WORLD BANK EAST ASIA AND THE PACIFIC ECONOMIC UPDATE OCTOBER 2024

JOBS AND TECHNOLOGY

WORLD BANK GROUP

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Contents

List of Figures

Technology and Jobs in EAP

Appendix

List of Tables

List of Boxes

Preface and Acknowledgments

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Throughout the report, geographic groupings are defined as follows:

Developing East Asia and Pacific comprises Cambodia, China, Indonesia, Lao People's Democratic Republic (PDR), Malaysia, Mongolia, Myanmar, Papua New Guinea, the Philippines, Thailand, Timor-Leste, Viet Nam, and the Pacific Island Countries.

The **Pacific Island Countries** comprise Fiji, Kiribati, the Marshall Islands, the Federated States of Micronesia, Nauru, Palau, Samoa, the Solomon Islands, Tonga, Tuvalu, and Vanuatu.

The **ASEAN** member countries comprise Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam.

The **ASEAN-5** comprise Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam.

The analysis in this report is based on the latest country-level data available as of September 27, 2024.

List of Abbreviations

AE	Advanced Economy
AD	Anti-dumping
AI	Artificial Intelligence
ASEAN	The Association of Southeast Asian Nations
BPO	Business Process Outsourcing
COVID	Coronavirus Disease
CPI	Consumer Price Index
EMDE	Emerging Markets and Developing Countries
EPU	Economic Policy Uncertainty
EU	European Union
EV	Electric Vehicle
FAI	Fixed Asset Investment
FDI	Foreign Direct Investment
FX / FOREX	Foreign Exchange
GPR	Geopolitical Risk Index
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GVC	Global Value Chain
HIC	High Income Country
IP	Industrial Policy
ICT	Information and Communications Technology
ISCO	International Classification of Occupations
IFR	International Federation of Robotics
ILOSTAT	International Labour Organization Statistics
IMF	International Monetary Fund
ISIC	International Standard Industrial Classification
ITU	International Telecommunication Union
LFS	Labor Force Survey
NPL	Nonperforming loans
O-NET / ONET	Occupational Information Network
OECD	Organisation for Economic Co-operation and Development
pp	Percentage point
PTA	Preferential Trade Agreement
PIAAC	Program for the International Assessment of Adult Competencies
PISA	Program for International Student Assessment
PPP	Purchasing Power Parity
R&D	Research and Development
RHS	Right Hand Side
STEM	Science, Technology, Engineering and Mathematics
STEP	Skills towards Employment and Productivity
SME	Small and Medium Enterprise
SEL	Socio-emotional learning
SD	Standard Deviation
SOE	State-Owned Enterprise
TFP	Total Factor Productivity
UNCTAD	United Nations Trade and Development
VIX	Volatility Index
WDI	World Development Indicator
WEO	World Economic Outlook
WTO	World Trade Organization

Regions, World Bank Classification and Country Groups	
EAP	East Asia and Pacific
ECA	Eastern Europe and Central Asia
LAC	Latin America and the Caribbean
MNA	Middle East and North Africa
SAR	South Asia
SSA	Sub-Saharan Africa

Currency Units	
B	Thai baht
CR	Cambodian riel
D	Vietnamese dong
F$	Fiji dollar
K	Myanmar kyat
K	Papua New Guinea kina
Kip	Lao kip
P	Philippine peso
RM	Malaysian ringgit
RMB	Chinese renminbi
Rp	Indonesian rupiah
SI$	Solomon Islands dollar
Tog	Mongolian tugrik
US$	Timor-Leste (U.S. dollar)
US$	United States dollar

Country/Economy Abbreviations	
CHN	China
EU	European Union
FJI	Fiji
FSM	Federated States of Micronesia
HKG	Hong Kong SAR, China
IDN	Indonesia
JPN	Japan
KHM	Cambodia
KIR	Kiribati
KOR	Republic of Korea
LAO	Lao People's Democratic Republic
MNG	Mongolia
MMR	Myanmar
MYS	Malaysia
NRU	Nauru
PHL	Philippines
PICs	Pacific Island Countries
PLW	Palau
PNG	Papua New Guinea
RMI	Republic of the Marshall Islands
SLB	Solomon Islands
THA	Thailand
TLS	Timor-Leste
TON	Tonga
TUV	Tuvalu
TWN	Taiwan, China
UK	United Kingdom
USA / US	United States
VNM	Viet Nam
VUT	Vanuatu
WSM	Samoa

Sector Abbreviations	
AGR	Agriculture, forestry and fishing
MIN	Mining and quarrying
FOOD	Manufacture of food products; beverages and tobacco products
TEX	Manufacture of textiles, wearing apparel, leather and related products
PAPER	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; manufacture of paper and paper products; printing and reproduction of recorded media
MIN_CHEM	Manufacture of chemicals and non-metallic mineral products
METAL	Manufacture of basic metals and fabricated metal products, except machinery and equipment
COM	Manufacture of computer, electronic and optical products
ELEC	Manufacture of electrical equipment
MACHINE	Manufacture of machinery and equipment n.e.c.
AUTO	Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment
O_MANU	Manufacture of furniture; jewellery, musical instruments, toys, etc.; repair and installation of machinery and equipment
UTIL	Electricity, gas, steam and air conditioning supply
WATER	Water supply; sewerage, waste management and remediation activities
CONST	Construction
TRADE	Wholesale and retail trade; repair of motor vehicles and motorcycles
TRANS	Transportation and storage
ACCOM	Accommodation and food service activities
ICT	Information and communication
FINA	Financial and insurance activities
REAL	Real estate activities
PROF	Professional, scientific and technical activities
ADMI	Administrative and support service activities
PUB	Public administration and defence; compulsory social security
EDU	Education
HEAL	Human health and social work activities
ARTS	Arts, entertainment and recreation
O_SRV	Other service activities
SELF	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use

Abstract

East Asia and the Pacific, seen in the context of the world economy, stands out as a paragon of development. Despite the recent ravages of the pandemic and the persistent tensions of geopolitics, the region is growing at stably high rates and the benefits are widely shared. But seen in the context of its own past and its potential, the region's economic performance is less impressive. Growth is still below pre-pandemic levels, except in Indonesia, and output has not yet recovered to pre-pandemic levels in several countries, especially in the Pacific.

This Economic Update examines three challenges faced by the region: shifting growth dynamics, trade protectionism, and technological change. For three decades, China's growth has spilled over beneficially to its neighbors, but the size of that impetus is now diminishing. The region will therefore need to strengthen domestic drivers of growth by implementing long-deferred *deeper reforms* (Reviving Growth, April 2023 EAP Economic Update).

The other two challenges stem from changes in the twin pillars of the region's remarkable inclusive growth: exporting to predictably open global markets and producing with labor-intensive methods. Policies and uncertainty precipitated by global tensions are changing patterns of trade and investment. While some countries, like Viet Nam, are benefiting from their role as hubs, the divergent and conflicting objectives of their large trading partners may limit opportunities to play this role. Concluding *deeper international trade agreements* within the region and with other large countries may help create more open and stable trade regimes.

Lastly, new technologies, such as robots, artificial intelligence, digital platforms, and broader digitalization, are irresistible because of their powerful impact on firm productivity (Firm Foundations of Growth, April 2024 EAP Update). These technologies are, however, affecting the relationship between growth and jobs, through three channels: creating new tasks, enhancing labor productivity, and displacing workers. The productivity gains from automation and the resulting higher scale of production helped create jobs for skilled workers engaged in non-routine manual and cognitive tasks in Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam. However, robots have also displaced low-skilled formal workers who were engaged in routine manual work.

EAP countries, with their weaker services sectors, employ fewer people in cognitive task occupations than advanced countries but the share of workers potentially exposed to AI is in fact larger than the share exposed to robots. Digital platforms are encouraging participation in the labor force of the marginalized but also inducing some formal sector workers to embrace a new digital informality. While the evolution of technology is hard to predict, the region must equip its people with deeper technical, digital and soft skills that complement the new technologies; facilitate capital mobility and worker mobility across sectors, occupations and space; remove factor price distortions that could lead to excessive automation; and encourage social insurance for workers in the new digital informal economy.

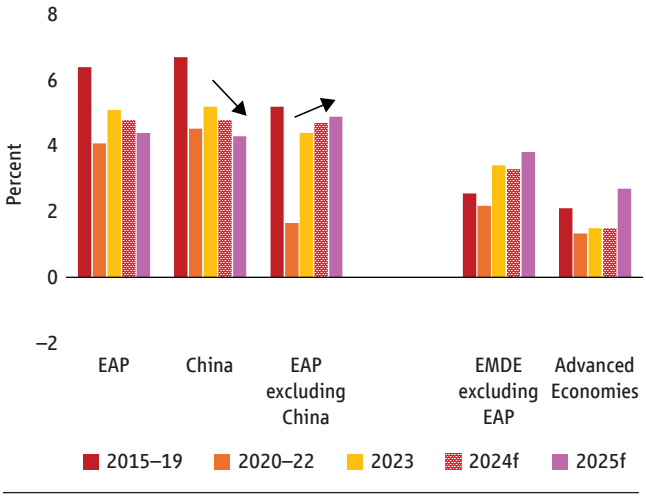
Overview

Recent developments

The economies of developing East Asia and Pacific (EAP) continue to outperform economies in the rest of the world. Regional growth is projected to be 4.8 percent in 2024, compared to an average growth of 3.3 percent in other EMDEs and 1.5 percent in advanced economies (figure O1; Table O1). In EAP countries, private consumption and services exports helped sustain growth, but private investment and goods exports remained weak.

EAP growth is anticipated to slow to 4.4 percent in 2025. That is mostly because growth in China, the region's largest economy, is projected to decline from 4.8 percent this year to 4.3 percent in 2025. China's growth in 2024 was supported by the bounce back of services consumption and exports in the early part of the year. But growth is expected to slow down in 2025 in the face of persistent property market weakness, low consumer and investor confidence, as well as the challenges of aging and global tensions. Recently signaled fiscal support may lift short-term growth but longer-term growth will depend on deeper structural reforms.

Figure O1. The region continues to grow faster than the rest of the world but slower than before the pandemic



Source: World Bank.
Note: EMDE: Emerging Market and Developing Economies.

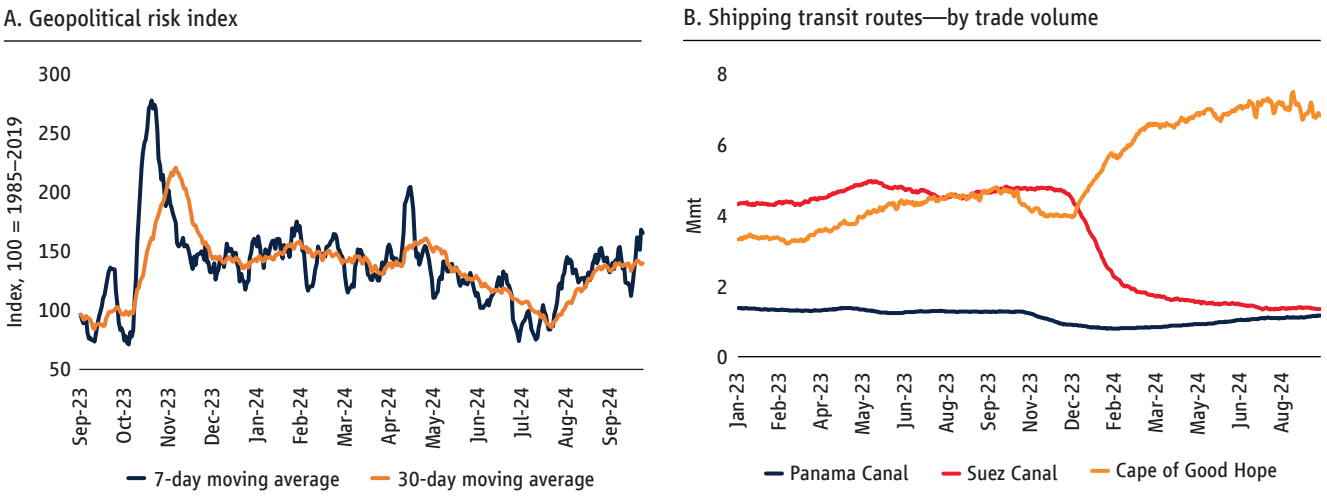
The rest of the EAP region is forecast to grow at 4.7 percent in 2024 and 4.9 percent in 2025. Growth in 2024 benefitted from increasing domestic consumption, recovering goods exports, and a tourism rebound. Growth in 2025 is expected to be sustained by continued export recovery and more benign financial conditions. The Pacific Island Countries are projected to grow by 3.5 percent in 2024 and 3.4 percent in 2025.

Economic performance across the region is also being affected by *geopolitical*, *macroeconomic and policy* uncertainty. Geopolitical risks have been aggravated by the conflict in the Middle East and are reflected in higher shipping costs and higher volatility in commodity prices (figure O2). An indicator of global shipping rates has risen by nearly 40 percent since the start of the Middle East conflict in October 2023. Heightened economic policy uncertainty abroad—for example, increased fiscal or trade policy uncertainty in the US—could reduce industrial production and stock prices in EAP by up to 0.5 percent and 1 percent, respectively. Increased domestic policy is expected to have comparable effects on EAP stock markets and output.

In the longer term, the region could see shifts in relative dynamism, as well as fundamental changes in trade and technology.

- China has led growth in the region for more than three decades, but its relative growth is likely to slow down in future.

Figure O2. Geopolitical risks have increased and Red Sea disruptions to shipping and trade continue



Source: Bloomberg, *Caldara and Iacoviello (2022); Comtrade (database); Haver Analytics: UN Global Platform, UNCTAD, International Energy Agency; IMF PortWatch; World Bank.*
Note: A. Geopolitical risk index (GPR) reflects automated text-search of electronic articles from 10 newspapers related to adverse geopolitical events in each newspaper for each month. A higher index is related to lower investment, stock prices, and employment. Last observation is September 30, 2024. B. 40-day rolling averages, in millions of metric tons. Last observation is September 17, 2024.

- Global tensions are changing patterns of trade and investment, the lifeblood of regional economies, with opportunities for some countries to function as hubs constrained by the divergent objectives of large trading partners.

- Technological change, taking the form of robots, artificial intelligence, digital platforms, and broader digitization, is affecting the relationship between economic expansion and jobs, which has been central to the region's model of inclusive growth.

Changing regional growth dynamics

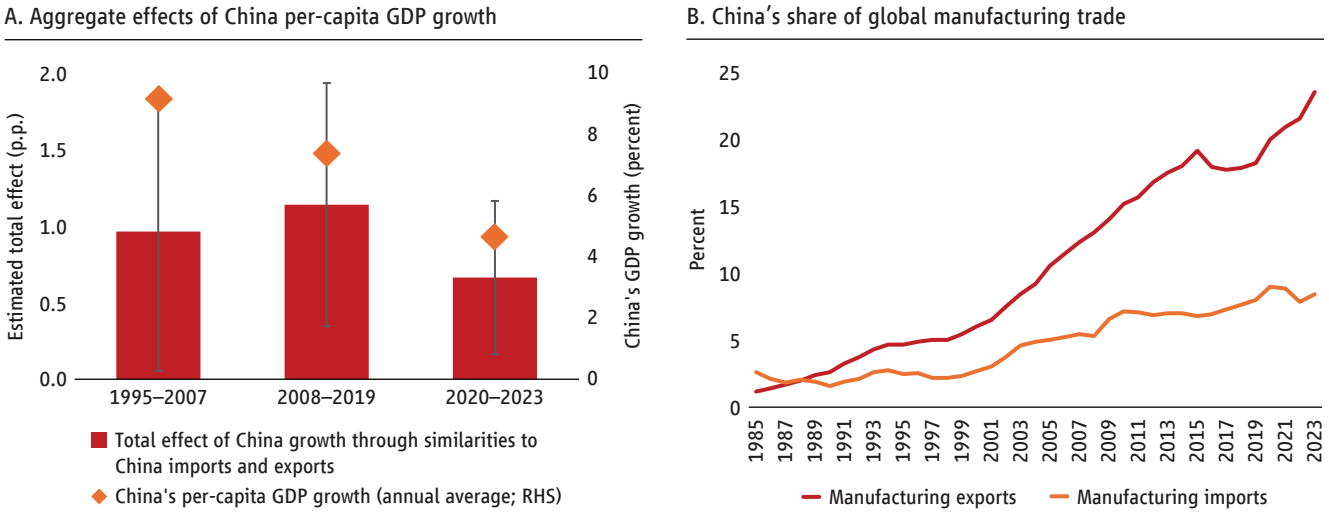
The prospect of diminishing spillover benefits from China's growth heightens the need for EAP countries to seek sources of autonomous growth, especially through deeper domestic reform. New empirical analysis reveals that, in the past, growth in other EAP economies benefited more on average from China's increasing demand for imports than it was hurt by China's increasing competition in export markets. China's growth is estimated to have boosted developing countries' growth by around 1 percentage point annually during the 1995-2019 period, and by 0.67 percentage points annually during the period 2020-2023 when China's growth slowed down (figure O3).

Two concerns arise. First, if China's growth slows down further (say, to the projected 4.3 percent in 2025), the benefits for developing countries will decline. A one percentage point slowdown in China's growth could reduce growth in other developing countries by an estimated 0.14 to 0.21 percentage points. Second, if China's exports grow faster than its imports, as has continued to be the case (in the first seven months of this year, merchandise exports grew year-on-year by 4 percent and imports by 2.8 percent), then the negative impact of increased competition in international markets may outweigh the positive impact from greater demand.

Trade, investment, and global tensions

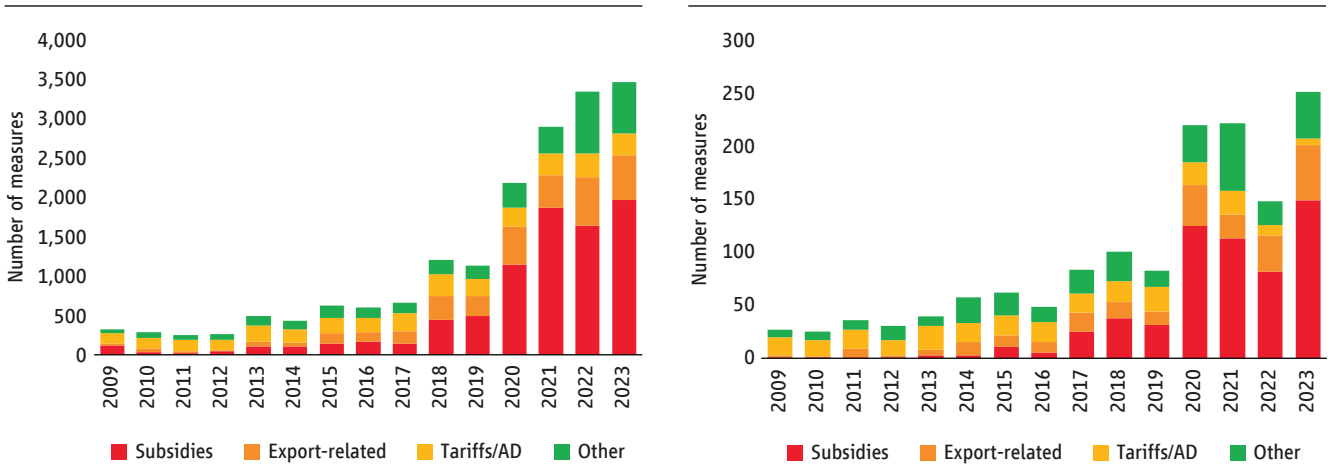
Recent years have been marked by a surge in both trade protectionism and potentially trade-distortive industrial policy (IP) actions in many countries. The number of such measures taken globally and by developing EAP economies has been increasing (figure O4).

Figure O3. China's growth has benefitted developing economies, but the benefits have become smaller as its growth slows down and its exports grow faster than it imports



Source: UN Comtrade, BACI, WDI.

Figure O4. The number of new trade-distorting measures continues to increase, both globally and in the EAP region



Source: Global Trade Alert.
Note: The charts divide the type of interventions in four categories: domestic subsidies, export-oriented policies (including export subsidies), tariff and contingent protection, and a residual category including all other types of interventions (on FDI, licensing, migration etc.). See notes in the main document for detailed explanation.

Countries like Viet Nam have benefited from "connecting" major trading partners as global tensions rose, but the scope for playing such a role may be shrinking. Vietnamese firms exporting to the US saw sales grow almost 25 percent faster than those exporting to other destinations over the period 2018–2021. However, economies may now be limited to playing a "one-way connector" role. While countries have been able to harness imports and investment from China to boost exports to the US, investment from the US has not boosted exports to China. Furthermore, the application of more stringent rules of origin may limit even the one-way connector role. In this context, concluding deep trade agreements with large trading partners may act as a shield against the negative effects of their restrictive trade and industrial policies.

Labor markets and digital technologies

We first highlight certain aspects of EAP labor markets.

- Overall economic growth has benefitted workers, with wages increasing faster than labor productivity. Wages have grown for most categories of workers. The gender wage gap is declining, but women still earn between 10 to 15 percent less than men; the better educated earn significantly more than the less educated but the higher education wage premium is shrinking; and workers in relatively high-paid technical and ICT services have seen relatively higher growth in wages

- EAP countries have had high rates of employment compared to the rest of the world, but the working age population is shrinking in Mongolia, China, Thailand, and Viet Nam, mainly due to aging populations. Youth unemployment rates are higher in China, Indonesia, Malaysia and Mongolia than in other economies in the region; although older workers have lower unemployment rates than younger workers, fewer participate in the labor force.

- Female labor force participation is higher than in other developing regions, but it remains lower than for men across the region. It has improved little except in Malaysia, the Philippines, and Indonesia.

- The work force is more educated than it was two decades ago, but the quality of basic education is uneven, and the share of workers with a college education or more remains under one third of the workforce.

- After a period of rapid industrialization, employment has shifted primarily from low-productivity agriculture to low-productivity services and less to high productivity manufacturing and services. Informal employment has declined overall but increased in low-productivity services, and remains higher than in other middle-income regions – it comprises over half of employment in the Pacific islands.

New technologies are affecting labor markets in the region. Technological advancement is expanding the scope of tasks that machines can perform. Robots are already displacing industrial workers in routine manual task occupations. AI threatens to displace primarily services workers not just in routine but increasingly also in non-routine cognitive task occupations. AI empowered robots also potentially could take over the tasks of workers in non-routine manual occupations both in manufacturing and services. The adoption of new technologies is affected, however, not just by technical feasibility but by economic viability, which depends on their quality-adjusted cost, the local labor cost and the responsiveness of demand to price changes.

The adoption of new technologies is enhancing firm productivity and changing job opportunities. Since increased productivity leads to increased scales of production and growth, technological progress generally supports increases

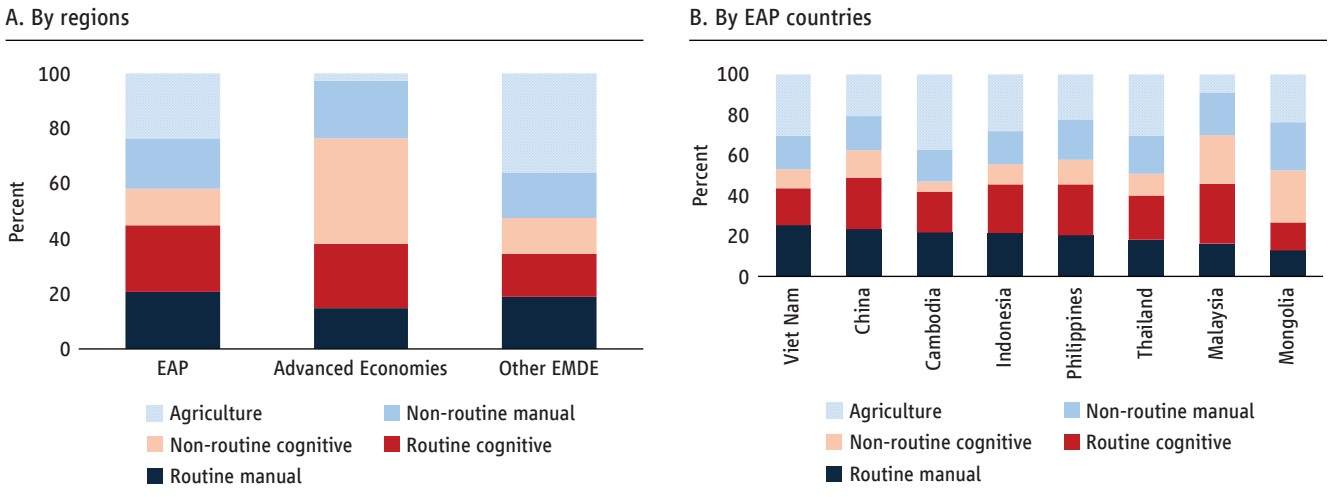
in jobs and wages. But if technological progress takes labor saving forms, then it can dampen growth in employment and wages. And because the effects of technology are heterogenous across age groups, gender, skills, and work status, technology can either exacerbate or ameliorate inequalities in EAP labor markets.

- Jobs in most EAP countries are likely to be affected both by robots and AI though in ways that differ from advanced economies. EAP countries employ more people in routine manual task occupations and less people in cognitive task occupations than advanced countries (figure O5). This occupational structure reflects successful industrialization in countries like China, Malaysia, Thailand, and Viet Nam, and the relatively weaker state of regional services sectors. Therefore, EAP countries, like other EMDEs, are more vulnerable today than advanced countries to job displacement by industrial robots and less to displacement by AI. However, the share of the population in EAP potentially exposed to AI is in fact larger than the share exposed to robots. Malaysia and China stand out as countries with a relatively high share of people employed in non-routine cognitive tasks who may be equipped to benefit from complementarities with AI.

- Rapid robot adoption, particularly in high value-added, trade-oriented manufacturing industries such as computers & electronics and automotives, is associated with increases in employment and labor income - in Viet Nam of about 10 and 5 percent, respectively (figure O6). In Viet Nam, the medium and high-skilled workers benefit but the low-skilled, especially those engaged in routine tasks, suffer reduced employment and are likely to be absorbed into the informal sector. Between 2018 and 2022, robots displaced an estimated 1.4 million or 3.3 percent of low-skilled formal workers who were engaged in routine manual work in Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam. At the same time, the productivity gains from automation and the resulting higher scale of production helped create an estimated 2 million jobs (4.3 percent of formal skilled employment) for skilled workers engaged in non-routine manual and cognitive tasks.

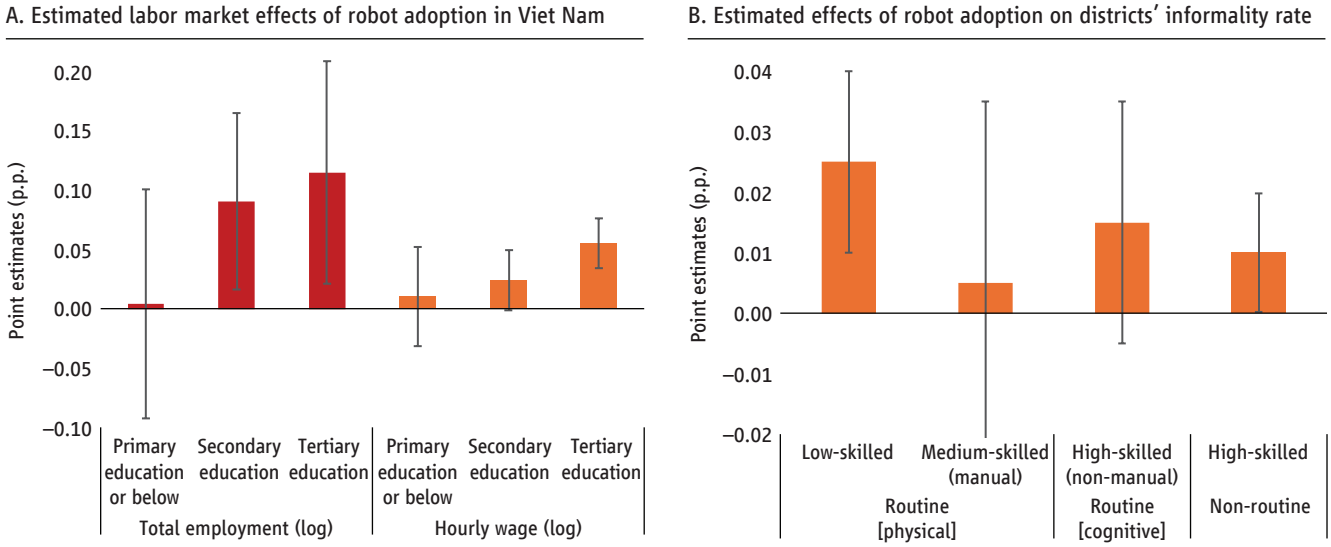
- Across countries and over time, aging countries adopted robots faster in manufacturing, and population aging alone accounts for 35 percent of the variation in robot adoption across countries between 1993–2014. At the

Figure O5. EAP countries employ more people in routine manual occupations and fewer people in cognitive occupations than advanced countries



Source: Microdata, ILOSTAT, China Census 2020.
Note: Latest year data. A. EAP shows simple average of the share of employment classified by the task intensity of occupations in China, Indonesia, Malaysia, the Philippines, Thailand and Viet Nam. Advanced Economies and other EMDE show the population weighted averages for advanced economies and emerging economies, respectively. See notes in the main document for detailed explanation.

Figure O6. Robot adoption has led to higher employment and earnings of more educated workers while increasing the informality rate of the low-skilled



Source: World Bank estimations, based on data from International Federation of Robotics (IFR), Viet Nam Labor Force Survey (2011–2020).
Note: Econometric estimates of the effects of exposure to robots on local labor market outcomes in Viet Nam during 2014–2020. See notes in the main document for detailed explanation.

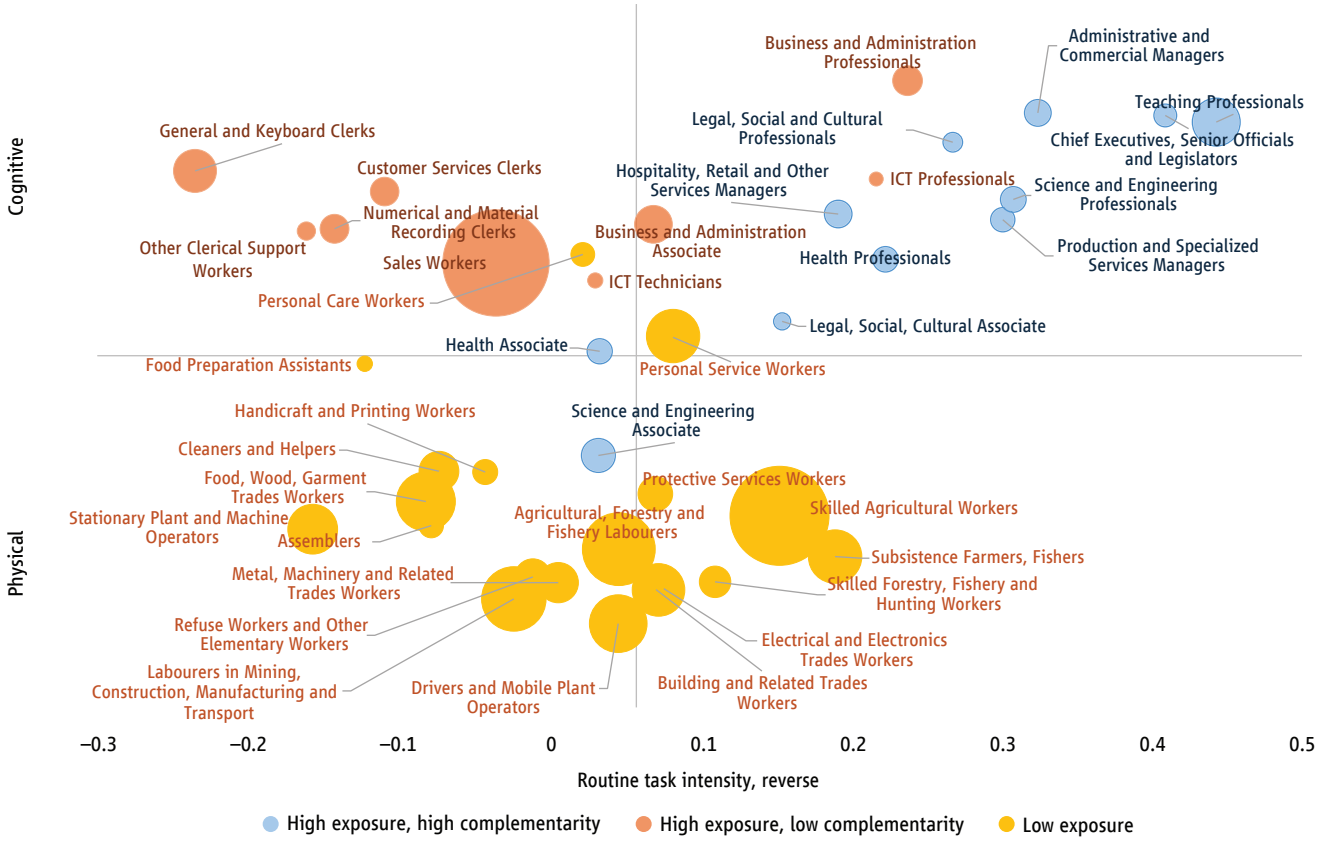
same time, older workers in EAP countries are more exposed than younger workers to automation, less engaged in digital occupations, and less likely to benefit from digitization. These findings together suggest that robot adoption and digitization in the region could help remedy the problem of the declining work force in aging countries but could also magnify it by accelerating the exit of older workers from the work force.

- The impact of AI deployment cannot yet be estimated but the emerging evidence suggests that AI has both displacement and augmentation effects across occupations. Displacement effects are beginning to be felt in occupations involving primarily routine cognitive tasks that involve standard optimization and low social interaction (risk assessors), and more gradually in occupations involving non-routine cognitive tasks (translation). Augmentation effects are being felt in occupations where a significant subset of tasks involving social interaction, creativity or strategy can still only be performed by humans, but another subset of tasks can be delegated to AI (teachers, financial analysts). Jobs involving tasks complementary to AI are only about 10 percent in EAP, which is comparable to that in other emerging economies but much lower than the 30 percent in advanced economies (figure O7).

- Working with digital technologies more broadly also appears to have worker augmentation benefits, being associated with higher and increasing wage premia, for example, in Malaysia, the Philippines and Thailand (25, 21 and 17 percent increase, respectively, corresponding to 1-standard-deviation of digital-intensity of occupations). The benefit also tends to be larger for women in most EAP countries, with the increase in premia in some cases twice as large as that for men (in Viet Nam and Indonesia).

- New technologies have encouraged the emergence of new business models, like digital platforms. In general, platforms enhance the efficiency of intermediation and therefore can also affect the number and nature of jobs. First, platforms operate on a large scale and therefore can accelerate automation and AI adoption and hence

Figure O7. AI largely affects cognitive task-based occupations, while complementing some non-routine cognitive task-based occupations; the EAP workforce is less exposed to AI than advanced economies due to the higher share of manual jobs



Source: World Bank estimations using Labor Force data and ILOSTAT, and the methods developed by Felten, et. al. (2021) and Pizzinelli et al. (2023).
Note: Vertical axis captures the manual and cognitive task content of occupations; horizontal axis measures their routine task intensity, following Autor and Dorn (2013). Color code is based on median threshold of AI exposure (Felten, et. al. 2021) and AI complementarity measure (Pizzinelli et al. 2023). Bubble size denotes the average employment share in EAP in the latest available year (9 countries). See main document for detailed explanation.

the effect of each on employment. The size of the digital platform economy has reached 5–7 percent of GDP in most EAP countries in 2023. The growth of digital platforms has increased firm productivity in dependent sectors, for example in the Philippines and Viet Nam. Second, platforms facilitate labor force participation, task matching and the emergence of new tasks, but in some cases by shifting tasks from formal to informal employment. Within the services sector where they operate, platforms induce contraction in employment in some existing enterprises but offer entrepreneurial opportunities for small businesses and self-employed workers, including women.

- Digital platforms are turning some formal sector workers into informal workers but encouraging the beneficial participation in the labor force of the marginalized. For example, digital workers in the informal sector in Indonesia earn almost as much as nondigital workers in the formal sector, indicating digitization could shrink the gap between the formal and informal sectors. The rollout of ride-hailing apps in Viet Nam did not durably benefit taxi drivers who were previously in the formal sector but led to a 20 percent increase in the earnings of motorbike drivers who were already in the informal sector.

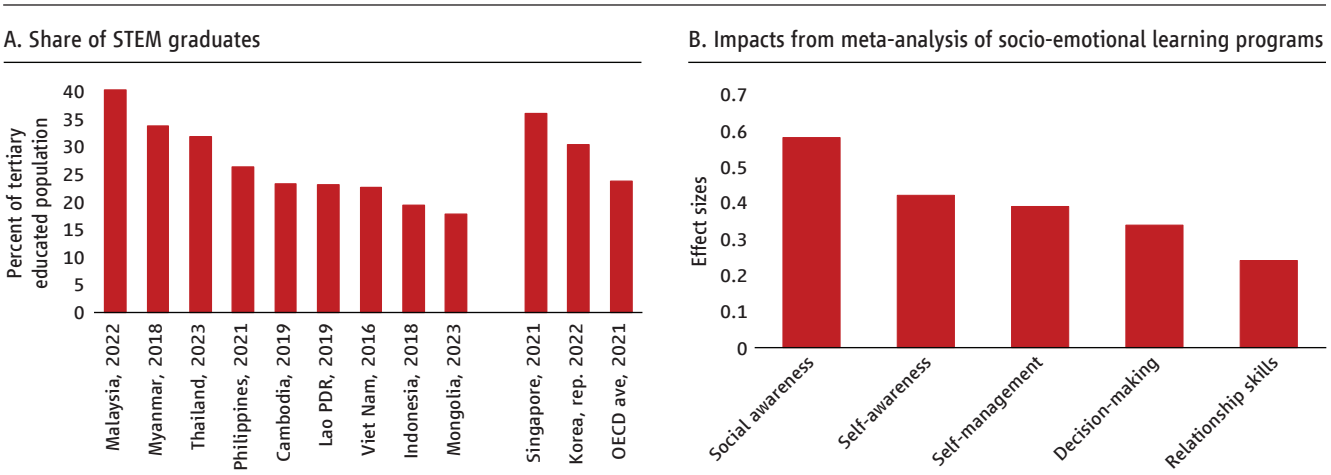
Finally, *policy* must try to turn technological change into a blessing rather than a curse for all. While the evolution of technology is hard to predict, the region must equip all its people with deeper technical, digital and soft skills that complement the new technologies; facilitate capital mobility and worker mobility across sectors, occupations and space; remove factor price distortions that could lead to the adoption of inappropriate technologies; and encourage social insurance for workers in the new digital informal economy.

Equipping the workforce with the necessary skills

- Digital skills would equip people to engage with an increasingly digitized workplace, using digital devices, applications, and digital platforms. In Japan, Singapore and the Republic of Korea, teachers receive continuous professional development to enhance their digital pedagogic competencies and there is an emphasis on digital skills in the curriculum, the use of digital textbooks, online learning platforms, and coding classes.

- Social and emotional skills would give people a comparative advantage over machines in tasks that involve social interactions, from education to healthcare. Research supports the notion that social and emotional skills are malleable and teachable through school interventions (figure O8). In Indonesia, a large-scale intervention to develop a Growth Mindset – beliefs that intelligence and other socio-emotional qualities are not fixed but develop with effort – through structured lessons had positive impacts on attitudes and test scores.

Figure O8. Hard and soft skills: the share of STEM graduates is relatively small in developing EAP; socio-emotional learning (SEL) can be fostered in schools



Source: UIS statistics; van de Sande et al. (2019).
Note: A. *Figure shows the percentage of college graduates in STEM fields. B. Figure shows the effect sizes of interventions from a meta-analysis that covers 40 RCT and QE studies in 12 countries, ages 11-19. See main report for details.*

- Advanced technical skills would enable people to work in creating and working with these new technologies. The supply of such skills is relatively scarce in developing EAP. In the Republic of Korea, the Meister high schools address critical technical skill needs in priority sectors, including ICT, semiconductor manufacturing, and biotechnology, and offer a customized vocational training curriculum developed in collaboration with companies like Samsung Electronics and Hyundai Motor Company.

Facilitating labor and capital mobility

- Labor mobility is impeded by both market failures and policy distortions. The former include poor information about job opportunities, underdeveloped land and housing markets, and inadequate connectivity; the latter comprise rigid labor market institutions and inadequate portability of benefits. For example, in China and Viet Nam, the household registration systems that regulate access to housing and public social services have curtailed rural-urban migration, trapping many farmers in low-productivity agricultural jobs. In Indonesia, reducing barriers to internal mobility could lead to productivity and labor income gains of around 20 percent. Private digital job intermediation platforms like online job boards and freelance marketplaces can facilitate matches and mobility. Labor mobility, of course, also requires capital to be mobile. Therefore, impediments to capital mobility, such as restrictions on firm entry and exit in the form of burdensome licensing requirements and bankruptcy procedures, also need to be addressed.

Removing factor price distortions

- Across a range of developed and developing economies, the stock of industrial robots (per thousand workers) is negatively associated with the relative taxation of capital and labor. Empirical evidence from the US and other advanced economies shows that exemptions and allowances (e.g., for depreciation) lead to higher effective tax rates on labor than on capital complementary to automation technologies, and hence to favor "excessive automation" and suboptimally lower employment. Removing these distortions would bring the adoption of automation technologies closer to what is socially optimal and raise employment levels.

Expanding social insurance for workers in the new digital informal economy

- Self-employed workers in Malaysia are willing to accept a slight reduction in their income in exchange for regular contributions to social insurance schemes such as unemployment insurance and pensions. A range of schemes across the world, from the public (in Indian and Colombia), public-private partnerships (in Malaysia), and purely private initiatives (in Denmark), have successfully used approaches from informing workers about the existence and benefits of schemes (as in India), financial incentives (as in Colombia and Malaysia) and behavioral nudges to offer social insurance to informal workers.

