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Regional Disparities in Hungary

Drivers and Implications of the Digital and Green Transitions

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Regional Disparities in Hungary: Drivers and Implications of the Digital and Green Transitions
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ABSTRACT: Hungary is gradually converging to the average income level of the EU, but regional disparities remain persistently high and may worsen with the digital and green transitions. This paper employs income convergence and growth decomposition techniques to pin down the drivers of regional disparities in Hungary and analyze these trends through the lens of the ongoing digital and green transitions. The results indicate that divergence in productivity and labor force participation has played an outsized role in driving regional disparities, especially due to the concentration of economic activity in low-value-added and carbon-intensive sectors in lagging regions. Targeted reforms, particularly aimed at strengthening governance, increasing female labor force participation, and incentivizing migration, can promote economic dynamism and growth in lagging regions. Enhancing digital infrastructure and literacy has a statistically significant effect in reducing the urban-rural productivity gap, while investment in reskilling workers and incentivizing green R&D can promote an inclusive transition from brown to green jobs in regional economies.

Regional Disparities in Hungary: Drivers and Implications of the Digital and Green Transitions

Hungary

Prepared by Augustus J. Panton[1]

REGIONAL DISPARITIES IN HUNGARY: DRIVERS AND IMPLICATIONS OF THE DIGITAL AND GREEN TRANSITIONS[1]

A. Introduction

1.   Hungary is gradually converging to the average income level of the EU. Hungary's per capita income has been steadily rising over the last two decades, reaching 76 percent of the EU average in 2022, up from 66 percent in 2010 (Figure 1, left panel). Integration into global value chains—particularly Germany's automobile manufacturing sector—and increased foreign direct investment (FDI) inflows in recent years toward the electric vehicle (EVs) and battery production sector continue to play a significant role in facilitating Hungary's income convergence.

2.   However, within Hungary, regional income disparities remain persistently high. Despite the national progress towards the average EU income level, regional income disparities remain persistently high (Figure 1, right panel) as Budapest outpaces the rest of the country while growth remains low and stagnant in the least developed southern and northern regions. Beyond growth, these lagging regions continue to underperform the national average on several dimensions, including education, digitalization, infrastructure, and health outcomes (European Commission, 2023)[2].

Figure 1. Regional Income Disparities and Convergence in Hungary

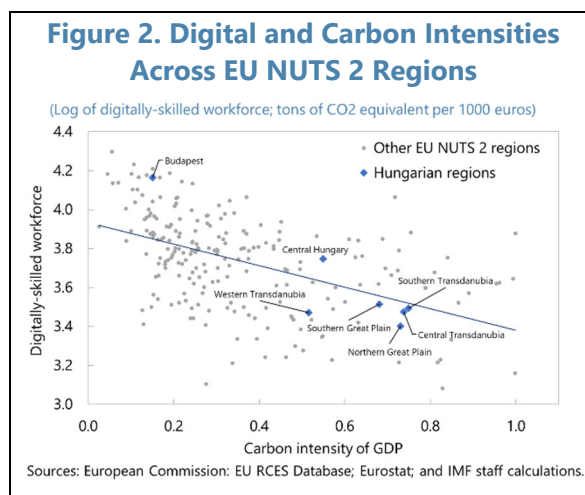Sources: Eurostat; and IMF staff calculations.

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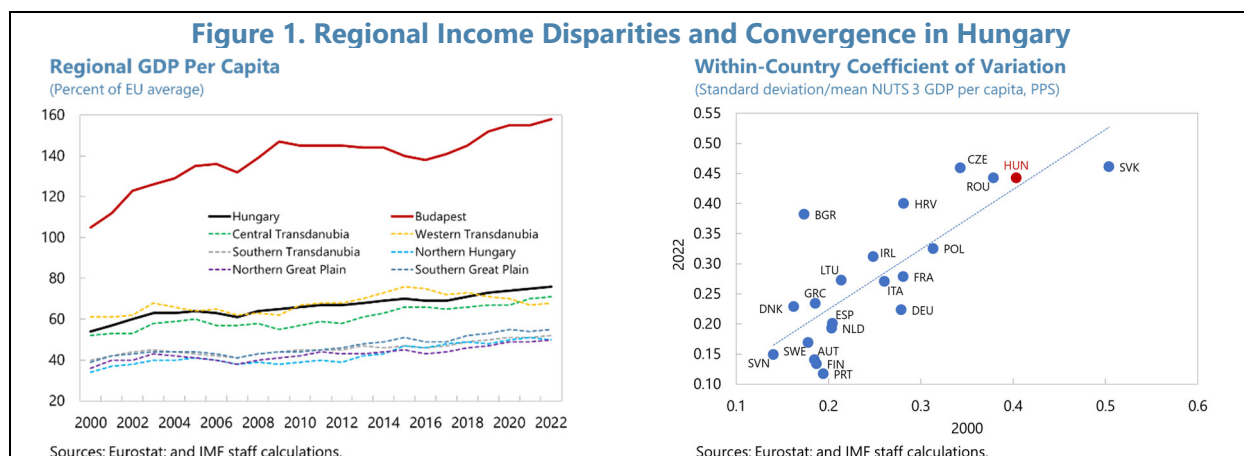
[1]Prepared by Augustus J. Panton (EUR).

