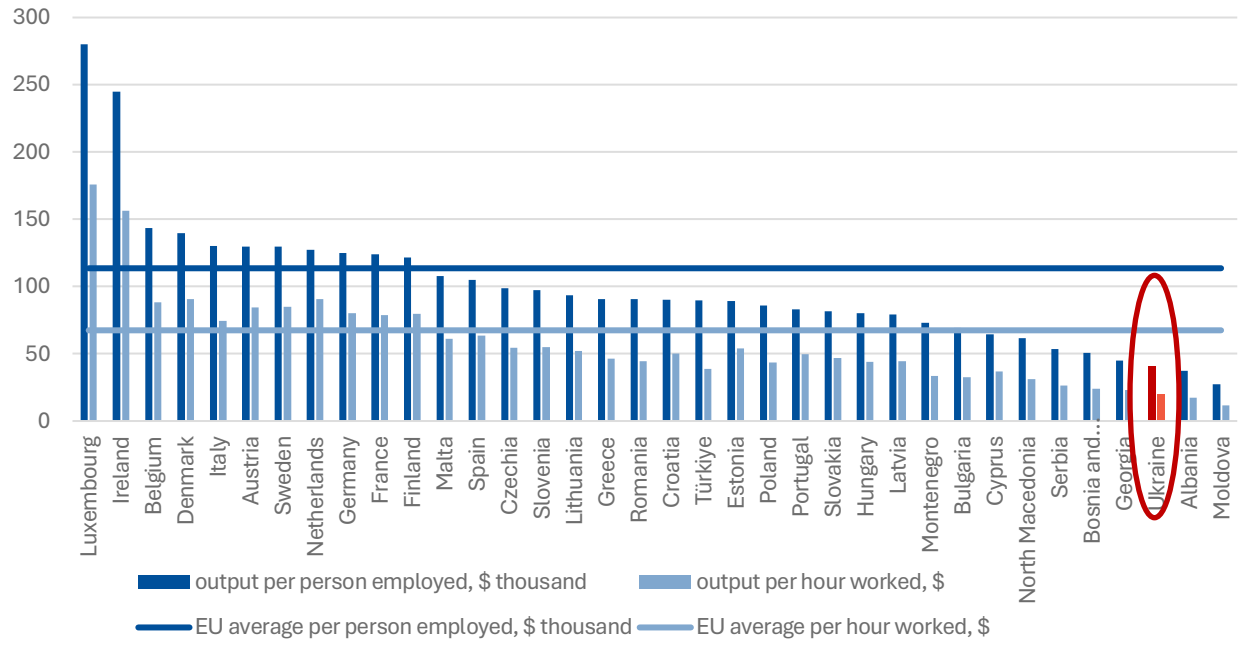
[31] Saraf, P. (2017) *On-the-Job Training: Returns, Barriers to Provision, and Policy Implications*. World Bank Policy Research Working Paper 8090. Washington, DC: World Bank.

4. LABOUR PRODUCTIVITY IN UKRAINE

4.1. LABOUR PRODUCTIVITY IN UKRAINE COMPARED TO EUROPE

Over time, labour productivity in Europe has grown substantially, with Luxembourg, Ireland and Norway among the global leaders in 2024[32]. However, it remains uneven globally, even within the EU, with some countries showing substantially higher labour productivity growth than others. Namely, Ireland's labour productivity (GDP per person employed) has increased by over 53% between 2014 and 2024. According to the Irish Central Statistics Office[33], high productivity is concentrated in the foreign sector, with capital-intensive growth attributed to multi-national enterprises (MNEs). Conversely, Italy's labour productivity improved only by 2% over the same period due to a shortage of highly skilled labour[34].

Figure 1. Labour productivity in Europe in 2021



Sources: World Bank, ILO. GDP is given in constant 2021 PPP $.

According to World Bank data[35], even before Russia's full-scale invasion, Ukraine's labour productivity was the third lowest in Europe after Moldova and Albania, and 65% lower than the EU average, and remained substantially lower than that of peer countries such as Poland, Hungary, Czechia and Romania.

[32] World Bank. GDP per person employed in constant 2021 PPP $.

[33] Central Statistics Office, Productivity in Ireland 2022-2023: key findings.