Table O1. GDP growth forecast

						Oct 2024 forecast		Apr 2024 forecast	
	2015–19	*2020*	*2021*	*2022*	*2023*	*for 2024*	*for 2025*	*for 2024*	*for 2025*
East Asia & Pacific	6.4	1.2	7.6	3.4	5.1	**4.8**	**4.4**	4.5	4.3
East Asia & Pacific (excluding China)	5.2	–3.8	2.9	5.8	4.3	**4.7**	**4.9**	4.6	4.8
Pacific Island Countries	3.1	–10.3	–2.8	9.5	5.7	**3.5**	**3.4**	3.6	3.3
China	6.7	2.2	8.4	3.0	5.2	**4.8**	**4.3**	4.5	4.3
Indonesia	5.0	–2.1	3.7	5.3	5.0	**5.0**	**5.1**	4.9	5.0
Malaysia	4.9	–5.5	3.3	8.9	3.6	**4.9**	**4.5**	4.3	4.4
Philippines	6.6	–9.5	5.7	7.6	5.5	**6.0**	**6.1**	5.8	5.9
Thailand	3.4	–6.1	1.6	2.5	1.9	**2.4**	**3.0**	2.8	3.0
Viet Nam	7.1	2.9	2.6	8.1	5.0	**6.1**	**6.5**	5.5	6.0
Cambodia	7.1	–3.6	3.1	5.1	5.0	**5.3**	**5.5**	5.8	6.1
Lao PDR	6.6	0.5	2.5	2.7	3.7	**4.1**	**3.7**	4.0	4.1
Mongolia	4.6	–4.4	1.6	5.0	7.2	**5.3**	**6.5**	4.8	6.6
Myanmar	6.4	6.6	–9.0	–12.0	4.0	**1.0**	**1.0**	1.3	2.0
Papua New Guinea	4.0	–3.2	–0.8	5.2	2.7	**4.6**	**3.7**	4.8	3.6
Timor-Leste	5.1	–8.3	2.9	4.0	2.3	**3.0**	**3.5**	3.6	4.5
Palau	1.7	–9.1	–13.4	0.0	0.2	12.0	11.0	12.4	11.9
Fiji	3.1	–17.0	–4.9	20.0	8.0	3.1	3.3	3.5	3.3
Solomon Isl.	3.0	–3.3	2.6	2.3	3.0	2.5	2.9	2.8	3.1
Tuvalu	6.7	–4.3	1.8	0.7	3.9	3.5	3.0	3.5	2.4
Marshall Isl.	4.8	–1.8	1.0	–0.6	3.0	3.4	4.0	3.0	2.0
Vanuatu	3.5	–5.0	–1.6	1.9	2.2	0.9	1.5	3.7	3.5
Kiribati	5.8	–0.6	8.5	3.9	4.2	5.8	4.1	5.6	2.0
Tonga	2.4	0.5	–1.3	0.1	2.0	1.8	2.4	2.5	2.2
Samoa	3.4	–3.1	–7.1	–5.3	8.0	10.5	5.5	4.5	3.6
Micronesia	2.0	–1.8	–3.2	–1.4	0.4	1.1	1.7	1.1	1.7
Nauru	1.8	0.7	7.2	2.8	0.6	1.8	2.0	1.4	1.2

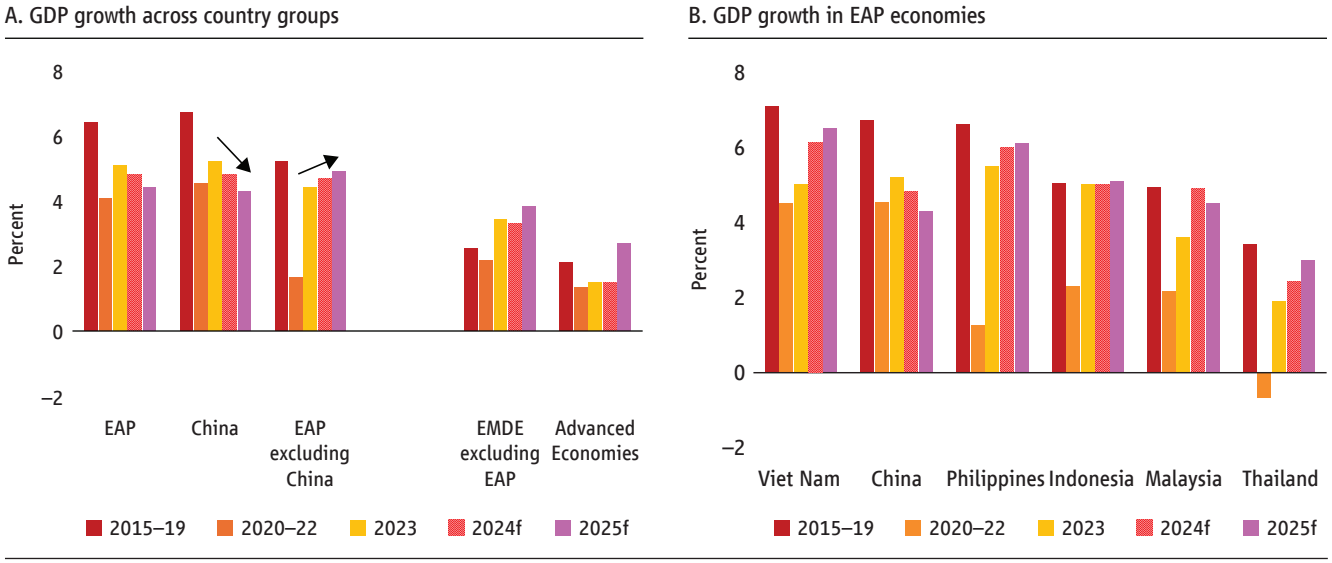
Sources: World Bank.
Note: Percent growth of GDP at market prices. Values for 2023 for the small island economies refer to GDP growth estimates. Values for Timor-Leste represent non-oil GDP. For the following countries, values correspond to the fiscal year: Federal states of Micronesia, Palau, and Republic of the Marshall Islands (October 1 - September 30); Nauru, Samoa, and Tonga (July 1 - June 30). Myanmar's growth rates refer to the fiscal year from April to March.

Recent Developments and Outlook

Recent developments

Developing East Asia and Pacific (EAP) is growing faster than the rest of the world, but growth is slower than before the pandemic (figure 1). Growth in the region is projected to be 4.8 percent in 2024. China's economy is projected to grow by 4.8 percent and the rest of the region by 4.7 percent in 2024, slower than the 6.7 percent and 5.2 percent, respectively, recorded during the 2015–19 period. The Pacific Island Countries are projected to grow by 3.5 percent in 2024, faster than the 3.1 percent during 2015–19 period.

Figure 1. The region continues to grow faster than the rest of the world but slower than before the pandemic



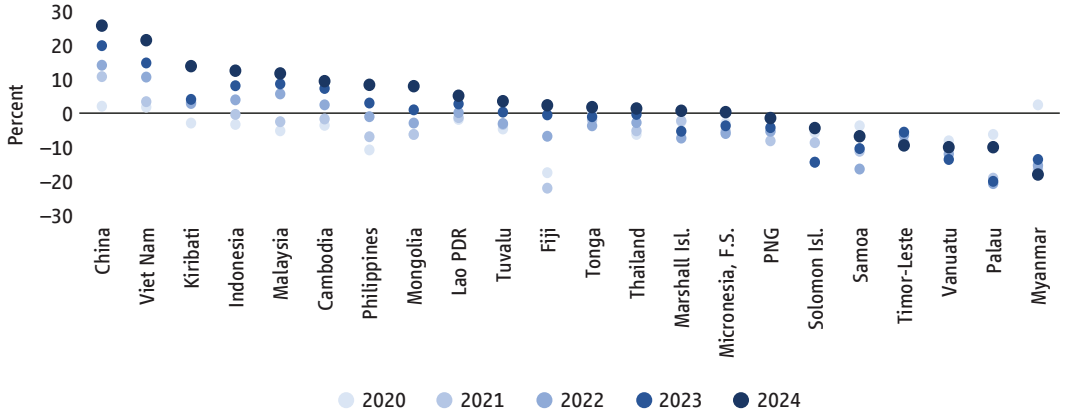
Source: World Bank.

Growth in the region is expected to slow to 4.4 percent in 2025. China is forecast to grow by 4.3 percent, more slowly than the rest of the region's forecast growth of 4.9 percent. China's growth is being influenced by persistent property market weakness, low consumer and investor confidence, as well as challenges like aging and global tensions will weigh on growth. Recently signaled fiscal support may lift short-term growth but longer-term growth will depend on deeper structural reforms. The likely recovery of global trade and the expected easing of global financial conditions are expected to support growth in the rest of the region. The growth rate in the Pacific Island countries is expected to moderate to 3.4 percent in 2025, as the post-COVID-19 rebound dissipates.

Recovery remains uneven across the region. Per capita output in China and Viet Nam had already exceeded pre-pandemic levels in 2020 and is now about 20 percent and 15 percent higher, respectively. But output remains below pre-pandemic levels in the rest of the Pacific Island countries (PICs) as well as in Myanmar and Papua New Guinea (figure 2).

Figure 2. While output per capita is well above pre-pandemic levels in most of the larger economies, it remains below those levels in many Pacific Island Countries and Myanmar

Evolution of GDP per capita (estimate) compared to 2019

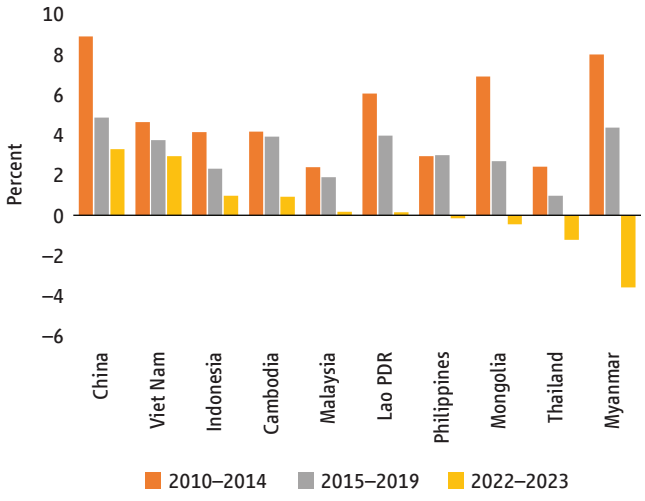


Source: World Economic Outlook database.

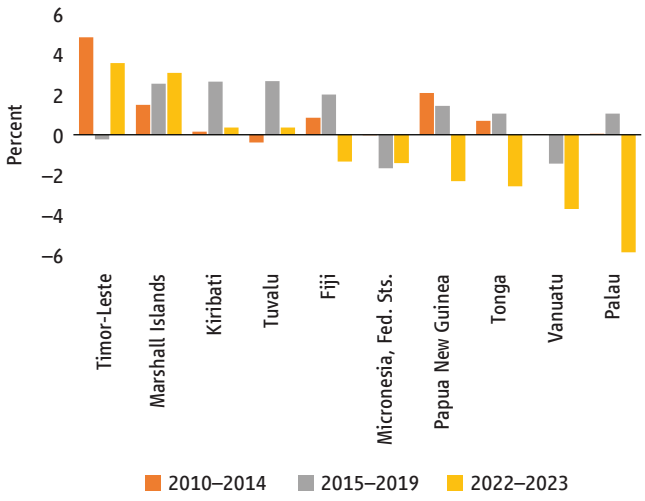
EAP countries were closing the gap in per-capita incomes with advanced economies since the early 1990s but the process has slowed down in recent years. Output per capita in the region was growing much faster than that in the advanced economies, on average, output per capita in the rest of the region is expected to grow at roughly the same rate as in advanced economies (figure 3).

Figure 3. The EAP countries were rapidly catching up with per-capita incomes in advanced countries but the process has slowed down

A. Percent change in GDP per capita relative to EU, UK, and US, larger EAP economies



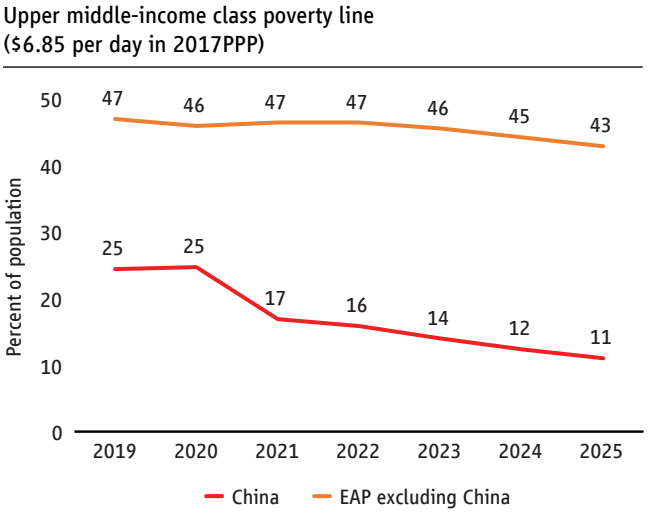
B. Percent change in GDP per capita relative to EU, UK, and US, smaller EAP economies



Source: World Development Indicators.
Note: GDP per capita in PPP. Bars denote period averages of the 5-year moving average of the percent change in relative per-capita income.

Poverty rates in the region continue to decline (figure 4). China's pace of poverty reduction picked up in 2023 and is expected to continue over the next years based on the upper-middle income poverty line (US$6.85/day, 2017 PPP) although still at a slower pace than in the pre-pandemic years. In the rest of the region, the rate of poverty reduction also picked up in 2023, averaging around half of China's rate. Overall, 29 million people in the region are projected to escape poverty between 2023 and 2024 based on the upper-middle income poverty line.

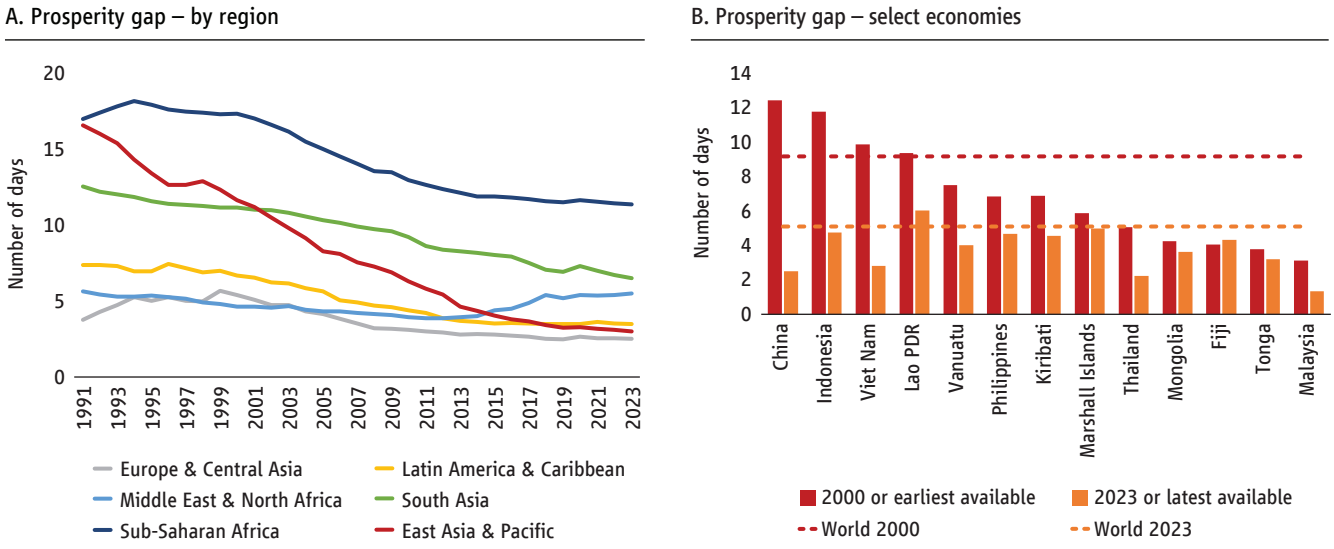
Figure 4. Poverty rates are expected to decline further



Source: World Bank staff's estimation. Poverty estimates are based on growth forecasts, population projections, and historical growth elasticities of poverty.
Note: Forecasts are based on GDP growth projections as of September 24, 2024.

The EAP region has made remarkable progress in reducing the Prosperity Gap - a new measure of shared prosperity introduced by the World Bank which measures the average factor by which incomes in country must increase to reach $25/day (the typical poverty line in rich countries today). It also represents the number of days that a typical person in a country would need to work to earn what a person at the poverty line in rich countries earns in a day. On average, the EAP region experienced the fastest decline in this indicator compared to other regions (figure 5). In 2000, it would have taken 12 days for a worker in China to earn $25 dollar. By 2023, it takes two and a half days. Indonesia and Viet Nam also saw large improvements in this new measure of prosperity, as have most countries in the region. By 2023, Prosperity Gap remains above world average only in Lao PDR.

Figure 5. The EAP prosperity gap has been steadily declining

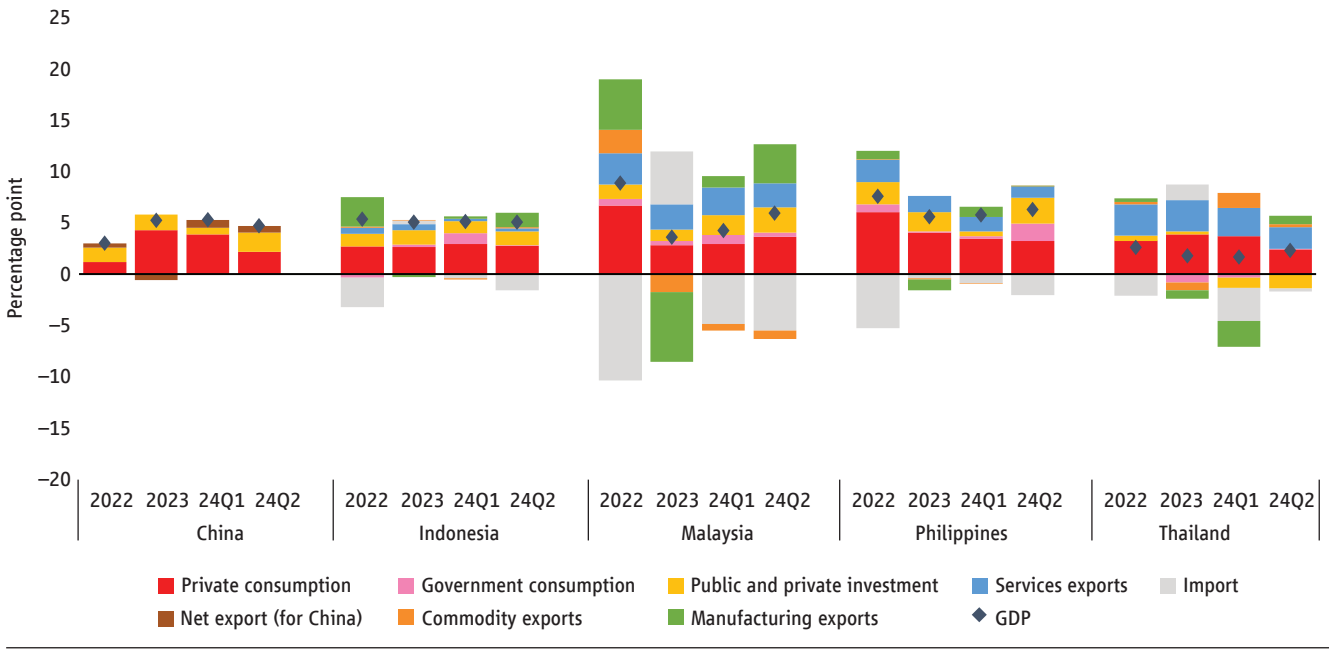


Source: World Bank staff's estimation.
Note: The prosperity gap is the average factor by which incomes in country must increase to reach $25/day (the typical poverty line in rich countries today). Earliest and Latest available data vary by country. China: 2000, 2023; Indonesia: 2000, 2023; Malaysia: 2003, 2018; Philippines: 2000, 2021; Thailand: 2000, 2021; Viet Nam: 2002, 2022; Fiji: 2002, 2019; Lao PDR: 2002, 2018; Mongolia: 2010, 2018.

Components of demand: consumption, investment, exports, government spending

Private consumption has sustained growth in the major countries, but its contribution has been declining in China, Philippines and Thailand (figure 6). Manufacturing exports have supported growth in Malysia, while providing only a modest boost in Indonesia and Thailand. Services exports have helped boost growth in Malaysia, the Philippines, and Thailand. Public investment has supported growth in China, Indonesia, Malaysia and the Philippines, while private investment remains low in much of the region and goods exports remain weak in most countries.

Figure 6. Private consumption has sustained growth in the major countries, but its contribution has been declining in China and Thailand; services exports have helped boost growth in Malaysia, the Philippines, and Thailand, and public investment in Indonesia and Malaysia; private investment and goods exports remain weak in most countries



Source: Haver Analytics; World Bank.
Note: Figure shows the percentage point contribution to GDP growth. China's private consumption includes government consumption.

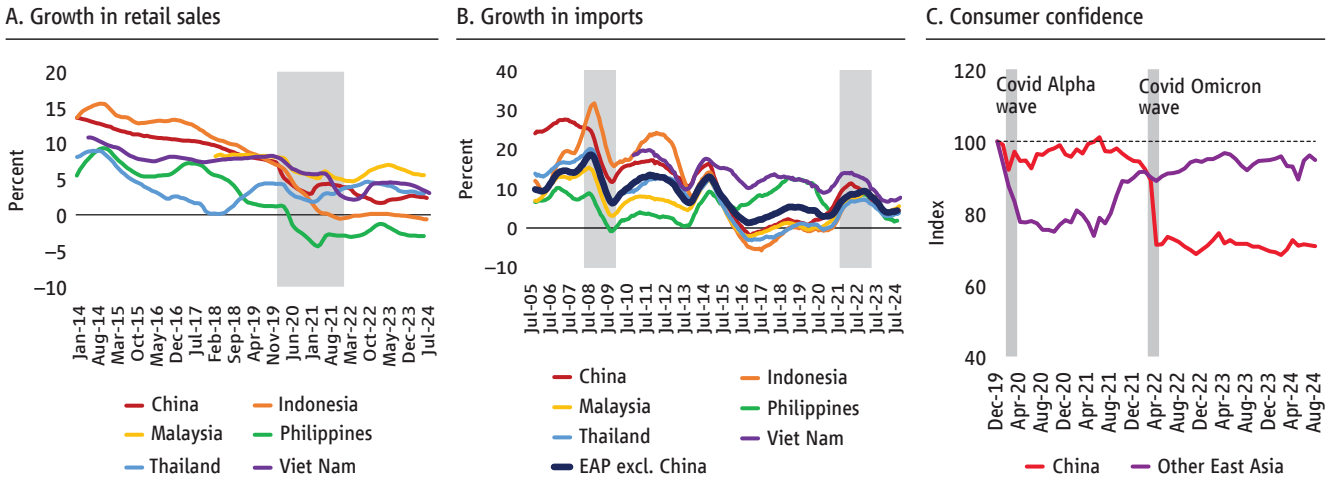
Consumption

Consumption growth is contributing to growth in the region, but the pace has declined over time. This trend is evident in the slower growth of retail sales and imports compared to the pre-pandemic period, with retail sales now below pre-pandemic levels in Indonesia and the Philippines (figure 7; the Philippines refer to manufacturing sales). Import growth has also decreased across the region in the past two decades. Additionally, consumer confidence remains weak across the region. In China, consumption has been dampened, on the one hand, by slowing growth in wage, salary and property incomes, and wealth declines caused by lower property prices; and on the other hand, by higher savings due to demographic trends and limited social safety nets.

Investment

Investment growth has been declining across most countries in the region over the past two decades, with particularly sharp drops in China, Indonesia, Malaysia, and more recently, the Philippines. Currently, investment

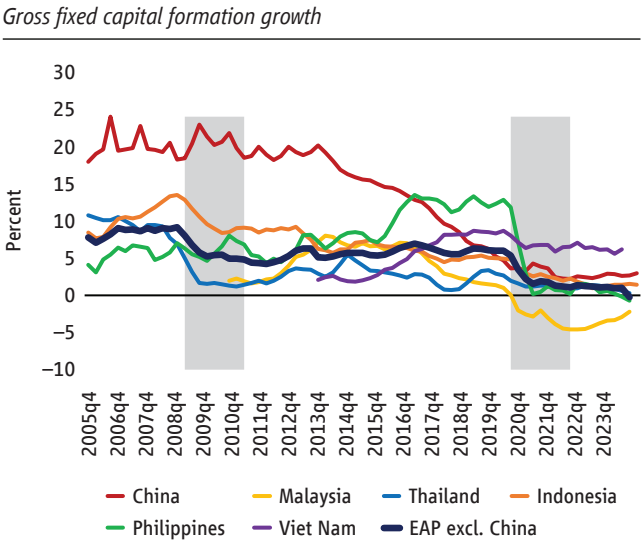
Figure 7. Even though consumption is supporting growth, consumer spending, imports and confidence remain subdued, especially in China



Source: Haver Analytics.
Note: A.B. Lines show 12-month moving average of annualized 5-year growth rate. Indonesia, Malaysia and Thailand are volume-based indices; China and Viet Nam are value-based indices; Philippines show manufacturing sales based on volumes. Shaded areas in A and B denote global recessions. C. Seasonally adjusted series. Other East Asia includes Indonesia, Malaysia, Thailand, Philippines and Viet Nam.

levels are below pre-pandemic levels in Malaysia and the Philippines and have not surpassed pre-pandemic levels in Thailand (figure 8). In China, the property market slump is contributing to the investment growth slowdown, while manufacturing investment is supporting growth (box 1). Investment growth appears to be relatively robust in Viet Nam.

Figure 8. Investment growth has been declining in most countries but has revived in Viet Nam

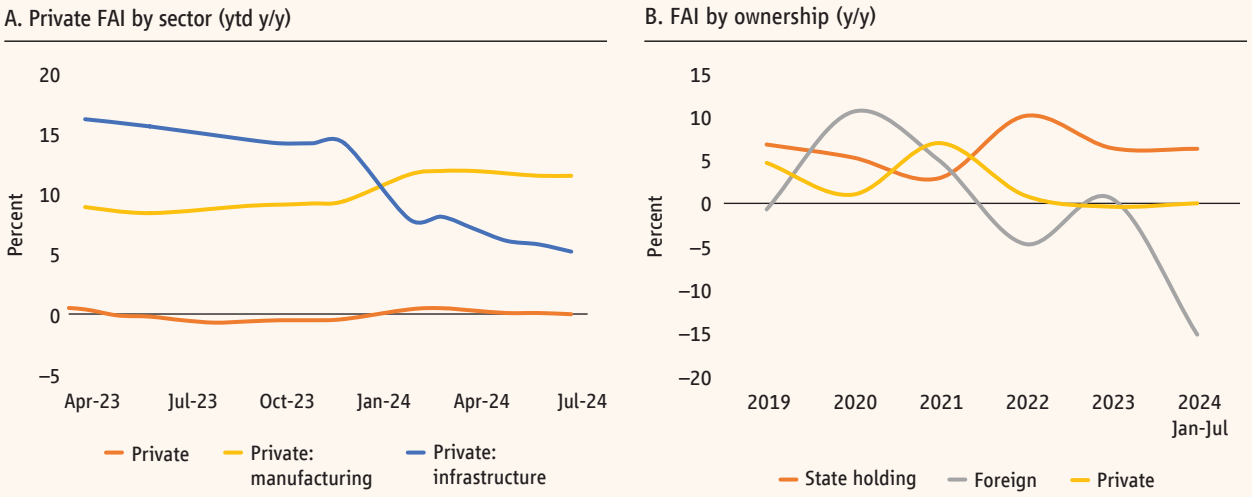


Source: Haver Analytics.
Note: Quarterly data. Lines show 12-month moving average of annualized 5-year growth rate. Due to data availability, rates are based on investment in fixed assets, excluding rural households in China, and estimates of quarterly GFCF from annual GFCF in Viet Nam. Shaded areas denote global recessions.

Box 1. Investment in China

Lower investment has been one of the key contributors to China's growth slowdown in recent years. The prolonged property market downturn has led to a large and persistent decline in real estate investment, which fell by a cumulative 26.7 percent from its peak in June 2021. This sharp contraction has contributed to stagnant private investment over the past two years, despite higher private investment in manufacturing (figure B1.1A). State Owned Enterprise (SŒ) investment growth has moderated somewhat but remains robust, while foreign investment has slowed recently amid heightened economic uncertainty and geopolitical tensions (figure B1.1B). Robust manufacturing investment has compensated to some extent for the decline in real estate investment.

Figure B1.1. Property market slump has weighed on residential investment growth, whereas manufacturing investment remains robust



Source: NBS, PBC, World Bank staff estimates.
Note: Figure B: Foreign investment dœs not include investment through Hong Kong SAR, China, Macau SAR, China and Taiwan, China.

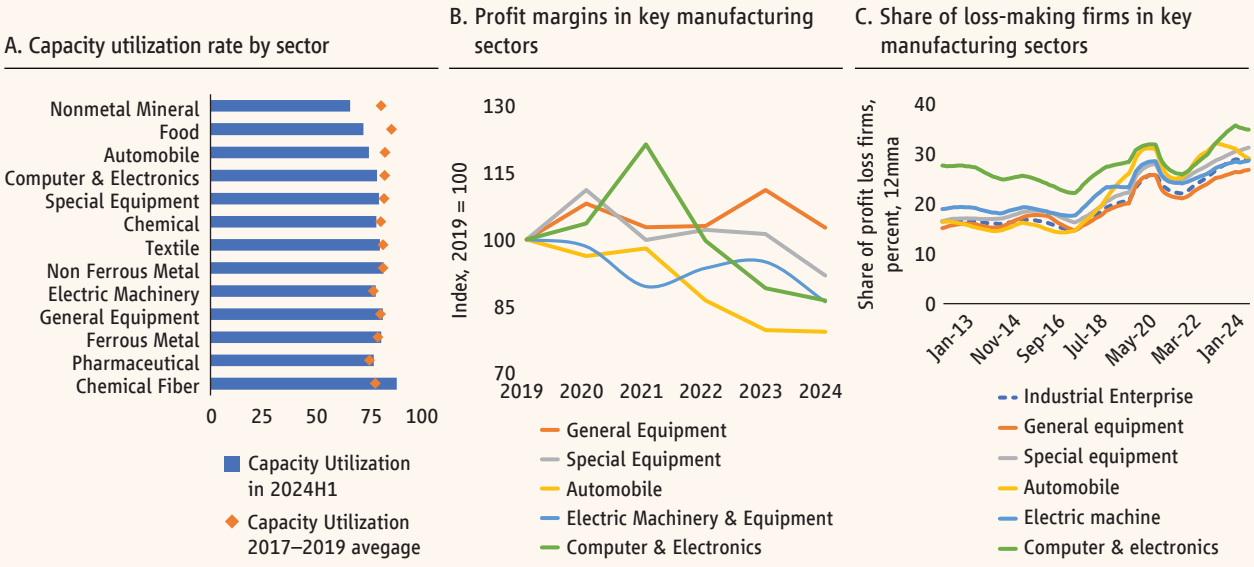
At the same time, parts of China's manufacturing sector confront demand and supply imbalances. Overall industrial capacity utilization has decreased slightly to 74.9 percent in 2024H1, from 76.7 percent in 2017-19. However, a few sectors have experienced more pronounced declines. These include construction materials (e.g. non-metal minerals, which include cement and glass) in which capacity resulting from years of high property investment now exceeds demand (figure B1.2A). Meanwhile, the computer and electronics sector has also seen a decline in capacity utilization, resulting from a rapid production capacity expansion during the pandemic and the subsequent global demand normalization post-pandemic. Capacity utilization in the auto sector has also dropped likely driven by a combination of lower capacity utilization in the internal combustion engine (ICE) automobile sector as well as a rapid expansion of EV capacity.

(continued)

(Box 1. continued)

Lower capacity utilization rates have led to a deterioration in financial performance in these sectors. Profit margins in some sectors have fallen below the 2019 levels (figure B1.2B) and the proportion of loss-making firms has risen in the past two years (figure B1.2C). In the automobile sector, the share of loss-making enterprises has been declining in recent quarters, with profit margins stabilizing, which might signal a start of market consolidation within the sector. Nevertheless, there is a risk that sustained investment in manufacturing capacity could exacerbate resource misallocation especially if non-viable firms continue to operate in sectors with persistent demand-supply imbalances.

Figure B1.2. Capacity utilization has decreased in some sectors as profit margins decline and the share of loss-reporting firms increases



Source: Wind.

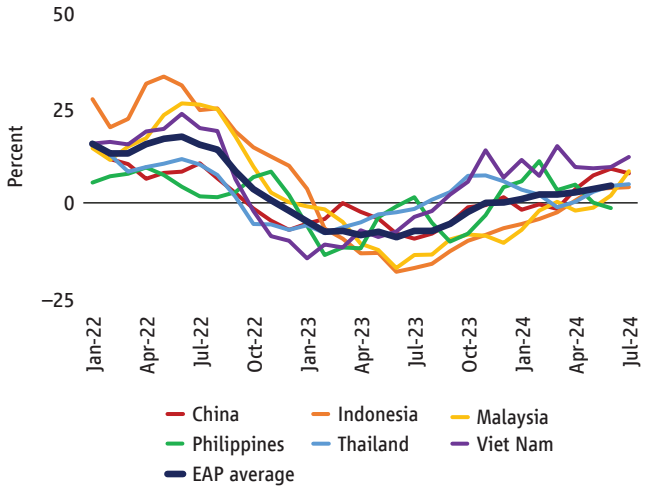
Exports

Goods export growth is positive this year after the contraction in 2003 (figure 9). But the recovery in goods exports has been slower than anticipated. The revival of tourism has boosted services exports in some EAP economies, but tourist arrivals have only exceeded pre-pandemic levels in a few countries. Cambodia, Fiji, Malaysia, and Viet Nam have seen tourist arrivals return to or surpass pre-pandemic numbers, while in the rest of the EAP region, arrivals have plateaued below those levels, partly due to the slow recovery of China's outbound tourism. Additionally, discretionary spending by tourists remains below pre-pandemic levels in several countries, reducing their overall contribution to the domestic economy.

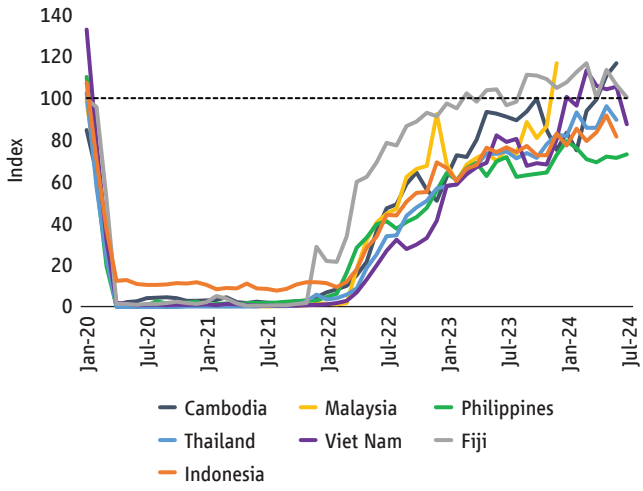
China's merchandise exports rebounded with a growth of 4.0 percent y/y in the seven months of the year, driven by the automobile and machinery sectors, as well as the upswing in the global technology cycle (Figure 10A). Shipments to developing markets, led by ASEAN, have been the primary driver of export growth. In 2023, ASEAN overtook the US to become China's largest export market amid escalating trade tensions between the US and China (Figure 10B). China's merchandise import grew moderately at 2.8 percent y/y in the first seven months as domestic consumer demand remained subdued.

Figure 9. The region's exports are recovering only gradually as is tourism

A. Goods exports



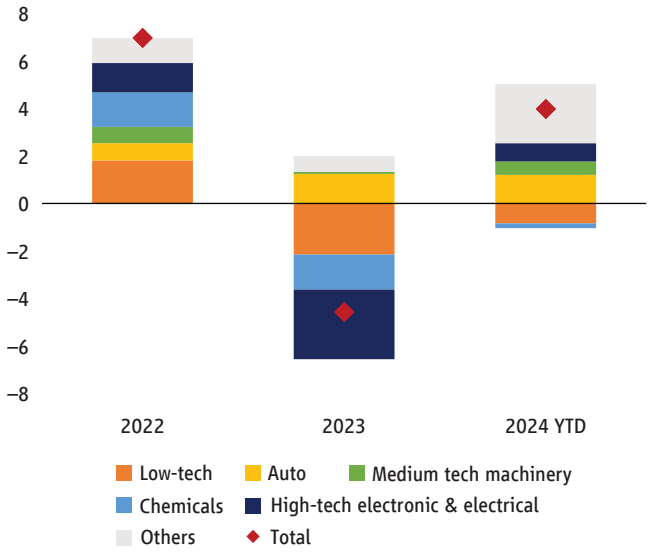
B. Tourist arrivals



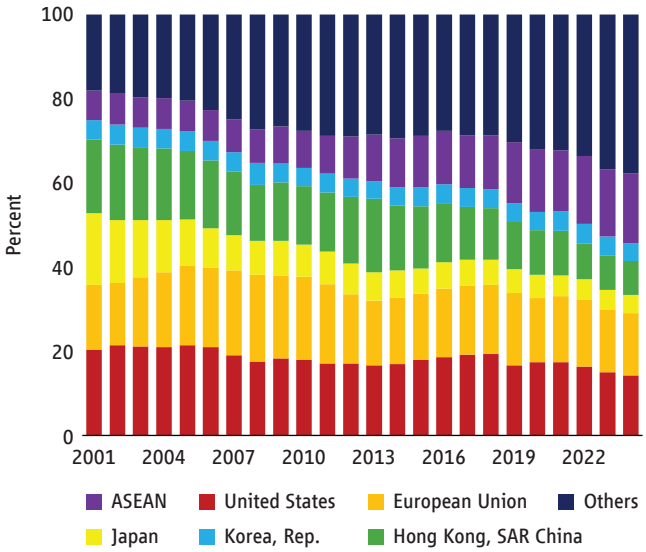
Source: Haver Analytics, World Bank.
Note: Seasonally adjusted series. B. 100 = 2019 average.

Figure 10. China's exports rebounded from the slump in 2023 supported by an increasing share of exports to the rest of the region

A. Export by sector



B. Export by country



Source: General Administration of Customs, UNCTAD, HAVER, World Bank staff estimates.

Macroeconomic policy

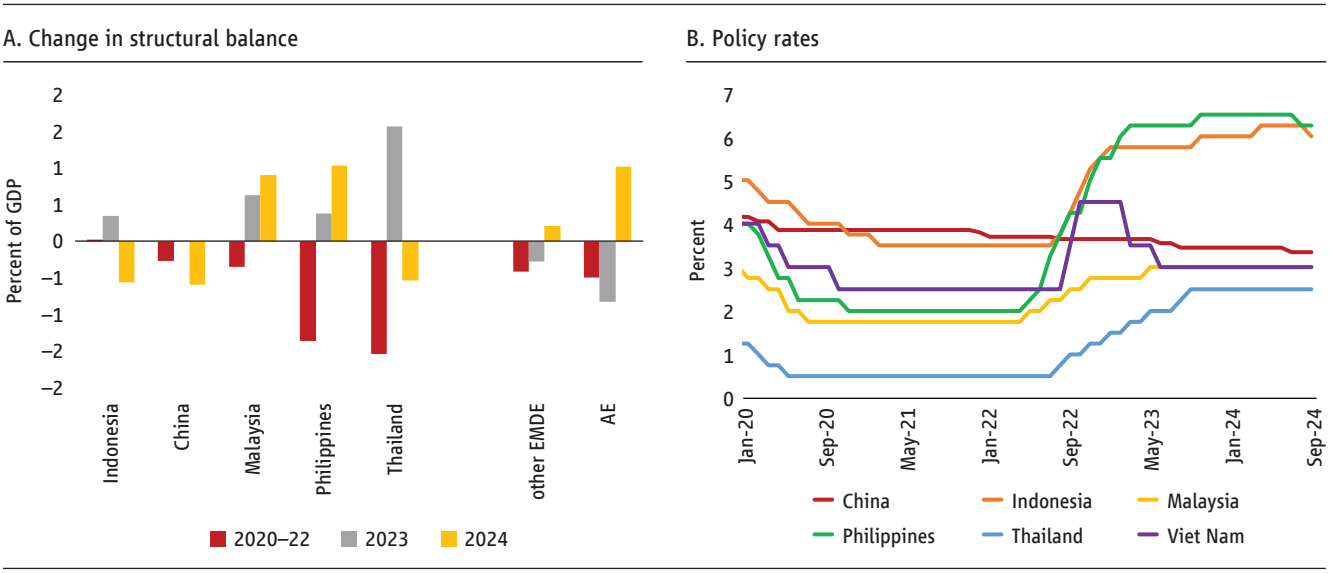
The fiscal stance in 2024 has not been expansionary in Malaysia and the Philippines but has been expansionary in Indonesia and China. Malaysia and the Philippines are projected to have a structural deficit lower than in the previous year, suggesting relatively conservative stance. This stance is reflected in a higher structural deficit in these countries in 2024 compared to 2023 (figure 11A). In Thailand, a seven-month delay in approving the budget has resulted in a smaller fiscal deficit compared to last year for the first three quarters of FY24. By the end of the first 10 months of FY24, only 45 percent of the public investment budget had been spent. Responding to the recent moderation in economic activity in China, the authorities signaled in September that additional counter-cyclical fiscal support will be provided in the short term. Higher central fiscal transfers to local governments could help ease financing constraints and increase public spending lifting short-term growth but longer-term growth will depend on deeper reforms.

Monetary policy for the most part has not been expansionary except for in China, the Philippines, and Indonesia (figure 11B). Policy interest rates were raised globally to address inflation. The rise in policy rates in many EAP countries was smaller than in other emerging market and developing economies (EMDEs) because inflationary pressures in the EAP region were weaker. EAP countries were nevertheless obliged to maintain higher interest rates because the relatively high rates in industrial countries raised concerns about capital flight and exchange rate depreciation.

Now low inflation in some countries is pushing up real interest rates. For example, in China, despite the recent cuts in the policy rate, real interest rates remain elevated due to the low inflation. Recent measures that lowered policy rates and the reserve requirement ratio, as well as additional measures to support the property sector and the stock market, are likely to ease financial conditions, but the impact on growth will be moderated by weak credit and housing demand. In Viet Nam, the central bank sold dollars to fend off pressure on the exchange rate coming from the interest rate differential with the US and the US dollar global strengthening in the first half of 2024, resulting in tightened liquidity.