[2] This is despite significant inflows of EU cohesion funds for regional integration—up to 2 percent of GDP annually—since joining the EU in 2014 (EU, 2024): Ninth report on economic, social and territorial cohesion.

3. **The twin digital and green transitions may widen regional disparities and slow the**
pace of income convergence. The ongoing digital
and green transitions may deepen disparities
among regions on at least two fronts. First, like
elsewhere in the EU, poorer Hungarian regions lack
the high skill requirements of the green and
increasingly digitalized economic environment
(Figure 2), potentially widening the productivity
gaps relative to richer regions (Maucorps and
others, 2023). Second, these lagging regions are
also more carbon intensive (per unit of output)
than their higher-income counterparts, exposing
them to more structural challenges in the transition
to carbon neutrality (OECD, 2023). In essence,
workers in poorer and carbon-intensive regions,
most of whom are not highly skilled, remain exposed to unfavorable labor market outcomes
stemming from the digital and green transitions. This could amplify inter and intra-regional
disparities absent targeted policy interventions.

Figure 2. Digital and Carbon Intensities Across EU NUTS 2 Regions

(Log of digitally-skilled workforce; tons of CO2 equivalent per 1000 euros)

Sources: European Commission: EU RCES Database; Eurostat; and IMF staff calculations.

4. **The analysis in this paper employs beta convergence and growth decomposition**
techniques to pin down the drivers of regional disparities and slow income convergence in
Hungary. The goal of the analysis is twofold. First, it examines the key drivers of regional income
disparities in Hungary during the last two decades. To this end, a standard growth decomposition
framework is employed to unpack how different growth components may have affected regional
income disparities while highlighting heterogeneities across regions. Second, regional disparities are
viewed through the lens of the digital and green transitions, with emphasis on how targeted policy
interventions could prevent these major structural transformations from amplifying existing gaps.

5. **The rest of the paper is structured as follows.** The next section analyzes regional income
convergence and the drivers of Hungary's uneven growth using formal beta convergence and
growth decomposition frameworks. Section three assesses Hungary's preparedness for the digital
transition, focusing on how uneven digitalization (and adoption of artificial intelligence) may
exacerbate income disparities, and examines the challenges of the green transition and the
implications for regional income convergence. The fourth section sums up the paper with
conclusions and policy recommendations.

B.   Drivers of Regional Disparities

6. **A standard beta convergence framework is used to examine the extent of**
heterogeneity in regional income convergence in Hungary. As stylized in Figure 1, regional
income convergence in Hungary has been slow and uneven amid low and stagnant growth in
poorer regions while high income regions push ahead, widening the regional income gap over time.

Following the literature (Barro and Sala-i Martin, 1992; Sala-i Martin, 1996), a standard beta convergence[3] is used to examine whether Hungary's least-developed regions have been growing faster than their high-income counterparts to eventually catch up. This is formally estimated as

$$\Delta y_{r,t} = \alpha + \beta y_{r,t-1} + \varepsilon_{r,t} \qquad (1)$$

where $\Delta y_{r,t}$ and $y_{r,t-1}$ represent the average annual growth of regional per capita GDP and its initial level respectively. An estimated negative β coefficient implies regional income convergence—that is, higher initial per capita income level is associated lower growth, and vice versa. This allows regions starting with lower income levels to eventually converge to their higher income counterparts. With region and time fixed effects added, the framework is used to examine conditional beta convergence among Hungary's NUTS 3 regions during the last two decades (2000-2019). The results are summarized in Table 1.

7.   Hungary's regional growth dynamics are characterized by heterogeneous patterns of convergence and divergence. The results in Table 1 confirm the stylized facts presented in Figure 1 with two nuances. First, at the national level, the existence of beta convergence is confirmed under different model specifications—controlling for time invariant factors (e.g., common global economic or policy shocks) and regional specificities (e.g., geographical location; institutional quality). Second, at the sub-national (NUTS 3) level, growth dynamics are heterogeneous, with poorer regions growing slower and failing to catch up with their higher-income counterparts. For example, while *Pest* and *Győr-Moson-*Sopron—sub-regions of the high-income capital and Western Transdanubia regions—are growing faster despite their higher initial per capita GDP, relatively poorer regions in the south (e.g., *Somogy, Tolna,* Bács-Kiskun) and the north (e.g., *Heves, Borsod-Abaúj-Zemplén, Jász-Nagykun-Szolnok*) are falling behind.