[34] International Monetary Fund, Italy needs higher productivity and more people working.

[35] World Bank, GDP per person employed (constant 2021 PPP $).

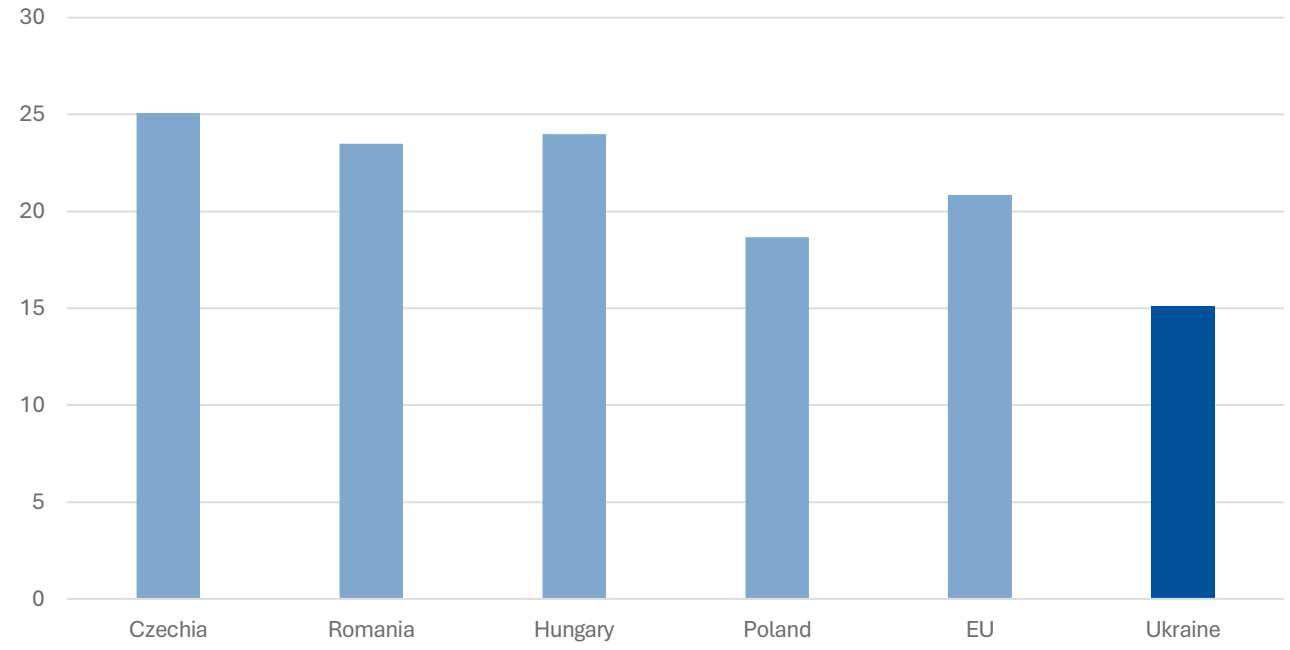
Before the full-scale war, Ukraine accounted for around 5% of Europe and Central Asia's total population, yet produced only 3% of the region's GDP. Meanwhile, Poland, with a similar population, accounted for 13% of the region's GDP.

The prevalence of low-value-added industries in the Ukrainian economy hampers labour productivity, as these sectors are more labour-intensive. From 2010 to 2021, agriculture and mining, on average, accounted for over 15% of GDP.

A large public sector, averaging around 13% of GDP during that period, also reduces labour productivity due to operational inefficiencies and less profitable state-owned enterprises[36], which are more resource-intensive than the private sector.

In addition, the flow of both domestic and foreign direct investment (FDI) in recent decades was lower in Ukraine than in peer countries, resulting in a lower, less productive capital stock.