The combination of low domestic inflation and declining international interest rates is creating greater space for more supportive monetary policy in the EAP region. Inflation remains contained in most of the EAP region, and especially low in

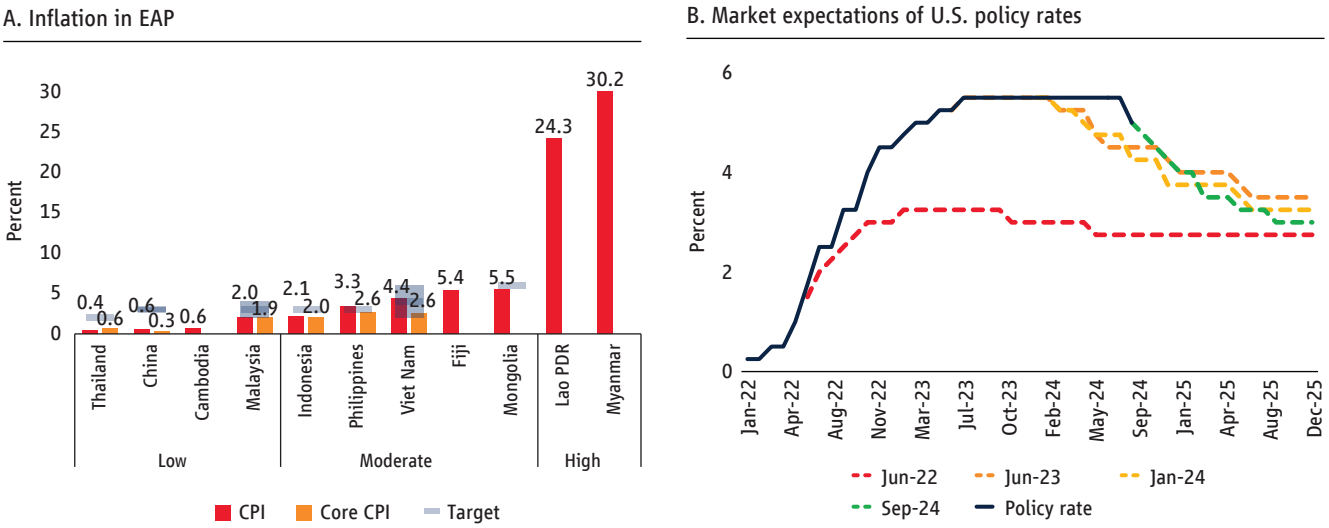
Figure 11. Fiscal policy is expansionary in China, Indonesia and Thailand, but not in Malaysia and the Philippines; monetary policy remains non-expansionary, but has started to ease



Source: WEO Database, April 2024; Haver Analytics.

Cambodia, China, and Thailand, as most commodity prices have stabilized and supply constraints have eased (figure 12A). Exceptions are some Pacific Island Countries, as well as Lao PDR and Myanmar, where inflation is stubbornly high, reflecting the rising prices of some commodities like rice, high dependence on imports, and/or rapid depreciation of currencies. At the same time, interest rates in advanced countries, which had increased significantly, are now declining as inflation has dropped (figure 12B), though they remain higher than pre-pandemic.

Figure 12. Inflation remains contained in most of the region, but is still high in Lao PDR and Myanmar, and the US interest rates are expected to decline



Source: Haver Analytics; CME Group Fed Watch; Citigroup, Federal Reserve Bank of St. Louis; Haver Analytics; World Bank.
Note: A. Figure shows year-on-year change of CPI/Core CPI, latest month available. B. A. Solid blue line is the upper bound of the target range for the U.S. federal funds rate. Dotted lines are vintages of market-based policy rate expectations, derived from derivatives markets. Last data point: 9/24/2024.

Capital outflow pressures on EAP exchange rates have therefore subsided. When the US Federal Reserve started to tighten monetary policy, China, Indonesia, and Malaysia experienced capital outflows (figure 13). Currencies depreciated earlier in the year in all major economies, reflecting higher-than-anticipated interest rates in the US. Depreciation was steepest in Lao PDR because of serious macrœconomic imbalances. Pressures have now eased in most countries, though outflows continue in Thailand amid weakening investor confidence. Major economies' currencies have started appreciating since early August, anticipating the beginning of the rate cut in advanced economies.

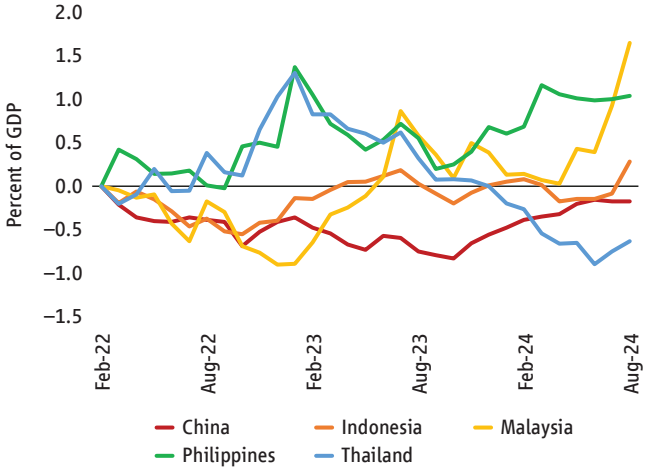
Four influences on regional growth

Shifting growth dynamics

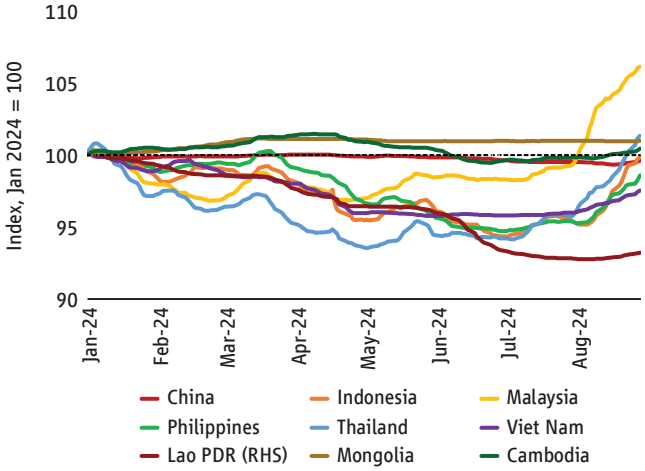
Growth in developing EAP has been influenced by China's growth (EAP Economic Update, October 2023, April 2024). International trade has been a key channel of impact, as China's shares in global trade have increased dramatically (figure 14).A key question is how the dual aspects of China's influence in export and import markets affects growth in EMDEs in general and the EAP in particular. On the one hand, the expansion of China's demand for imports, especially of intermediate goods, implies higher global prices for a range of products that developing countries export. On the other hand, the expansion in China's exports, especially of final consumer goods, has reduced the global prices of products that developing countries export. New empirical analysis shows that growth in other developing economies benefitted more on average from China's increasing demand for imports than it was hurt by China's increasing competition in export markets. But these spillover benefits from China's growth may diminish in the future, heightening the need for EAP countries to seek sources of autonomous growth.

Figure 13. Capital outflows continue, and some countries face depreciation pressures

A. Capital flows (cumulative since Feb 2022)



B. Nominal exchange rates (local currency to dollar)

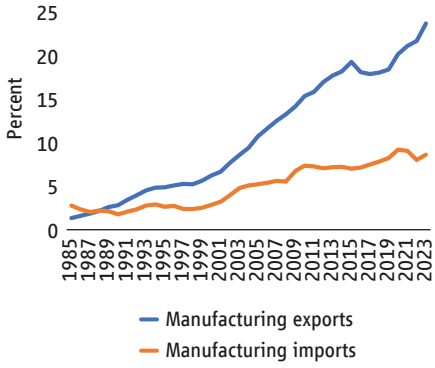


Source: Haver Analytics.
Note: B: 7-day moving average

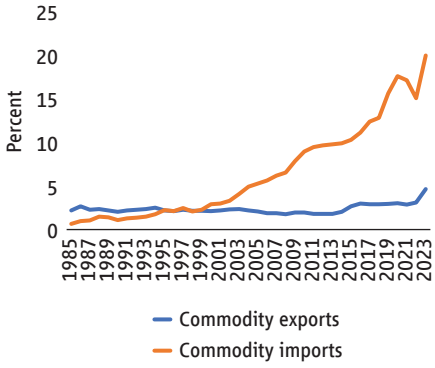
The specific impact of China's trade growth on countries in the EAP region has depended on their stage of development and pattern of comparative advantage (figure 15). Most of the relatively industrialized countries – Malaysia, Thailand, the Philippines, Viet Nam and even Indonesia – have faced direct competition at home and abroad from China in manufactured goods. But countries have also benefited from the impact on increased Chinese demand for commodities (Indonesia, Myanmar, Lao PDR and Mongolia); services (e.g. Philippines, Thailand and the Pacific Islands); from integration into global- and China-linked manufacturing value chains (e.g. Malaysia and Viet Nam); and from relocation of Chinese production (e.g. Viet Nam and Cambodia). The positive impact of China's demand and supply has been felt not just through direct trade with China but also through changes in prices in global markets for EAP products that China demands and supplies.

Figure 14. China's share in global trade has significantly increased, 1985-2023

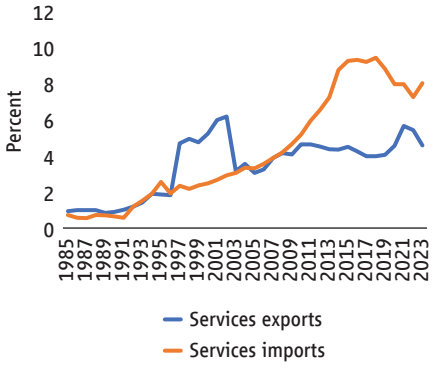
A. China's share of global manufacturing trade



B. China's share of global commodity trade

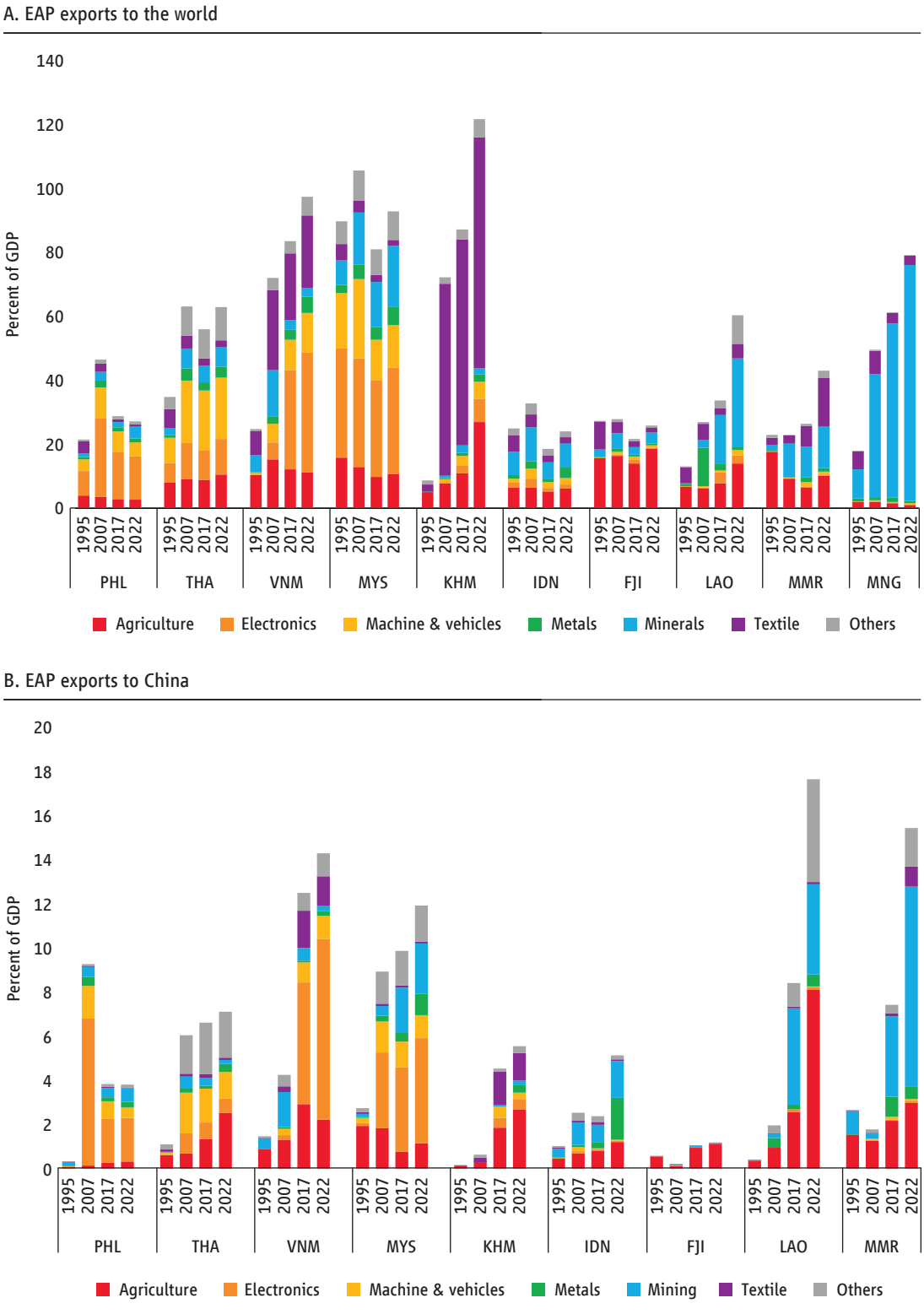


C. China's share of global services trade



Source: UN Comtrade, BACI, WDI.

Figure 15. Within the EAP region, some countries' exports are dominated by manufactured goods while other countries specialize in commodities

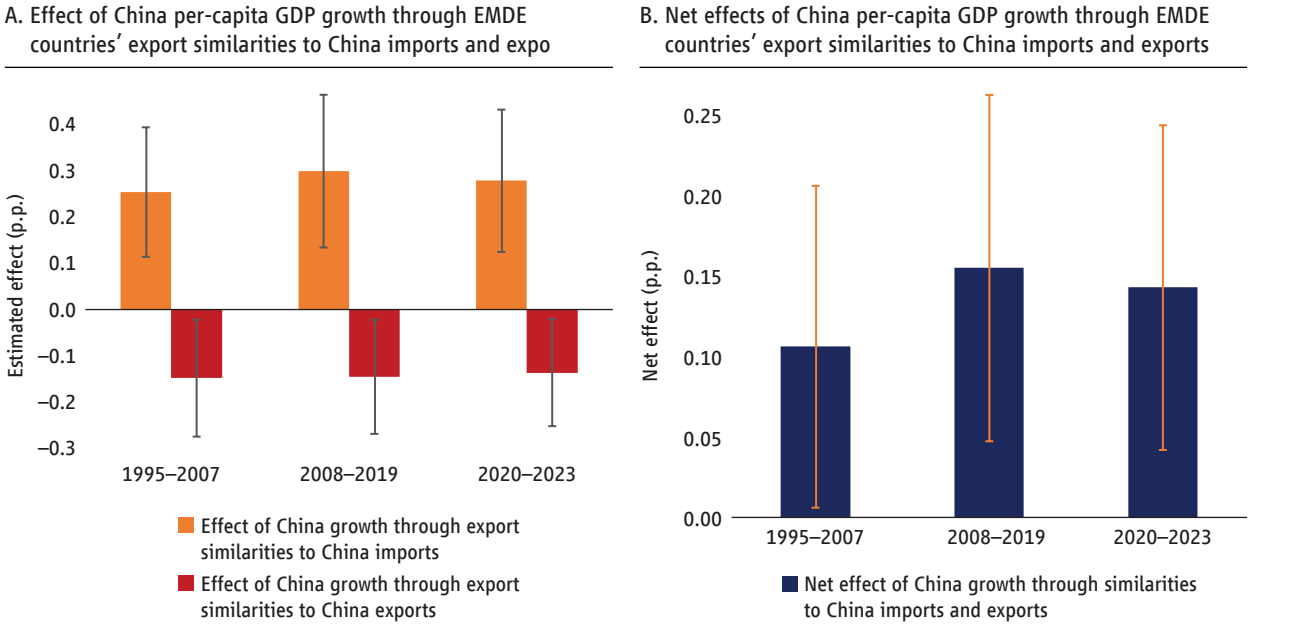


Source: BACI.

Empirical analysis of the dual aspects of China's influence in export and import markets shows that growth in other developing economies benefitted more on average from China's increasing demand for imports than it was hurt by China's increasing competition in export markets.

The net incremental effect is positive and statistically significant. The estimates suggest that a one-percent increase in China's GDP per-capita growth was associated with a 0.11 percentage-point increase in EMDE's GDP per-capita growth during 1995-2007, a 0.14 percentage-point increase in 2008-2019, and a 0.13 percentage-point increase in 2020-2023. The overall effect of China's per-capita GDP growth on average EMDE growth during 2020-2023 was still positive, at 0.67 percentage-points, but smaller than the 1.1 percentage-points during the 2008-2019 period (figure 16).

Figure 16. Developing economies' growth benefitted on average more from China's increased demand for imports than it was hurt by China's increased competition in export markets



Note: Estimated effects from regressing EMDE's per-capita GDP growth on the interactions between China's per-capita GDP growth and each EMDE country's export similarity to China's imports (red) and to China's exports (orange). The sample includes all EMDEs with available GDP per-capita growth and values of export similarities to China's imports and exports within the analysis period (1995-2019). The regression controls for country and year fixed effects, and EMDE's lagged GDP per capita growth. Each bar height is a product of the estimated cœfficients and EMDE's average similarities calculated separately for three periods, 1995-2007, 2008-2019, and 2020-2021 (data for 2022 and 2023 are extrapolated). Whiskers represent 90-percent confidence intervals. Export similarity to China's exports and imports are measured using the definition proposed by Finger and Kreinin (1979), using detailed product-level data at the 4-digit level. This index takes values between zero and one, and the higher its value the closest is the product distribution of exports in the two countries. B. Net effects are calculated as the linear combinations of import and export similarities estimated separately for each period corresponding to figure A.

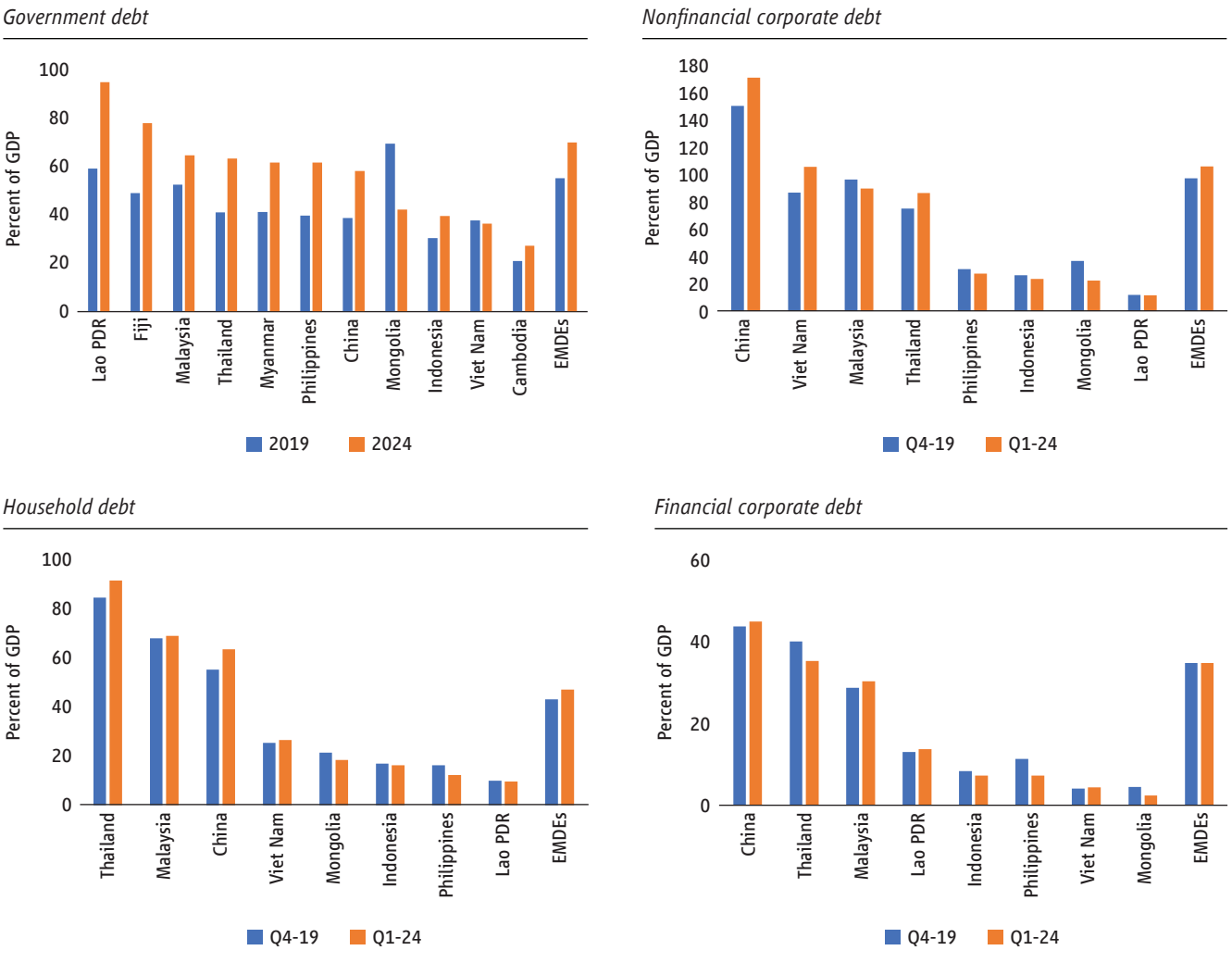
However, two concerns arise going forward. First, if China's growth slows down further, the benefits for developing countries will decline: for example, a one percent slowdown in China's growth could reduce growth in other developing countries by 0.14 to 0.21 percentage points. Second, if China's exports grow faster than its imports, as has continued to be the case in manufacturing and overall trade, then the negative impact of increased competition may outweigh the positive impact of demand enhancement in international markets. The prospect of diminishing spillover benefits from China's growth heightens the need for EAP countries to seek sources of domestic growth, especially through domestic reform.

The burden of debt

Debt as a share of GDP is higher than the pre-pandemic share in most EAP countries. General government debt as a share of GDP is significantly higher today in the region's economies, except in Mongolia and Viet Nam (figure 17). The

rise in government debt followed the easier financial conditions after the global financial crisis and increased budget deficits during the pandemic. High government debt limits fiscal space, constraining public investment, and may also hinder private investment by raising interest rates. Private debt has also surged in major economies. Corporate debt as a share of GDP has increased in China, Malaysia and Thailand, by [30, 20 and 40 percentage points, respectively]. By 2024, nonfinancial corporate debt in China and Viet Nam exceeded the levels most other EMDEs. High corporate debt may hurt private investment by leaving firms with less resources for new projects. Household and financial corporate debt too is higher in China, Malaysia and Thailand compared to levels in other emerging markets, and that is squeezing consumption and investment (Box 2).

Figure 17. Public and private debt have increased compared to pre-pandemic levels; private debt remains high in China, Malaysia, Thailand and Viet Nam



Source: Institute of International Finance, World Bank staff estimates.

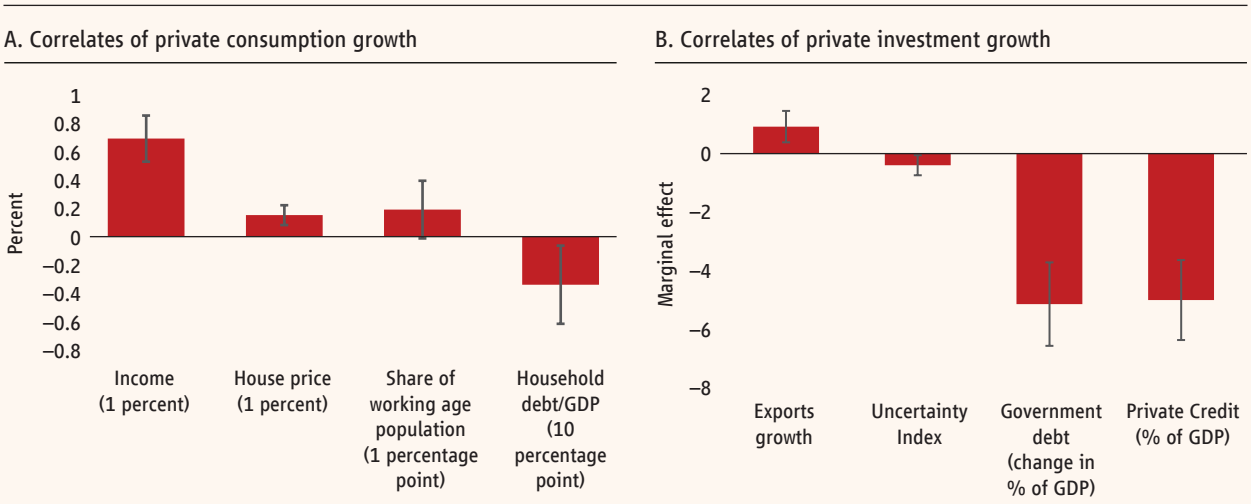
Box 2. The effects of higher debt in consumption and investment

Increased indebtedness can negatively impact consumption and investment in the EAP. Rising household debt in several economies can reduce disposable income and limit consumption, while elevated private debt can constrain private investment by reducing available funds and increasing borrowing costs. Additionally, increases in government debt can crowd-out private investment.

Traditional models such as the life-cycle permanent income hypothesis (PIH) suggest that anticipated income changes should not affect consumption, as they are presumed to be internalized. However, research shows that consumption is more sensitive to income changes than PIH predicts, highlighting the role of liquidity and credit constraints. This sensitivity is further influenced by factors like house prices and population aging (October 2023 EAP Economic Update). Empirical evidence suggests that a 10-percentage point increase in household debt would decrease consumption growth by 0.4 percentage points (figure B2.1A).

Investment growth has been closely linked to rising levels of corporate and government debts, as well as export growth and increased policy uncertainty (figure B2.1B). Previous studies have shown that economic policy uncertainty is negatively correlated with investment growth (Bloom 2009; Baker et al., 2016). Elevated private debt in the region, particularly in China, Thailand and Viet Nam, has likely constrained private investment by reducing available funds and increasing borrowing costs.

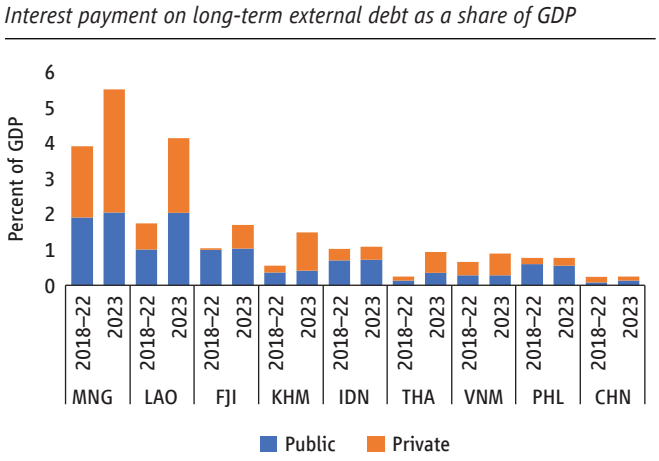
Figure B2.1. Increased household debt is negatively correlated with consumption growth; Increased government debt and high private debt are negatively correlated with private investment growth



Source: World Bank staff estimates.
Note: A. Figure shows regression cœfficients (bar height) and 90% confidence interval (whiskers) on private consumption per capita growth on income per capita growth and (i) house prices growth; (ii) share of working age population; and (ii) household debt as a share of GDP. Regressions control for time and country fixed effects. Standard errors are clustered at country level. Data is quarterly for 65 emerging market and developing economies between 2001-2022. B. Bars show marginal effects of each variable in predicting investment growth. Cœfficients are standardized by diving by the standard deviation of each variable. Black lines show 90 percent confidence intervals (1.68 x standard errors). Other variables included in the regression are lagged GDP growth, credit growth, FDI growth, lagged government debt as a share of GDP, lagged public investment as a share of GDP and change in private investment as a share of GDP, and a dummy for crisis. The regressions include country and year fixed effects. Sample included 98 emerging markets and developing economies.

In 2023, interest payments on external debt increased significantly in most countries in the region. Highly indebted countries such as Lao PDR and Mongolia have experienced a larger increase in interest payments, especially on private debt on which interest rates are more likely to follow the market rate (figure 18). In Lao PDR, which has been assessed to be in debt distress, interest payments to China (approximately 165 million USD or 1.1 percent of GDP) were deferred in 2023. While the deferral provides temporary relief, the repayment profile remains uncertain and subject to the conclusion of debt negotiations. The increase in interest payments limits fiscal space and can constrain public and private investment. Interest payments on private external debt have also increased markedly in Cambodia, Fiji, Thailand and Viet Nam.

Figure 18. Interest payments on external debt have increased in 2023 in most countries, but falling interest rates may offer some respite



Source: International Debt Statistics, World Bank staff estimates.
Note: Data is according to the original repayment plan and could include deferred debt such as in Lao PDR.

Uncertainty

While the EAP region has enjoyed higher growth rates than most other economies, three immediate risks could weigh on growth in the near term: geopolitical tensions, global economic slump, and policy uncertainty.

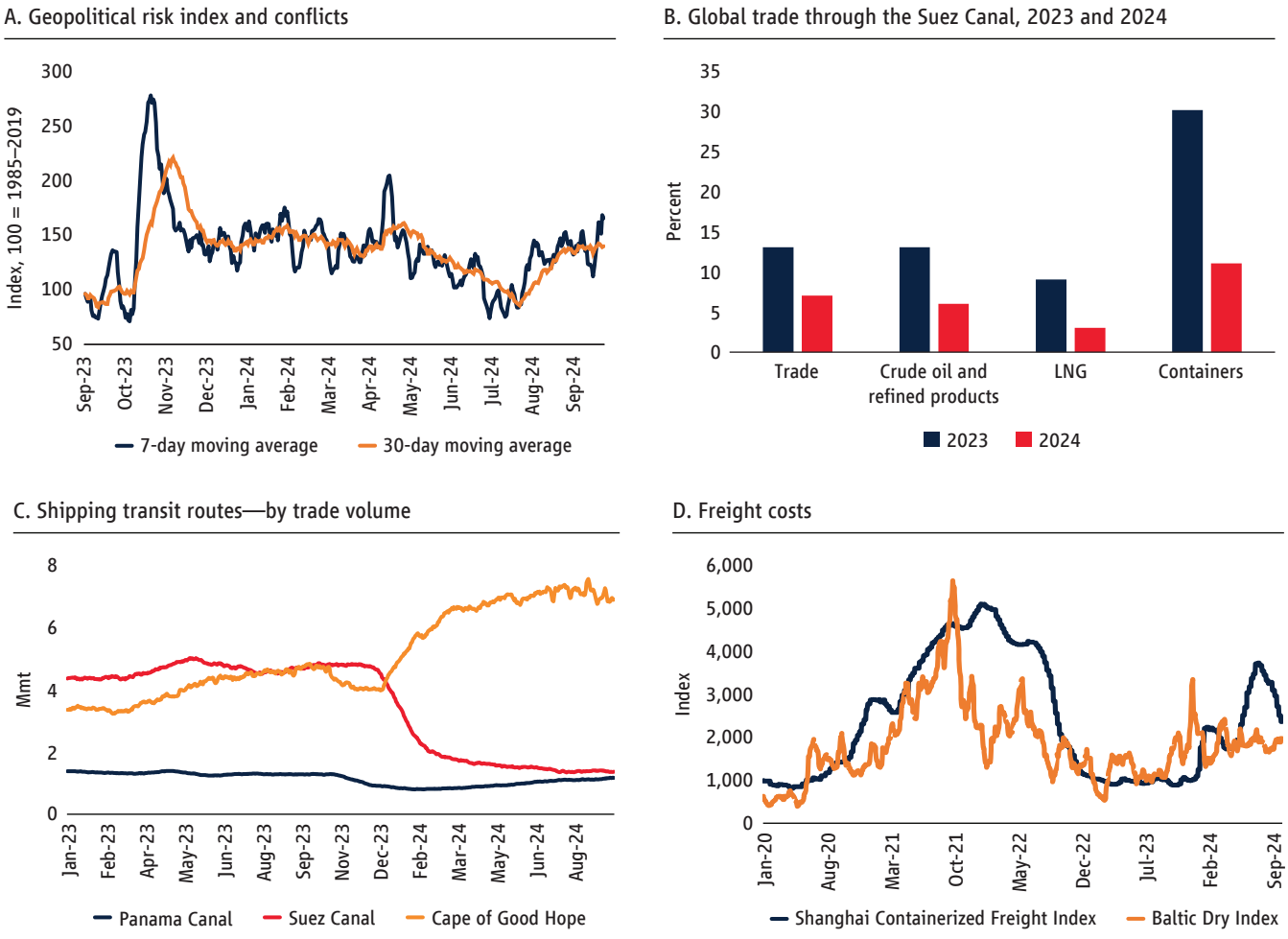
Geopolitical risk

An intensification of geopolitical tensions poses a downside risk. The conflict in the Middle East, in addition to creating a humanitarian crisis, has added to the ongoing challenges posed by the protracted Russian invasion of Ukraine.

The geopolitical risk index has moderated in recent months but remains over 40 percent above its 10-year average since the conflict began (figure 19A). Throughout 2024, ships have continued to avoid the Red Sea due to ongoing security concerns; a year earlier, this route handled about 15 percent of global shipments (figure 19B). As of mid-September, trade transit volume through the Red Sea had dropped by 75 percent since the beginning of 2024, with traffic diverting through the Cape of Good Hope (figure 19C). On a positive note, the traffic delays through the Panama Canal, caused by severe drought-induced low water levels in 2023, have subsided.

Shipping costs have increased but are likely to add little to inflation in the region. Since the start of the Middle East conflict, the Shanghai Containerized Freight Index (SCFI) has surged by 175 percent—rising 82 percent in January alone—while the Baltic Dry Index, a broader indicator of global shipping rates, has risen by nearly 40 percent (figure 19D). The increased freight rates suggest that shippers anticipate the elevated costs to persist, which in turn could raise the cost of imported goods across supply chains. However, the effect on inflation is likely to be small. According to estimated elasticities from Carriere-Swallow et al. (2023), the rise in the Baltic Dry Index could increase annual global headline and core inflation by 0.4 percentage points by September 2024 (currently 2.6 percent and 4.0 percent, respectively, as of August 2024). A similar analysis for 11 East Asian economies, using the SCFI, suggests that the pass-through effect is nearly double, with rising shipping costs raising annualized headline inflation by 0.7 percentage points and core inflation by an estimated 0.4 percentage points. Given that 12-month core inflation in East Asia is around 2.5 percent (as of August 2024), the effect on inflation is likely to be relatively mild.

Figure 19. Risks from Red Sea disruptions to shipping and trade continue



Sources: Bloomberg, Caldara and Iacoviello (2022); Comtrade (database); Haver Analytics: UN Global Platform, UNCTAD, International Energy Agency; IMF PortWatch; World Bank.
Note: A. Geopolitical risk index (GPR) reflects automated text-search of electronic articles from 10 newspapers related to adverse geopolitical events in each newspaper for each month. A higher index is related to lower investment, stock prices, and employment. Last observation is September 30, 2024. B. Average share of trade passing through Suez Canal. C. 40-day rolling averages, in millions of metric tons. Last observation is September 17, 2024. D. Shanghai Containerized Freight Index (SCFI) is a composite measure of spot rates for export container transport market. It includes both freight rates (indices) of 15 individual shipping routes and a composite index. The Baltic Dy Index measures the average price paid to transport dry bulk materials (which accounts for about half of world trade across more than 20 oceanic shipping routes (UNCTAD 2015). Daily data, last observation is September 23, 2024.

Although the rise in commodity prices has been limited so far, an escalation or expansion of the Middle East conflict could disrupt oil and other commodity markets. The conflict in Gaza has heightened uncertainty in oil markets, leading to increased price volatility. After an initial spike to $90/bbl in October 2023, Brent crude oil prices have fluctuated significantly but eased to $74/bbl by mid-September as supply concerns lessened. While oil prices are projected to average $81/bbl in 2024, further geopolitical disruptions could keep prices volatile, potentially causing moderate to extreme supply disruptions and impacting transport costs and other commodity prices.

Macroeconomic, financial and policy uncertainty

Increased uncertainty can result in a "wait-and-see" response from consumers and investors, delaying spending and investing and leading to drop in investment and output, especially in the short run. Increased uncertainty about macroeconomic developments abroad can negatively affect economic activity in EAP through various channels. First, increased uncertainty abroad can depress economic activity abroad and result in negative spillovers through real channels in EAP. Second, uncertainty can affect financial asset prices and credit costs abroad and in the EAP, amplifying the contractionary effects of economic uncertainty (Glichrist et al., 2014, Caballero et al., 2019; Caggiano et al., 2021, Akinci et al., 2023). Third, heightened uncertainty abroad, especially if global or in major partner countries, can transmit to higher country-specific uncertainty in individual EAP countries (Carrière-Swallow and Céspedes 2013; Londono et al. 2021; Miescu 2023; Georgiadis et al. 2024). Domestic economic uncertainty also negatively impacts economic confidence and sentiments in EAP countries (Ha and So 2023).[1]

Our empirical analysis focuses on three types of uncertainty: macroeconomic uncertainty–forecast-based measures; economic policy uncertainty–news-based measures; and financial uncertainty–stock market volatility-based measures.[2] In addition, economic policy uncertainty is also decomposed into different types of policy uncertainty—monetary, fiscal, and trade policies.

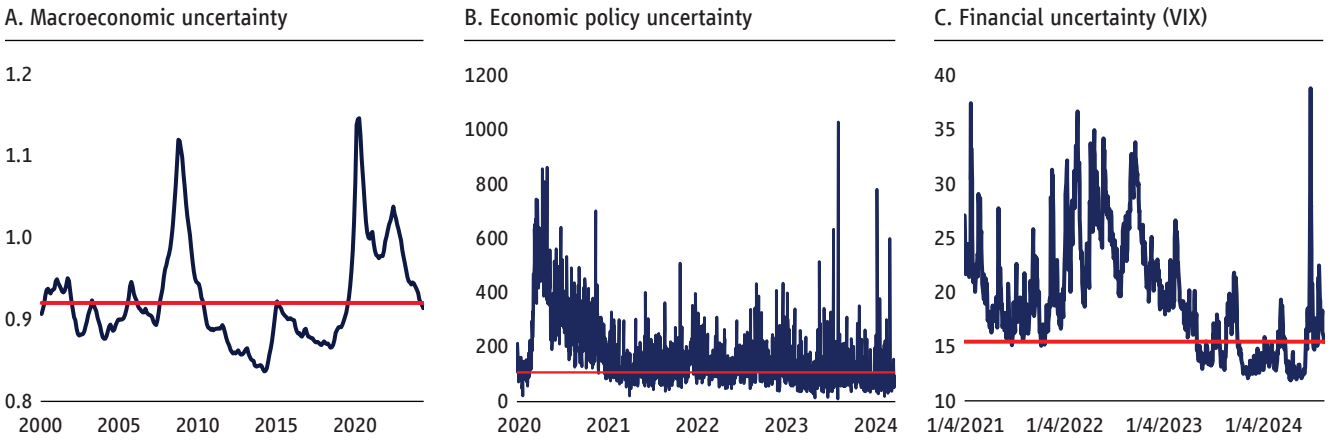
Global economy uncertainty has spiked and remains elevated—well above the pre-pandemic level—in the latter half of 2024. High-frequency financial uncertainty indicators, such as the VIX, spiked to 38.57 in August 2024, the highest level since 2020 (figure 20). This spike was driven by heightened concerns over potential US economic downturns and rising geopolitical tensions in the Middle East. Similarly, daily economic policy uncertainty, reflecting future monetary, fiscal, financial, and trade policies, experienced significant volatility in July 2024. This rising policy uncertainty also encompassed uncertainties surrounding the upcoming US election and ongoing debates over future monetary policy decisions by the Federal Reserve; the monetary policy uncertainty index has remained persistently above long-term averages since 2020.

Uncertainty appears to be synchronized across countries, likely driven by global factors. Novel empirical analysis utilizes harmonized monthly uncertainty measures in 71 countries over the 2008-2024 period – as compiled by Ahir, Bloom, and Furceri (2022) – and investigates comovement across countries. The first principal component of the cross-country data serves as a measure of global uncertainty, with factor loadings representing the sensitivity of country-specific uncertainty to the global factor. Positive factor loadings indicate that global uncertainty has positive contemporaneous impacts on a country's economic uncertainty (figure 21). The factor loadings are positive in around 90 percent of countries, suggesting that a one percentage point increase in global uncertainty is associated with around a 0.3 percentage point increase in domestic uncertainty. The loadings are higher among advanced economies (0.41) compared to EMDEs (0.30). In EAP EMDEs, 60 percent showed positive loadings over the 2008-24 period (average 0.25).

1 Several studies document the transmission of uncertainty shocks for individual EAP countries. Cheng (2017) explores the impact of foreign and domestic uncertainty shocks on South Korea's economy. Fontaine et al. (2018) study the spillover effects of economic policy uncertainty in China. Arbatli et al. (2017) examine policy uncertainty in Japan. Apaitan et al. (2022) provide evidence of uncertainty transmission in Thailand. Shah et al. (2019) investigate the international transmission of uncertainty shocks in Malaysia. Nguyen and Vo (2024) study economic policy uncertainty transmission from Viet Nam. Kuncoro (2024) examines inflation uncertainty for Indonesia and the Philippines.