Table 1. Hungary: Beta Convergence: Panel Regression Estimates

	Model 1	Model 2
$y_{r,t-1}$	-0.100* [0.0542]	-1.113*** [0.0789]
$y_{r,t-1} * (regional\ dummy)$		
Pest		-0.165*** [0.0247]
Fejér		0.190*** [0.0283]
Komárom-Esztergom		-0.0951*** [0.0246]
Veszprém		0.0774 [0.0893]
Györ-Moson-Sopron		0.0908*** [0.0275]
Vas		-0.304*** [0.0344]
Zala		-0.140*** [0.0476]
Baranya		-0.0731 [0.0828]
Somogy		0.199* [0.0958]
Tolna		0.401*** [0.0489]
Borsod-Abaúj-Zemplén		0.129*** [0.0202]
Heves		0.334*** [0.0407]
Nógrád		-0.0296 [0.0887]
Hajdú-Bihar		-0.0491 [0.0640]
Jász-Nagykun-Szolnok		0.251*** [0.0371]
Szabolcs-Szatmár-Bereg		0.354*** [0.0635]
Bács-Kiskun		0.542*** [0.0216]
Békés		0.0739 [0.0845]
Csongrád-Csanád		0.0701 [0.0749]
Constant	1.158** [0.523]	10.05*** [1.084]
Observations	320	320
R^2	0.593	0.895
Time fixed-effects	Y	Y
Regional fixed-effects	N	Y

Sources: Eurostat, OECD, and IMF staff calculations.
Note: Robust standard errors shown in square brackets.
Statistical significance at the following levels: *** = 1%, ** = 5%, * = 10%

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[3] A related concept is σ-convergence, which examines whether regional per capita income dispersion decreases over time, indicating poorer regions are catching up (Kremer et al., 2021). Both beta and sigma convergence are essential to assess the quality of convergence, as faster growth in lower-income regions alone does not ensure a reduction in income dispersion.

8.   A standard decomposition is adopted to pin down the drivers of regional disparities.
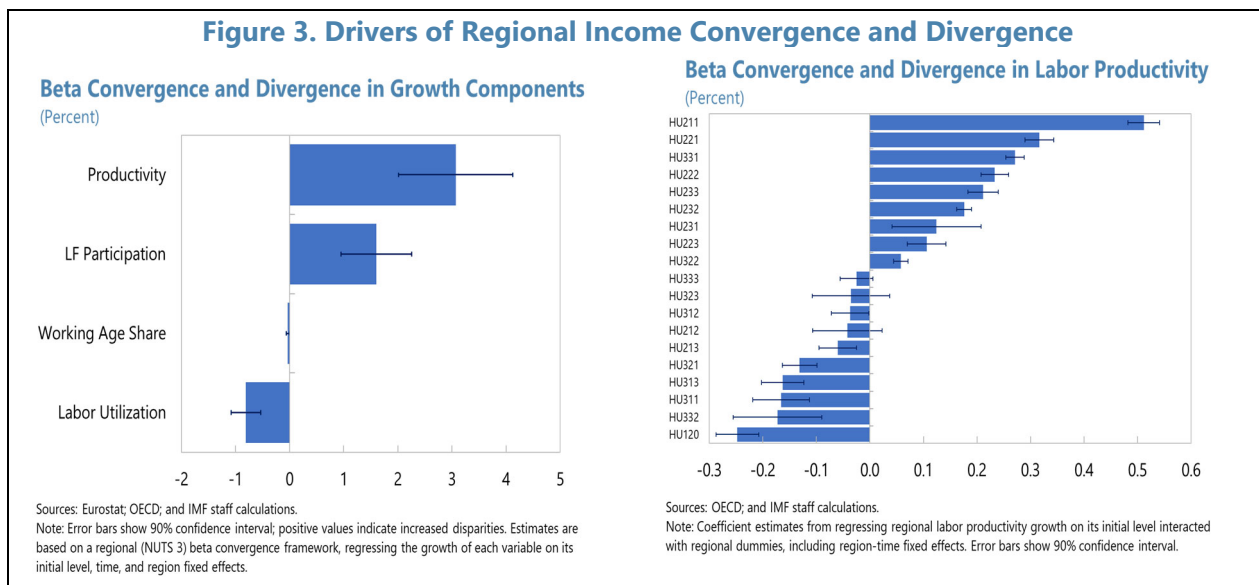The results analyzed above show that regional income convergence dynamics have been mixed.
However, different growth components (e.g., labor productivity, labor force participation rates) may
play different roles in different regions. To discipline the analysis on the search of the drivers
underpinning regional income disparities, a standard growth decomposition framework—à la
Balakrishnan and others (2022)—is employed as summarized below:

$$y_{pc} = \frac{GDP}{Pop} = \frac{GDP}{Emp} \times \frac{Emp}{LF} \times \frac{LF}{WorkAgePop} \times \frac{WorkAgePop}{Pop} \qquad (2)$$

where GDP per worker $\left(\frac{GDP}{Emp}\right)$ represents labor productivity, employment to labor force ratio $\left(\frac{Emp}{LF}\right)$

indicates labor utilization, while the labor force participation rate and working age share are
represented by the last two terms. Convergence (or divergence) in each growth component is then
empirically examined, one at a time, using Equation 1 with region and time fixed effects.