Figure 2. Gross fixed capital formation, average in 2014 – 2021, % of GDP

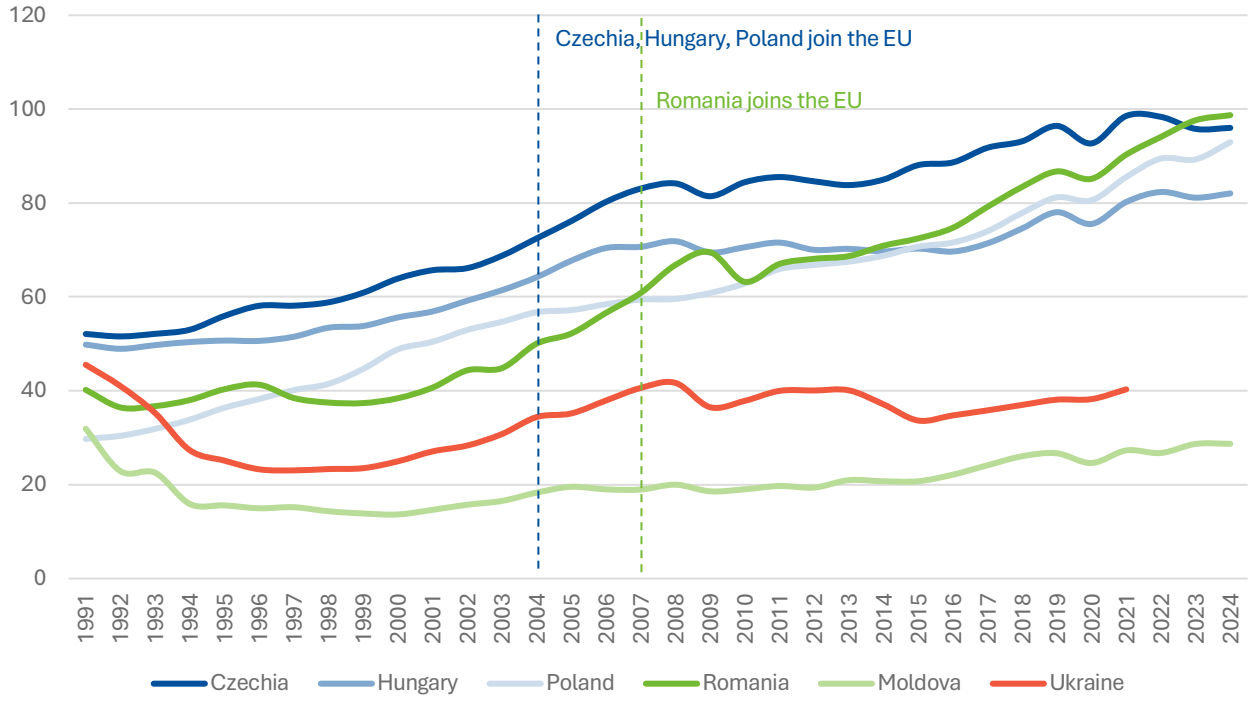


Source: Eurostat, SSSU, CES calculations.

Before their accession to the EU, Poland and Hungary faced labour productivity challenges similar to those of Ukraine. The reasons for this mirrored Ukraine's current issues, including the prevalence of agriculture in the economy (to a lesser extent) and allocative inefficiency, in which labour is concentrated in inefficient industries.

[36] Centre for Economic Strategy, To what extent state-owned enterprises are less profitable than private firms: a 10-year analysis.

Figure 3. Labour productivity per person employed, $ thousands.



Sources: World Bank. GDP is given in constant 2021 PPP $.

The most significant contributor to low labour productivity, particularly in Poland, was substantial regional disparities in productivity, with some regions notably more efficient at allocating labour.

4.2. THE MAIN TRENDS OF PRODUCTIVITY IN UKRAINE

In recent decades, labour productivity in Ukraine has increased, meaning that, on average, workers produce more output than before. This growth was associated with the transformation of the economy and the transition to a market economy.