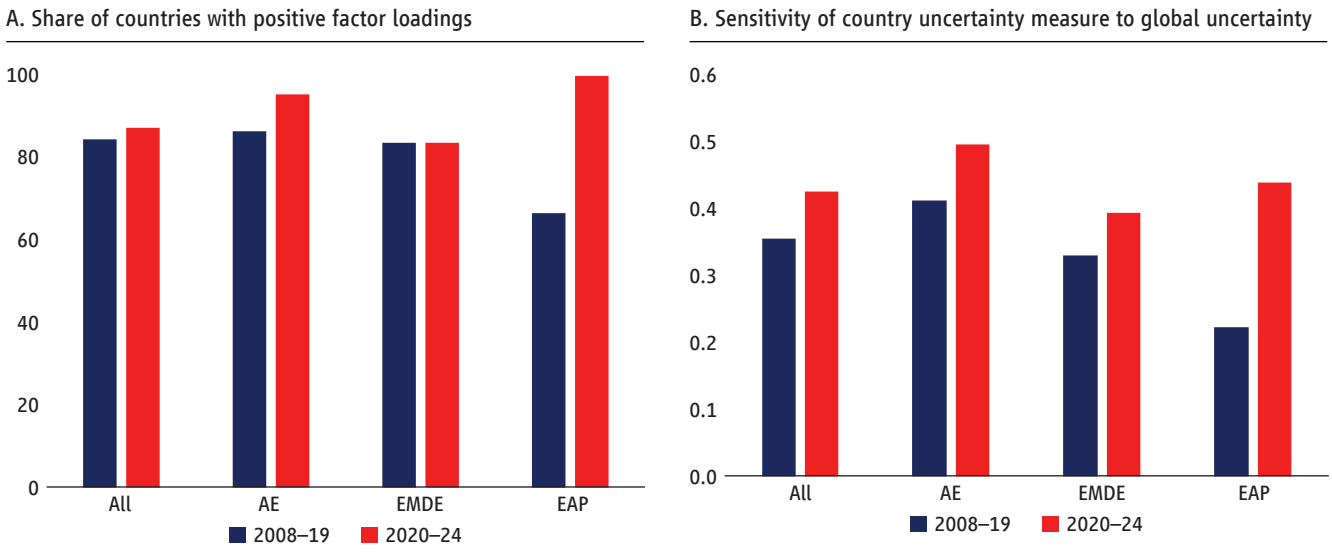
2 See Ha, Islamaj, and Mattoo (2024) for details.
Notes: A. Macroeconomic uncertainty is based on forecast-based measures by Jurado et al. (2015). The long-term average is 0.9. B. Daily U.S. Economic Policy Uncertainty (EPU) index is based on news-based measures by Baker et al. (2016). C. Daily financial market uncertainty measured by CBOE VIX index. B.C. Horizontal lines indicate long-term average = 100. Last observation is August 21, 2024.

Figure 20. Uncertainty in the United States has spiked and remains elevated



Source: World Bank estimates, Haver Analytics, Baker, Bloom, and Davis (2016), Jurado et al. (2015).
Notes: A. Macroeconomic uncertainty is based on forecast-based measures by Jurado et al. (2015). The long-term average is 0.9. B. Daily U.S. Economic Policy Uncertainty (EPU) index is based on news-based measures by Baker et al. (2016). C. Daily financial market uncertainty measured by CBOE VIX index. B.C. Horizontal lines indicate long-term average = 100. Last observation is August 21, 2024.

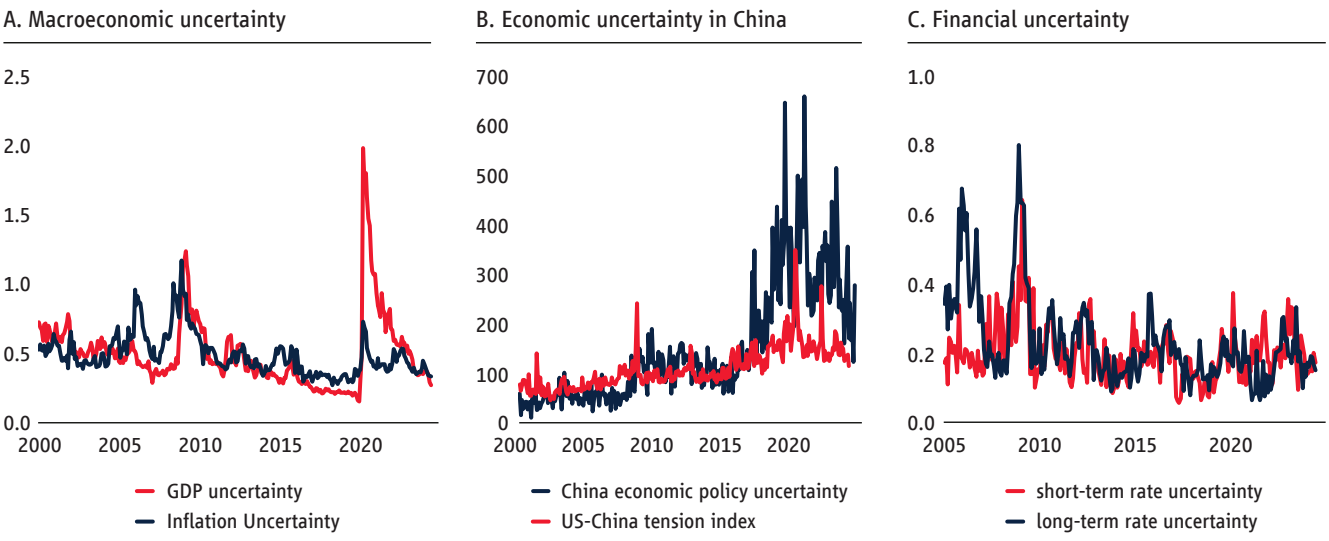
Figure 21. Uncertainty appears to be synchronized across countries, likely driven by global factors



Sources: World Bank estimates, Ahir, Bloom, and Furceri (2022).
Note: The results are based on the principal component analysis using monthly economic policy uncertainty in 71 economies—22 advanced economies and 29 EMDEs (including 6 EAP)—compiled by Ahir, Bloom, and Furceri (2022). A. Charts show the share of countries with positive factor loadings to the first principal component (in percent). B. Charts show the average magnitude of factor loadings across countries during the sample periods.

Unsurprisingly, country-specific measure of economic uncertainty in EAP countries have seen recent spikes. Economic uncertainty remained elevated, surpassing pre-pandemic levels in several EAP countries. News-based economic policy uncertainty continues to stay high, particularly in China, partly reflecting ongoing US-China trade tensions (figure 22). Survey-based uncertainty indicators on short- and long-term interest rates, reflecting global and US, and China policy uncertainty as well as domestic macroeconomic and financial uncertainty, have also ticked up across EAP economies since 2024.

Figure 22. Uncertainty in the EAP has seen recent spikes



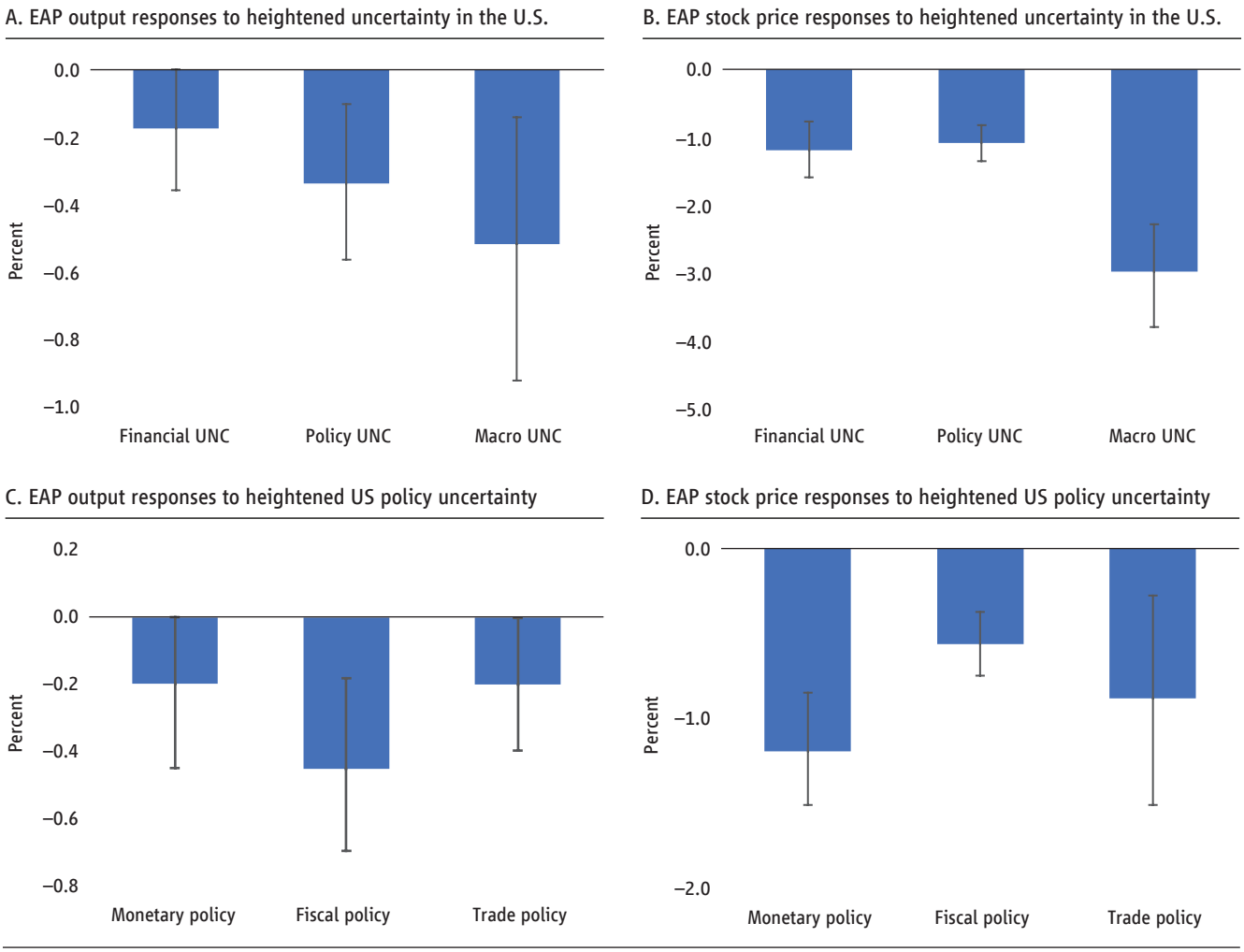
Source: World Bank estimates, Consensus Economics, Baker, Bloom, Davis (2016), Rogers, Sun, Sun (2024).
Notes: A. EAP macroeconomic uncertainty is based on the average cross-sectional standard deviation of Consensus Forecast surveys for 4 countries (CHN, IDN, MYS, THA). B. China policy uncertainty is based on news-based measures by Baker et al. (2016). the U.S.-China Tension (UCT) index, constructed by Rogers, Sun, and Sun (2024) computes the share of articles discussing rising U.S.-China tension, in particular, the share of articles containing mention of (i) United States (or U.S.) and China (or Chinese), (ii) contentious issues in the bilateral relationship, and (iii) phrases indicating tension. C. EAP financial uncertainty is based on the average standard deviation of Consensus Forecasts for 3-month TB yields and 10-year bond yields in 4 countries (CHN, IDN, MYS, THA).

As discussed above, global uncertainty shocks can negatively impact macroeconomic and financial conditions in EAP countries. Empirical analysis shows that a sustained (one month) three standard deviations from the long-term average of VIX – comparable to the most recent financial market turbulence in August 2024 – can lead to declines in industrial production and stock prices by up to 0.5 percent and 4 percent, respectively, in the average EAP economy (figure 23). Similarly, heightened economic policy uncertainty—whether political uncertainty due to the US election or monetary policy uncertainty by the Federal Reserve—is expected to have comparable effects on EAP stock markets and outputs.

Moreover, the empirical analysis reveals that different types of uncertainty shocks have heterogeneous effects on EAP countries. Macro uncertainty has the most significant impact on key domestic macro variables (output and prices) in EAP, followed by policy and financial uncertainty, in terms of stock prices, financial market uncertainty generally had greater impact than policy uncertainty. In addition, as shown in the figure, among various types of policy uncertainties, monetary policy uncertainty significantly affects stock markets, while fiscal uncertainty impacts output more directly, and trade uncertainty influences both financial markets and output.[3]

3 Although not shown in the chart, the analysis also indicates that while China is affected by global and US uncertainty shocks, its own uncertainty shocks also impact the macroeconomic and financial conditions in EAP. These findings suggest that China is both a source and recipient of uncertainty shocks in global markets, especially in connection with EAP countries.

Figure 23. Impact of US uncertainty on EAP



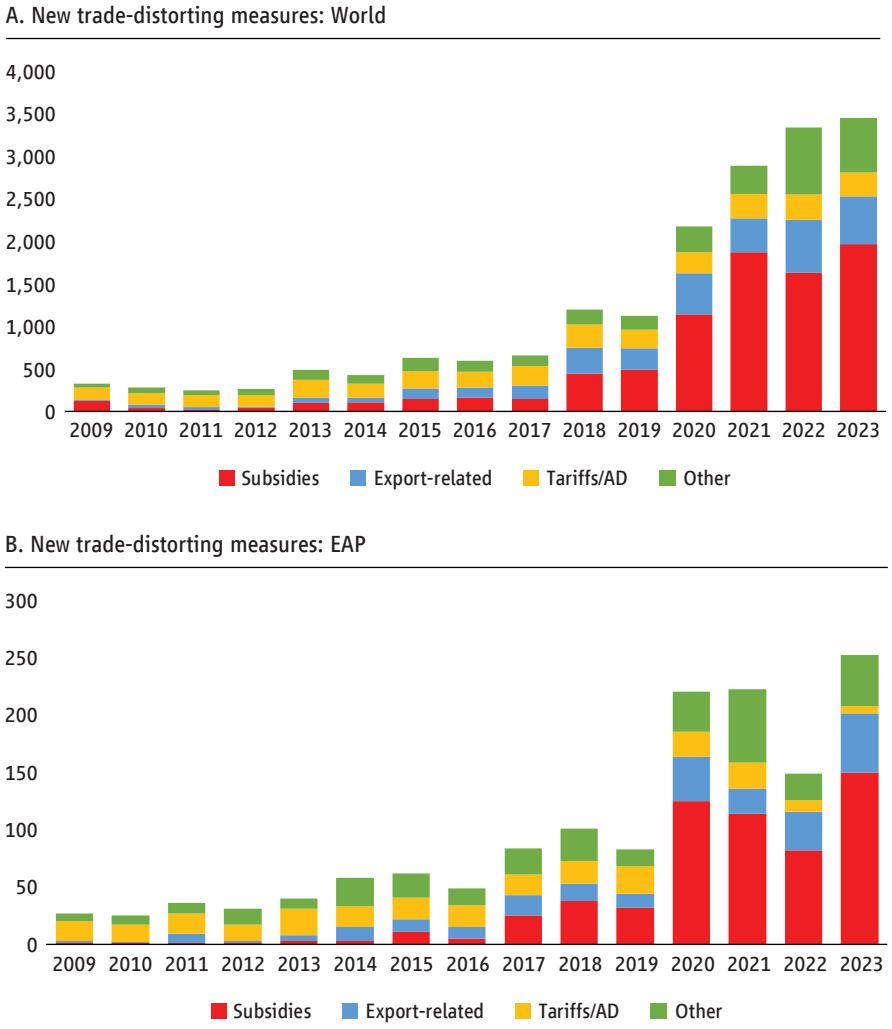
Source: World Bank estimates, Baker, Bloom, Davis (2016).
Note: The results are based on a panel Vector autoregression estimated for 2000m1–2019m12 for four EMDEs in EAP (MYS, IDN, PHL, THA). The model includes, in this order, the US production, US CPI, US uncertainty, China production, CPI, uncertainty measure, and domestic (EAP) industrial production, prices, stock prices, exchange rates, and uncertainty measures. A. Bars shows dynamic responses of EAP industrial production and CPI to a one-standard-deviation increase in uncertainty in the U.S. B. Bars shows dynamic responses of EAP productions to a one-standard-deviation increase in macrœconomic uncertainty in the U.S . C.D. US policy uncertainty is based on Baker, Bloom, Davis (2016).

Overall, the empirical findings in this box lead to three key implications. First, as noted by Ha, Islamaj, and Mattoo (2024), the elevated effect of uncertainty is expected to have substantial transmission effects on EAP. The effects of uncertainty shocks are distinct from the effects of level (first moment) fluctuations in business, financial, and policy variables, with significant economic consequences comparable to those of level shocks. Second, while the transmission of uncertainty shocks operates through various channels, different types of uncertainty shocks have distinct effects on macrœconomic and financial variables. Finally, the international transmission of uncertainty shocks causes correlated movements of uncertainty across countries. The principal component analysis in this box suggests a substantial increase in EAP's sensitivity to global uncertainty, warranting greater attention from policymakers.

Trade, investment and global tensions

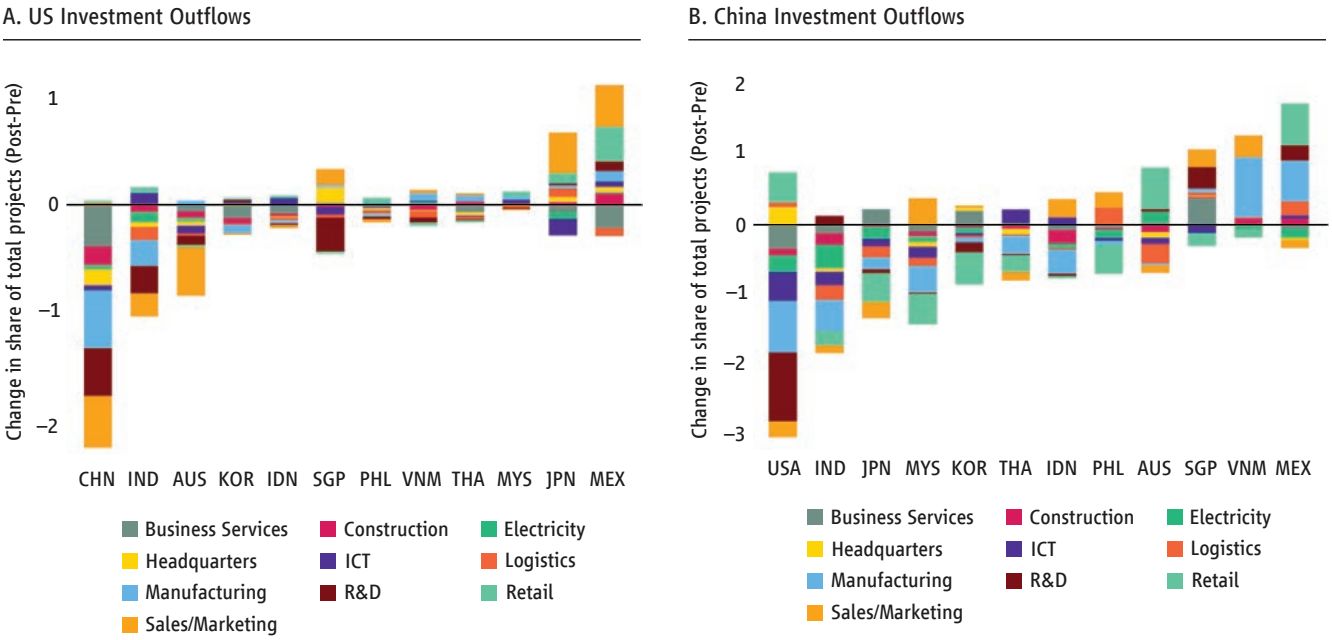
Recent years have been marked by a surge in both trade protectionism and potentially trade-distortive industrial policy (IP) actions in many countries. The number of new protectionist measures taken globally and by developing EAP economies has been increasing (figure 24). Recent examples include the export restrictions by the US on advanced technology products to China beginning in 2022 and by China on germanium and gallium (minerals used in semiconductors and other high-technology products) in 2023; and tariff hikes announced by the US in May 2024 on several products from China (including semiconductors, electric vehicles, and solar cells), which were followed by announcements of tariff hikes on electric vehicles by the EU and Canada in August 2024. As Figure 24 shows, many of the new trade-distorting measures are subsidies. Box 6 shows that deep trade agreements can shield against the effects on export growth of the implementation of industrial policies by trading partners.

Figure 24. The number of new trade-distorting measures continues to increase, both globally and in the EAP region



Source: Global Trade Alert. Panel A reports the total number of new interventions in the WTO countries in the period 2009–2023. Panel B includes the 22 countries in the developing EAP for which the data is available. All measures classified by the GTA to be harmful to trade (coded "red") are included. The charts divide the type of interventions in four categories: domestic subsidies, export-oriented policies (including export subsidies), tariff and contingent protection, and a residual category including all other types of interventions (on FDI, licensing, migration etc).

Figure 25. US and China decreased their reciprocal share of FDI in manufacturing and R&D. China increased its share of FDI to Mexico and Viet Nam



Source: World Bank staff illustration using data from fdiMarket.
Note: Panel A, B: The bars show the change in share of a country in US/China's total number of announcements of new greenfield FDI project abroad, pre and post US-China trade war. Pre = May 2014–May-2018; Post = June 2018–June 2022.

Reallocation of global trade and investment flows

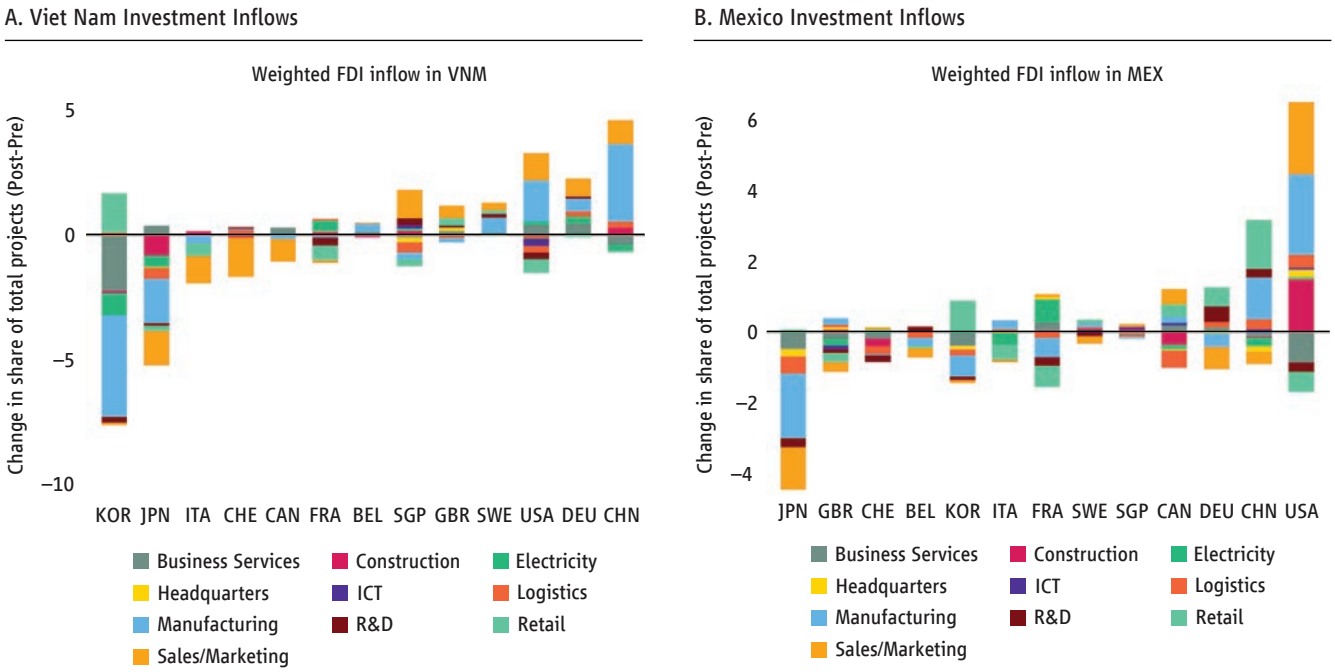
Recent global trade tensions spurred a reallocation in both trade and FDI patterns across the world. We explored the changes in trade patterns in previous EAP economic updates. In the appendix, we present charts for US and Chinese import and export shares, where the increase in import shares in the US of Viet Nam, Mexico, Thailand, Malaysia, is accompanied by an increase in the share of China's exports of those same countries. This global reallocation of trade flows, documented also by Freund et all (2023) and Alfaro and Chor (2023), earned the label of "connector" countries for Mexico and Viet Nam (Gopinath et al, 2024).

We focus in this Update on the changing patterns of foreign direct investments (FDI), using micro-level data from FDI Markets. This source provides data disaggregated by countries of origin and destination as well as by sectors, but covers only greenfield investments and not mergers and acquisitions. Figures 25 reports the shifts in shares in US and Chinese outward FDI, measured by cumulating the total number of greenfield investment projects announced over the periods 2014-2018 and 2018–2022.[4] Figures 25 shows how the decrease in the share of China's investments in the US and US investments in China was especially concentrated in manufacturing and R&D.

4 While using the number of FDI announcements is standard when using these data, fdimarket also provide an estimated capital expenditure (in dollars). In the appendix, we present the results of analysis using values instead of number of announcements. The results are broadly consistent with the main analysis presented here, but some specific results are different when considering values instead of numbers. See the appendix for a discussion of the differences.

The flip side of the findings of Figure 25 are reported in Figure 26. Panel A and B report the change in the share of inward FDI received by Mexico and Viet Nam, which both saw a large increase in their share of US and China's outward investments, especially in manufacturing. This FDI reallocation complements the reallocation in trade flows. Other countries in the EAP region, notably Malaysia and Thailand, also witnessed a recent increase in inflow of investments from both China and the US.

Figure 26. Viet Nam and Mexico emerged as "connector" countries, especially in the manufacturing sector



Source: World Bank staff illustration using data from fdiMarket.
Note: The bars show the change in share of a country total number of announcements of new greenfield FDI projects in Viet Nam and Mexico, pre and post US-China trade war. Pre = May 2014–May 2018; Post = June 2018–June 2022.

A key asymmetry

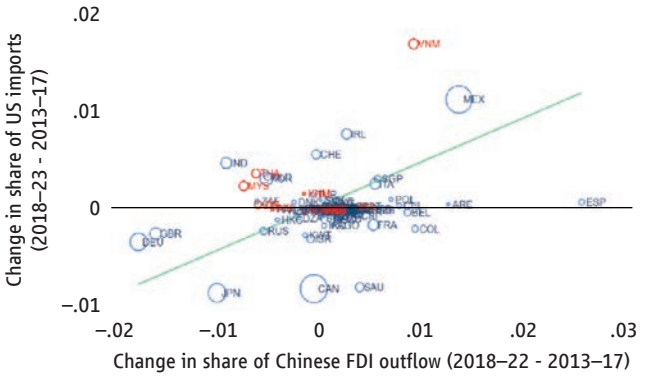
Putting together shifts in trade and investment patterns reveals a key asymmetry. The change in the share of Chinese investments is found to be positively correlated with the change in those countries' shares in US imports in the same period (Figure 27.A). However, Figure 27.B reveals the existence of a negative relation between the change in the share in US investment and the change in the share in Chinese imports. This asymmetry suggests that while countries have been able to harness imports and investment from China to boost exports to the US, the converse is not true. Less surprisingly, Figure 27.C and 27.D both show a positive relation between the change in the share of US (China) FDI in a country and the change in the share of that country in US (China) imports.

Looking forward

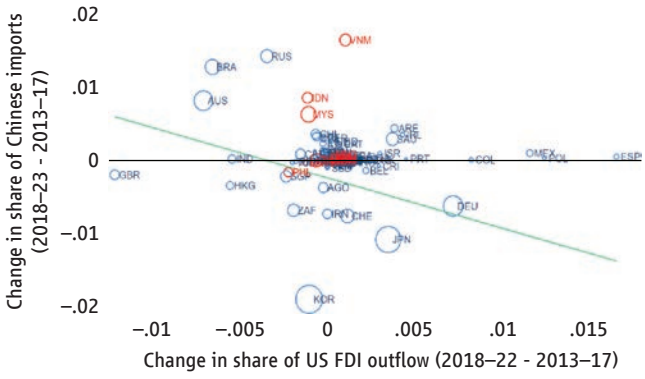
Taken together, Figures 24-27 leave open important questions facing the countries of the region. The first, is whether the "connector" countries will keep being able to fulfil this role, given the uncertainty about the future stance of the trade policy in the US and China. Recent measures by the US to investigate more closely the origin of certain steel products

Figure 27. The increase in the share of Chinese (US) FDI outflows to a country is positively (negatively) correlated to increase in its share of US (China) imports. An increase in the share of Chinese (US) FDI outflows to a country is positively correlated to increase in its share of Chinese (US) imports

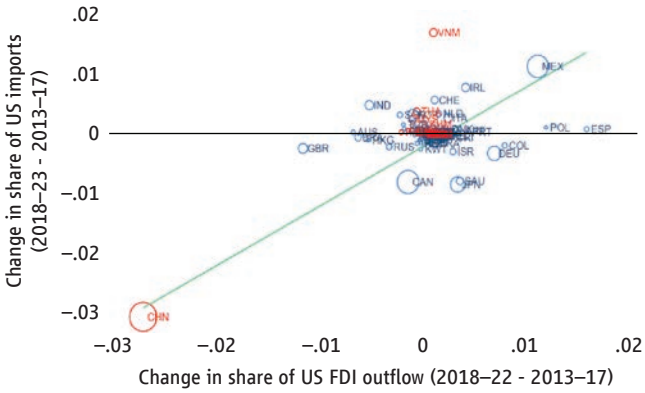
A. Δ share in US imports vs Δ share in Chinese FDI



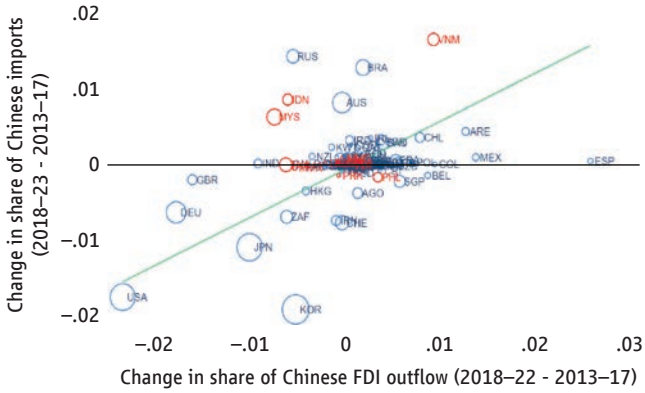
B. Δ share in Chinese imports vs Δ share in US FDI



C. Δ share in US imports vs Δ share in its FDI



D. Δ share in Chinese imports vs Δ share in its FDI



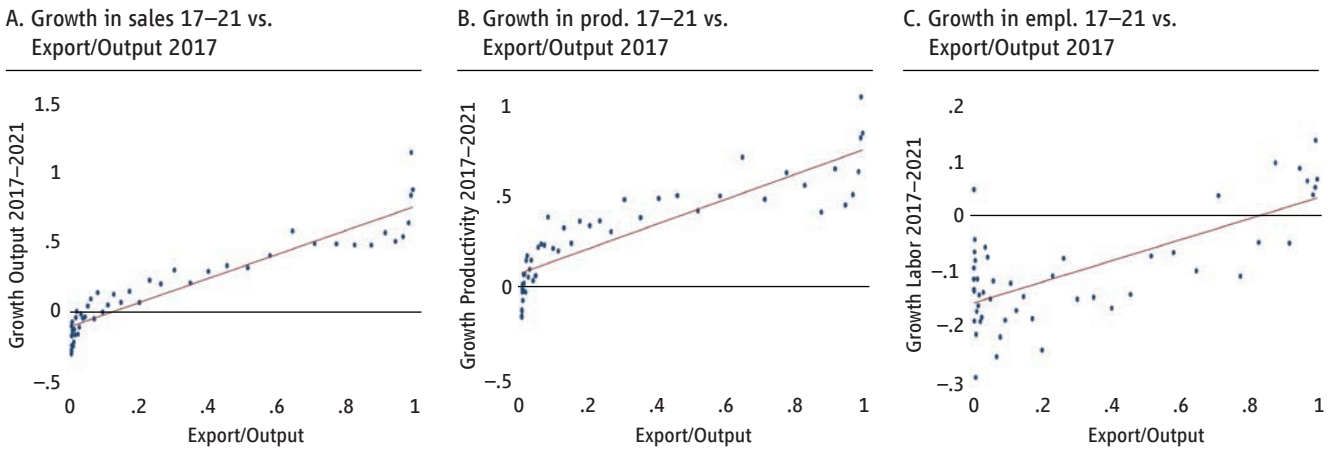
Source: World Bank staff illustration using data from fdiMarket and UN-COMTRADE.
Note: Relationship between the change in a country's share in Chinese/US FDI outflows, measured as total number of FDI projects abroad, and its change in the share of US/Chinese imports. The fitted line is the linear fit from a weighted regressions with total imports in 2013-17 as weights.

imported from Mexico as well US countervailing and antidumping duty investigations of photovoltaic cell imports from Cambodia, Malaysia, Thailand, and Viet Nam using components from China,[5] might be considered a signal of future more stringent policies to contain indirect trade through connector countries. One possible defense for small countries against the trade distorting impact of measures like industrial policies is for countries to conclude deep trade agreements with large countries (see Box 3).

The second question is how far the "connector" countries are benefiting from this role in terms of domestic development, for instance in terms of employment or productivity. Figure 28 reports some initial firm level analysis for Viet Nam, pointing toward a positive relation between the export intensity of firms in 2017 and the subsequent growth in sales, productivity, and employment.

5 See Federal Register of 08/23/2023. Available at: https://www.federalregister.gov/documents/2023/08/23/2023-18161/antidumping-and-countervailing-duty-orders-on-crystalline-silicon-photovoltaic-cells-whether-or-not.

Figure 28. Deep dive Viet Nam: the more firms were engaged in international exports in 2017, the higher the gain in sales, productivity and employment over 2017–2021



Source: World Bank staff illustration using data from GSO Enterprise Survey and Viet Nam Custom data.
Note: Binned scatterplot of a firm's export to sales ratio in 2017 and its growth in total sales, productivity and employment over the period 2017–2021. Non-Exporters in 2017 are excluded.

Figure 29 presents an event study analysis to investigate the relative dynamics of firms exporting specifically to the US (at least in one year in the period 2016-2021) relative to the exporters to other destinations. As the figure shows, exporters to the US display increases in sales and productivity relative to exporters to other countries (Figure 29A and 29B). Moreover, they also display a relative increase in employment, albeit delayed, and a relative increase in capital intensity and material use (Figures 29C, 29D, and 29E). Figure 29 points to the existence of potentially positive effects for Vietnamese firms stemming from the new opportunities offered by the trade tension between US and China. However, several caveats to this analysis must be considered. First, the analysis focuses on relative outcomes, and thus it does not allow definitive statements about the aggregate impacts on employment or productivity. Second, potential negative spillovers effects on firms that do not export or export to other countries are not considered. Lastly, from a methodological point of view, our definition of "treatment" is potentially affected by endogeneity issues. These caveats, coupled with the uncertainty about the future policy stance of US and China, imply that the development effects of being a "connector" country are not yet fully established.

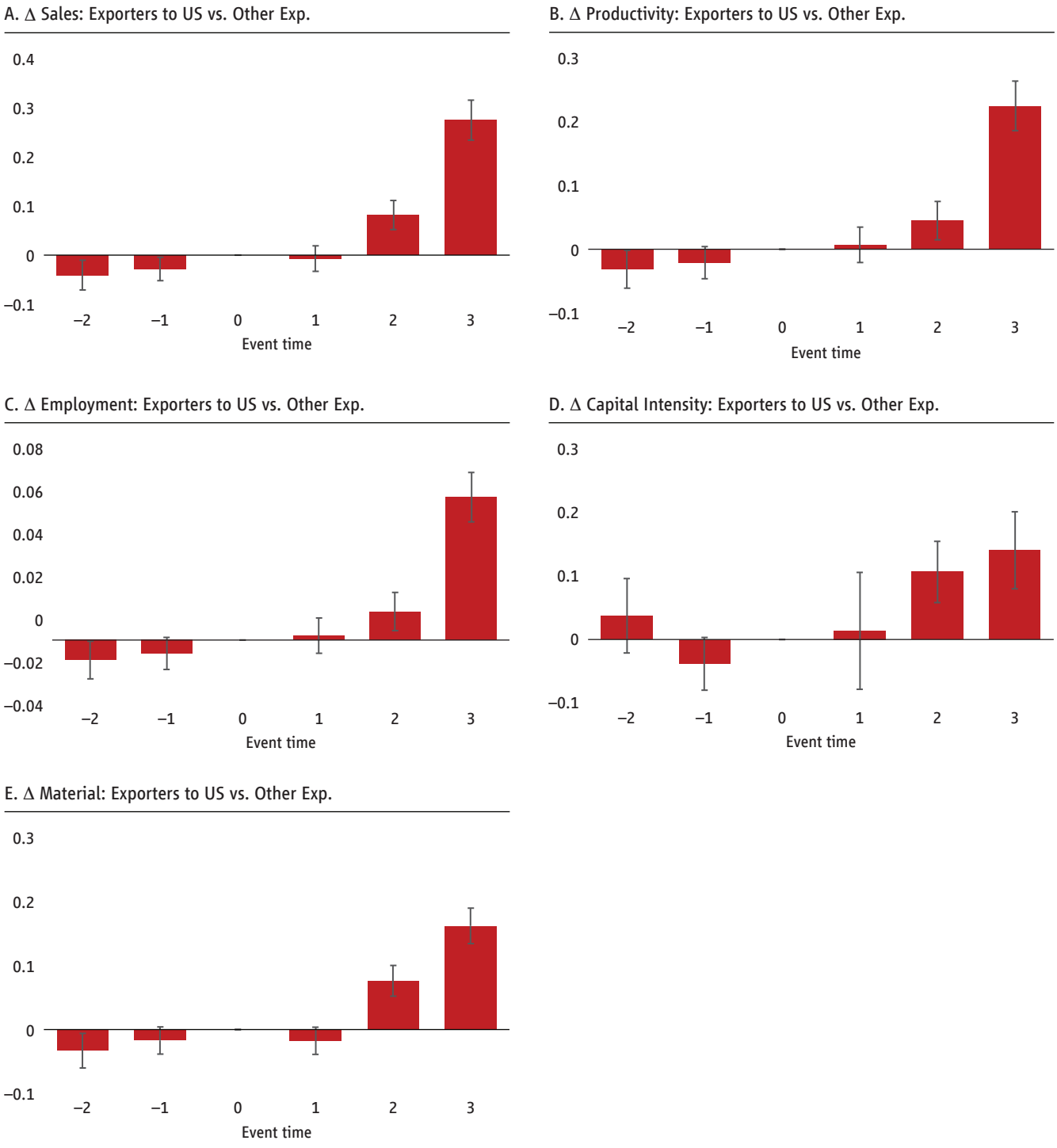
Growth forecasts

Outlook

Most EAP economies are expected to experience robust growth in 2024, supported by private consumption and a positive external environment. The region is projected to grow by 4.8 percent in 2024, slightly down from 5.1 percent in 2023 (Table 1). China's growth is forecast to be 4.8 percent in 2024, down from 5.2 percent in 2023, as the bounce back of services consumption and exports fades, the labor market softens, and the property sector investment weakness continues.

The rest of the region is forecast to grow by 4.7 percent in 2024, up from 4.3 percent in 2023, benefiting from increasing domestic consumption, recovering goods exports, and tourism rebound. However, signs of moderating domestic demand are emerging, particularly in Indonesia, Thailand, and the Philippines, and private investment growth remains weak

Figure 29. Deep dive Viet Nam: event study analysis reveals that firms who were exporting to the US at any point between 2016 and 2021 had higher sales, employment, and productivity growth than the other exporters in 2018-2021, this coupled with a relative increase in capital intensity and use of material.



Source: World Bank staff illustration using data from GSO Enterprise Survey and Viet Nam Custom data.
Note: Event study analysis where treated firms are firms that were exporting to US at least once in the period 2016-2021, and control firms are firms that were exporting but never to the US. The baseline period is 2018. Firm, sector and year fixed effects are included. Standard errors are clustered at firm level. Whiskers show 95% confidence intervals.

Box 3. Preferential Trade Agreements: A Shield against Industrial Policy?

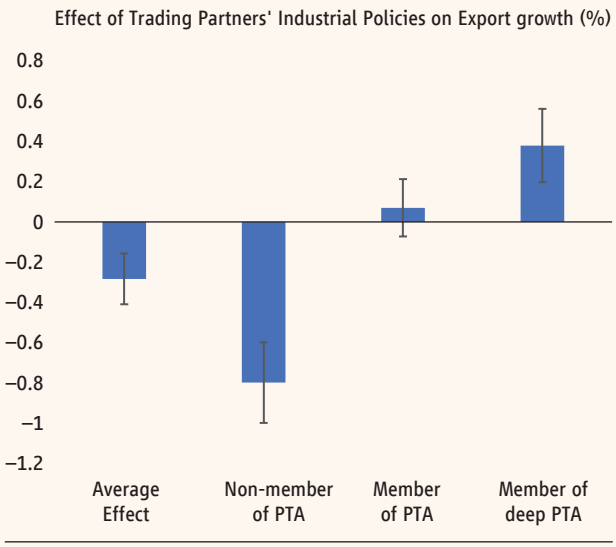
Utilizing data from the Global Trade Alert, a recent paper investigates the impact of industrial polices on trade between countries during the period 2012–2022, focusing on how Preferential Trade Agreements (PTAs) influence the impact.

It yields three main conclusions (Figure B3.1 summarizes in graphical form the main results). First, the introduction of a new industrial policy measure in a destination market reduces export growth to that market on average by about 0.28 percent.

Second, a newly introduced industrial policy measure reduces imports from non-members of a PTA while leaving imports from members of the PTA roughly unchanged.

Third, deep disciplines on subsidies in a PTA can lead to increased imports from members of a deep trade agreement, effectively making them beneficiaries of industrial policy. For a level of depth equal to that in the top 5 percent of the PTAs in the sample, the introduction of an industrial policy measure increases imports from other members by about 0.39 percent.

Figure B3.1. Trade Effects of Industrial Policies and PTAs



Source: Barattieri, Mattoo and Taglioni, 2024.
Note: The analysis combines data for the period 2012-2022 on detailed product level bilateral trade, industrial policy (IP) announcements, and rules on subsidies in different PTAs. The analysis controls for various confounding factors.

These findings suggest that PTAs can provide a shielding effect against the potentially distortive trade effects of discriminatory industrial policies. This shielding effect appears to be heterogeneous across products and regions: it is more pronounced in industries such as chemicals and transport equipment, and for advanced and developing East Asian economies.

across the region. Public investment is supporting growth in the Philippines and Timor-Leste. In the Pacific Island countries, growth is forecast to slow to 3.5 percent in 2024 from 5.7 percent in 2023, largely due to a normalization of growth in Fiji (comprising about 50 percent of GDP in PICs) while growth rates in most other economies are projected to increase as tourism continues to recover (Box 4).

Growth in the region is projected to slow to 4.4 percent in 2025. Growth in China is projected to moderate to 4.3 percent in the face of persistent property market weakness, low consumer and investor confidence, as well as the challenges of aging and global tensions. Recently signaled fiscal support may lift short-term growth but longer-term growth will depend on deeper structural reforms. Growth in the rest of the region is set to rise to 4.9 percent, supported by a continued recovery in global trade and a normalization of interest rates in advanced economies. Country-specific factors, such as Thailand's

Digital Wallet program and increased copper mining in Mongolia, are also likely to boost growth. Growth in the Pacific Island countries is forecast to slow to 3.4 percent in 2025, reflecting a normalization following the delayed recovery from Covid-19.