**9.   Divergence in productivity and labor force participation have been the key drivers of
regional income disparities in Hungary over the last two decades**. The results show strong
divergence in labor productivity and labor force participation (Figure 3, left panel) while
convergence is observed in the other two factors—working age share and labor utilization. The large
and statistically significant labor productivity beta estimates clearly point to the outsized role of
productivity differentials in underpinning regional income disparities in Hungary (European
Commission, 2023). That is, while regions enjoying high initial productivity and labor force
participation rates are improving faster on these indicators, those with lower initial conditions are
falling behind (Figure 3, right panel).

Figure 3. Drivers of Regional Income Convergence and Divergence

Beta Convergence and Divergence in Growth Components (Percent)

Beta Convergence and Divergence in Labor Productivity (Percent)

Sources: Eurostat; OECD; and IMF staff calculations.
Note: Error bars show 90% confidence interval; positive values indicate increased disparities. Estimates are based on a regional (NUTS 3) beta convergence framework, regressing the growth of each variable on its initial level, time, and region fixed effects.

Sources: OECD; and IMF staff calculations.
Note: Coefficient estimates from regressing regional labor productivity growth on its initial level interacted with regional dummies, including region-time fixed effects. Error bars show 90% confidence interval.

10. However, there is strong heterogeneity in labor productivity convergence and divergence patterns across thriving versus lagging regions, with some lagging NUTS 3 regions in the north (e.g., HU331—*Bács-Kiskun*) gradually catching up with relatively higher-income and more productive regions (e.g., HU120—*Pest*). Despite their low productivity, the results (Figure 4) suggest that lagging Hungarian regions[4] tend to have higher employment shares in industr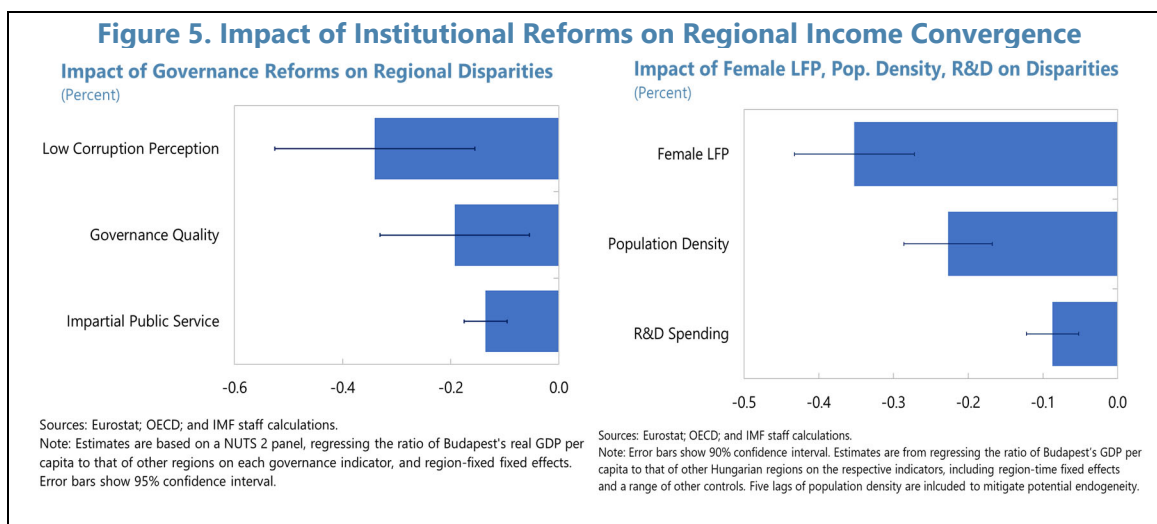y, (and manufacturing subsector), contrary to trends observed in other emerging markets and advanced economies (IMF, 2019). This result possibly points to the low value-added nature of regional industrial activity in Hungary as well as the uncompetitive structure of SMEs financing amid strong dependence on public subsidies (European Commission, 2023). Like trends elsewhere, these lagging regions tend to have higher employment concentration in agriculture but lower in high productivity services (e.g., professional business services, real estate, finance & insurance, ICT) than other regions.

Figure 4. Sectoral Employment Shares: Lagging vs. Other Regions

(Percentage point difference)

Sources: Eurostat; OECD regional database; and IMF staff calculations.
Note: Error bars show 90% confidence interval. Lagging regions are defined as those with real GDP per capita below the national regional median in 2000–19 and with average growth below the country's average over 2000–19. Coefficient estimates are from regressing the mean-normalized difference between respective employment shares in lagging vs other regions.

11. The role of strong institutions, proxied by good governance, is also examined. The decomposition framework (Equation 2) employed above does not directly include several other factors that drive growth, especially institutions. Using good governance as a proxy for institutional quality, Equation 1 is re-estimated with the ratio of Budapest's per capita income to the income of other NUTS 2 (or 3) regions on the respective reform indicators as the dependent variable. This is regressed on selected governance reform indicators from the European Quality of Governance database,[5] with region-time fixed effects and a range of other controls included. The results, presented in Figure 5 (left panel), suggest that good governance (i.e., low corruption perception, quality institutions, and impartial public service deliver) has a statistically significant effect in reducing disparities and promoting regional income convergence. These results are consistent with findings in the literature that closing governance gaps can promote a conducive business climate, thus incentivizing private investment and facilitating economic diversification (Budina and others, 2023).