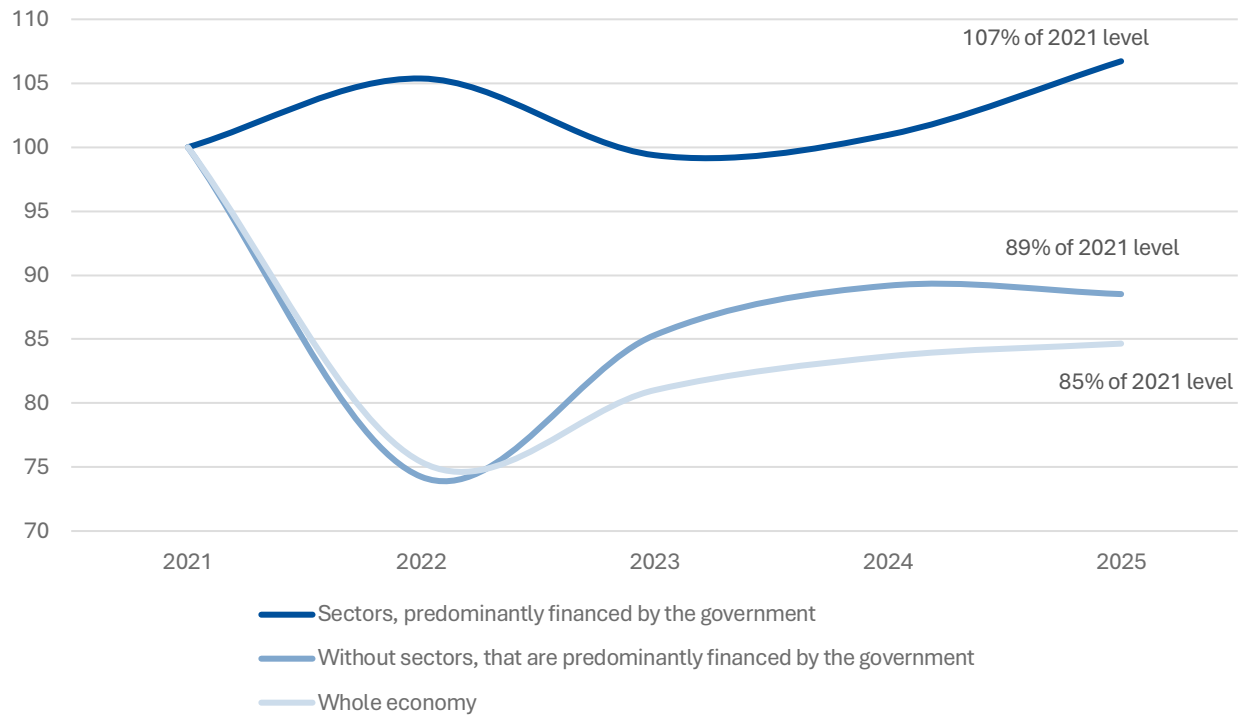
Figure 4. Labour productivity per person employed in Ukraine, $ thousands

Source: World Bank. Productivity is calculated as GDP in constant 2021 prices in $ per person employed.

However, productivity growth was interrupted during periods of crisis, marked by a significant fall in GDP. In addition, in 2021, even before a full-scale invasion, productivity remained lower than its peak in 2007 amid the occupation of Crimea and parts of the well-industrialised Donetsk and Lugansk regions.

With the beginning of the full-scale invasion, official statistical data regarding employment and labour productivity is unavailable, making comparisons over long periods of time impossible. However, labour productivity dynamics between 2021 and 2025 can still be evaluated using data from the Pension Fund, which covers only official employment[37]. The paper's further conclusions are based on this data and on GDP and Gross Value Added (GVA) by type of economic activity from the State Statistics Service of Ukraine (SSSU).

Figure 5. Labour productivity per person employed in Ukraine*, index 2021=100%



*Official employment. 2025 – preliminary data.
Source: SSSU, Pension Fund, CES calculations.