Inflation in most of the EAP region is expected to moderate and remain within target bands, reflecting stable input costs, tepid demand conditions, and easing food inflation pressures. However, inflation in Lao PDR is projected to remain above 20 percent in 2024, due to continued currency depreciation pressures from high external debt service and import needs. Similarly, inflation in Myanmar is expected to stay high at 23 percent, although moderating slightly, due to persistent exchange rate depreciation and increased transport and logistics costs pushing up prices of both food and non-food items. Additionally, central bank financing of fiscal deficits is also likely to keep inflationary pressures high.

Table 1. GDP growth forecast

						Oct 2024 forecast		Apr 2024 forecast	
	2015–19	2020	2021	2022	2023	for 2024	for 2025	for 2024	for 2025
East Asia & Pacific	6.4	1.2	7.6	3.4	5.1	**4.8**	**4.4**	4.5	4.3
East Asia & Pacific (excluding China)	5.2	–3.8	2.9	5.8	4.3	**4.7**	**4.9**	4.6	4.8
Pacific Island Countries	3.1	–10.3	–2.8	9.5	5.7	**3.5**	**3.4**	3.6	3.3
China	6.7	2.2	8.4	3.0	5.2	**4.8**	**4.3**	4.5	4.3
Indonesia	5.0	–2.1	3.7	5.3	5.0	**5.0**	**5.1**	4.9	5.0
Malaysia	4.9	–5.5	3.3	8.9	3.6	**4.9**	**4.5**	4.3	4.4
Philippines	6.6	–9.5	5.7	7.6	5.5	**6.0**	**6.1**	5.8	5.9
Thailand	3.4	–6.1	1.6	2.5	1.9	**2.4**	**3.0**	2.8	3.0
Viet Nam	7.1	2.9	2.6	8.1	5.0	**6.1**	**6.5**	5.5	6.0
Cambodia	7.1	–3.6	3.1	5.1	5.0	**5.3**	**5.5**	5.8	6.1
Lao PDR	6.6	0.5	2.5	2.7	3.7	**4.1**	**3.7**	4.0	4.1
Mongolia	4.6	–4.4	1.6	5.0	7.2	**5.3**	**6.5**	4.8	6.6
Myanmar	6.4	6.6	–9.0	–12.0	4.0	**1.0**	**1.0**	1.3	2.0
Papua New Guinea	4.0	–3.2	–0.8	5.2	2.7	**4.6**	**3.7**	4.8	3.6
Timor-Leste	5.1	–8.3	2.9	4.0	2.3	**3.0**	**3.5**	3.6	4.5
Palau	1.7	–9.1	–13.4	0.0	0.2	12.0	11.0	12.4	11.9
Fiji	3.1	–17.0	–4.9	20.0	8.0	3.1	3.3	3.5	3.3
Solomon Isl.	3.0	–3.3	2.6	2.3	3.0	2.5	2.9	2.8	3.1
Tuvalu	6.7	–4.3	1.8	0.7	3.9	3.5	3.0	3.5	2.4
Marshall Isl.	4.8	–1.8	1.0	–0.6	3.0	3.4	4.0	3.0	2.0
Vanuatu	3.5	–5.0	–1.6	1.9	2.2	0.9	1.5	3.7	3.5
Kiribati	5.8	–0.6	8.5	3.9	4.2	5.8	4.1	5.6	2.0
Tonga	2.4	0.5	–1.3	0.1	2.0	1.8	2.4	2.5	2.2
Samoa	3.4	–3.1	–7.1	–5.3	8.0	10.5	5.5	4.5	3.6
Micronesia	2.0	–1.8	–3.2	–1.4	0.4	1.1	1.7	1.1	1.7
Nauru	1.8	0.7	7.2	2.8	0.6	1.8	2.0	1.4	1.2

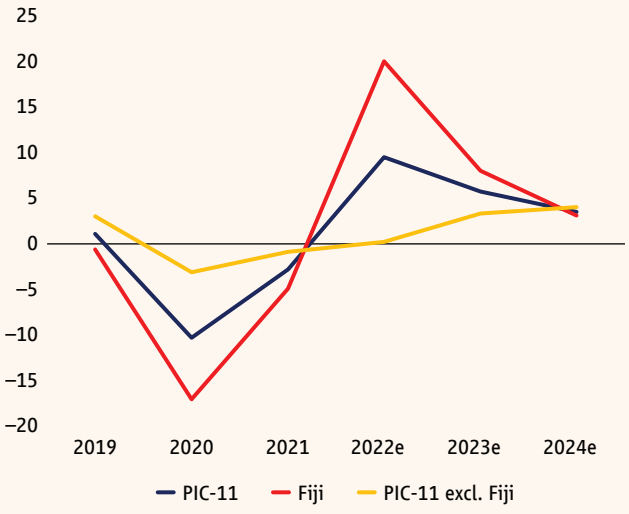
Sources: World Bank.
Note: Percent growth of GDP at market prices. Values for 2023 for the small island economies refer to GDP growth estimates. Values for Timor-Leste represent non-oil GDP. For the following countries, values correspond to the fiscal year: Federal states of Micronesia, Palau, and Republic of the Marshall Islands (October 1 - September 30); Nauru, Samoa, and Tonga (July 1 - June 30). Myanmar growth rates refer to the fiscal year from October to September and data beyond 2024 is excluded because of a high degree of uncertainty.
1. Aggregate growth rates calculated using GDP weights at average 2010-19 prices and market exchange rates.
2. Data for Myanmar (beyond 2024) is excluded because of a high degree of uncertainty.
3. Annual GDP is on fiscal year basis, as per reporting practice in the country.

Box 4. Economic recovery and outlook in the Pacific Island Countries[6,7]

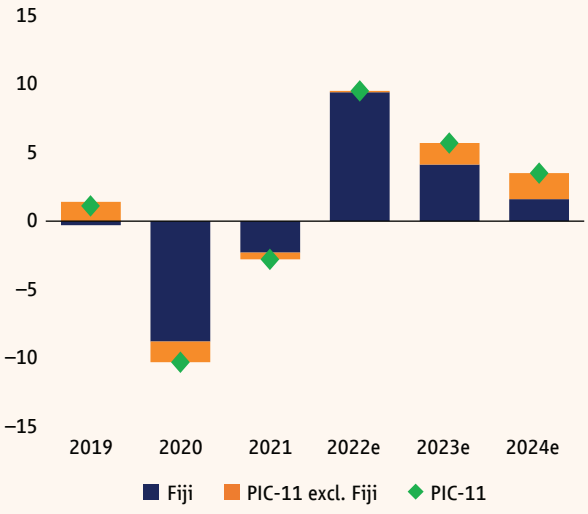
The PIC-11 demonstrated notable resilience in 2024, with most economies expected to surpass pre-pandemic output levels. Over half of the PIC-11 economies are estimated to have experienced stronger growth in 2024 than in 2023 supported by the global recovery in trade and tourism. However, despite this broad-based recovery, the aggregate growth of the PIC-11 slowed to an estimated [3.5] percent in 2024, down from [5.7] percent in 2023 (Figure B4.1A). This deceleration is primarily due to the continued normalization of economic activity in Fiji, which accounts for over 50 percent of the PIC-11's total output and experienced exceptionally strong performance in 2022 and 2023 (Figure B4.1B).

Figure B4.1. GDP growth and contributions

A. GDP growth, the PIC-11, Fiji, and the PIC-11 excluding Fiji (percent change)



B. Contributions to growth (percentage points)



Sources: Haver Analytics; World Bank.
Note: e = estimate; p = projection. All data in the report is presented on a calendar year basis for consistency and comparability. For countries with fiscal year different to the calendar year period, data in a calendar year basis are computed based on fiscal year's estimates. The data presented, corresponding to fiscal years, is explicitly indicated as such.

6 The Pacific Islands comprise 11 countries, with Fiji being the most populous and economically significant, followed by the Solomon Islands. The 9 other economies are categorized into two main groups. The first group relies heavily on tourism and remittances (Palau, Samoa, Tonga, Vanuatu). The second group depends on natural resources, non-tax revenue, and development aid (FSM, Kiribati, Nauru, RMI, Tuvalu) (Pacific Island Economic Update March 2024). The economies of the former group are vulnerable to global economic shifts and travel conditions, while the latter's stability is tied to commodity prices, fishing and non-tax revenue, and donor funding. Tourism and remittances-led countries experienced more severe contractions due to the travel restrictions during the COVID-19 shocks and have been enjoying a delayed recovery

7 GDP growth projections are based on calendar year data and may differ from the fiscal year projections provided elsewhere in this update

(continued)

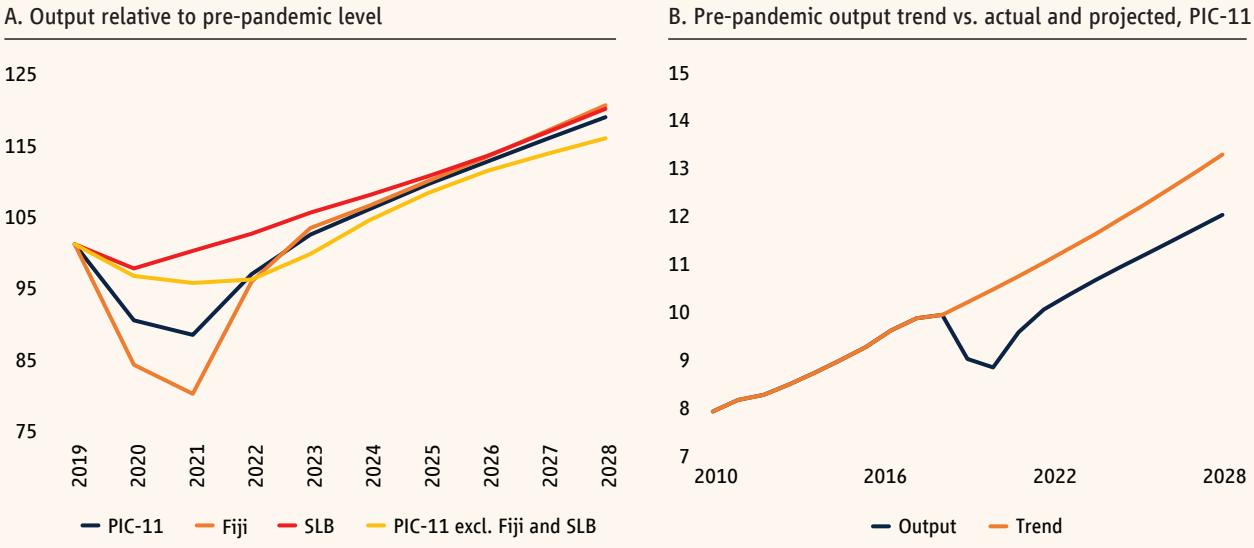
(Box 4. continued)

Robust growth is projected to continue in 2025. GDP growth in the PIC-11 is forecasted to be [3.4] percent in 2025, which is slightly above the historical average for this group of countries. This projected moderation is largely driven by developments in Fiji, where demand is expected to ease due to fiscal policy tightening, though to a lesser extent than previously anticipated.

The headline numbers for PIC-11 mask several significant forecast revisions. The growth forecast for Vanuatu for 2025 has been downgraded by over two percentage points due to the impact of Air Vanuatu's collapse, which significantly affects tourism and the fiscal outlooks. This downgrade is partially offset by forecast upgrades in Kiribati, Marshall Islands, Samoa and Palau. Palau's forecast upgrade reflects a projected recovery in international flights from Asia. Growth forecasts for the Marshall Islands has been revised significantly upward due to the approval of Compact of Free Association agreement with the US and the expected associated capital spending.

Despite a commendable recent rebound, medium-term growth projections for the region remain mixed, with many of the PIC-11 facing subdued expectations. Although output has returned to pre-pandemic levels in most countries, the PIC-11 are likely to endure permanent and significant output losses (Figure B4.2). The per capita income of the PIC-11, which once approached [25 percent] of the average advanced-economy level, is now projected to stagnate at around [20–22 percent] by 2030.

Figure B4.2. Measures of real output



Source. World Bank.
Note. Index; A. 2019 = 100.

Risks

The baseline projection for the region is subject to several downside risks, including a slowdown in the global economy and a slower-than-expected decline in inflation in advanced economies resulting in tighter-than-expected global financial conditions. In China, a prolonged weakness in consumer confidence could hold back spending and weigh on growth, particularly as China's property sector remains vulnerable.

A faster-than anticipated slowdown in China's growth would affect the rest of the region, primarily through trade channels. China's importance as the ultimate destination for domestic value-added in the region has significantly increased since early 2000s, especially for Malaysia, Thailand, Viet Nam and Lao PDR. Mongolia, the Solomon Islands, Lao PDR, and Myanmar are especially exposed to China as a destination for exports of construction materials, as well as a source of FDI (World Bank 2023ab).

Several countries in the region are also exposed through trade linkages to economic activity in the US and EU (Cambodia, Malaysia, Philippines, Thailand and Viet Nam). Further growth downgrades in these destination economies would negatively affect demand for EAP exports.

EAP economies are also exposed to external financial conditions. Smaller economies such as Timor-Leste, Cambodia, and Lao PDR are particularly vulnerable through large external financing needs to fill current account deficits and debt servicing and refinancing. While service of long-term debt is the major financial need for Mongolia (mainly by mining firms) and Lao PDR, refinancing of short-term debt is the major need for Cambodia and Malaysia. Timor-Leste and the Pacific Island Countries tend to have large deficits due to their high dependence on imports. Continuing high interest rates in the US would make it costlier for governments to raise new debt or refinance existing debt. Uncertainty regarding future macrœconomic and financial conditions, especially as they withdraw pandemic-related forbearance measures, can increase the risk premia for these vulnerable economies (box 5).

An intensification of geopolitical tensions presents an additional downside risk. The Israæl-Hamas conflict that broke out on October 7th 2023 can escalate to a wider regional conflict. In addition to creating a humanitarian crisis in Gaza and beyond, an intensification or widening of conflict in the Middle East could disrupt markets for oil and other commodities. In addition, the protracted Russian invasion of Ukraine can prolong the ongoing war and lead to renew shortages in basic commodities.

Natural disasters, including extreme weather events related to climate change, especially for the small Pacific Island economies, could hurt growth. Historical data show that damage from natural disasters can be substantial for some countries, such as Fiji, Samoa, Tonga, and Vanuatu. The cost of natural disasters, when they do occur, has been around 60 percent of GDP in Vanuatu and 29 percent in Tonga, indicating their high toll on livelihoods (World Bank, 2024a). The Pacific atoll nations—Kiribati, RMI, and Tuvalu—also face considerable risk from climate variability and sea-level rise.

Box 5. Financial sector policy in a post-forbearance landscape

The withdrawal of the COVID-19 forbearance measures across EAP has not yet translated into widespread vulnerabilities in the region, but it has revealed potential weaknesses within selected countries. Across the EAP region, the phase-out of COVID-19-related forbearance measures has largely been completed by 2022, though there are exceptions, such as Viet Nam, which reintroduced measures to address ongoing economic challenges. China maintains forbearance for its real estate developers, albeit SME loan forbearance has ended. The withdrawal revealed weaknesses within the financial systems of selected countries, particularly in terms of asset quality, loan performance, and broader stability. For instance, countries like Lao PDR, Viet Nam, and Cambodia are facing rising NPLs and increased leverage, among other challenges. As the EAP region transitions to a more normalized lending environment, the potential for heightened financial vulnerabilities could affect the financial sector's support to economic growth and, therefore, warrants attention.

Table B5.1. Financial Vulnerabilities in EAP

	Financial											
	Credit Expansion		Capital Adequacy		Asset Quality		Profitability		Solvency		Liquidity	
	Domestic credit to private sector (% of GDP)		Regulatory Capital to Risk-Weighted Assets (%)		NPLs to Total Gross Loans (%)		Return on equity (%)		Deposit to loan ratio (%)		Liquid asset (% short-term liability)	
	2023	change	2024	change	2024	change	2024	change	2024	change	2024	change
China	230	8	15	0	2	0	9.5	1	127	13	69	7
Indonesia	40	−1	24	0	2	0	15.3	3	106	−3	22	−5
Malaysia	158	−5	18	−1	2	0	9.8	0	124	3	21	0
Philippines	48	−1	16	0	3	0	12.7	0	132	−1	41	−4
Thailand	178	−2	20	0	3	0	8.9	1	112	20	35	1
Viet Nam	126	0	11	0	4	1	10.7	−3	93	−14	23	1
Cambodia	127	0	23	0	6	3	0.7	−6	89	6	24	1
Lao PDR	57		19	0	2	0	21.5	7	159		36	0
Mongolia	39	−3			9	0	13.5	12	125	3	50	9
Myanmar							3.0	0	209	14	64	−2
Timor-Leste	27	3					11.1	0	279	−39	94	9
Fiji	75	−6	21	0	8	0	17.5	4	104	−4	206	22
Solomon Islands	32	−1	35	3	9	−1	5.7	−16	158	8	70	3
Papua New Guinea	14	1	40	3	5	0	24.3	−4	199	23	25	−16
Samoa	45	−6	33	2	5	0	28.3	18	139	21	57	16
Vanuatu	53	−4	23	0	15	0			169	23		
Tonga	39	−1	31	−1	11	4	13.2	3	173	31	65	−6
									China manual		China manual	

Source: IMF, WB, Haver Analytics.
Note: Color scale represents country percentile across EMDEs. Change denotes percentage point/level change compared to average 2021–23 average. Credit to private sector includes claims on corporate and household sectors.

Cambodia is experiencing a strong deceleration in credit growth and deteriorating asset quality—much of which is related to the real estate sector. Reported non-performing loans (NPLs) reached a record high of 5.3% in 2023, up from 1.9% in 2021. This increase is attributed to the phasing out of pandemic-related forbearance measures, higher interest rates, elevated debt levels, and slower economic recovery.[8] Additionally, credit growth slowed to

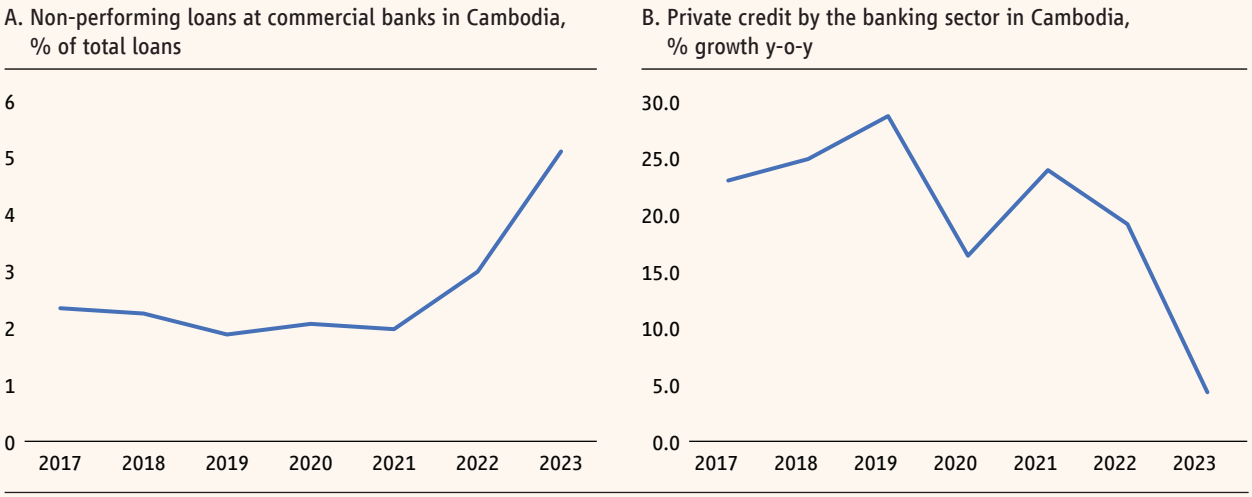
8 Yet, at the Government-Private Sector Forum in November 2023, the government announced select measures to support banks/lenders. These included loan restructuring for loans in tourism and real estate—while staying line with regulations on e.g. the need for provisioning.

(continued)

(Box 5. continued)

3.9% in 2023, the lowest in two decades, with a high concentration of credit to real estate-related exposures (32.5% of the banking sector's loan portfolio) (figure B5.1).

Figure B5.1. In Cambodia, non-performing loans are rising as private credit growth is declining



Source: National Bank of Cambodia.

Lao PDR is facing potential vulnerabilities due to forbearance policies that have permitted banks to delay addressing troubled loans. While these measures are being phased out, several large banks have accrued interest payments exceeding 3% of gross loans, indicating deteriorating asset quality. Limited information on the extent of forbearance and potential evergreening suggests that current NPL levels may be understated. The sharp drop in the exchange rate has inflated the value of banks' balance sheets in local currency, as about 70 percent of bank loan portfolios are in FX. Additionally, many depositors are moving to FX deposits, worsening the mismatch between assets and liabilities. This has reduced the relative value of kip-denominated capital available for addressing non-performing assets (figure B5.2).

(continued)

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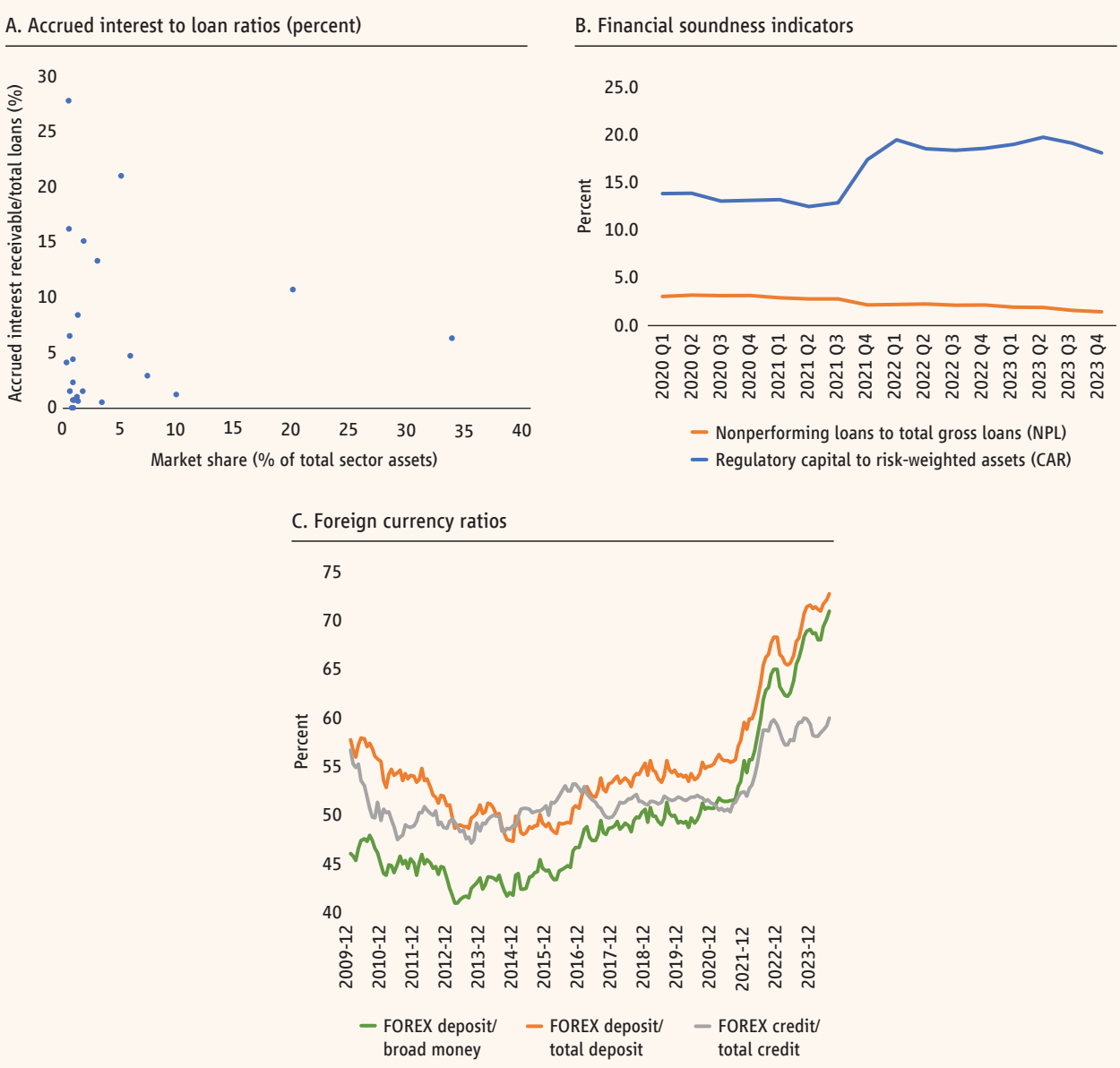
(Box 5. continued)

Figure B5.2. Lao PDR's banking sector is facing higher accrued interest payments, worsening asset quality, and increasing currency mismatches



Source: Bank of Lao PDR; Lao Economic Monitor (LEM), April 2024.
Note: A. Each dot represents a different bank, percent).

(continued)

(Box 5. continued)

Viet Nam has reintroduced forbearance measures in 2023 and extended them until the end of 2024. This is done in response to ongoing economic challenges and the need to support businesses and individuals who continue to face financial difficulties post-pandemic, including in the real estate sector. Despite this, on-balance-sheet NPLs have increased since the Covid outbreak, reaching 4. 6% in H1 2024 from 1.9 percent ion 2022. This increase is partly attributed to the recognition of bad debts held by Saigon Joint Stock Commercial (SCB) bank. However, total problem loans could be as high as 7.9 percent if restructured loans and Viet Nam Asset Management Company (VAMC) debts are included. In addition, the expiration of pandemic forbearance measures, set to end in December 2024, may further increase NPL levels.

China is implementing a regulatory forbearance approach to loans to property developers to mitigate risks and stabilize the sector. This involves extending loan maturities and classifying new loans as performing loans, aiming to support the completion of unfinished projects. While SME loan forbearance provisions have been discontinued, the real estate loan provisions remain. NPLs stood at 1.56% at the end of June 2024, slightly lower than the previous quarter. Overall loan growth is slowing down mainly due to weak credit demand. Downward pressure on banks' net interest margins (also stoked by considerations of supporting industrial policy) could erode profitability and capital replenishment. The congoing financial deleveraging in some sectors can be expected to lead to a moderation in debt growth levels and could open more space for the financial sector to finance the next phase of growth, but the emergence of new risks should be prevented.

Going forward, financial sector policy in the region should prioritize three areas. First, countries should continue strengthening regulatory and supervisory frameworks to address emerging vulnerabilities and ensure the resilience of their financial systems, including through strict application of prudential standards and enhancement of crisis management framework and financial safety nets. Second, banks and financial institutions need to enhance their risk management practices mitigating the impact of rising NPLs and other financial challenges. Efforts should also be made to improve corporate governance practices and further enhance data transparency. Finally, EAP economies should strive to strengthening regional cooperation. Collaboration between EAP countries can help to share information and best practices, address cross-border financial risks, and promote financial stability in the region.

Technology and Jobs in EAP

Overview of EAP labor market

Economic growth, structural transformation, demographic change, education, and global forces have impacted labor markets in EAP. The ensuing shifts in the supply and demand of labor have affected the level and structure of employment as well as the labor earnings of different groups. The special focus of this Update examines the impact of digital technologies—comprising robots, artificial intelligence, digital platforms, and broader digitization—as a key global trend impacting jobs and labor earnings, and highlights key implications for labor, skills, and social protection policies.

The first section of this chapter presents ten stylized facts about the evolution of employment and labor earnings in the region. This sets the stage for an analysis of the observed and likely effects of digital technologies on work and the policies needed to ensure that economic growth continues to benefit workers.

The analysis suffers from some limitations in terms of data and the ability to identify the effects of emerging technologies. Many labor surveys in the region do not collect data on the earnings of the self-employed who comprise roughly half of total employment, and do not allow us to distinguish the informal salaried. Direct measures of worker skills are rare, so we need to use proxies like educational achievement. Comparable microdata to analyze longer trends in labor outcomes are only available in a subset of countries. The available microdata often does not allow for detailed spatial disaggregation, which restricts the ability to identify the impact of diffusion of technologies like robots. Finally, it is too early to aspire to measure the actual effects of AI, so we estimate the extent of employment exposure and from this analysis infer its potential impacts.

Five facts about employment in EAP

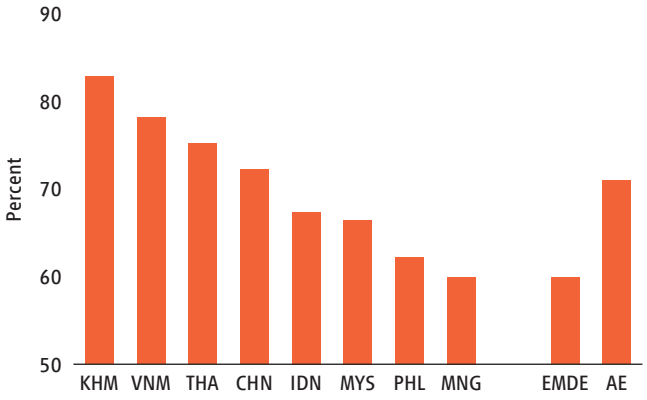
Changes in the structure of employment are inherent to the process of economic transformation as countries develop. World Bank (forthcoming, Global Jobs report) distinguishes four dimensions to characterize the relationship between jobs and structural transformation: the sectoral, spatial, occupational and organizational. Less productive jobs in agriculture (in rural areas) are replaced by more productive jobs in industry and services which are largely located in denser urban and rural areas. Jobs shift from self-employment or in very small firms with little physical or organizational capital, to wage work in larger, more modern and often formal firms producing higher value-added products and services (often linked to trade). Finally, the variety and complexity of jobs increase and along with these the variety and sophistication of skills required to perform the job tasks. The interplay of these transformations with demographic shifts and changes in the supply of skills, drive changes in the composition of the workforce and employment.

***Fact 1*: A larger share of the working age population is employed in EAP countries than in most other developing economies, but the working age population is shrinking in aging EAP countries.**

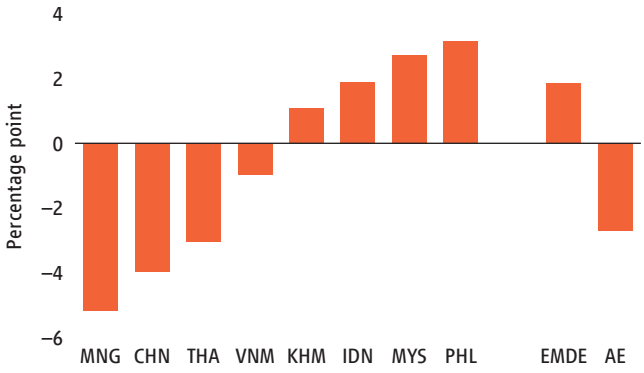
EAP countries have a higher employment to working age population ratio than other developing economies. But there are significant differences within the region: this ratio is between 72 and 83 percent in China, Thailand, Viet Nam and Cambodia, and between 60 and 67 percent in Mongolia, the Philippines, Malaysia and Indonesia (Figure 1A). These differences reflect in part the lower labor force participation of women in the latter group of countries (Fact 3 below). The working age to population ratio has declined in aging Mongolia, China, Thailand and Viet Nam, but has increased in more youthful Philippines, Malaysia, Indonesia and Cambodia.

Figure 1. A larger share of the working age population is employed in EAP countries than in most other developing economies, but the share of the working age population in total population is falling in Mongolia, China, Thailand, and Viet Nam

A. Employment to working age population ratio (2023 or latest year)



B. Change in working age population to total population ratio (2010–2023)



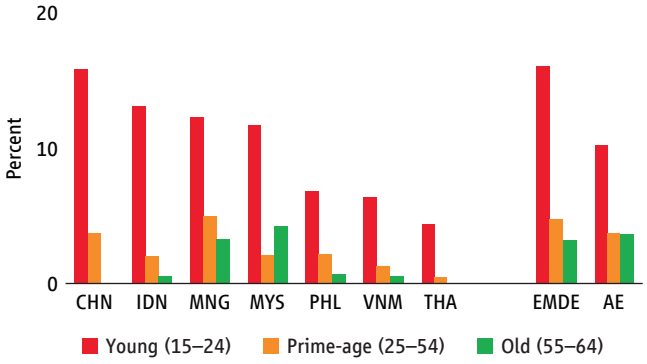
Source: WDI, ILO.
Note: Working age population is population aged between 15-64. EMDE and AE show median of a group of Emerging Market and Developing Economies, and Advanced Economies, respectively.

***Fact 2*: Younger workers are struggling to find jobs, especially in countries like China and Indonesia; although older workers have lower unemployment rates, fewer participate in the labor force.**

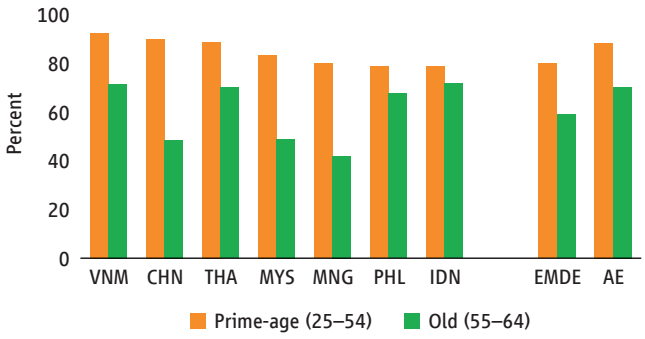
Employment rates and labor force participation status differ across age groups. Relative to prime-age (25-54 years old) and older populations (55-64 years old), the youth (15-24 years old) experience higher unemployment rates in all countries; the gap is especially visible in China, Indonesia, Mongolia and Malaysia (Figure 2A). The rates of youth unemployment in countries such as Thailand, Viet Nam and Philippines are below the levels observed in other developing and advanced economies. Older workers (55-64 years old) have the lowest unemployment rates compared to other age groups in all countries except Malaysia. However, older workers also have lower rates of participation in the labor force (Figure 2B), which indicates that many stop seeking employment prematurely.

Figure 2. The young are struggling to find jobs, especially in countries like China and Indonesia, and older workers have lower labor force participation rates

A. Unemployment rates by age group (2023 or latest)



B. Labor force participation by age group (% working age population; 2023 or latest)



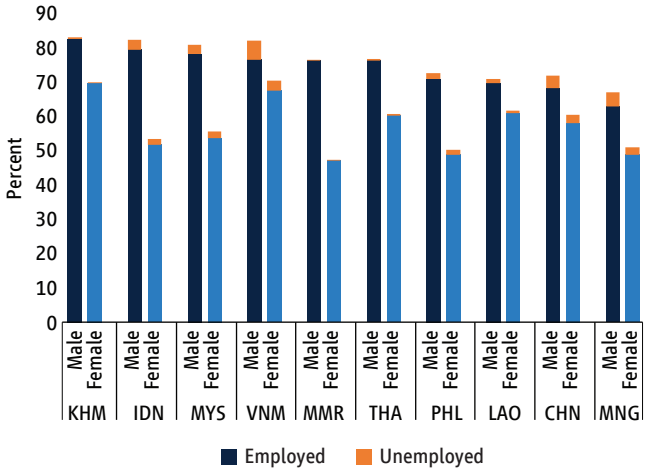
Source: WDI, ILO.
Note: 2023 or latest year data. A. China's prime age estimate corresponds to ages 25+. B. Labor force participation for the young is not shown as many can still be in education or training.

***Fact 3*: Labor force participation of women is higher in EAP than in other developing regions but has improved very little and remains lower than for men.**

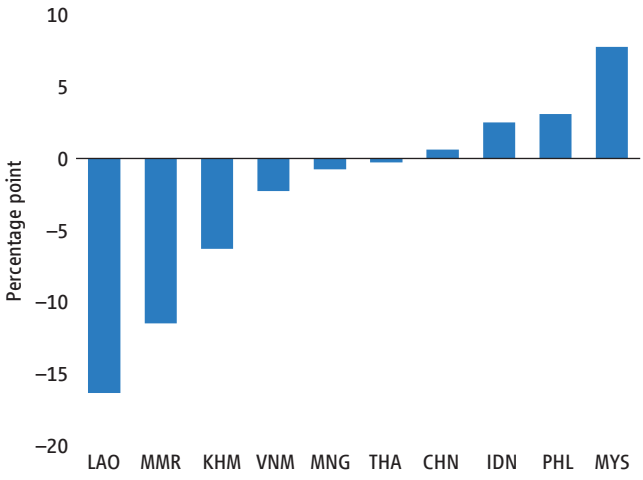
The majority of the EAP working-age population that is not employed is not part of the labor force rather than unemployed (i.e., actively seeking employment) (Figure 3A). Women in EAP countries participate in the labor market at higher rates than in other developing economies (Figure 3A). The gender gap in labor force participation in EAP is about 19 percentage points, below the global gender gap in labor force participation estimated at 25 percentage points (ILO, 2022). However, female labor force participation has improved little in most EAP countries over the last decade, except in Malaysia, the Philippines, and Indonesia (Figure 3B). Female participation remains lower than men, especially in Indonesia, Mongolia, the Philippines, Thailand, and Malaysia.

Figure 3. Labor force participation remains lower for women, though to a lesser extent in Cambodia and Viet Nam, and has improved little except in Malaysia, the Philippines, and Indonesia

A. Labor force status of working age population, circa 2022



B. Changes in Female labor force participation (% working age population; circa 2010–2022)



Source: ILOSTAT.
Note: Percentage of working age population by gender.

The region's success with labor-intensive manufacturing and recently the shift to services have helped facilitate women's integration into the labor force. Empirical studies show that firms that are integrated into global value chains employ a larger share of women and trade expansion in unskilled manufacturing has had a positive impact on female employment (World Bank and World Trade Organization, 2020). Moreover, services tend to have higher female-to-male employment ratios, which increase as countries move up in their level of development (Chiplunkar and Kleinberg, 2023).

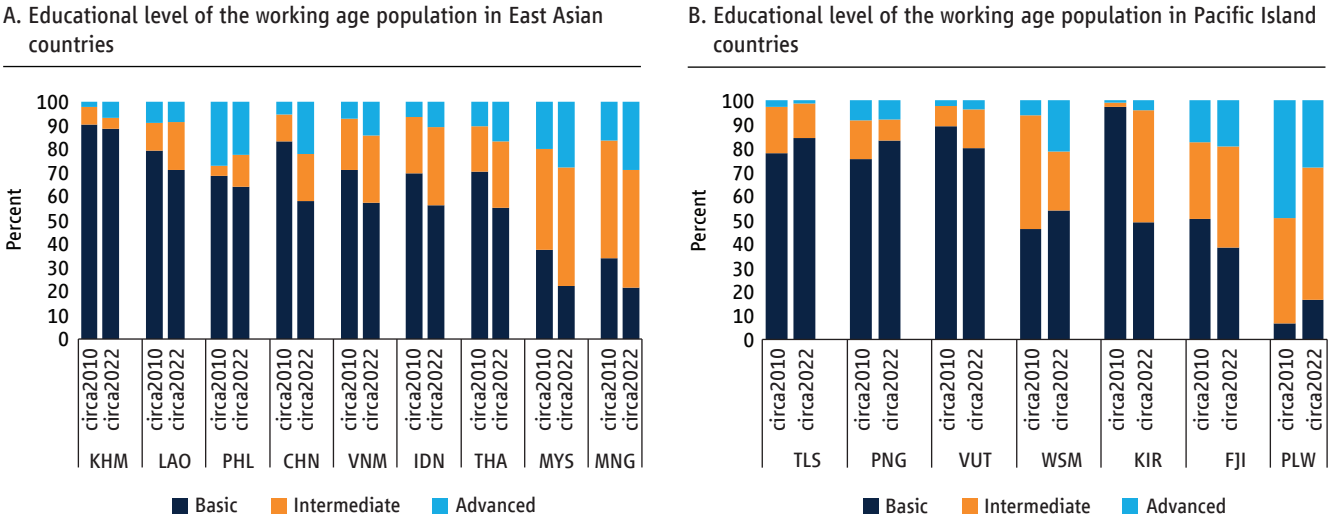
However, like in much of the world, female labor force participation is still hindered by social and cultural norms—for instance, related to family care—as well as biases (explicit or implicit) and regulations that restrict women's employment (Klasen 2019; World Bank 2024a; Bertrand 2020). As an example, a recent study for the Philippines found that married women with young children are less likely to participate in the labor market controlling for education and other socio-economic characteristics (Belghith and Fernandez, 2021). Survey data reveals that nearly 90 percent of economically inactive married women cite household and family duties as the main reason for not seeking work, while 75 percent of Filipino men and 80 percent of women agree with the statement: "A man's job is to earn money while a woman's job is to look after home and family."

Facts 2 and 3 imply that there is room to expand the supply of labor in EAP through greater labor force participation of women and youth, especially in countries facing aging populations. A recent analysis shows that closing the gaps in participation of women and youth could increase the employment share by around 3 to 5 percentage points in EAP (World Bank, forthcoming Global Jobs report).

***Fact 4*: The educational levels of the workforce have risen but a majority of the workforce in many countries lack the skills needed in modern economies.**

With the significant progress in access to basic education, a large share of the labor force in many EAP countries has completed secondary education (Figure 4). Notable exceptions include Thailand, Indonesia, Cambodia, Lao PDR, and the Pacific Islands, where a majority of the workforce has achieved only primary or some secondary education. Moreover, less than one-third of the working-age population has a tertiary education in the region, except in China and Mongolia. While most countries have increased enrollment in tertiary education significantly over the last decade, these efforts need to be sustained since it takes time for this expansion to affect the stock of college-educated workers.

Figure 4. The educational levels of the workforce have risen but only a small fraction have tertiary education, except in Mongolia



Source: ILOSTAT.
Note: China's data for circa2010 corresponds to the year 2000; Philippines data for circa2010 corresponds to the year 2014. Fiji data for circa2022 corresponds to year 2016, Palau data for circa2010 corresponds to year 2014. Working age population corresponds to ages 15–64.

Moreover, years of schooling are an imperfect, first-pass measure of actual skills. As examined in Afkar et al (2023), despite nearly universal access to basic education, many children and youth in EAP fail to acquire basic foundational skills. In 14 of the region's 22 middle-income countries, more than half of 10-year-olds are unable to read and understand age-appropriate reading material – they experience learning poverty. According to the 2022 PISA assessment, even in countries like the Philippines and Malaysia with high secondary completion rates, only 16 percent and 24 percent of 15-year-olds leave high school with basic literacy and numeracy skills, respectively (OECD, 2023).