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[4] Lagging regions are defined as those with real GDP per capita below the national regional median in 2000 and with average growth below the country's average over 2000–19.

[5] These are NUTS 2 (rather than national) governance indicators (see Charron and others, 2024). With overall governance reforms centered at the national level, these indicators reflect local institutional capacity.

Figure 5. Impact of Institutional Reforms on Regional Income Convergence

Impact of Governance Reforms on Regional Disparities
(Percent)

Impact of Female LFP, Pop. Density, R&D on Disparities
(Percent)

Sources: Eurostat; OECD; and IMF staff calculations.
Note: Estimates are based on a NUTS 2 panel, regressing the ratio of Budapest's real GDP per capita to that of other regions on each governance indicator, and region-fixed effects. Error bars show 95% confidence interval.

Sources: Eurostat; OECD; and IMF staff calculations.
Note: Error bars show 90% confidence interval. Estimates are from regressing the ratio of Budapest's GDP per capita to that of other Hungarian regions on the respective indicators, including region-time fixed effects and a range of other controls. Five lags of population density are inlcuded to mitigate potential endogeneity.

12.   Institutional reforms aimed at increasing female LFP, migration, and R&D investment can also help speed up regional income convergence. The results (in Figure 5, right panel) also reveal that increasing female labor force participation and population density can promote regional income convergence, consistent with the adverse impact that regional LFP differentials have on convergence (Figure 3, left panel). Increasing spatial density, including via incentivized inter and intra-regional labor mobility, can attract investments and promote efficiency in regional economies (Krugman, 1991). Such increased investments, particularly when directed to R&D, can promote regional dynamism amid structural transformations (Budina and others, 2023) like the ongoing digital and green transitions.
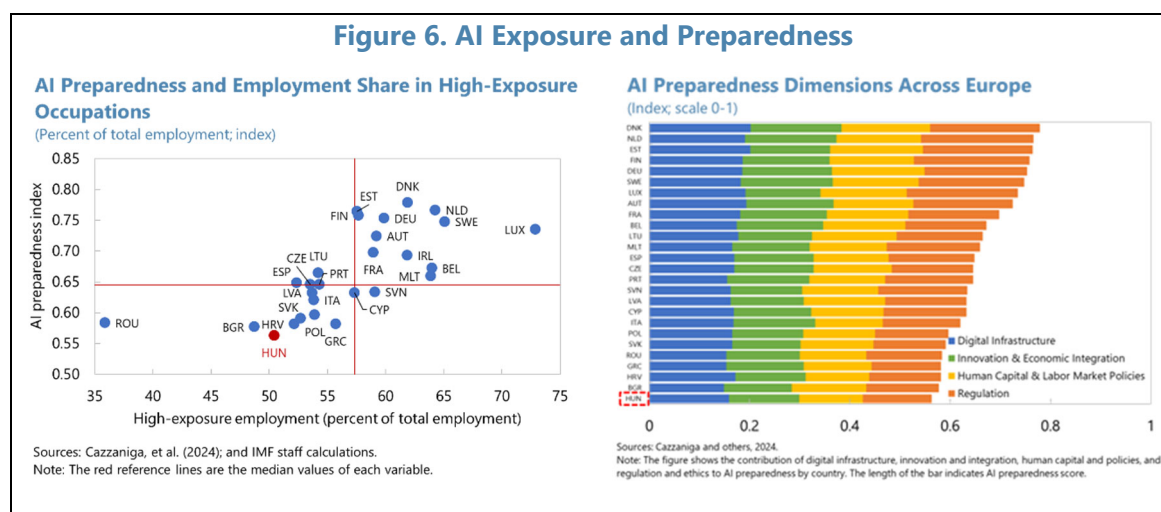
C.   Regional Disparities Through the Lens of the Twin Digital and Green Transitions

13.   The Hungarian economy, like elsewhere in Europe and globally, is undergoing the twin digital and green transitions, requiring structural adjustments that vary by region due to differing economic structures and specializations. Absent targeted policy interventions, regional disparities may deepen as higher-income regions exploit their high knowledge- and green-intensity (Figure 2) to thrive while poorer regions lag (OECD, 2023; Maucorps and others, 2023). With a focus on how the labor market effects of these transitions could affect regional disparities, this section proceeds in two steps. First, it assesses Hungary's digital preparedness—relative to the EU—and examines how sub-national differences in digital access and skills could widen existing productivity gaps. Second, it summarizes the regional concentration of 'green jobs' and explores the association between labor market greenness, knowledge intensity, and regional income levels.