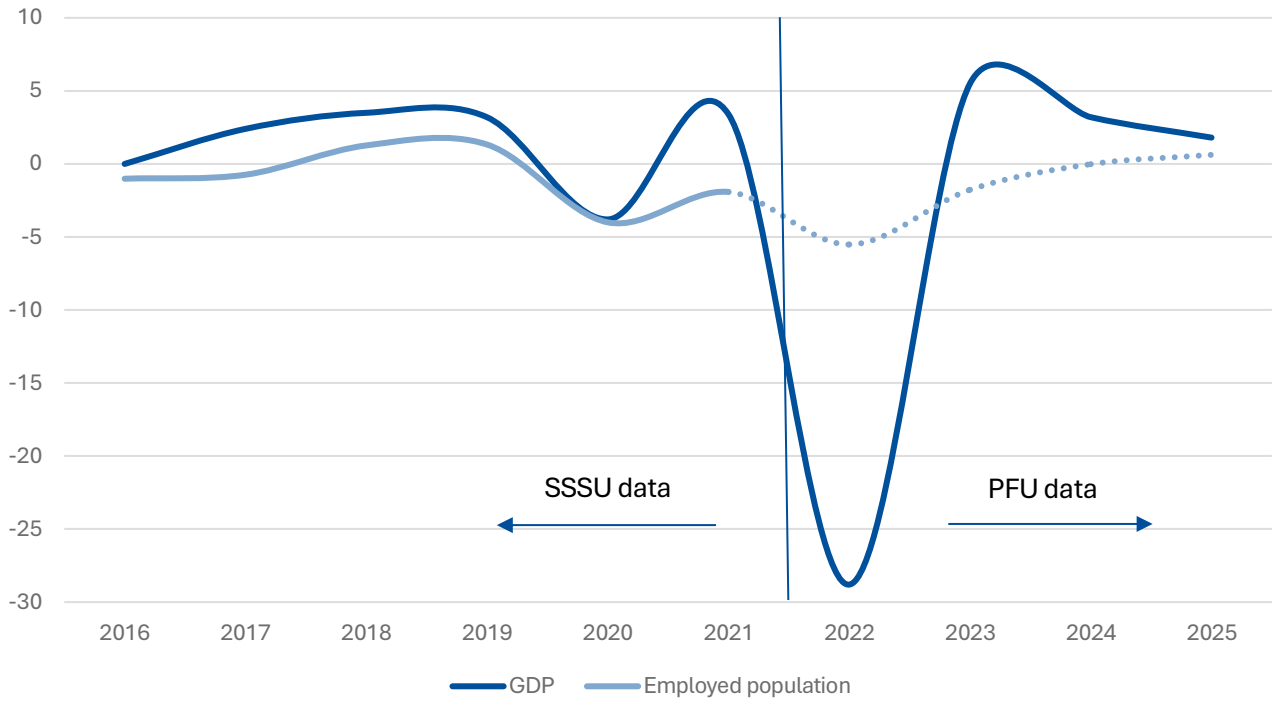
Labour productivity in Ukraine fell sharply in 2022 due to Russia's full-scale invasion. The war's consequences include the loss of capital, mass migration, poor mental health among workers, and low-quality, inconsistent online education, which began in 2020 and has worsened in recent years as more educational facilities across the country cannot safely operate in person. The displacement and internal reallocation of the labour force have also contributed to low productivity, due to mismatches between the skills of displaced workers and employers' demands in host regions. This is particularly evident in the regional dominance of industries such as metallurgy in the eastern part of the country.

Since 2023, labour productivity has resumed its growth as the economy has adapted to wartime conditions. However, it remains 15% below 2021 levels, as output has fallen more than employment.

[37] The Pension Fund data consists of monthly data on the number of working people by type of economic activity.

Despite growth in 2023–2025, real GDP remained 21% below the 2021 level, and employment fell by 7% in 2025 compared with 2021.