To the extent that individuals in the workforce today have received a low-quality basic education, they are likely to lack the foundational skills needed to acquire more advanced skills in tertiary education and on the job. Data on adult skills in developing EAP is limited. Indonesia (Jakarta) participated in the 2014–15 OECD's Survey of Adult Skills (PIAAC) and Viet Nam (Urban areas) in the 2016 World Bank's STEP Skills Survey which offer comparable data on the proficiency of 15–65 year-olds in literacy and numeracy.

Over a quarter of adults in urban Viet Nam and 69 percent in Indonesia (Jakarta) achieved at or below basic literacy proficiency (OECD 2016, Bodewig et al., 2014). A recent assessment of adult skills in the Philippines found that 65 percent of youth and adults lack basic reading literacy (Miyamoto et al 2023). In all three countries, the young population did relatively better than older individuals. In comparison, the 2022 PISA assessment showed that 23, 65 and 75 percent of 15-year-olds in Viet Nam, Thailand and Indonesia, respectively, fail to acquire basic reading skills. These results suggest that the level of basic skills of the current generation of children in school offers a good indication of the level of foundational skills of older cohorts in the workforce.

Another dimension of the skills gap is the growing need for digital and socio-emotional skills. A good foundation of digital literacy and more advanced digital skills are essential for a workforce that can adopt new technologies and be competitive in services and advanced manufacturing. As documented in previous Economic Updates (World Bank 2023), survey data from the ITU, reveals that the workforce, especially older adults, in developing EAP lags in both basic digital skills (e.g., processing a document or presentation) and more advanced digital skills (e.g., coding). Increasingly jobs will continue to require a good foundation of skills due to increasingly digitalized work environments.

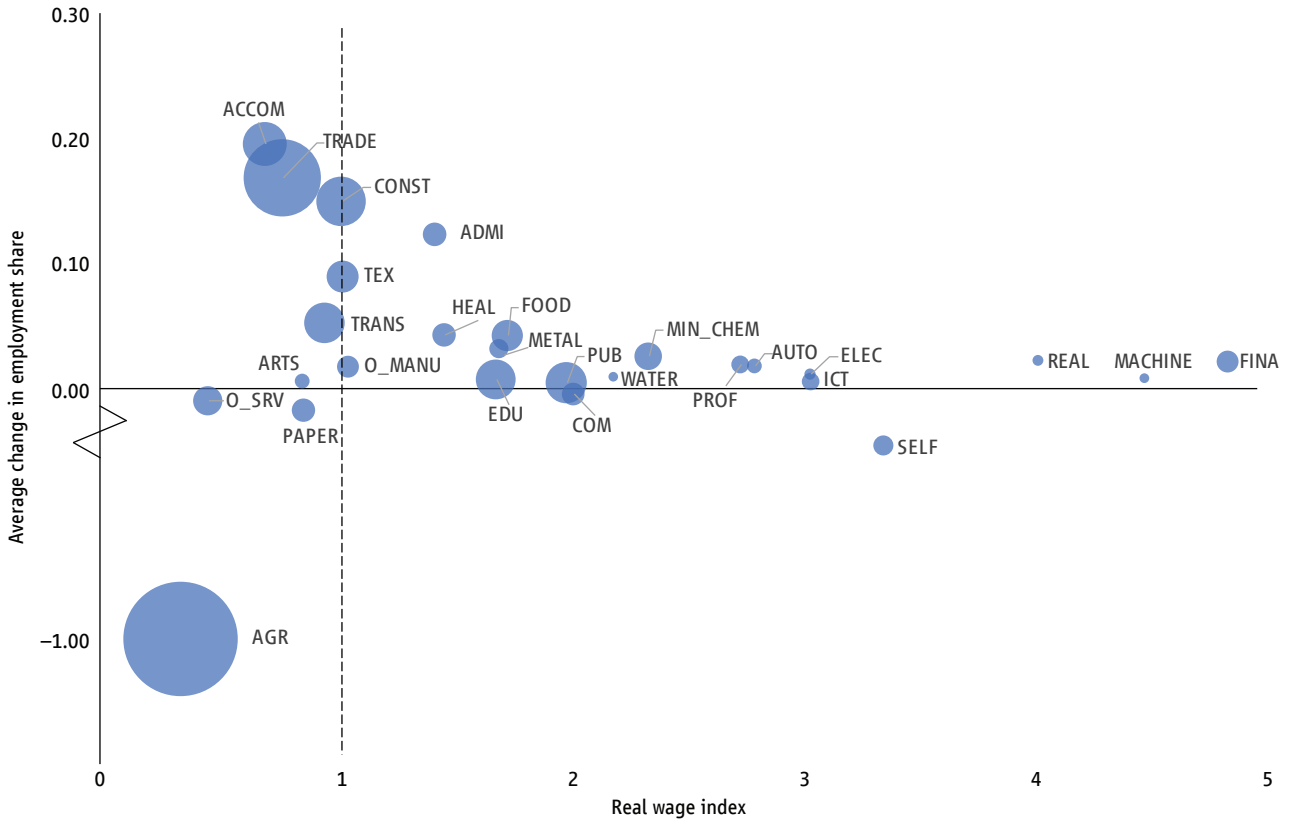
Strong foundations of socio-emotional skills are also needed. These skills include grit (the persistence to pursue long-term goals despite challenges), self-regulation, creativity, curiosity, empathy, assertiveness, and cooperation. These skills are essential for tasks where humans can have a comparative advantage in working with digital technologies (e.g., creative and social tasks), and to constantly learn and navigate changes in their working lives.

Unfortunately, comparative data on socio-emotional skills is limited even for developed economies. They are inherently difficult to measure comparably across countries since they manifest differently across social and cultural contexts. The OECD Survey on Social and Emotional Skills (SSES) is a first attempt to measure social and emotional skills consistently across countries, and has collected data among 10- and 15-year-old students across cities in 25 countries in 2019 and 2023, including in Jinan and Suzhou in China and Kudus in Indonesia. The study finds big gaps in these skills across socio-economic groups within cities, which suggests that there is room to develop them nationwide.

***Fact 5*: Employment has shifted mostly from agriculture to lower-earning sectors such as trade, accommodation and construction, limiting improvements in formal employment.**

EAP has experienced a dramatic structural transformation with less productive jobs in agriculture replaced by more productive jobs in industry and services (Figure 5). After a period of rapid industrialization, the share of manufacturing employment has started to fall in countries like China, the Philippines and Malaysia but less so than in advanced and other middle-income economies. As examined in previous Updates, the strong integration of EAP into global manufacturing value chains has delayed the diminishing role of manufacturing. Countries like Cambodia and Viet Nam have even seen an increase in the share of manufacturing employment. Overall, over the last decade, employment increased in lower-earnings services such as construction and trade, and changed little in high-earnings sectors such as business services, finance, and real estate.

Figure 5. Employment has moved mostly from agriculture to low-earning sectors such as trade, accommodation and construction, and less to high-earning sectors



Source: OECD, WDI.
Note: Figure shows average of China and ASEAN-5 countries. Each bubble corresponds to different sectors (ISIC rev4, 2 digit level). Y axis shows average change in employment share during 2010 and 2019. X axis shows real wage index compared to the national mean in the initial year. Bubble size denotes relative employment size in the initial year.

The employment shifts from low-productivity agriculture to low-productivity services have restricted gains in formal employment. The share of informal employment (measured by self-employment) fell over the last decade largely due to the expansion of formal employment in both manufacturing and services. Informal employment remains higher than in other middle-income regions and remains highly prevalent in most of the Pacific Islands (Figure 6B). The decrease in informal employment in agriculture across most EAP countries was partly offset by increases in services (Figure 7).

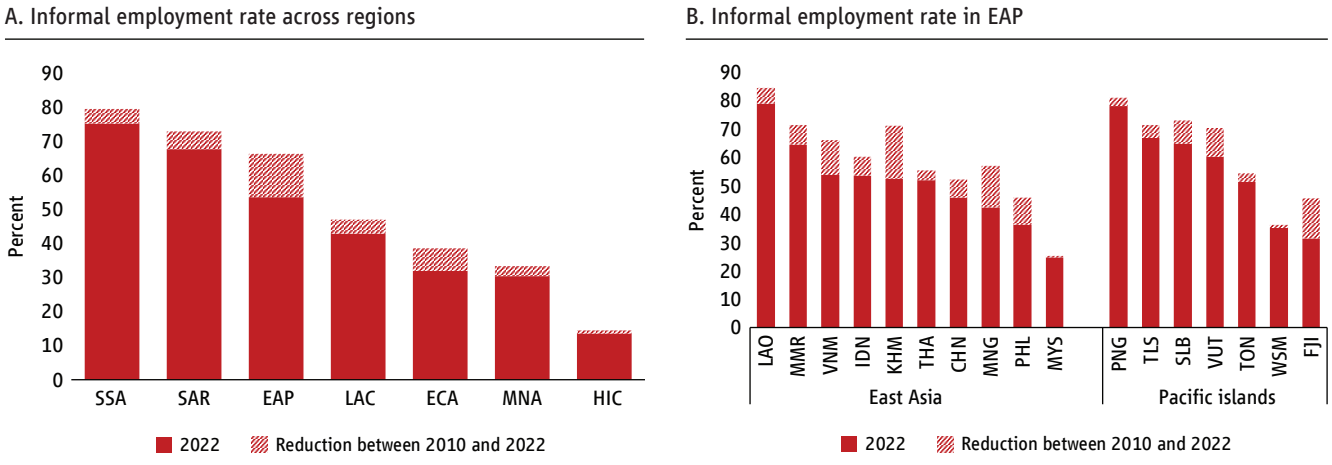
Five facts about labor earnings in EAP

***Fact 6*: Wage growth has been robust and faster than labor productivity growth in EAP countries.**

Overall, economic growth has benefitted salaried workers in the region, with hourly wages increasing faster than labor productivity (Figure 8). Hourly wages rose faster in countries like Cambodia, Viet Nam, and Malaysia.

These results do not give a complete picture of the evolution of labor income since the earnings of the self-employed (roughly half of total employment) are not collected by most labor surveys in the EAP region. Global evidence indicates

Figure 6. Informal employment has declined in EAP more than in other regions, but is still high in Lao PDR, PNG, Timor-Leste, Myanmar and most Pacific Island Countries

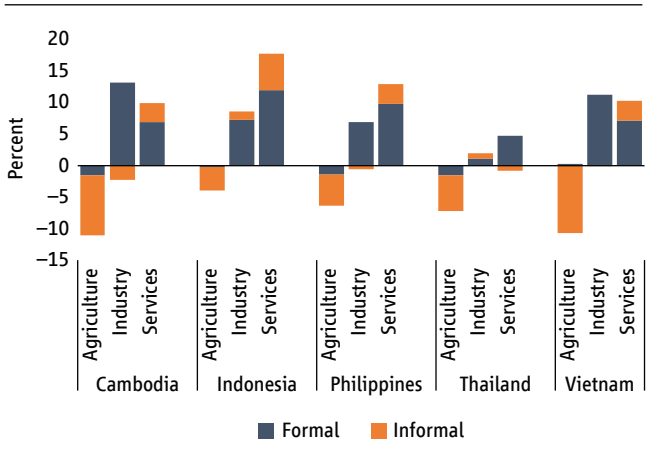


Source: World Development Indicators/ILO.
Note: Self-employment share. A. Figure shows median of countries with more than 1 million population. EAP includes 12 East Asian countries.

that growth in total labor income per person is closely associated with labor productivity growth. In a sample of 134 advanced and developing economies, on average, labor productivity grew at 2.5 percent per year while labor income rose at 2.4 percent between 1990 and 2019 (World Bank, forthcoming). The study found that labor productivity accounts for three-fourths of the variation in growth in labor income per person across countries.

Comparable labor survey data to analyze wage trends across worker groups over the last decade is only available for a few EAP countries. Harmonized microdata constructed for this report reveals that hourly wages have grown across most categories of workers in the region over the last decade, before the onset of COVID-19. As shown next, wage differentials largely declined, but significant wage gaps persist across some groups and in some cases defy the broader trend of wage convergence.

Figure 7. The decrease in informal employment in agriculture was partly offset by increase in services

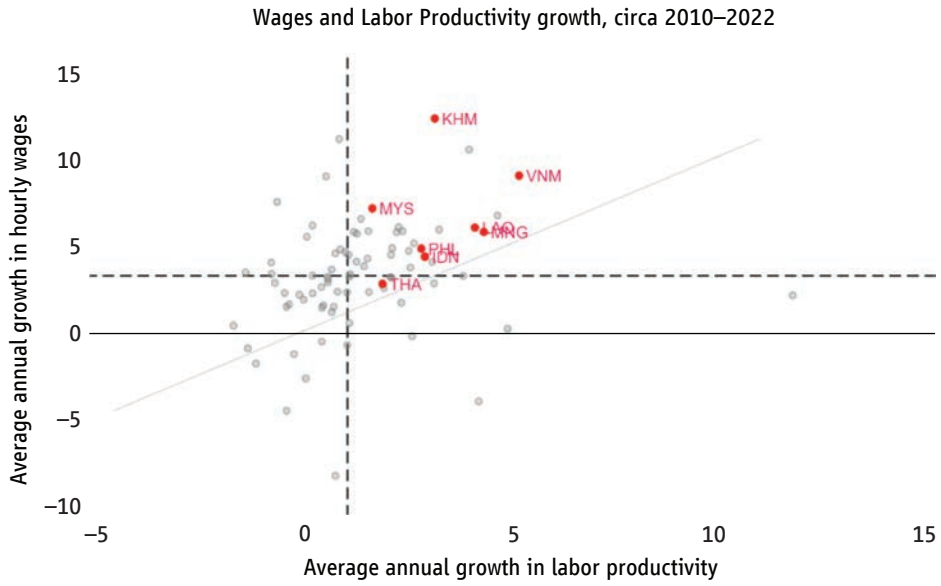


Source: ILOSTAT.
Note: Figure shows changes of employment compared to the total employment in 2010.

***Fact 7*: The gender wage gap fell, except in Indonesia, but women still earn less than men.**

Wages of women grew faster than men's over the last decade, especially in Thailand and the Philippines (Figure 9). However, women still earn between 10 to 15 percent less than men in salaried jobs across countries, controlling for gender differences in education, age, and sector of employment. In Indonesia, this "adjusted" gender wage gap is much higher and rose to reach nearly 35 percent.

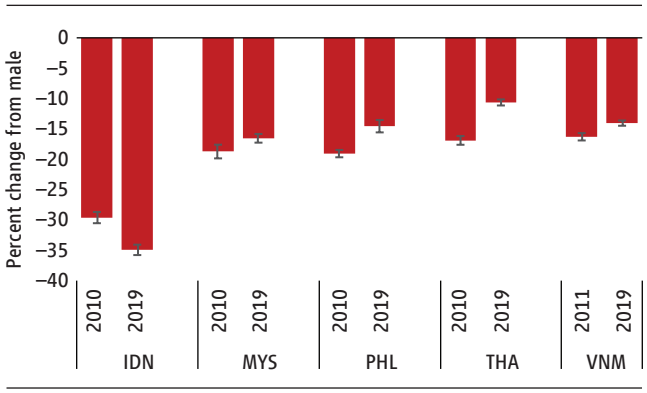
Figure 8. Wage growth has been robust in EAP countries and faster than labor productivity growth



Source: WDI, ILOSTAT.
Note: Vertical and horizontal dash lines show global medians in hourly wages and labor productivity. Circa 2010 considers the earliest available data starting 2010, circa 2022 considers the latest available data prior to 2022.

The "adjusted" gender wage gap in most EAP countries is somewhat lower than in other middle-income economies. A 2018 global ILO report estimates this gap globally and for middle-income countries at 21 percent (ILO, 2018). The gender wage gap can result from differences in skills (not captured by education), occupational segregation, the family division of labor, and discrimination related to institutional, cultural, and social norms (Blau and Kahn, 2017). Less is known about the impact of new technologies on the gender wage gap in EAP, which may arise from differences in the tasks of jobs performed by men and women and their susceptibility to automation (Cortes and Pan, 2019).

Figure 9. Women still earn less than men but the gender wage gap is declining, except in Indonesia



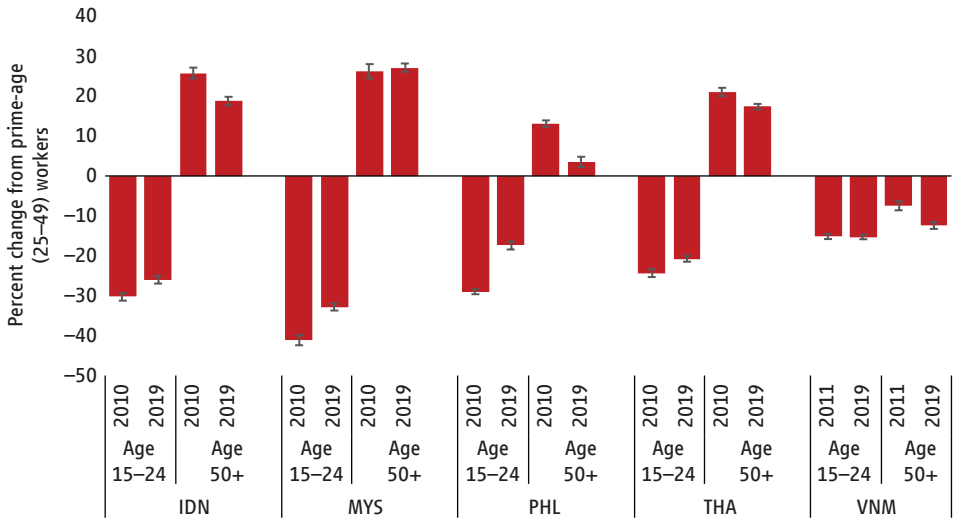
Source: Own estimates from Labor force surveys.
Note: Figure shows gender coefficient (turned into a female/male gap) from regressions of log annual wages of paid employees controlling for education level, age group, and sectors.

Fact 8: Wages grew faster for young and middle-aged workers.

Wages of young workers (15–24 years old) rose faster than wages of the 25–49 age group while wages of over-50 workers lagged, except in Viet Nam (Figure 10). Young workers experienced larger wage gains in Malaysia and the Philippines, while they changed little in Viet Nam.

Wages are higher as workers age, consistent with the well-established premium to the work experience people develop by learning-on-the-job. At the same time, the larger wage gains for younger workers may reflect that they have skills (such as digital literacy) and are entering occupations better aligned with the demand in the growing sectors of the

Figure 10. Wages rose faster for younger workers



Source: Own estimates from Labor force surveys.
Note: Figure shows age coefficients from regressions of log annual wages of paid employees controlling for gender, education level, and sectors. The reference category is prime-age workers (25-49).

economies. As examined in this chapter, older workers may hold jobs more intensive in tasks that are more susceptible to being impacted by new technologies.

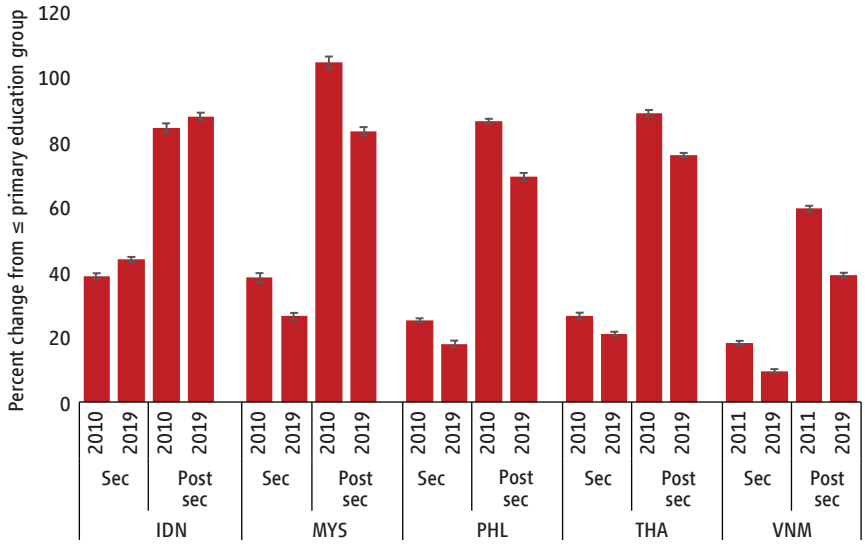
***Fact 9*: The skill wage premium is shrinking, but the more educated still earn significantly more.**

Wages of all education groups over the last decade, but the less educated workers saw larger gains. The wage premium, controlling for age and sector of employment, of having tertiary education or a high school degree fell, except in Indonesia (Figure 11). The wage advantage of the more educated shrank especially in Malaysia and Viet Nam and to a lesser extent in Thailand and the Philippines. However, workers with tertiary education earn wages 40 to 80 percent higher than wages of those with incomplete secondary or primary education. The wage premium of a higher school diploma is much smaller, ranging from 10 to 40 percent.

The level and evolution of the skill wage premium reflect the interplay of shifts in the demand and supply of educated workers in the region. With nearly universal basic education and the recent fast expansion of enrolment in tertiary education, the supply of more educated workers has grown over the past two decades. However, as noted above, the supply shift has been relatively modest since it takes decades for educational expansions to affect the educational composition of the workforce. As cohorts of high school and college graduates entered the labor force, they are likely to have exerted an increasing downward pressure on the skill wage premium in EAP.

Moreover, structural transformation, linked to trade and changes in technology, has affected the demand for skills in EAP. Low-skilled intensive manufacturing exports continue to sustain the demand for less skilled workers in countries like Cambodia, Viet Nam, and Indonesia, while more skill-intensive exports drive the demand for more educated workers in Malaysia, Thailand, and China. As examined in our previous regional Economic Updates, the shift to services is increasingly impacting the demand for skills: in business services, finance, and communications which are more skill-intensive, and traditional retail and transport which employ predominantly less-educated workers. Finally, as analyzed in this report, the diffusion of digital technologies is impacting the demand for skills across and within sectors through changes in comparative advantage and increased scale and tradability (with the emergence of digital platforms).

Figure 11. The wage premia on secondary and tertiary education are significant but have declined, except in Indonesia



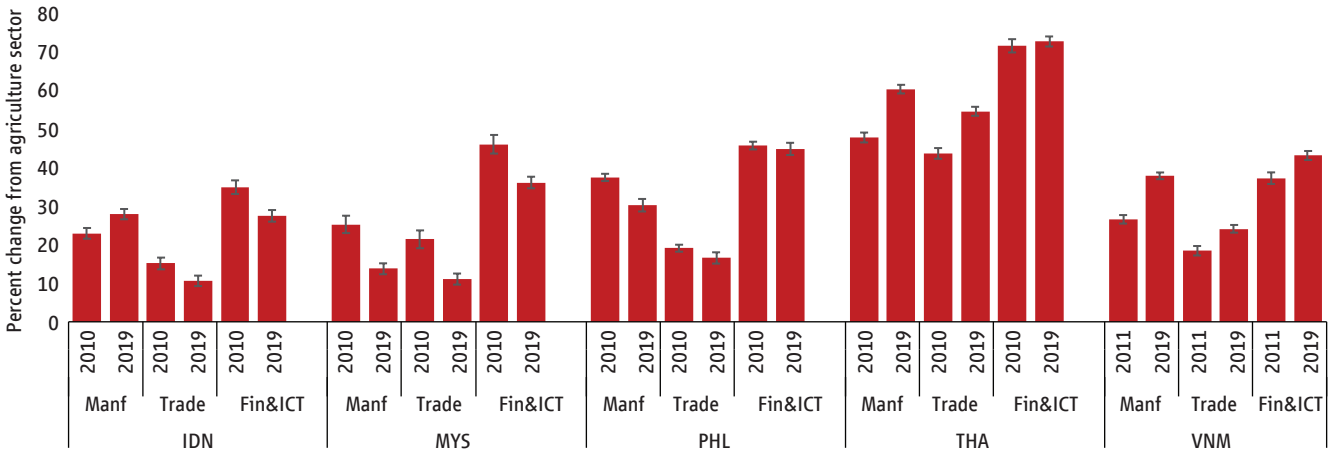
Source: Own estimates from Labor force surveys.
Note: Figure shows estimated coefficients from regressions of log annual wages of paid employees controlling for gender, age, and sectors. The reference category is individuals with primary education or less.

***Fact 10*: Wages have been converging across sectors, except in Thailand and Viet Nam, and across occupations except for ICT and technical professionals.**

Wages rose across the board in services, manufacturing, and agriculture, but with distinctive patterns. The sectoral wage differentials, controlling for education and gender, that favor the higher-wage sectors shrank in Indonesia, Malaysia and the Philippines, and widened in Thailand and Viet Nam (Figure 12). The wage premium for working outside of agriculture is highest in ICT and finance services (between 25 to 65 percent), followed by manufacturing and lower-productivity services.

Figure 12. The highest wages are earned in skilled services, followed by manufacturing, low-skilled services, and agriculture

Real wages growth by sector (2010–circa 2019)

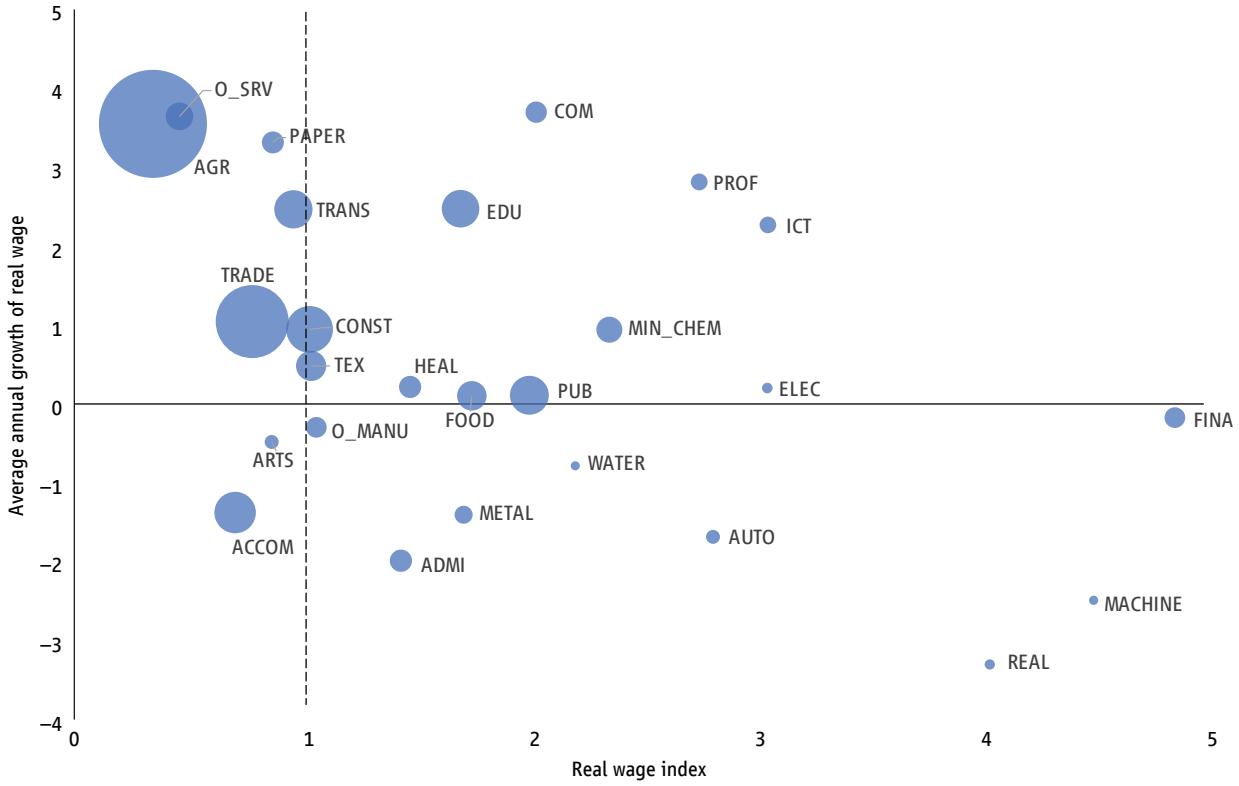


Source: Own estimates using Labor force surveys.
Note: Figure shows employment sector coefficients from regressions of log annual wages of paid employees controlling for gender, age and education. The reference category is Agriculture.

Wage differentials have shrunk across occupations over the past decade, except for the higher-paid technical and ICT-related jobs. Wages in these occupations –which were already two to three times above the national average—rose 2 to 4 percent per year over the decade, defying the broader trend of wage convergence across most occupations (Figure 13).

Figure 13. Wages have been converging across sectors and occupations, except that ICT and technical professionals have seen their already high wages increase even faster

Real wages growth by sector (2010–2019)



Source: Own estmiates based on OECD, WDI.
Note: Each bubble corresponds to different occupations & sectors (ISIC rev4, 2 digit level). Y axis shows average change in real earnings during 2010 and the most latest year. X axis shows real wage index compared to the national mean in the initial year. Bubble size denotes relative employment size in the initial year.

Again, these patterns of wage differentials across sectors and occupations reflect the evolution of the demand for skills in EAP countries. These changes in skills demand are linked to long-term structural transformation, trade, and technological change. With the backdrop of the above ten facts relating labor markets in EAP, the next section of this Chapter examines how the penetration of technologies are affecting employment, wages, and skills demand in the region.

Technology and the labor market

Digital technologies are reshaping the landscape of employment and the nature of jobs across the globe. Technological advancement is not only altering the fabric of existing jobs but also catalyzing the creation of new employment

avenues. This section examines the evolution of three key technological forces: industrial robots, artificial intelligence (AI), and digital platforms, analyzing how they are transforming the nature of work, affecting employment levels, wages, and the distribution of tasks across occupations in EAP, building on previous work in the region (e.g., Asian Development Bank 2018). The section also discusses the broader issue of the digital intensity level in the EAP workforce and its implications.

The emergence of new technologies can both displace and augment tasks performed by workers. Production requires the completion of a range of tasks which can be performed by a combination of human labor and machines. New technologies can affect the distribution of tasks between man and machine as well as the productivity of economic activity (Acemoglu & Restrepo 2019a, 2019b, Acemoglu et al., 2024):

Changes in task content of jobs

- Technology adoption can expand the set of tasks that can be done by machines rather than humans. If a machine is sufficiently cheap, automation will lead to the substitution of capital for labor in these tasks. Examples include software systems that can take over office tasks or robots that now perform various welding, cutting, and assembly tasks.

- Technology can also create new labor-intensive tasks[1]. It can automate one task but require another task by humans (e.g. drones and drone operators). Furthermore, some technology such as platforms and AI may facilitate the creation of new tasks (e.g. AI trainers, prompt engineers). In the US, the introduction and expansion of new tasks and job titles explains about half of employment growth between 1980 and 2010. In the period, 1940–1980, these new tasks were primarily in middle-wage production and clerical occupations, but after 1980, we see a polarization, with new tasks mostly in high-paid professional occupations and in low-paid services (Acemoglu and Restrepo. 2016; Autor et. al. 2024).

Productivity effect

- The substitution of cheaper machines for human labor can lead to a productivity effect which reduces overall cost of production. As prices fall, the quantity demanded increases and may increase the demand for labor in non-automated tasks. For example, the introduction of automated teller machines (ATMs) increased the employment of bank tellers as reduced costs of banking encouraged banks to open more branches, raising the demand for bank tellers who then specialized in a range of tasks that ATMs did not automate (Bessen 2016). The productivity effect also leads to higher real incomes and thus to greater demand for all products, including those not directly affected by technologies.

The competing forces of task displacement and task enhancement (augmentation and new tasks) determine the net effect of technological change on labor demand: if displacement outpaces enhancement, labor demand falls; and conversely, if enhancement outpaces displacement, labor demand rises.

Technological advancement has expanded the breadth of tasks that machines perform, ranging from routine manual tasks to more cognitive and non-routine tasks. Since the Industrial Revolution in the 18th century, mechanization and technological advancement expanded the types of tasks machines perform. The first Industrial

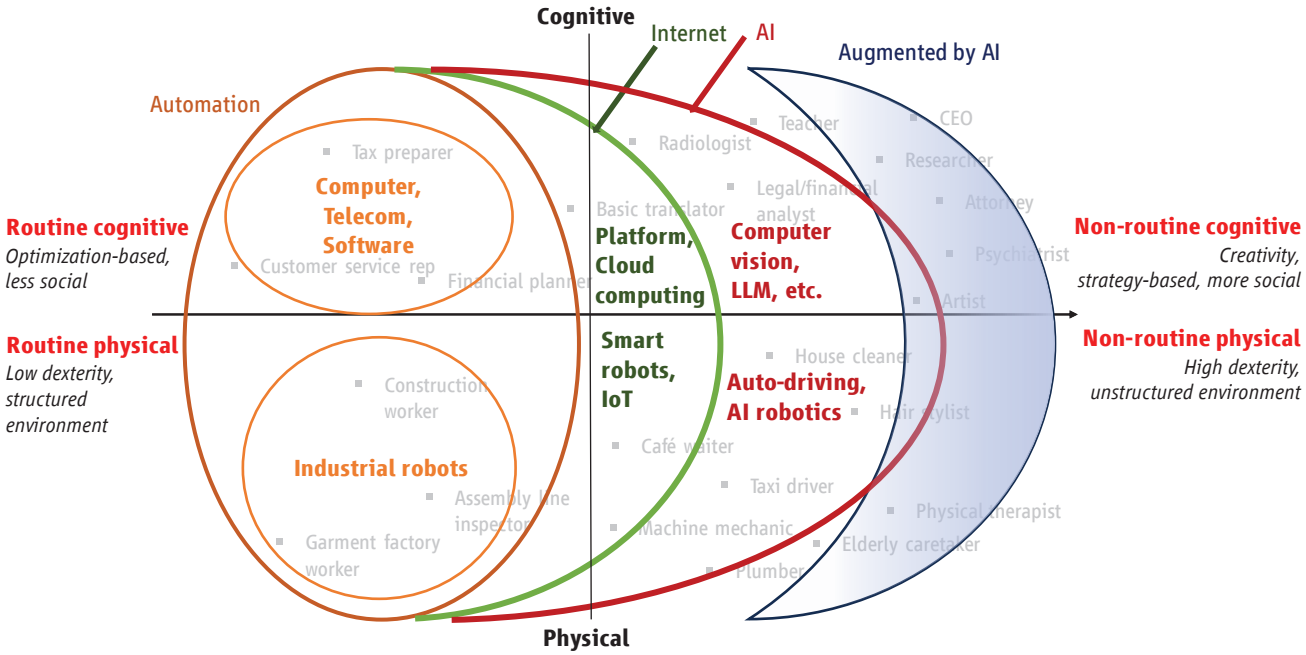
1 Both productivity effect and displacement of labor-intensive tasks make the production process more capital intensive and tend to increase productivity more than the wage, as a consequence reducing the share of labor in national income. Only the creation of new tasks increases the demand for labor as well as the share of labor in national income (Acemoglu and Restrepo. 2019).

Revolution[2] and the second in the 19th century, which added electric power to allow mass production, mostly affected physical and routine tasks. The third Industrial Revolution in the 20th century expanded the scope of technology to cognitive areas through advances in information technology including computers and internet. The fourth Industrial Revolution, which is underway, is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. Artificial Intelligence (AI) is an important part of the current revolution, which leverages the combination of machine learning and computing power and allows machines to carry out increasingly complex, non-routine tasks.

The scope of labor displacement and enhancement has also shifted from routine manual tasks to cognitive and nonroutine tasks. Rapid technological advancement has expanded the scope of human tasks affected by technology. Depending on the bundle of tasks involved in each occupation, the emergence of new techonologies could displace, augment, or create new jobs (Acemoglu and Restrepo, 2019b). Previous automation technologies, including robots in industrial sectors and computer and digital software in ICT sectors, primarily affected routine cognitive and physical tasks (Figure 14). The introduction of internet and advanced robotics allowed machines to perform more complex tasks, thereby generating both labor displacement and enhancement effects on existing jobs. A better drill improved worker productivity (enhancement effect), but advanced robots may displace the worker in drilling.

Figure 14. An integrated view of new technologies and affected occupations

Illustrative diagram for technology and jobs



Note: Own illustration based on Acemoglu and Autor (2011) and Kai-Fu Lee (2018)

AI is poised to automate a wider range of cognitive tasks relative to previous ICT technologies. Displacement effects are beginning to be felt in occupations involving primarily routine cognitive tasks that involve standard optimization and low social interaction (risk assessors), and gradually to occupations involving non-routine cognitive-tasks (translation).

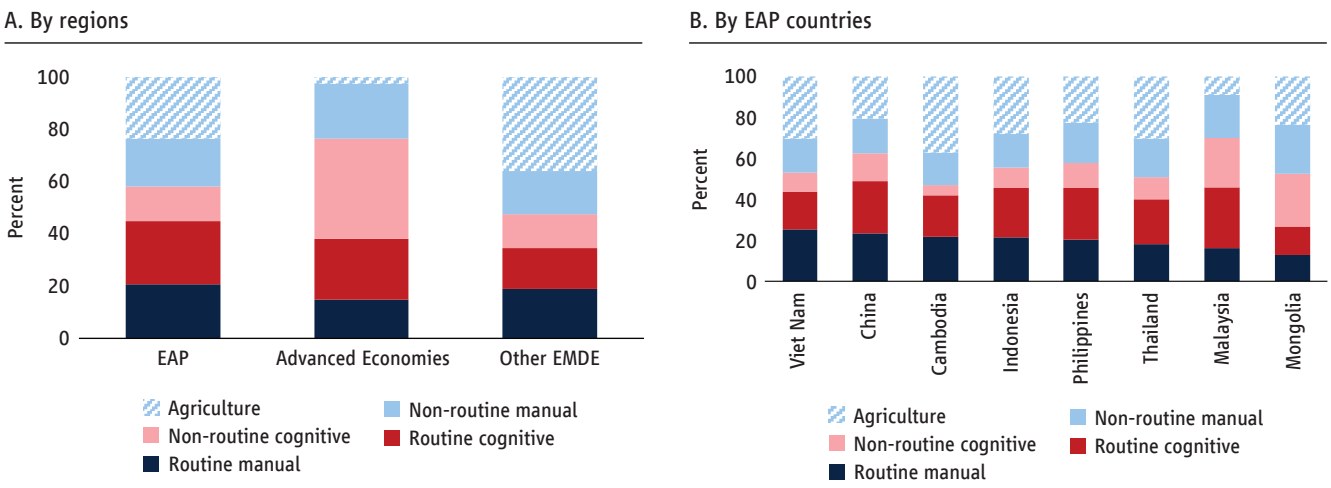
2 Definition of the first to the fourth industrial revolution follows the World Economic Forum (2016).

The integration of AI into robotics could enhance robots' capabilities, allowing them to perform a wider range of physical tasks with a higher cognitive component. For example, AI functionality is expanding to include physical tasks like driving. Occupations where a portion of tasks can be delegated to AI but a significant subset of tasks that can still only be performed by humans (social interaction, creativity or strategy) stand to be augmented by AI (teachers, financial analysts).

To sum up, robots and AI are affecting employment across economic sectors differently. Robots are already displacing industrial workers in routine manual task occupations. AI threatens to displace primarily services workers not just in routine but increasingly also in non-routine cognitive task occupations. AI empowered robots also potentially could take over the tasks of workers in non-routine manual occupations both in manufacturing and services, but that possibility seems further away for both technological and economic reasons. This analysis of new technologies is mainly considering the impact on industrial and services employment and not on agricultural employment which is sizeable in most EAP countries. Historically, the biggest impact on agricultural employment came through mechanization which varies across EAP countries. New technologies are also likely to affect jobs but we do no have enough data to conduct meaningful analysis.

Jobs in most EAP countries are likely to be affected both by robots and AI though in ways that differ from advanced economies. EAP countries employ more people in routine manual task occupations and less people in cognitive task occupations than advanced countries. This occupational structure reflects the successful industrialization in countries like China, Malaysia, Thailand, and Viet Nam, and the relatively weaker state of regional services sectors. Therefore, EAP countries, like other EMDEs, are more vulnerable today than advanced countries to job displacement by industrial robots than to displacement by AI (Figure 15 and Box 1). However, the share of the population in EAP potentially exposed to AI is in fact larger than the share exposed to robots. Malaysia and China stand out as countries with a relatively high share of people employed in non-routine cognitive tasks who may be equipped to benefit from complementarities with AI.

Figure 15. EAP countries employ more people in routine manual task occupations and less people in cognitive task occupations than advanced countries



Source: Microdata, ILOSTAT, China Census 2020.
Note: Each task measure is based on Autor and Dorn (2013)'s methodology and normalized at ISCO08 2-digit level. Intensity is based on occupational share of dominant task categories. Latest year data. A. EAP shows simple average of the share of employment classified by the task intensity of occupations in China, Indonesia, Malaysia, the Philippines, Thailand and Viet Nam. Advanced Economies and other EMDE show the population weighted averages for advanced economies and emerging economies, respectively.