Digital Transition

14.   Hungary risks missing out on the gains from AI and related digital technologies. As analyzed in the previous section, productivity differences have contributed to Hungary's persistent regional disparities and slow income convergence (Figure 3, left panel). Drawing on recent IMF research on generative AI and the future of work (see Cazzaniga and others, 2024; Pizzinelli and
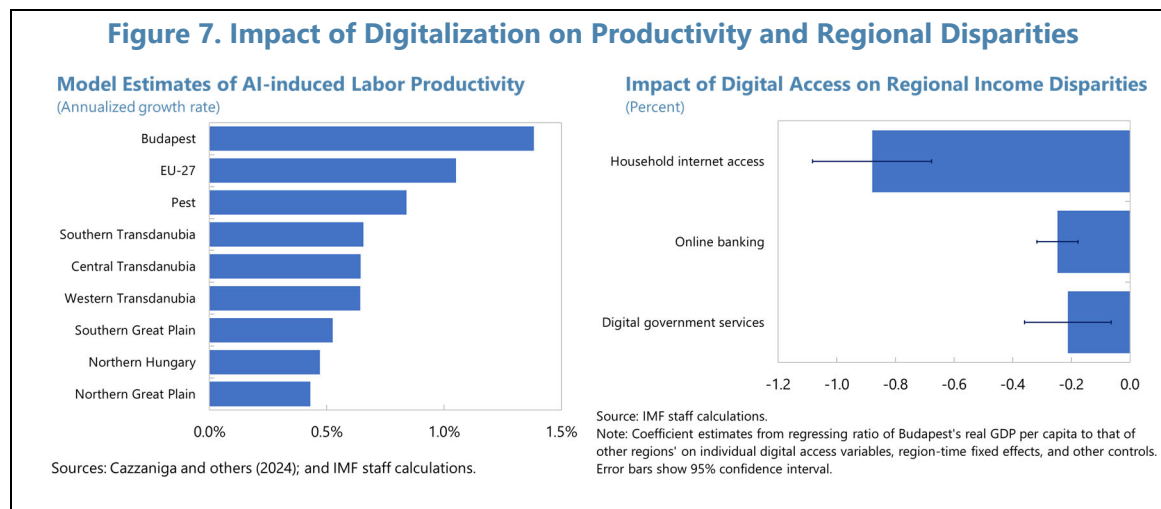
others, 2023), this section examines how the rapid emergence of AI could deepen existing regional digital access and skill gaps, thus widening the rural-urban productivity gap. Figure 5 puts Hungary's AI exposure and preparedness[6] into context with the EU, showing that despite being relatively less exposed (below regional AI exposure median) to AI-related labor market disruptions, Hungary is largely underprepared to integrate and harness the potential benefits of AI technologies. Active labor market policies and flexibility, coupled with strong legal frameworks are critical for facilitating AI-induced labor market transitions in Hungary (see Cazzaniga and others, 2024).

Figure 6. AI Exposure and Preparedness

AI Preparedness and Employment Share in High-Exposure Occupations
(Percent of total employment; index)

Sources: Cazzaniga, et al. (2024); and IMF staff calculations.
Note: The red reference lines are the median values of each variable.

AI Preparedness Dimensions Across Europe
(Index; scale 0-1)

Sources: Cazzaniga and others, 2024.
Note: The figure shows the contribution of digital infrastructure, innovation and integration, human capital and policies, and regulation and ethics to AI preparedness by country. The length of the bar indicates AI preparedness score.

15. **Model results point to AI-induced widening in regional labor productivity gaps.** To assess AI's economic impact on productivity, Cazzaniga and others (2024) employed a Cobb-Douglas aggregated task-based model—à la Acemoglu and Restrepo (2022)—that integrates several key factors, including differences in labor productivity, asset holdings, AI exposure, and the complementarity between human labor and AI. The model is calibrated to Hungary, specifically linking the productivity effects of AI[7] to the share of digitally skilled labor force in each region. The results suggest that thriving regions are likely to enjoy higher productivity gains, potentially widening regional income disparities (Figure 7, left panel). But increased investment in digital infrastructure (e.g., internet access and digitized public services) can help narrow the income gap (Figure 5, right panel).

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[6] The IMF AI Preparedness Index, constructed by Cazzaniga and others (2024), is now a standard IMF indicator, available in Datamapper: https://www.imf.org/external/datamapper/datasets/AIPI

[7] With AI technologies still being developed and adoption currently at low levels in many economies, particularly at sub-national levels, model-based estimates of AI-induced productivity are highly stylized and should be interpreted with caution (see Acemoglu, 2024).

Figure 7. Impact of Digitalization on Productivity and Regional Disparities

Model Estimates of AI-induced Labor Productivity
(Annualized growth rate)

Budapest
EU-27
Pest
Southern Transdanubia
Central Transdanubia
Western Transdanubia
Southern Great Plain
Northern Hungary
Northern Great Plain

0.0%   0.5%   1.0%   1.5%

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

Impact of Digital Access on Regional Income Disparities
(Percent)

Household internet access

Online banking

Digital government services

-1.2   -1.0   -0.8   -0.6   -0.4   -0.2   0.0

Source: IMF staff calculations.
Note: Coefficient estimates from regressing ratio of Budapest's real GDP per capita to that of other regions' on individual digital access variables, region-time fixed effects, and other controls. Error bars show 95% confidence interval.