Figure 6. Real GDP and employed population, % y-o-y



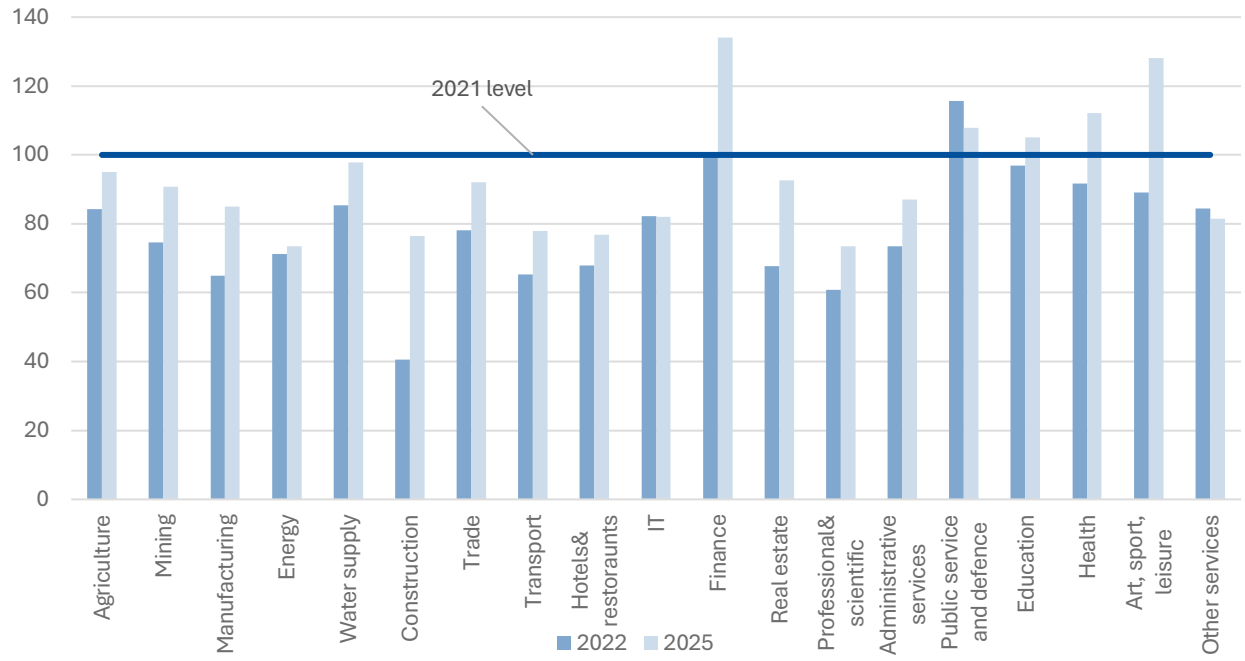
2025 – preliminary data.

Source: SSSU, PFU, CES calculations. PFU data for the employed population since 2021.

In addition, the economy's structure has changed significantly due to the full-scale war. Since 2022, the public sector has played a key role in the economy, driven by increased defence spending and the growth in military personnel. The share of sectors in nominal GDP, predominantly financed by the government (public administration and defence, health, and education), grew from 13% in 2021 to 26% in 2025, and employment in these sectors grew by 14% in 2025 compared to 2021, while employment in the non-government sector fell by 17%, resulting in an overall employment decline of 7%. As a result of structural changes, the drop in the non-government sector productivity was not compensated by an increase in government sector productivity, as the GDP per worker in the public sector is nearly three times lower. This structural shift imposed an economic burden, and the aggregate labour productivity index fell below that of both the government and non-government sectors.

Labour productivity in Ukraine increased by ~12% in 2025 compared with 2022, driven by economic recovery after the initial war shock. However, the recovery was uneven across sectors. Productivity in agriculture depends on weather conditions and harvests. Industry, construction, trade and transport saw a rapid recovery in productivity (by an average of ~30% in 2025 compared with 2022), but this did not offset the losses caused by the war.

Figure 7. Labour productivity per person employed* in Ukraine by types of activities in 2022 and 2025, % of 2021



*Official employment. 2025 – preliminary data.
Source: SSSU, Pension Fund, CES calculations.

Productivity in sectors predominantly financed by the government exceeded the 2021 level in 2022, while productivity in the private sectors is still mpstly below that level. In wartime, productivity growth in Ukraine partly offsets the deterioration of capital from shelling and low private-sector investment, as well as the shortage of labour due to migration and mobilisation. In particular, the Fifth Rapid Damage and Needs Assessment (RDNA5) report, released in February 2026[38], estimates capital losses as $195.1 bn in direct damage to the Ukrainian economy and $666.7 bn in economic losses[39]. Productivity increase leads to gradual growth in both potential and real GDP, despite the ongoing war. However, due to the destruction of capacity and infrastructure, the Ukrainian economy has already reached its potential, according to the National Bank of Ukraine estimates[40].

In turn, mobilisation and migration have significantly altered the Ukrainian labour market, and employment has fallen in all sectors, excluding defence. A significant proportion of Ukrainian refugees have already adapted to life abroad and joined the local labour market, with 60% of Ukrainians abroad being employed[41], as of January 2026. And their propensity to return has decreased. As a result, labour

[38] The World Bank, the Government of Ukraine, the European Union, the United Nations. Ukraine Fifth Rapid Damage And Needs Assessment Rdna5 Main Report, February 2022-December 2025, February 2026.