In the following sections, we explore the impact of various technologies on the EAP labor market. We begin by examining two major technological forces: industrial robots (section 2.2.1), which affect physical tasks, and artificial intelligence (section 2.2.2), which influences primarily cognitive tasks. Next, we discuss the implications of working with digital

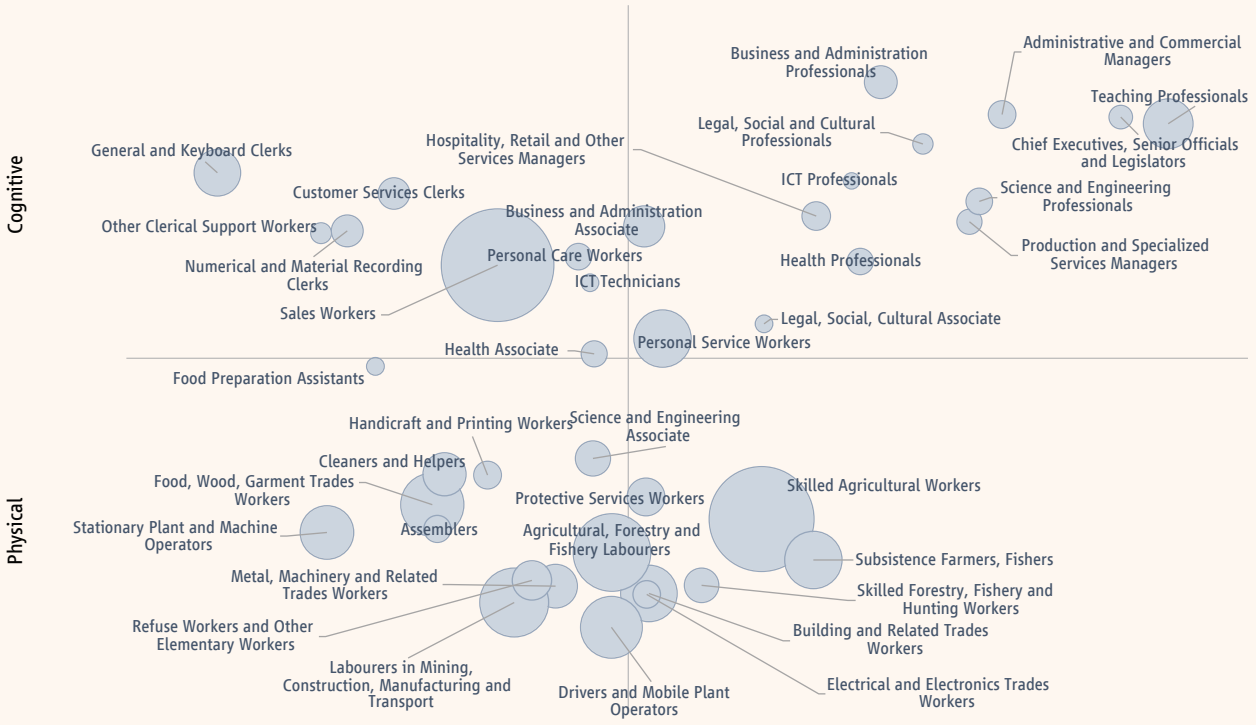
Box 1. Classifying jobs by task content

Mapping countries' occupational structure in the physical/cognitive and routine/nonroutine spectrum, makes it possible to see the distribution of occupations by the nature of tasks. For this exercise we draw on the methodology in Acemoglu and Autor (2011) based on the US O-NET classification of tasks in different occupations. The results are summarized in Figures 15 and B1.1. One important qualification of this exercise is that the nature of tasks in specific occupations in the US is likely to be different from the nature of tasks in the same occupation in a developing country. Lewandoski et al (2022) offer evidence of important cross-country differences in task content within the same occupations for a sample of emerging economies where data is available. For example, in heavily mechanized US agriculture, the remaining agricultural tasks are classified as non-routine manual, whereas in most low-wage developing countries a significant proportion of agricultural tasks are still likely to be routine manual. For this reason, we do not estimate the task content of employment in agriculture in EAP and other developing economies and reported separately in Figure 15.

A higher share of jobs in EAP are physical task-based than in advanced economies, and non-routine cognitive jobs are relatively scarce. In EAP, a large share of workers engaged in primarily physical task-based jobs such as in agriculture, assembly lines, machine operations, and construction.Routine-cognitive jobs are also a significant share of the labor market in the region. By comparison, advanced economies have less workers in physical jobs and more workers in a wide range of cognitive tasks (Figure B1.1 and Figure 15).

Figure B1.1. Jobs in EAP are more physical task-based than in advanced economies and non-routine cognitive jobs are relatively scarce

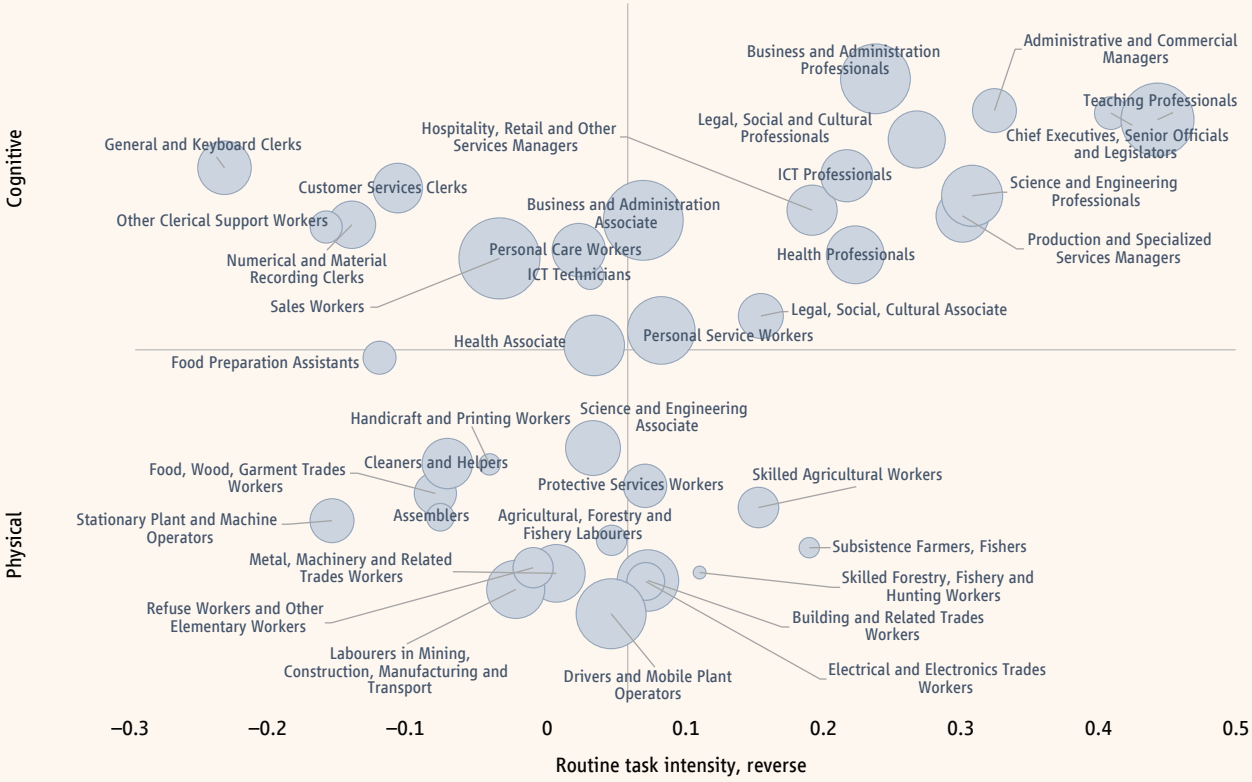
A. EAP



(continued)

(Box 1. continued)

B. Advanced economies



Source: Microdata, ILOSTAT, ONET.
Note: Vertical axis measures routine manual content of tasks; horizontal axis measures routine task intensity following Autor and Dorn (2013). Bubble size denotes average worker share in EAP (9 countries) and AE (36 countries). Latest year data.

Nearly half of jobs in the EAP region are primarily routine task-based, a higher share than in advanced economies and other EMDEs. About 21 percent of jobs in EAP region are routine manual-based, higher than in AEs (15%) and slightly higher than other EMDEs. This is due to EAP's high share of labor-intensive manufacturing and low-skill manual task-based services. The share of jobs which primarily involve routine cognitive tasks is 24% in EAP – higher than in other EMDEs (16%) and similar to that in advanced economies. Within EAP, Cambodia, China and Viet Nam have a relatively high share of routine manual-based jobs due to their high share of labor-intensive manufacturing, while China, Indonesia, Philippines and Malaysia have a relatively high share of routine cognitive-based jobs reflecting their relatively high share of service sector jobs.

Less than 15 percent of jobs in EAP are non-routine cognitive task-based, significantly less than in other regions. Jobs in advanced economies tend to be more cognitive (both routine and non-routine) than manual, reflecting their services-led economies. However, the share of non-routine cognitive-based jobs (38%) is higher than routine cognitive-based jobs (23%), unlike in the case of EAP and other EMDEs. In EAP, only 13% of jobs primarily involve non-routine cognitive-based tasks. Malaysia and Mongolia have a relatively high share of non-routine cognitive-based jobs in the region.

technology (section 2.2.3), focusing on the digital intensity of jobs—the digital skills and knowledge required for various positions. Finally, we address digital platforms as a distinct and significant technological development within the broader context of digital technology use (section 2.2.4). It is important to note that modern technology applications are often interconnected (e.g., computers and the internet) and permeate a wide range of daily activities. Rather than isolating specific technologies, our analysis in section 2.2.3 takes a holistic approach to the increasing digital demands across various occupations.

Our analysis follows an established scholarly literature to empirically estimate the causal impact of robots, where rapid and sustained adoption has been observed in several EAP countries since as early as the 2000s. While it remains too early to causally estimate the impact of nascent AI technologies, correlational evidence suggests that AI has both displacement and augmentation effects across occupations.

Industrial robots

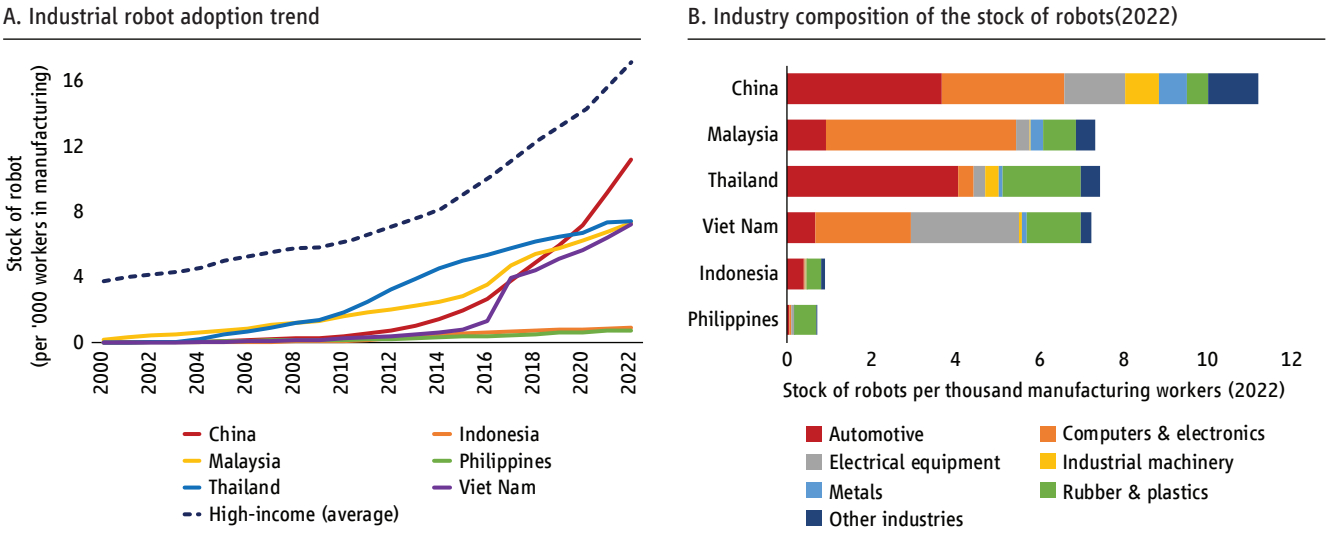
Given the relatively high industrial employment in the region, a significant concern from a job-displacement or job-opportunity perspective today is the rapid robot adoption. Modern industrial robots perform a wide range of tasks with high speed and precision, such as material handling, labeling, packaging, assembling, painting, welding, and mechanical cutting. Most of these tasks are usually performed by low-skilled and medium-skilled workers, and developing EAP countries host a large fraction of such workers.

There is a wide variation over time and across industries in robot adoption in the large developing EAP countries. Malaysia and Thailand were the early adopters in the region– the countries where we could track annual stocks of robot imports across broad industries from the International Federation of Robotics (IFR) over the past three decades. Robot adoption, measured as the stock of robots per thousand manufacturing workers, picked up in the early 2000s in these countries and adoption growth has been sustained (Figure 16A). China and Viet Nam started importing robots during the early 2010s, and both countries have experienced explosive adoption growth since then, mimicking the growth in industrial output in these countries. By comparison, the level of robot adoption remains relatively low in Indonesia and the Philippines. A linear projection assuming robot adoption continues at the average pace observed in the last five years (2018–2022) suggests that it would take Viet Nam, Malaysia, and Thailand approximately 13, 19, and 28 years to reach the current average adoption level in high-income countries (approximately 17 robot units per 1,000 manufacturing workers). China would reach this level in 2026.

In terms of industries, robot adoption in EAP has been concentrated and increasing in several high value-added sectors, such as computers & electronics, automotive, and electrical equipment. In 2022, the stock of robot imports in computers & electronics represented the major shares of adoption in Malaysia, Viet Nam, and China (60.3, 31.5, and 25.1 percent, respectively), the automotive sector in Thailand, Indonesia, and China (53.6, 44.8, and 32 percent, respectively), and electrical equipment in Viet Nam (35.2 percent) (Figure 16B). Besides the high value-added sectors, robot adoption in certain light manufacturing industries such as rubber & plastics also contributes a significant share in the Philippines, Indonesia, and Thailand (72.5, 38, 24.6 percent, respectively).

Adoption of robots is influenced by both technical and economic viability. Technological advancement has expanded the scope of tasks that machines can perform. At the same time, adoption of robots is affected by economic viability, which depends on the quality- and scope-adjusted cost of robots, the local labor cost, and the responsiveness of product demand to price changes. Box 2 summarizes empirical evidence on the determinants of robot adoption.

Figure 16. Robot adoption has increased not only in automotive and computer and electronics sectors but also in others such as rubber and plastics



Source: International Federation of Robotics (IFR) and OECD Employment Statistics.
Note: A. Evolution of the stock of robots per thousand workers in manufacturing in China, Malaysia, Thailand, Viet Nam, Indonesia, Philippines, and the average across high-income countries (HIC), middle-income countries (MIC), and all countries with complete information in the IFR and OECD datasets (World), between 2000 and 2022. The number of workers is fixed in a baseline year (2000). B. Industry composition of the stock of robots in the most recent year (2022).

Box 2. Empirical evidence on the determinants of robot adoption

The empirical literature examines several determinants of robot adoption, comprising three broad factors: economic incentives, industrial specialization, and the skills and demographic composition of the workforce. First, the relative labor-capital costs are a key driver of robot adoption. Economies with high labor costs (wage and non-wage) have a stronger economic incentive to adopt robots to reduce costs (Atkinson 2019; Graetz and Michaels 2018; Acemoglu et al. 2020; Acemoglu et al., 2018; Acemoglu and Restrepo 2019). Policies that provide incentives to lower robot adoption costs, including subsidies and tax exemptions, can boost robotization. In advanced economies facing high domestic labor costs, firms' robot adoption decision also weighs the relative robot investment cost at home vis-a-vis the costs associated with offshoring production to low-wage nations (De Backer et al. 2018, Krenz et al. 2018, Carbonero et al. 2018).

Second, industrial robot adoption is also driven by the industrial structure and trade specialization of a country. Robot adoption is dominant in manufacturing industries such as automotive, computer & electronics, and electrical equipment, due to the specific industry characteristics and nature of tasks in production that make them amenable to automation technology (such as product standardization). Countries with a greater share of workers engaged in routine manual tasks are more likely to adopt robots (Artuc et al. 2019).

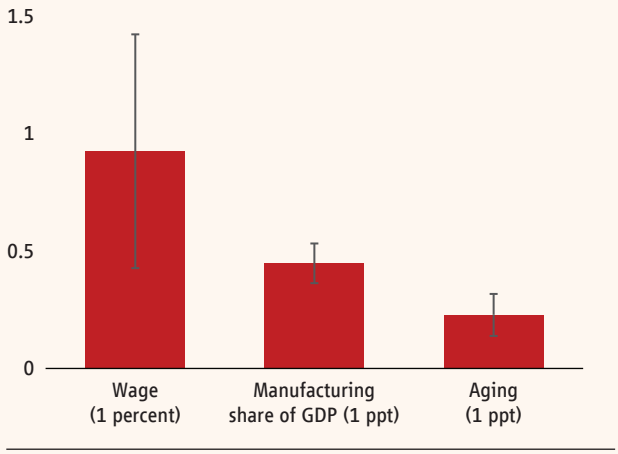
(continued)

(Box 2. continued)

Third, the skills and demographic composition of the labor force influence robot adoption. Studies find that countries with a higher share of workers with at least secondary education are more likely to adopt robots (Cali and Presidente 2021). Focusing on demographic changes, Acemoglu and Restrepo (2022) find that population aging – measured by the share of the population 65-year and older – is strongly correlated with increased robot adoption. Countries with faster aging populations tend to adopt more robots, with aging explaining about 35 percent of the cross-country variation in robot adoption. This trend is more pronounced in industries that rely heavily on middle-aged workers and those with greater opportunities for automation.

Figure B2.1. shows the results of a simple econometric analysis of the relationship between robot adoption across countries and sectors with three factors: share of industrial activity, to capture the technical scope for robot adoption; sectoral average earning level, to capture the economic attractiveness of deploying a robot relative to hiring workers; and population aging, which can also affect the incentives to adopt robots. Controlling for country-sector and sector-year fixed effects (to account for potential confounding factors which vary across countries, sectors, and time), the results show that sectoral wages, manufacturing share, and aging are positively correlated with robot adoption: (i) 1 percent increase in wages is associated with 0.9 additional robots per thousand workers; (ii) 1 percentage-point increase in the GDP-manufacturing share is associated with 0.4 additional robots per thousand workers; and (iii) 1 percentage-point increase in the share of the population older than 65 is associated with 0.2 additional robots per thousand workers. There is significant heterogeneity in the association between robot adoption and wages in EAP countries (see Annex).

Figure B2.1. Robot adoption is positively correlated with wages, industrial structure, and aging.



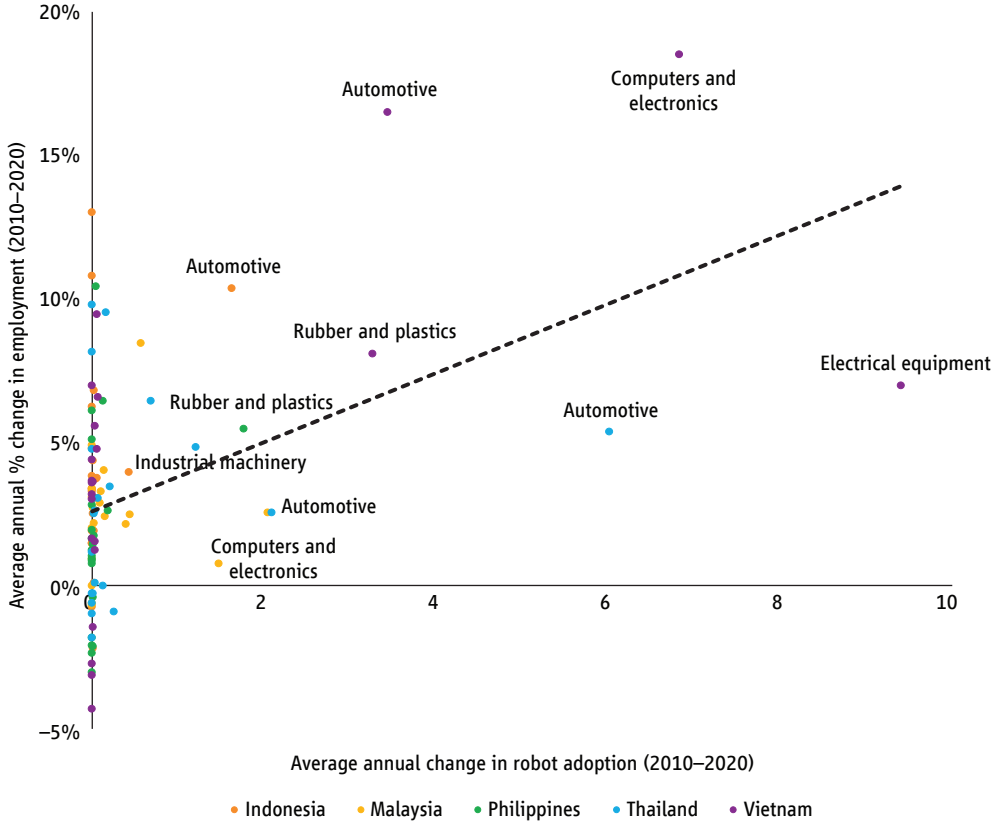
Source: IFR, WDI, OECD.
Note: Figure shows coefficients and 95% confidence intervals of country-sector-level panel regressions where the dependent variable is robot adoption per thousand workers and the independent variables are the log of sectoral average wages, the share of manufacturing in GDP, the share of the population 65-year and older (at the country level). Regression controls for country-sector and sector-year fixed effects. Sample period is 1995–2021.

Theoretically, industrial automation has ambiguous effects on employment and wages. A useful framework to think about these effects is the task model (Autor et al., 2003; Acemoglu and Autor, 2011; Acemoglu and Restrepo, 2022). Robots perform tasks previously done by workers, thereby reducing labor demand and generating a displacement/substitution effect. Simultaneously, robots reduce production costs and increase total factor productivity, increasing labor demand and wages, the reinstatement effect. These two countervailing forces depend on the degree of labor-robot substitutability and, also, on the productivity gains from automation technologies (Gregory et al., 2021).

In EAP, descriptive evidence suggests a positive correlation between robot penetration and overall employment growth in high-adoption industries across ASEAN-5 countries (Figure 17). Figure 11 also suggests a limited labor displacement effect of robotization at the industry-level in EAP; all industries having experienced greater penetration of robots have seen positive average annual growth in employment since 2010.

Figure 17. Among high-adoption industries in EAP, robot penetration is positively correlated with overall employment growth

Robot adoption and employment growth across industries in EAP countries



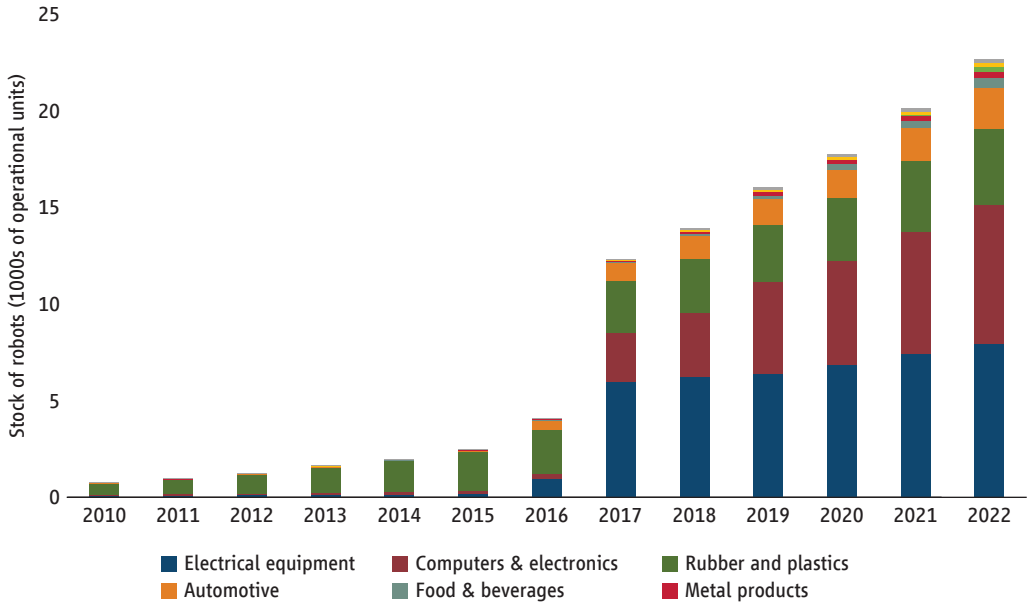
Source: International Federation of Robotics (IFR), OECD.
Note: Graph shows manufacturing industries where robot adoption data is available.

A deep-dive study in Viet Nam shows that robot adoption has rapidly increased in high value-added, trade-oriented manufacturing industries, especially after 2016. The accelerated adoption has taken place during a period that saw significant government policy promotions to incentivize domestic and foreign investments in key industrial sectors such as electrical equipment and computers & electronics (Figure 18). This period has also seen accelerated integration of Viet Nam in GVCs through participation in FTAs, FDI promotion, etc. and through the trade-diversion stemming from U.S.-China trade tensions. While current data does not make it feasible to track robot adoption at the firm level, statistics of industrial robot imports by industries suggest that robot adoption is concentrated in industrial zones, where there is a dominant presence of foreign-owned enterprises (Figure 19).

Rapid robot adoption in Viet Nam is associated with increased employment and income, especially of higher-educated workers. Following Acemoglu and Restrepo (2020), the causal impact of robot adoption on local labor markets can be estimated by exploiting the variability of industrial composition across different Vietnamese districts and the temporal evolution of robot adoption Vietnamese industries. Such empirical analysis accounts for the potential endogeneity in robot adoption intensity by instrumenting for robot adoption across industries and over time in Viet Nam with a measure of global exposure to robots that uses the average robot adoption by each industry in every year across 54 countries. The estimation also controls for potential confounding factors by including regional fixed

Figure 18. Robot adoption has rapidly increased in Viet Nam after 2016; driven by two high-productivity industries: (i) electrical equipment and (ii) computers & electronics

Industry composition of Viet Nam's stock of robots



Source: International Federation of Robotics (IFR).
Note: Evolution of industry composition of the total stock of industrial robots in Viet Nam between 2010 and 2022.

effects and districts' baseline demographic and economic characteristics. The findings suggest that districts with greater robot adoption have experienced differentially greater increases in overall employment and average wages of workers. Importantly, both the positive effects in overall employment and wages are driven by the significant positive impact on higher-educated workers – those having obtained at least secondary education. The analysis otherwise finds no significant effects for low-educated workers (Figure 20).

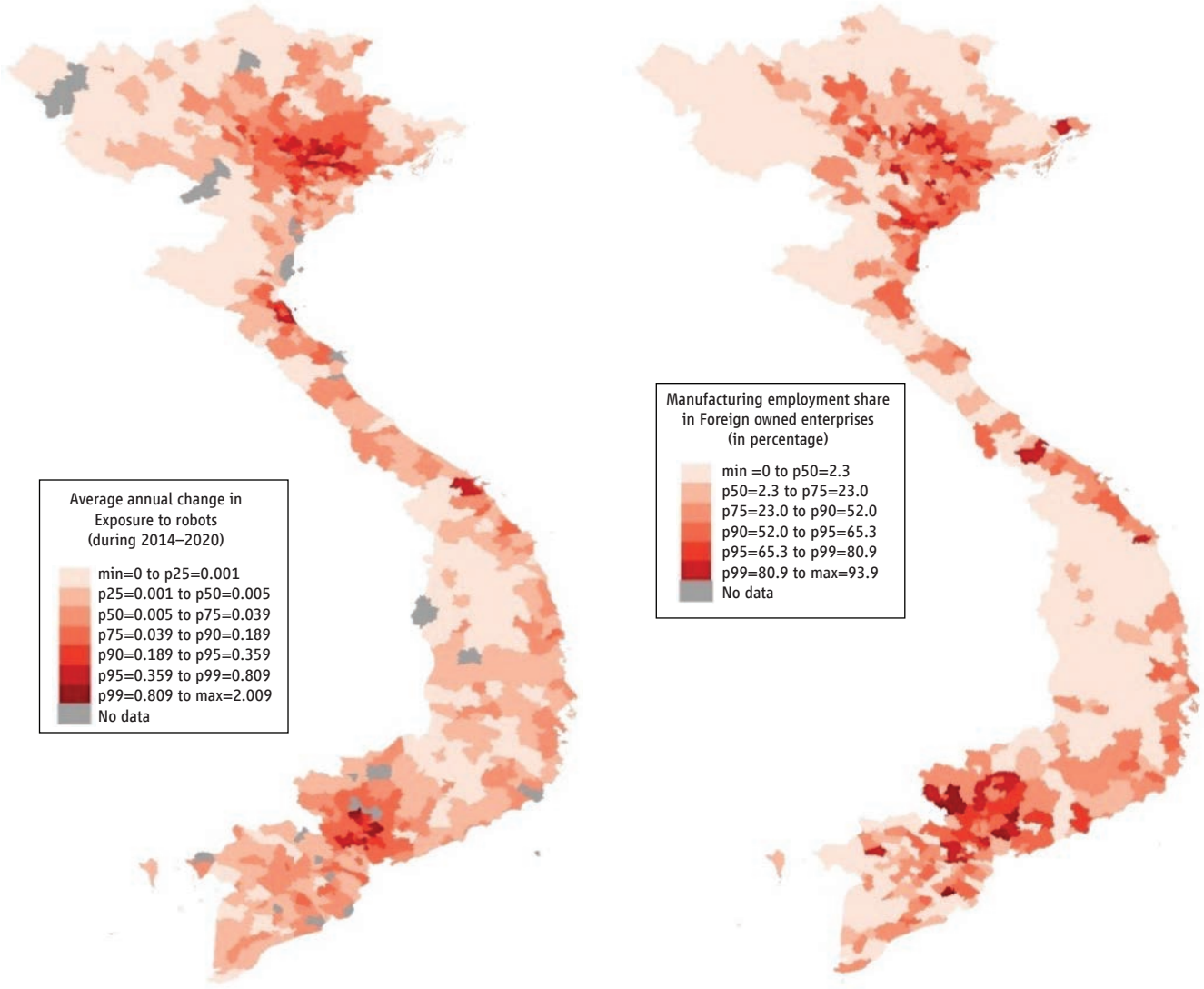
Greater exposure to robot adoption in Viet Nam negatively affects employment of low and medium-skilled wage workers in jobs requiring routine physical tasks, and these displaced workers are likely absorbed into the informal sector. A heterogeneity analysis across the skill spectrum of the workforce helps further unpack the employment effect of robot exposure, especially among less-skilled workers who have been shown to be more vulnerable to robot displacement (Autor and Dorn, 2013; Autor, 2015; Acemoglu and Restrepo, 2019b). Figure 21A suggests a negative and significant effect of robotization on the employment of low-skilled and medium-skilled salaried workers who mostly perform routine physical tasks. Based on the ILO's occupational classifications, these negatively exposed jobs include elementary occupations (low-skilled), plant and machine operators and assemblers, and craft and other related-trade workers (medium-skilled, manual).

Figure 21B further suggests that the workers who are likely to have been displaced by robots find shelter in the informal sector: districts with greater robot penetration have seen a significantly larger increase in the labor informality rate, strictly among low-skilled employment. The spillover of low-skilled, routine formal employment into the informal sector may explain why robot adoption is found to have no significant impact on the aggregate employment of low-educated

Figure 19. Robot adoption is concentrated in industrial zones, where there is a dominant presence of foreign-owned enterprises

A. Change in industrial robot penetration in Viet Nam (2014–2020; annual average)

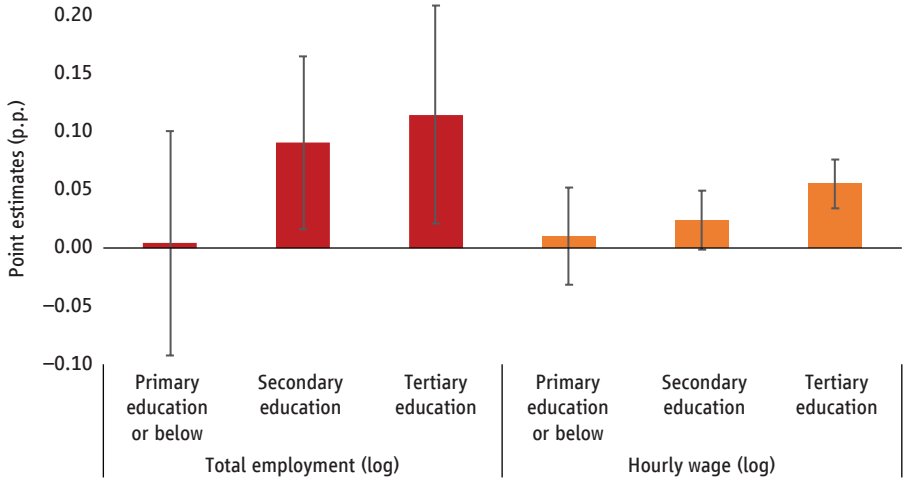
B. Share of manufacturing employment in foreign enterprises in Viet Nam (2014–2020; annual average)



Source: International Federation of Robotics (IFR), Viet Nam Labor Force Surveys (2014–2020), Viet Nam Enterprise Surveys (2014–2020).
Note: A. 2014–2020 average annual changes in exposure to robots across Vietnamese districts. Exposure to robots per thousand workers at the district level constructed as the interaction between 2011 industry shares in district employment and robot adoption at the industry-year level. B. 2014–2020 average annual changes in manufacturing employment share in foreign enterprises. The maps depict locations in continental Viet Nam with data collected on robot adoption and employment.

Figure 20. Districts with greater robot adoption have seen increases in higher-educated employment and their earnings

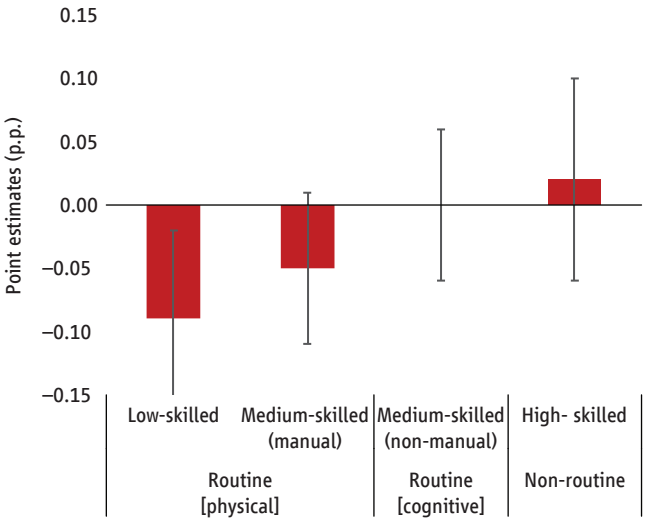
Estimated effects of robot adoption on districts' employment and wages by education level



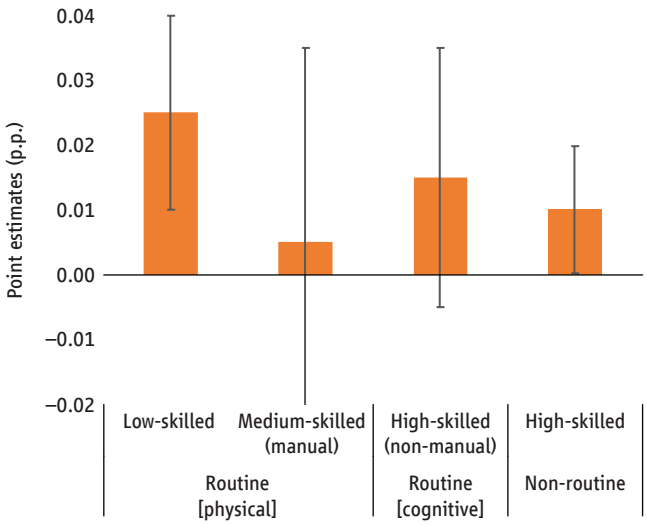
Source: World Bank estimations, based on data from International Federation of Robotics (IFR), Viet Nam Labor Force Survey (2011–2020).
Note: 2SLS estimates of the effects of exposure to robots on local labor market outcomes in Viet Nam during 2014–2020. Exposure to robots is measured as the interaction between the 2011 employment composition by industry in each district and robot adoption by industry-year in Viet Nam, and it is instrumented with "global exposure to robots" that uses the average robot adoption by industry-year across 54 countries (following Acemoglu and Restrepo, 2020). Low-skilled: Primary education (or below); Middle-skilled: Secondary education or high-school; High-skilled: Vocational, college or higher education. All regressions weighted by population in 2011 (baseline year) and controls for district and subregion × year fixed effects, baseline demographic characteristics of districts (log population; share of urban population; share of migrants; shares of population with primary, secondary, and tertiary education; shares of population under ages 21–55 and older than 56; and share of females), districts' baseline industry shares (employment in primary, manufacturing, services, and the female share of manufacturing employment), and districts' baseline economic characteristics (employment rate, unemployment rate, labor informality rate, share of salaried employment, share of self-employment, female employment rate, exposure to job routinization, log average hourly wage, log average labor income, and log total labor income).

Figure 21. The displacement effect of robotization can be observed on low and medium-skilled workers performing routine physical tasks, who are likely to be absorbed into the informal sector

A. Estimated effects of robot adoption on districts' formal employment



B. Estimated effects of robot adoption on districts' informality rate

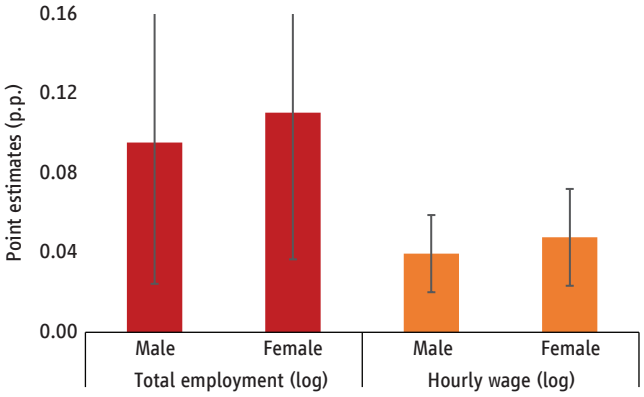


Source: World Bank estimations, based on data from International Federation of Robotics (IFR), Viet Nam Labor Force Survey (2011–2020).
Note: 2SLS estimates of the effects of exposure to robots on local labor market outcomes in Viet Nam during 2014–2020. Exposure to robots is measured as the interaction between the 2011 employment composition by industry in each district and robot adoption by industry-year in Viet Nam, and it is instrumented with Exposure to robots (world) that uses the average robot adoption by industry-year across 54 countries (following Acemoglu and Restrepo, 2020). Skill levels are based on ILO's 1-digit ISCO-08 occupational classifications. All regressions weighted by population in 2011 (baseline year) and controls for district and subregion × year fixed effects, baseline demographic characteristics of districts (log population; share in urban areas; share of migrants; shares of population with primary, secondary, and tertiary education; shares of population under ages 21–55 and older than 56; and share of females), baseline districts' industry shares (employment in primary, manufacturing, services, and the female share of manufacturing employment), and baseline districts' economic characteristics (employment rate, unemployment rate, labor informality rate, share of salaried employment, share of self-employment, female employment rate, exposure to job routinization, log average hourly wage, log average labor income, and log total labor income). A. Formal employment indicates salaried workers. B. Labor informality rate is defined as workers not receiving employment pension.

workers shown in Figure 20. Finally, across the gender dimension, the analysis shows that male and female workers in districts with greater robot adoption experience similar employment and wage gains (Figure 22).

Figure 22. Male and female workers in districts with greater robot adoption experience similar employment and wage gains

Estimated effects of robot adoption on districts' employment and wages for male and female workers



Source: World Bank estimations, based on data from International Federation of Robotics (IFR), Viet Nam Labor Force Survey (2011–2020).
Note: 2SLS estimates of the effects of exposure to robots on local labor market outcomes in Viet Nam during 2014–2020. Exposure to robots is measured as the interaction between the 2011 employment composition by industry in each district and robot adoption by industry-year in Viet Nam, and it is instrumented with Exposure to robots (world) that uses the average robot adoption by industry-year across 54 countries (following Acemoglu and Restrepo, 2020). All regressions weighted by population in 2011 (baseline year) and controls for district, subregion × year fixed effects, baseline demographic characteristics of districts (log population; share in urban areas; share of migrants; shares of population with primary, secondary, and tertiary education; shares of population under ages 21–55 and older than 56; and share of females), baseline districts' industry shares (employment in primary, manufacturing, services, and the female share of manufacturing employment), and baseline districts' economic characteristics (employment rate, unemployment rate, labor informality rate, share of salaried employment, share of self-employment, female employment rate, exposure to job routinization, log average hourly wage, log average labor income, and log total labor income).

Quantification of the estimated effects of robot adoption in Viet Nam suggests that the number of high-skilled jobs created by robots in the formal sector was greater than the number of low-skilled jobs displaced. Based on the empirical results in Figures 20 and 21 and the statitsics of robot adoption in Viet Nam (Figure 16A), an estimated 66,800 low-skilled workers in the formal sector were displaced by robots between 2018–2022 (or 2 percent of low-skilled formal employment in 2022; with a 90-percent confidence-interval (CI) range between 14,900 and 118,800 workers). Notably, the estimated *displacement* effect of robots is likely smaller than the *employment-creation* effect: robot adoption is estimated to had led to the creation of 254,700 formal jobs occupied by workers with tertiary education during 2018–2022 (or 2.7 percent of formal employment with tertiary education with in 2022; 90-percent CI range between 38,500 and 471,000 workers).

Combining country-specific robot adoptions in ASEAN-5 with the estimated impact of robot exposure extrapolated from the Viet Nam analysis, it is suggested that 1.4 million low-skilled workers in the formal sector have been displaced by robots between 2018–2022 (or 3.3 percent of low-skilled formal employment in 2022; 90-percent CI range between 0.31 and 2.50 million workers), whereas an estimated 2.04 million formal jobs occupied by workers with tertiary education were created (or 4.3 percent of formal employment with tertiary education in 2022; 90-percent CI range between 0.3 and 3.8 million workers).

Existing studies on employment and wage impacts of robotization in other EAP countries offer a mixed picture. Guintella et al. (2019) uses individual longitudinal data and finds a large negative impact of robot exposure on employment and wages of Chinese non-agricultural salaried workers. Similar to evidence shown for the formal sector in Viet Nam, the study shows a significant displacement impact of robot exposure on employment and wages of the least educated group. The skill-biased effect of robot adoption on employment is also documented in Tang et al. (2021), which uses firm-level data in China and finds that robot adoption encourages firms to hire more highly skilled and highly educated workers. Also aligning with the quantification of job-displacement and displacement effects in Viet Nam, Cali and Presidente (2021) finds that the productivity-enhancing effect of robot in Indonesia prevails over the replacement effect. Similarly, Jongwanich et al. (2022) finds limited displacement effect of automation in Thailand. Instead, robot exposure tends to promote the upskilling of the workforce. Box 3 further provides a literature review on employment effects of industrial robots outside of the EAP region. A follow-up meta-analysis suggests that the impact of robotization is more pronounced in developed countries, with studies covering the early adoption period more likely to find negative employment effects (Figure B3.1).

Box 3. A literature on employment effects of industrial robots across the world

Studies on how robotization affects labor markets have primarily focused on developed countries, largely because robots are predominantly adopted in these economies. Firms report that they invest in industrial robots mainly to improve process quality, upgrade existing processes, and automate tasks performed by labor (Acemoglu et al., 2022). There are concerns that automation technologies may displace a significant fraction of workers out of the labor market (Brynjolfsson and McAfee, 2014; Frey and Osborne, 2017). Studies, mostly using robot exposure measure derived from the International Federation of Robotics (IFR), suggest that robots have replaced and reduced the wages of low-skilled workers engaged in routine manual tasks (Graetz and Michaels, 2018; Chiacchio et al., 2018; Aghion et al., 2020; Borjas et al., 2019; Acemoglu and Restrepo, 2020; Webb, 2020; Bonfiglioli et al., 2022; Humlum, 2020; Albinowski and Lewandowski, 2024). Chen et al. (2024)'s comparative assessment of the impact of robots on local labor markets across eight European countries reveals employment losses in the manufacturing sector, while their impacts on total employment are more ambiguous.