Green Transition

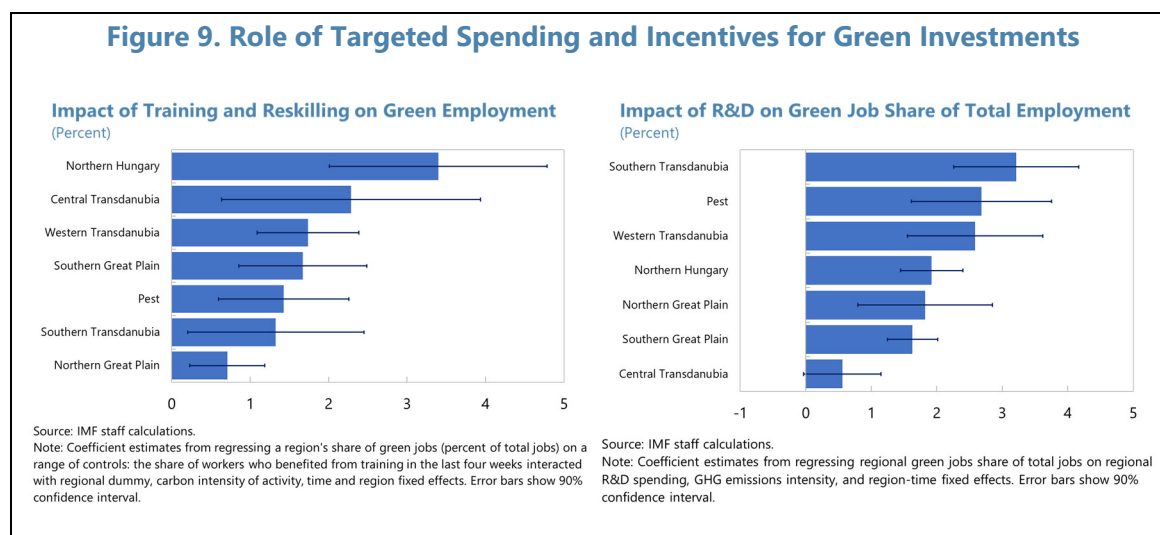**16.   The green transition may also deepen disparities, especially through regional differences in labor market outcomes.** Like the digital transition, the local effects of national green policies tend to differ across regions, often depending on regional heterogeneity in carbon intensity of activity and employment. In Hungary, like elsewhere in Europe, the green share of total employment tends to be larger in higher-income regions (Figure 6, left panel). Similarly, the greenness of labor markets is positively correlated with educational attainment (Figure 6, right panel), consistent with evidence in the literature that green-intensive jobs provide wage premium (Bergant and others, 2022) largely owing to their higher skill requirement. These trends position higher-income regions to thrive in the transition to carbon neutrality, potentially widening regional income disparities (Maucorps and others, 2023).

Figure 8. Green Job Composition of Regional Labor Markets

Correlation Between Green Jobs and Regional Income
(Log of each variable)

Green job share of total employment

Western Transdanubia
Northern Hungary
Pest
Budapest
Northern Great Plain
Central Transdanubia
Southern Transdanubia
Southern Great Plain

• Other EU regions
♦ Hungarian regions

3.6   3.8   4.0   4.2   4.4   4.6   4.8   5.0   5.2
GDP (PPS per inhabitant in percent of EU-27), 2022

Sources: European Commission: EU RCES Database; and IMF staff calculations.

Correlation Between Green Jobs and Education Attainment
(Log of each variable)

Green job share of total employment

Western Transdanubia
Northern Hungary
Pest
Budapest
Central Transdanubia
Northern Great Plain   Southern Great Plains
Southern Transdanubia

• Other EU regions
♦ Hungarian regions

2.6   2.8   3.0   3.2   3.4   3.6   3.8   4.0   4.2
Tertiary education attainment (age 25-64), 2023

Sources: European Commission: EU RCES Database; Eurostat; and IMF staff calculations.

17.   Targeted spending and incentives for green investments can help green regional labor markets. The extent to which the green transition deepen structural gaps in regional labor markets depends on how policies are designed and targeted, emphasizing the need for reskilling workers to transition to greener opportunities and incentivizing green R&D investments. To examine the impact

of these policies on green employment, the green job share of total employment in each Hungarian region is regressed on a range of controls, including the share of workers benefiting from training and R&D spending as separate independent variables. The results (in Figure 7) suggest that training, including in the form of reskilling, can reduce disparities in green employment. Prioritizing and incentivizing private R&D investment can also have similar positive effect.