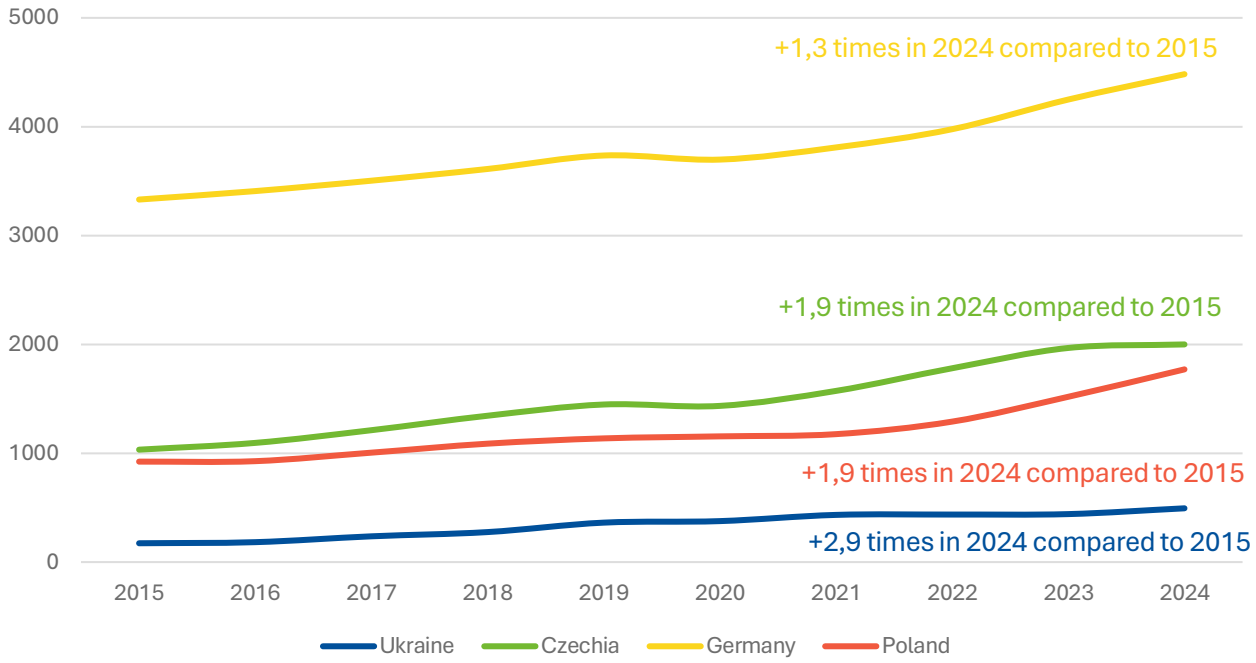
[39] Damage: Direct costs of destroyed or damaged physical assets and infrastructure. Losses: Changes in economic flows resulting from russia's invasion of Ukraine, including disrupted services, increased operating costs, loss of revenue for authorities and the private sector, and debris removal.

[40] The National bank of Ukraine. Inflation Report, January 2026.

[41] CES, Ukrainian Refugees. Fifth Wave of Research

shortages have become one of the main factors hindering firms' activity since 2023[42]. Given the impact of war and higher wages in the EU, the labour shortage will further remain significant.

Figure 8. Average gross monthly wages, €



Sources: Eurostat, SSSU, NBU, CES calculations.

Despite nominal wages in Ukraine growing much faster (by almost three times since 2015, compared with increases of between 1,3 and 2 times in countries that hosted the majority of Ukrainian labour migrants before 2022), they remain significantly lower than in EU countries. Government decisions, such as increases in the minimum wage and other public-sector wages, were an important driver of wage growth. Moreover, wages in Ukraine have begun to converge with those in countries that receive labour migrants as labour migration has intensified since 2016. During the full-scale war, the rapid decline in the labour force led to a labour shortage, forcing companies to raise wages (nominal wages in UAH grew by 75% in 2025 compared to 2022) to retain staff. The increase in productivity also slightly contributed to wage growth. However, faster wage growth than productivity growth intensified inflationary pressures[43].

As the war continues, the population will decline, and further destruction of capital is entirely possible. This makes increasing productivity a priority for the Ukrainian economy, to support economic activity, fiscal sustainability and household well-being.

[42] According to Business Outlook Surveys by the NBU and the New Monthly Enterprises Survey by the IER.

[43] NBU, Inflation Report, July 2019.

5. POLICIES TO SUPPORT PRODUCTIVITY GROWTH IN UKRAINE

A significant, most promising and effective way to improve labour productivity in Ukraine is to invest across various sectors of the economy. More broadly, investment can enhance labour productivity through innovation, better education, and investment in physical capital.

However, selecting priority sectors for investment is currently complicated by structural changes in the economy and the labour market caused by the war. It makes sense to invest in sectors that will yield rapid productivity growth. Sectors that already play a significant role in the economy – such as agriculture, agrifood processing, and other manufacturing industries – will be able to scale up quickly thanks to investment. Given the extent of the destruction caused by russia's war against Ukraine, it is crucial to increase productivity in sectors involved in reconstruction and recovery, such as construction and the production of building materials. Sectors that involve heavy physical labour also need to be modernised in light of the full-scale war's impact – specifically, by increasing the role of women, older adults, and people with disabilities, including veterans, in the labour market. Given the long-term security risks that will persist – not only for Ukraine but also for Europe – the defence and miltech sectors must be a priority. Identifying the most promising sectors for investments to increase productivity requires further research, particularly regarding the extent of the labour shortage and the potential for investment to close this gap.

According to research by the World Bank[44], private sector innovation and investment require a growth-friendly environment with supportive institutions and policies, including macroeconomic stability and the rule of law. Productivity growth also benefits from expertise in producing relatively complex and sophisticated exports, participation in global value chains, and cross-border technology transfer.

In wartime, the government plays a crucial role in investing in the Ukrainian economy through its support for the defence sector, repairs to destroyed energy and social infrastructure, and housing. However, post-war recovery needs to increase the role of private capital and expand public-private partnerships, assigning the government the primary role in creating favourable conditions for investment and meeting the requirements for EU accession, rather than relying on direct government funding of the economy.

Gorodnichenko & Obstfeld[45] noted the importance of investment in physical capital for Ukraine's post-war economic recovery. They identified a strong positive correlation between the net international investment position (a proxy for net capital inflows) and productivity levels. These investments could facilitate technology transfer and help to address demographic issues. Increased investment makes a

[44] World Bank, Global Productivity: Trends, Drivers, and Policies

[45] Yuriy Gorodnichenko and Maurice Obstfeld (PIIE) Working Paper 26-1 "You only live twice: Financial inflows and growth in a westward-facing Ukraine".

country more productive and liveable, which in turn makes it more attractive to investors. However, this approach requires financing. In this context, access to European cohesion funds and substantial private capital inflows are crucial for Ukraine. According to the authors, these investments could facilitate technology transfer and help to address demographic issues. However, it is not only the amount of capital that matters, but also a country's ability to allocate it effectively through proper government policy, the rule of law, simplified business operations, increased competitiveness, upgraded legislation, and further reforms under EU accession. Another essential issue is training. The world is fast-paced, and the skills needed tomorrow are only broadly defined today. However, before deciding what to teach and how to improve qualifications to enable more productive work, it is crucial to recognise that staff shortages in Ukraine will persist for a long time due to demographic and military trends. Therefore, training and upskilling alone are not enough; businesses need to modernise and technically re-equip production and service facilities. Investing in physical capital, automation, digitalisation, and the robotisation of processes is key to increasing productivity. It is also essential to train staff in the new skills required to work with the latest technology and automated processes.

In the context of structural economic changes, it is important to support workers' readiness to continuously update their skills and, when necessary, change professions. This requires both a positive societal perception of lifelong learning and well-developed systems for adult education and reskilling. At the same time, stronger career guidance for school students could support more informed educational and career choices aligned with labour market demand, facilitate a faster transition into employment, and improve returns on education investments.

In turn, this requires high-quality forecasts of the economy as a whole and the labour market, as well as projections of the most productive investments and employers' staffing needs, including the expected hard and soft skills of employees. Accordingly, it supports the necessary changes in education, including retraining and upskilling.

The next steps in the research on productivity issues in Ukraine will explore companies' attitudes toward and readiness for automation, as well as their readiness to train staff to increase labour productivity.