Figure 9. Role of Targeted Spending and Incentives for Green Investments

Impact of Training and Reskilling on Green Employment
(Percent)

Impact of R&D on Green Job Share of Total Employment
(Percent)

Source: IMF staff calculations.
Note: Coefficient estimates from regressing a region's share of green jobs (percent of total jobs) on a range of controls: the share of workers who benefited from training in the last four weeks interacted with regional dummy, carbon intensity of activity, time and region fixed effects. Error bars show 90% confidence interval.

Source: IMF staff calculations.
Note: Coefficient estimates from regressing regional green jobs share of total jobs on regional R&D spending, GHG emissions intensity, and region-time fixed effects. Error bars show 90% confidence interval.

D. Conclusion

18.   Hungary's convergence to the average EU income level is underway, but at a slow and uneven pace amid persistently high regional disparities. Hungary has experienced significant economic growth over the past decades, with per capita income approaching the EU average. This growth, however, has not been evenly distributed across the country, leading to pronounced regional disparities. Budapest and its surrounding areas have surged ahead, benefiting from higher levels of investment, better infrastructure, and greater access to global markets. In contrast, many rural and less developed regions have lagged, characterized by low productivity and higher unemployment rates.

19.   The ongoing twin digital and green transitions could worsen these disparities. They present both opportunities and challenges for regional development in Hungary. On the one hand, these transitions offer the potential for creating new jobs, fostering innovation, and promoting sustainable development. On the other hand, they risk exacerbating existing regional disparities without targeted interventions. Budapest and other thriving regions are better positioned to capitalize on the emerging opportunities, while lagging regions risk falling further behind amid lower levels of digital readiness and concentration of employment in carbon-intensive, low-value added sectors. Investment toward reskilling workers and incentives for green R&D can play a vital in closing the urban-rural income and green employment gaps.

HUNGARY

20.   Deeper, targeted reforms are needed to facilitate a balanced and sustainable income convergence path. To ensure that the benefits of economic growth and the digital and green transitions are more evenly distributed, targeted policy interventions are essential. These could include investing in digital infrastructure and education in lagging regions and providing incentives for green private investments. Good governance, including at the regional level (anti-corruption, regulatory quality of public institutions) can promote dynamism and growth in regional economies.

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References

Acemoglu, D. 2024. "The Simple Macroeconomics of AI." *NBER Working Paper* No. 32487. Cambridge, MA: National Bureau of Economic Research. DOI: 10.3386/w32487.

Acemoglu, D., and P. Restrepo. 2022. "Tasks, Automation, and the Rise in US Wage Inequality." *Econometrica* 90, no. 5: 1973–2016.

Balakrishnan, R., C. Ebeke, M. First, D. Malacrino, and L. Rabier. 2022. "Regional Disparities in Europe." *IMF Working Paper* WP/22/198. Washington, DC: International Monetary Fund.

Barro, R. J. 1991. "Economic Growth in a Cross Section of Countries." *The Quarterly Journal of Economics* 106, no. 2: 407–443.

Barro, R. J., and X. Sala-i Martin. 1992. "Convergence." *Journal of Political Economy* 100, no. 2: 223–251.

Bergant, K., R. C. Mano, and I. Shibata. 2022. "From Polluting to Green Jobs: A Seamless Transition in the U.S.?" *IMF Working Paper* WP/22/129. Washington, DC: International Monetary Fund.

Cazzaniga, M., F. Jaumotte, L. Li, G. Melina, A. Panton, C. Pizzinelli, E. J. Rockall, and M. M. Tavares. 2024. "Gen-AI: Artificial Intelligence and the Future of Work." *Staff Discussion Notes* 2024, no. 001. Washington, DC: International Monetary Fund.

European Commission. 2023. "Country Report: Hungary." DOI: 10.2765/354358.

International Monetary Fund (IMF). 2019. "Closer Together or Further Apart? Subnational Regional Disparities and Adjustment In Advanced Economies." *World Economic Outlook Chapter 2*, October. Washington, DC: International Monetary Fund.

Kremer, M., J. Willis, and Y. You. 2021. "Converging to Convergence." *NBER Macro Annual* 2021.

Krugman, P. 1991. "Increasing Returns and Economic Geography." *Journal of Political Economy* 99, no. 3: 483–499.

Maucorps, A., R. Römisch, T. Schwab, and N. Vujanović. 2023. "The Impact of the Green and Digital Transition on Regional Cohesion in Europe." *Intereconomics: Review of European Economic Policy* 58, no. 2: 102–110.

OECD. 2023. *Job Creation and Local Economic Development 2023: Bridging the Great Green Divide*. Paris: OECD Publishing. https://doi.org/10.1787/21db61c1-en.

Pizzinelli, C., A. Panton, M. M. Tavares, M. Cazzaniga, and L. Li. 2023. "Labor Market Exposure to AI: Cross-Country Differences and Distributional Implications." *IMF Working Paper* 2023/216. Washington, DC: International Monetary Fund.

Sala-i Martin, X. 1996. "The Classical Approach to Convergence Analysis." *The Economic Journal* 106, no. 437: 1019–1036. JSTOR. https://doi.org/10.2307/2235375.