Simultaneously, the negative displacement effects of robotization could be surpassed by productivity and reallocation effects, leading to positive effects on employment after a certain level of robot penetration (Sequeira et al., 2021). Among the positive effects, robotization has been shown to increase TFP and value-added per worker, lowers output prices, augment product quality, raise the demand for skilled labor, and increase production, exports and imports of intermediate inputs (Graetz and Michales, 2018; Klenert et al., 2023; Dekle, 2020; Dottori, 2021; Aghion et al.,2020; Dauth et al., 2021; Acemoglu and Restrepo, 2021; Koch et al., 2021; Stapleton and Webb, 2020; Acemoglu et al., 2022; Ing and Zhang, 2022; Alguacil et al., 2022; Artuc et al., 2023; De Stefano and Timmis, 2024). Antón et al. (2022) further shows that the impact of robotization may depend on the time period analyzed: while results for the period 1995–2005 are ambiguous, positive effects of robots on employment prevail in the period 2005–2015.

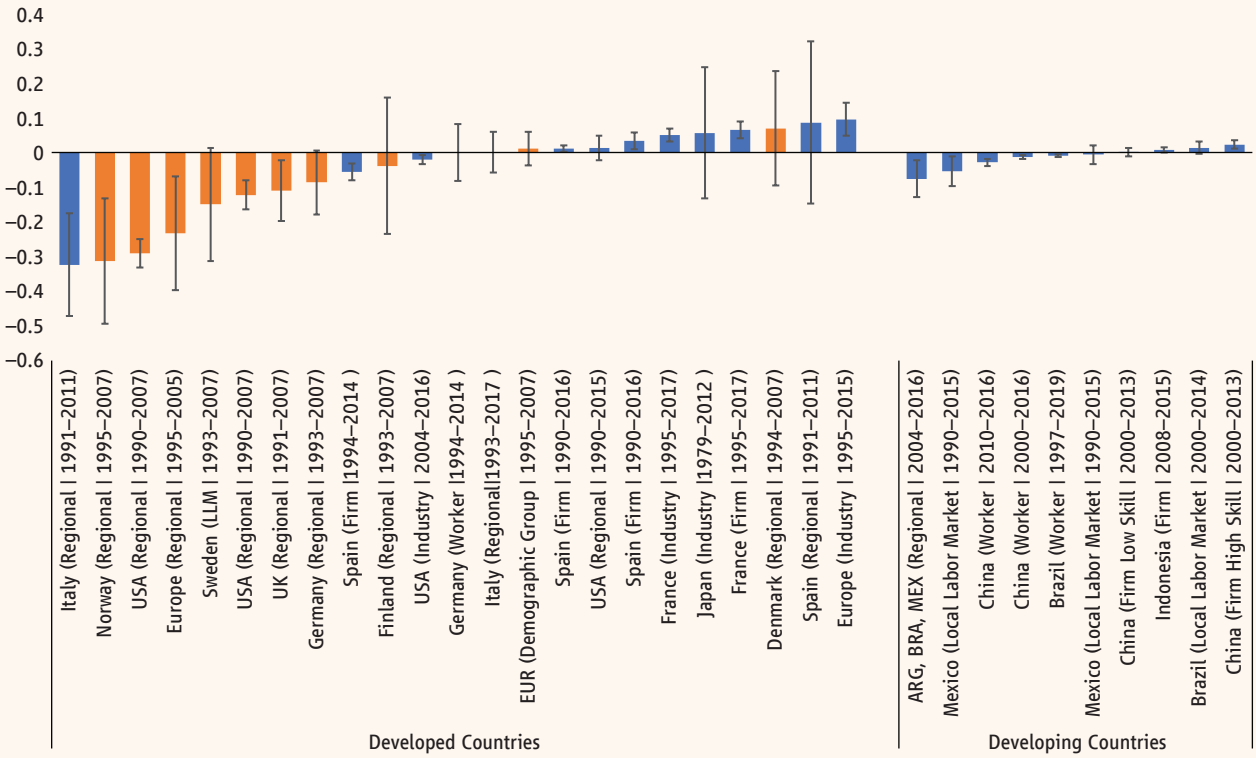
Compared with evidence in developed countries, studies on the impact of automation in developing countries are more limited and less conclusive. On the one hand, automation could reduce the importance of low labor costs as a determinant of international competitiveness, undermining prospects for industrialization, participation in global value chains (GVCs) and export-led growth in developing countries, as production reshores back to host countries (Rodrik, 2018; Faber, 2020; Stemmler, 2021; Krenz et al., 2021; Kugler et al., 2020; Gravina and Pappalardo, 2022; Diaz-Pavez and Martinez- Zarzoso, 2024). On the other hand, robot adoption in developed countries may increase both the imports from, and number of affiliates in, low-income countries (outward FDI), in line with the idea that firm's offshoring and automation decisions can be complementary (Stapleton and Webb, 2020; Artuc et al., 2023). Moreover, if automation technologies have diminishing returns, marginal productivity gains in developing countries (which are at an early stage of automation) may be larger than in industrialized economies (Ing and Zhang, 2022; Serrano, 2023; Cali and Presidente, 2022). If productivity gains translate into higher wages and greater demand for goods and services, the result will be higher economic growth, employment creation and improved welfare. Ultimately, the effects of automation technologies on employment, wages and well-being in developing countries are highly context-dependent.

(continued)

(Box 3. continued)

Adopting a meta-analysis methodology introduced by Guarascio et al. (2024), Figure B3.1 presents the comparative employment effects documented in the existing literature, where all individual studies' estimates are converted into a homogenous metric (partial correlation coefficients). As seen in these figures, the magnitude of robotization impact is more pronounced for developed countries as against developing countries. Furthermore, the majority of the studies documenting a negative employment effect in developed countries involve early-adoption period (e.g., up until circa-2007; orange bars). In contrast, studies involving analysis periods within the last decade appear to show overwhelmingly positively estimated effects (blue bar).

Figure B3.1. Meta-analysis documenting estimated employment effect of robotization



Source: World Bank's estimation.

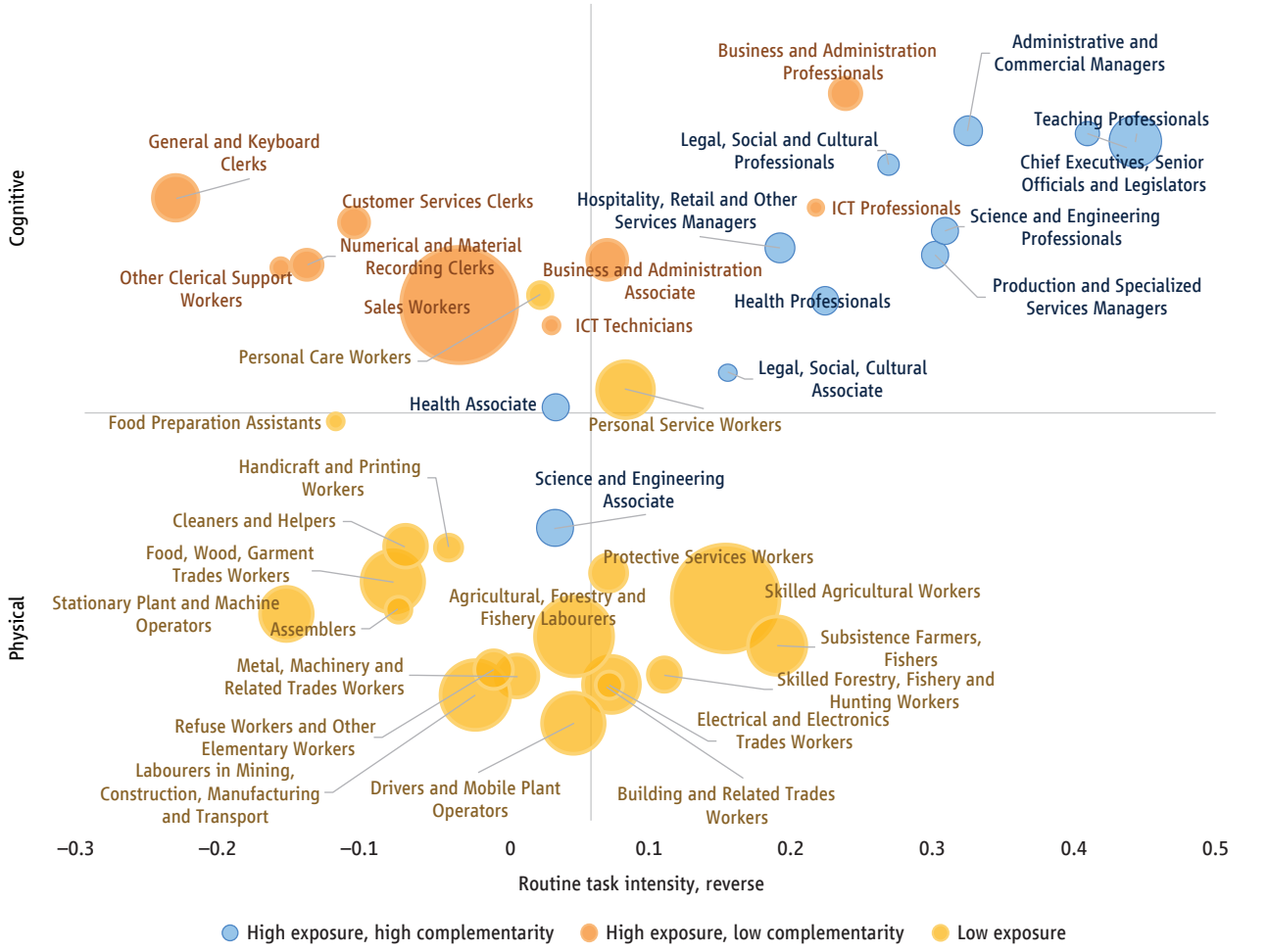
Artificial Intelligence (AI)

Artificial intelligence (AI) currently affects primarily cognitive tasks, but highly non-routine cognitive tasks may be complemented by AI. The existing literature (Felten, et. al. 2021, Gmyrek, et. al. 2023, Webb 2020) suggests that AI, including generative AI, affects a wide range of cognitive tasks due to its utilization of big data from the internet sphere. Like other technologies, AI can automate tasks but can also augment existing tasks and create new tasks. A recent study by the IMF suggests that AI-complementarity is influenced by the social, ethical, and physical context of occupations, along with required skill levels. The study suggests there is a negative correlation between complementarity of AI and routineness of occupations, but other aspects of tasks also affect complementarity (Pizzinelli et al. 2023; Box 4).

While it remains too early to causally estimate the impact of nascent AI technologies, analyzing the AI-exposed jobs in a country can shed light on the intensity and implications of AI exposure in that country. In EAP, many jobs are manual task-based, making overall AI exposure relatively low. However, there are also many jobs with routine cognitive intensity, which could potentially be negatively affected by AI's displacement effect. Non-routine cognitive task-intensive jobs which are potentially complementary to AI are more limited in EAP compared to advanced economies (Figure 23, A1).

Figure 23. AI largely affects cognitive tasks, but some non-routine cognitive tasks can be complemented by AI; the EAP workforce is less exposed to AI due to its high concentration in physical tasks

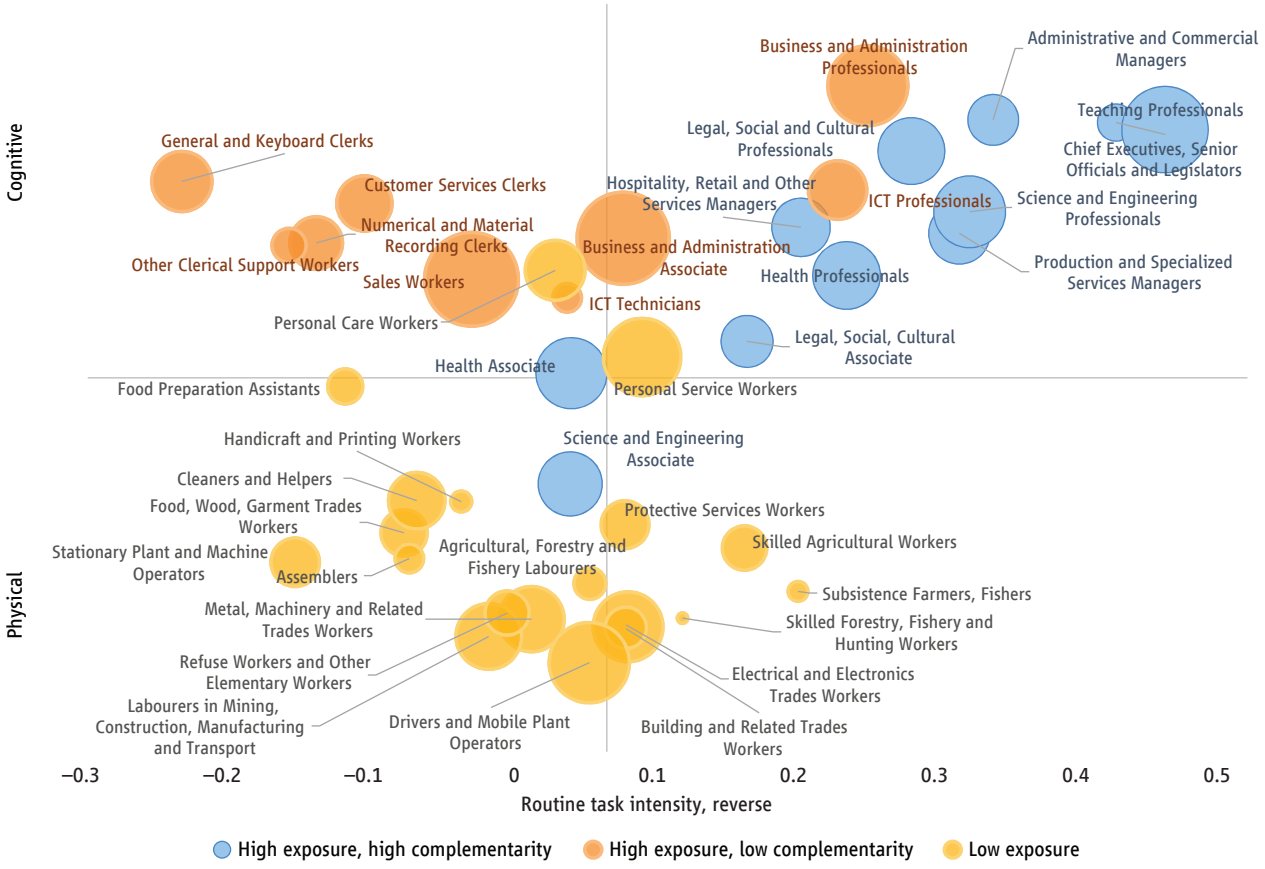
A. EAP



(*continued*)

Figure 23. AI largely affects cognitive tasks, but some non-routine cognitive tasks can be complemented by AI; the EAP workforce is less exposed to AI due to its high concentration in physical tasks (*Continued*)

B. Advanced economies



Source: Microdata, ILOSTAT, Felten, et. al. (2021), Pizzinelli et al. (2023).
Note: Vertical axis measures routine manual content of tasks; horizontal axis measures routine task intensity following Autor and Dorn (2013). color code is based on median threshold of AI exposure measure (Felten, et. al. 2021) and AI complementarity measure (Pizzinelli et al. 2023). Bubble size denotes average worker share in EAP (9 countries) and AE (36 countries). Latest year data.

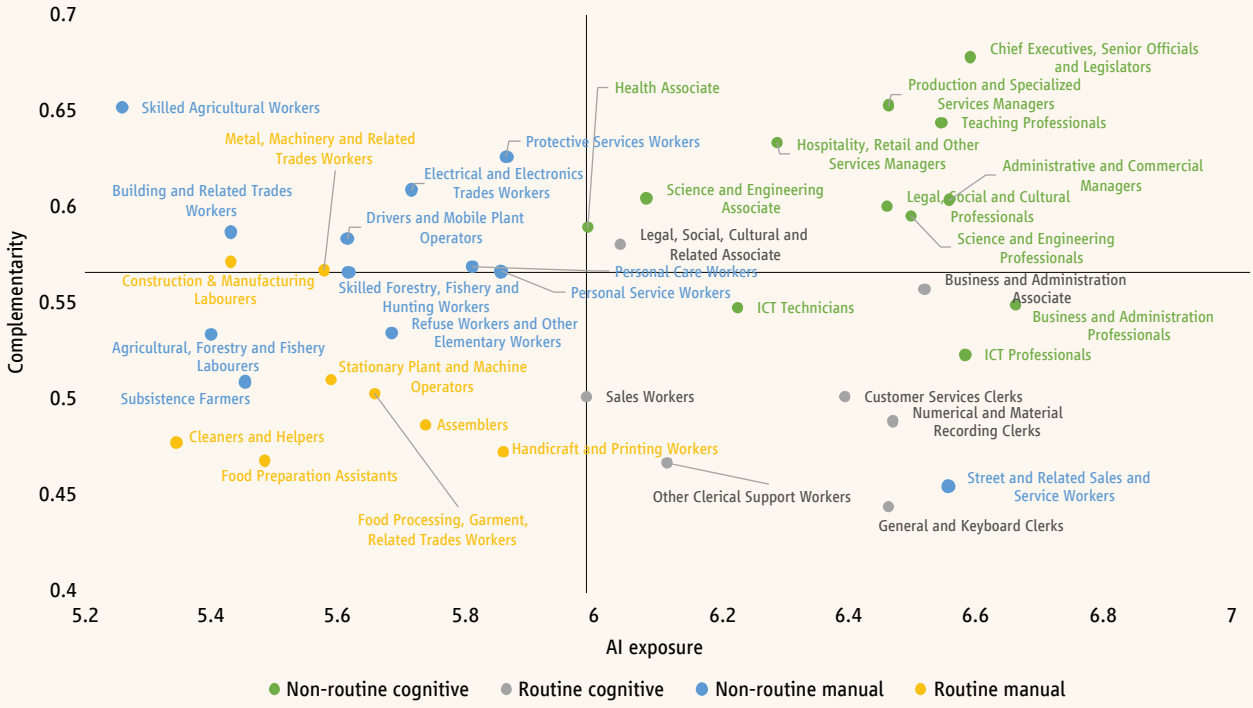
Box 4. Exposure to AI and complementarity

Recent advances in artificial intelligence (AI) have generated excitement about AI's potential to boost productivity, but there are concerns on the potential adverse impact on labor markets by displacing workers or transforming the scope of specific occupations. One measure of the extent of AI exposure to each occupation has been constructed by Felten, Raj and Seamans (2021). They define 'exposure' to AI as the degree of overlap between what AI applications can do and the tasks humans perform in each occupation. Building on this exposure measure, Pizzinelli et al. (2023) have attempted to measure also the 'complementarity' between what AI and humans do in each occupation. They construct an index combining complementarity with exposure to determine the extent to which an occupation is shielded from displacement by AI.

AI exposure tends to be higher with cognitive tasks rather than manual tasks, and occupations which primarily involve non-routine tasks (both manual and cognitive) show higher complementarity with AI than those which involve routine tasks (Figure B4.1A). Following Pizzinelli et al. (2023), the AI exposure index can be adjusted to reflect complementarity. Complementarity-adjusted AI exposure, in which a higher index implies higher risk of displacement, is highly correlated with the routineness of the tasks (Figure B4.1B). There is, however, significant heterogeneity among non-routine occupations. For example, ICT professionals and health professionals share similar degrees in routineness of tasks, but the former show much higher AI-displacement exposure. This difference arises because the nature of tasks performed by health professionals are more social, and less-codifiable than those performed by ICT professionals.

Figure B4.1. Jobs involving routine and non-routine cognitive tasks may be substituted by AI while some jobs involving non-routine cognitive tasks are likely to be complemented by AI

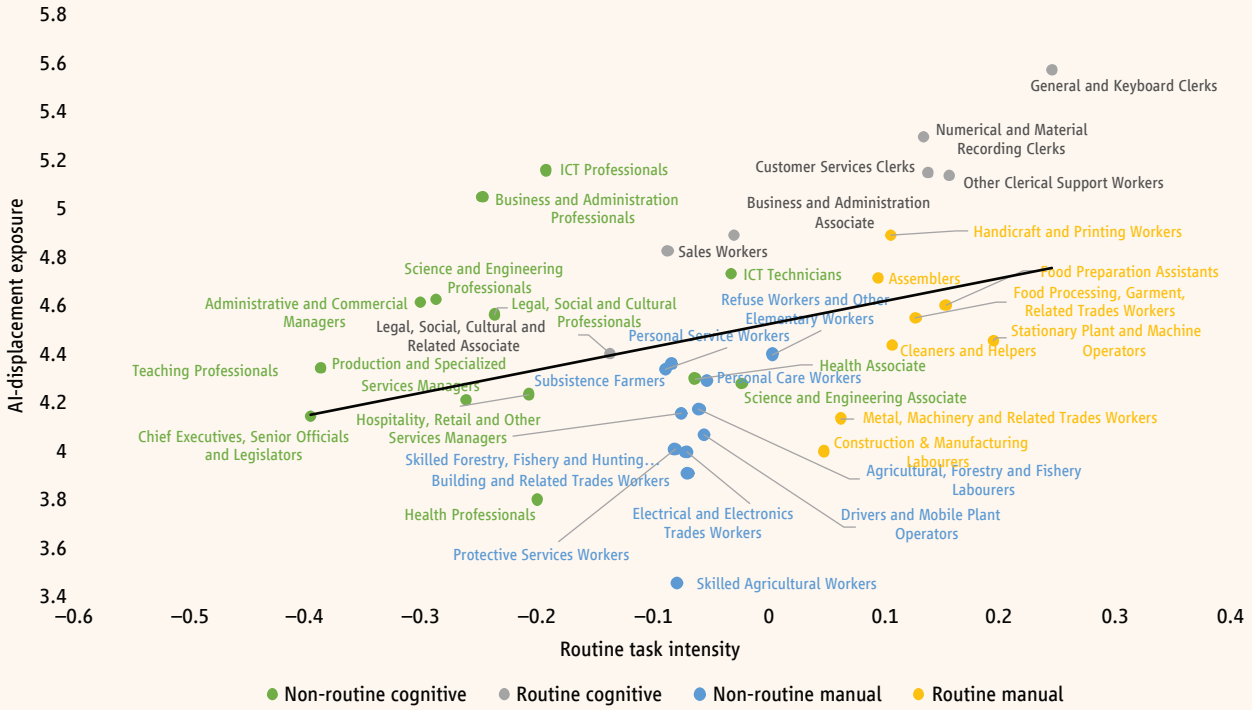
A. AI exposure and complementarity



(continued)

(Box 4. continued)

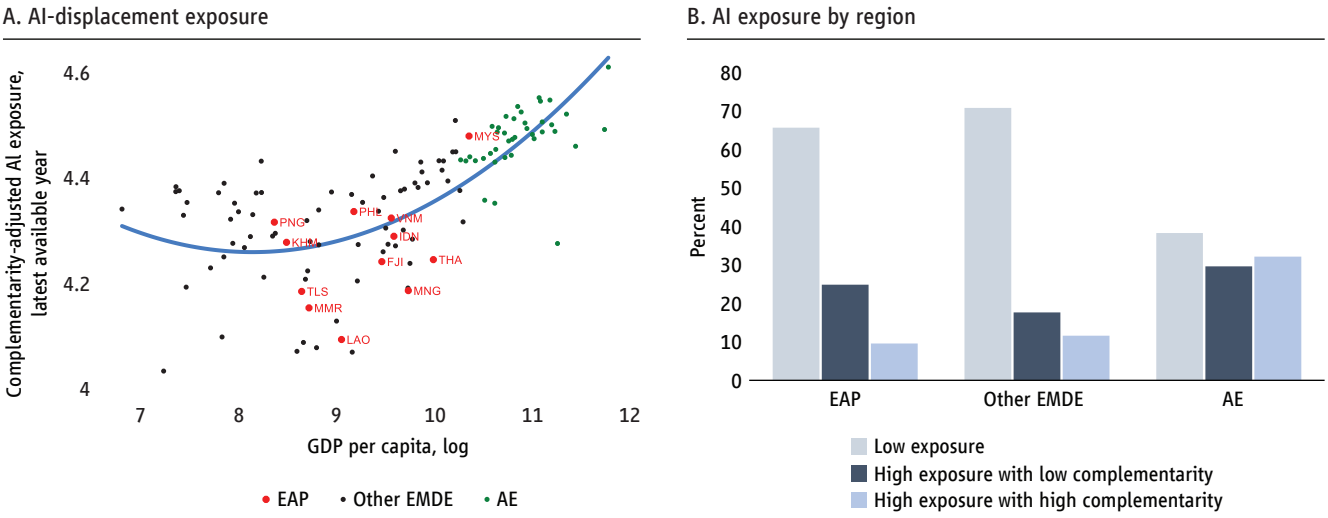
B. AI-displacement exposure and routine task intensity



Source: Pizzinelli et al. (2023), Felten et al. (2021).
Note: A. line shows median. B line shows linearly fitted line.

EAP countries are less exposed to labor displacing effects of AI than advanced economies but also less equipped to benefit from AI-complementarity (Figure 24A). The limited exposure to displacement in EAP is because of the relative dominance of manual task-based occupations. Within EAP, Malaysia, Thailand and Philippines are relatively more exposed to AI's displacement effect compared to other EAP countries due to higher engagement in cognitive services sectors. The share of AI-exposed occupations with high complementarity potential is about 10 percent, less than one third of that in advanced economies (Figure 24B). The relative shortage of jobs that would benefit from AI complementarity could be a challenge for the region.

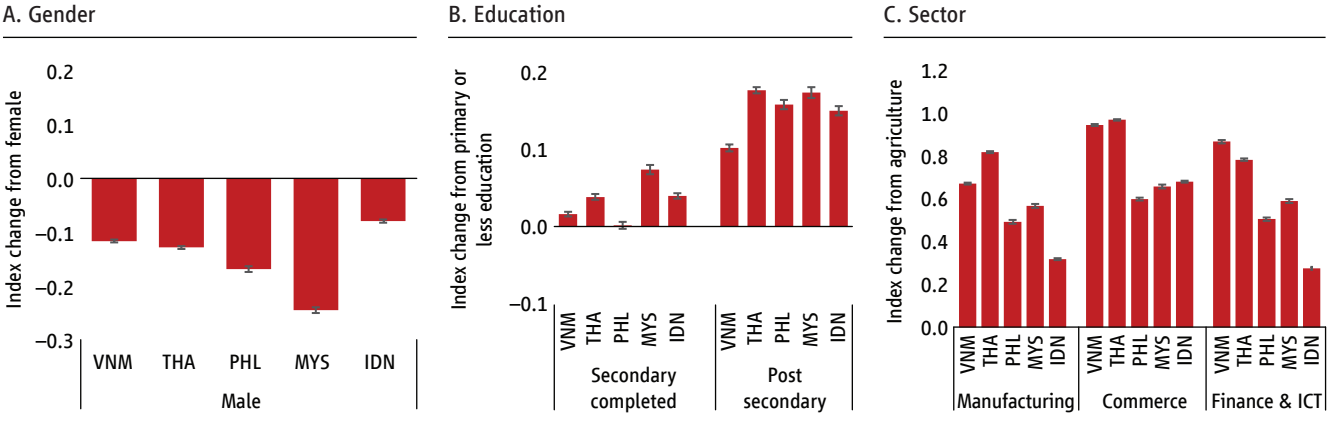
Figure 24. EAP countries are relatively less exposed to labor displacing effects of AI than advanced economies, and also have less jobs that are complementary to AI



Source: Felten, et. al. (2021), Pizzinelli et al. (2023), WDI.
Note: A. Figure shows complementarity-adjusted AI exposure measure at country level where a higher value of exposure corresponds to greater risk of displacement. B. Figure shows share of workers in occupations under each category. Categorization is based on median threshold of AI exposure measure (Felten, et. al. 2021) and AI complementarity measure Pizzinelli et al. (2023).

In EAP, women, the higher-educated, and workers in commerce sectors are more exposed to AI's displacement effect. AI exposure is not uniform across demographics and economic sectors. Occupational differences across different demographic groups and sectors reveal the heterogeneity of AI exposure. In the EAP region: women are more exposed to AI's displacement effect than men, especially in Malaysia and the Philippines; higher educational attainment is associated with greater AI exposure, with tertiary-educated workers being more exposed than secondary-educated workers; workers in non-agriculture sectors are much more exposed to AI than those in the agriculture sector, with the commerce sector being the most exposed in all countries (Figure 25).

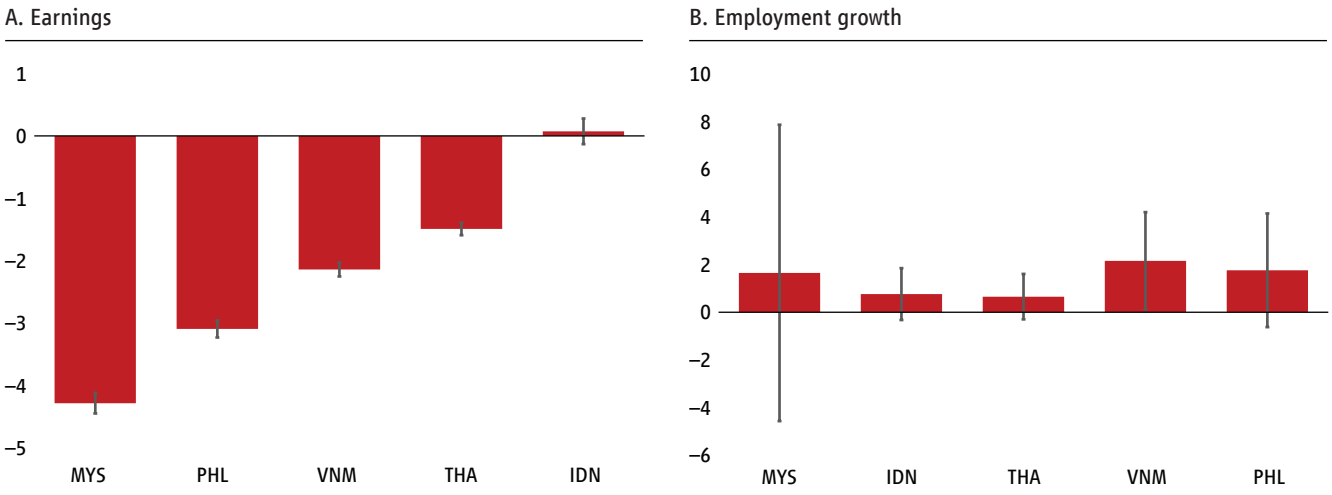
Figure 25. In EAP, women, the higher-educated, and workers in commerce sectors are more likely to be engaged in AI-exposed occupations



Source: Microdata, Felten (2021), Pizzinelli et al. (2023).
Note: Figure shows regression coefficient of Complementarity-adjusted AI index controlling for gender, education level, age group, and sectors.

AI exposure in the EAP region does not yet translate into significant employment impacts but is associated with lower earnings. When controlling for the effect of broader occupational categories (1-digit-level occupations), exposure to AI is negatively correlated with earnings in most EAP countries (Figure 26A). This finding suggests that AI-affected occupations are already experiencing negative impacts through the nature of their tasks (routineness, less social interaction, etc.) even though penetration of AI in the region is still nascent. The largely insignificant correlation of AI on aggregate changes in employment and wages is also observed in advanced economies (Acemoglu et al. 2022).

Figure 26. Higher exposure to AI is associated with lower earnings in most EAP countries, while AI exposure is not correlated with employment growth



Source: Own analysis using microdata, Felten et al. (2021), Pizzinelli et al. (2023).
Note: Regressor is standardized complementarity-adjusted AI exposure measure (ISCO 2 digit). A. Dependent variable is log of annual earnings in the latest survey year. Regressions control for age group * gender * education, 1-digit industry, 1 digit occupation fixed effect. B. Dependent variable is average employment growth between 2010–2019 at 2-digit occupation level.

Working with digital technologies

Digital technologies can increase labor demand by increasing productivity and allowing flexible work. As the task model suggests, automation and AI can create a negative impact on labor through the displacement effect on automatable tasks. But it can be counterbalanced by the creation of new tasks, which are often related to new technology (Box 5), and the increase in labor demand due to the positive productivity effect. In the case of ICT, the productivity effect has typically outweighed the displacement effect at the aggregate level (Box 6). Furthermore, digital platforms, including e-commerce, have created flexible work arrangements that have proven especially advantageous for demographics previously facing barriers to traditional employment, such as women and youth. To harness the full potential of technological advancements and mitigate their potential disruptive effects on the labor market, it is essential for workers to become comfortable working with digital tools.

Box 5. The creation of new digital jobs in China

Adoption of new technology often creates new tasks and occupations. In China, the increasing adoption of digital technologies induced the government to add new jobs in the National Occupation Classification (NOC). Since 2019, the Ministry of Human Resources and Social Security added 93 new occupations to the NOC, making the total number of occupations 1658 in 2024. Among 93 new occupations, nearly half of the occupations are related to new technologies. The nature of the new jobs ranged from Big Data technician and Artificial Intelligence technician, added in 2019, to Blockchain operator in 2020, Integrated circuit technician in 2021, and Cybersecurity evaluator and Generative AI system operator in 2024 (Table B5.1). The trend is closely related to the rapidly evolving technological development in the country. These professions not only advance technological development but also reflect the growing need for security, sustainability, and intelligent systems across industries.

Table B5.1. Examples of newly added digital occupations in China

Year	*Examples of newly added digital occupations*	
2019	Internet of Things Engineering Technician	Big Data Engineering Technician
	Artificial Intelligence Engineering Technician	Cloud Computing Engineering Technician
2020	Virtual Reality Engineering Technician	Artificial Intelligence Trainer
	Intelligent Manufacturing Engineering Technician	Blockchain Application Operator
2021	Integrated Circuit Engineering Technician	Digital Forensics Analyst
	Cryptography Application Technician	Industrial Vision System Maintenance Technician
2022	Robotics Engineering Technician	Agricultural Digitalization Technician
	Data Security Engineering Technician	Database Operations Administrator
2024	Cybersecurity Protection Evaluator	Generative Artificial Intelligence System Operator
	Cloud Network Intelligent O & M Staff	Intelligent Connected Vehicle Tester

Source: Ministry of Human Resources and Social Security, China.

Box 6. The literature on employment and welfare impacts of digital connectivity

1. Impact of internet access

Studies examining the employment effect of digital connectivity have focused on (i) high-speed broadband and (ii) mobile internet connections. In both cases, employment gains through the "productivity" effect have been shown to largely outweighed the labor "displacement" effect at the aggregate level.

First, on broadband internet connectivity, the diffusion has positively affected employment rates with little or no job displacement along with increased firm entry, productivity and exporting (Hjort & Poulsen 2019). Existing studies in developed countries show that broadband internet expansion increases firm labor demand, labor force participation, employment rates, and wage growth (Atasoy, 2013; Crandall et al. 2007; Dettling 2017; Forman et al. 2012, Akerman et al. 2015; Fabritz 2013; Ivus & Boland 2015). In developing economies, Cariolle et al. (2019) find that fiber optic telecommunications via submarine cable networks positively impacted firm performance in 40 developing countries across Asia, South America, and Africa, leading to greater employment of production workers. In Africa, Hjort and Poulsen (2019) show that high-speed internet access from submarine cables positively affected firm entry, productivity, and exports in Ghana, Kenya, Mauritania, Nigeria, Senegal, and Tanzania, followed by increases in employee training, worker productivity, wages, and aggregate employment rates. In EAP, broadband infrastructure investment improves firm and labor productivity, increased worker wages and welfare in China (Chen et al. 2020; Jin et al. 2023; Zhang et al. 2022). Broadband adoption is also associated with increases in labor demand, employment growth, and reduction in the unemployment rate in Viet Nam, Indonesia and other ASEAN countries (Chun & Tang 2018; Fadzil 2018; Salsabila & Oktora 2022).

The second strand of literature documents the expansion of mobile internet coverage and its labor market impact. The expansion of 3G networks, mobile cellular and telephone subscriptions increase labor force participation and employment rates (Chiplunkar & Goldberg, 2022; Ndubuisi et al. 2021). Evidence from South Africa, Rwanda and Nigeria suggests that 3G networks and mobile broadband boost waged employment and labor force participation, particularly of women, which can be partially explained by the enhancement in online job searches and shifting traditional social norms (Bahia et al., 2021; Caldarola et al., 2023; Donati, 2023; Viollaz & Winkler, 2022). In EAP contexts, mobile internet availability also influences labor force participation in Indonesia (Kusumawardhani et al., 2023), increases rural household consumption in China (Wan et al., 2021), and average household income in Viet Nam (Pham, 2023).

Studies that do not delineate fixed-line and mobile internet but utilize available survey indicators to proxy for internet access also emphasize the broad effects of internet adoption on labor markets. Access to internet services helps enhance employment and improve labor productivity and earnings for both salaried and self-employed workers, especially for skilled female workers in India and some Latin American countries (Jain, 2021; Navarro, 2010). In EAP, internet access leads to increase household income in rural Indonesia (Ariansyah, 2018), raises

(continued)

(Box 6. continued)

firm productivity and employment by reducing ICT costs in China (Fernandes et al., 2019). In agriculture sector, internet access boosts agricultural output for younger and more remotely-located households in Viet Nam (Kaila & Tarp, 2019; Nguyen et al., 2023; Nguyen, et al., 2023), and increases farm household income in China (Ma & Wang, 2020).

In addition to documenting the overwhelmingly positive effects of internet connectivity, the existing literature has also highlighted the heterogeneous employment effects of internet adoption across demographic groups. Several studies focusing on gender disparity suggest that internet adoption may reduce female labor supply as it pushes women into unpaid jobs as men shift away from agriculture (Chiplunkar & Goldberg, 2022; Klonner & Nolen, 2010). Internet availability could also limit supply of female labor in high-skill jobs while sustaining the within-firm gender wage gap (Chun & Tang, 2018) In terms of skill differentials, the adoption of skill-biased technology such as high-speed internet has favored educated workers (Atasoy, 2013; Chen et al., 2020; Hjort & Poulsen, 2019; Michaels et al., 2014), shifting labor demand from low-skilled manual to interactive tasks in ICT-driven industries (Akerman et al., 2015; Atasoy, 2013; Chun & Tang, 2018; Forman et al., 2012; Hjort & Poulsen, 2019). Such an effect is also more pronounced for younger workers equipped with stronger digital literacy (Jin et al. 2023).

2. Impact of computer and mobile phone as complementary digital appliances

A separate literature discusses the role of computer and mobile phone usage as complementary digital appliances that help magnify the positive effect of internet connectivity. Before the internet boom, the availability of computer usage in pedagogy has been shown to benefit more educated workers, potentially increasing the wage gaps (Autor et al. 2008; Autor et al. 1998; Autor et al. 2003; Goldin & Katz, 2009; Katz & Margo, 2014). In manufacturing production, studies show that computer investment positively impacts firm productivity, wage structure changes, and entrepreneurship (Brynjolfsson & Hitt, 2003; Fairlie, 2006; Krueger, 1993). Mobile phone adoption helps reduce price dispersion, improves marketing decisions, increases market participation, particularly for women (Klonner & Nolen, 2010; Muto & Yamano, 2009; Shimamoto, Yamada, & Gummert, 2015; Tadesse & Bahiigwa, 2015), leading to sectoral labor reallocation and fostering non-farm employment and entrepreneurship (Andjelkovic & Imaizumi, 2012; Emerick, 2018; Foster & Rosenzweig, 2007). In agriculture, mobile phones provide farm households with information on weather hazards, market conditions, and prices, thereby enhancing decision-making and reducing communication and transaction costs (Aker, 2010; Aker & Fafchamps, 2015; Aker & Ksoll, 2016; Aker & Mbiti, 2010; Fafchamps & Minten, 2012; Ifeoma & Mthitwa, 2015; Jensen, 2007; Krell et al., 2021; Lee & Bellemare, 2013; Mitra et al., 2018; Mittal & Mehar, 2012; Muto & Yamano, 2009; Qiang et al., 2012). In EAP, mobile phone usage has been shown to boost growth in per capita household consumption in the Philippines (Blumenstock et al., 2020; Labonne & Chase, 2009), and help alleviate energy poverty by increasing household consumption and off-farm income, particularly benefiting poorer and less educated populations in China (Zang et al., 2023).

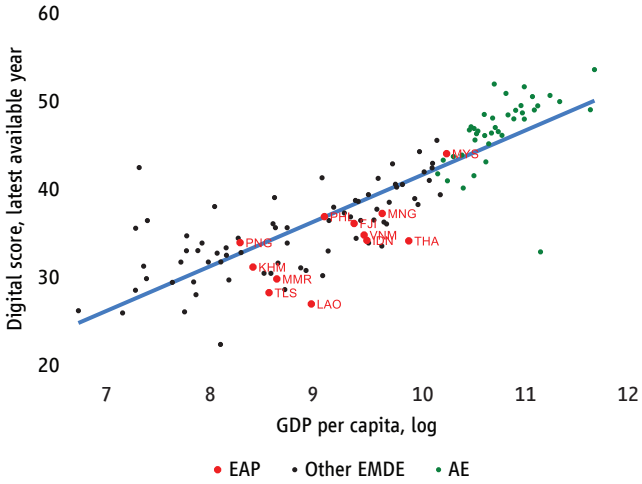
The share of employment in digitally intensive occupations is lower in EAP countries than in advanced economies and in other EMDEs with similar incomes. One way to measure the digital intensity of workforce is to look at the composition of occupations related to digital technologies. Intensity can be measured by the level of knowledge and usage of digital technologies in each occupation. In general, digital intensity of the workforce is closely associated with income levels. EAP countries show relatively lower digital intensity compared to advanced economies and other

EMDEs of similar income due to the shortage of IT-related occupations and high-skill professionals (Figure 27; Box 7). Within EAP, Malaysia ranks the highest in digital score reflecting its relatively high share of science and engineering professionals and business associates, while lower-income economies such as Lao PDR, Myanmar, and Timor-Leste rank lower.

In EAP, digitally intensive occupations see higher wage premia and higher employment growth in some countries. Working with advanced digital technologies requires higher skills and is generally associated with higher earnings. In EAP, the digital intensity of jobs is positively associated with earnings (Figure 28A). The wage premia are particularly large in Malaysia, the Philippines and Thailand (25, 20 and 17 percent increase corresponding to 1 standard deviation of digital score, respectively). The employment change is also positively correlated with the digital intensity of jobs in Indonesia, Thailand and Viet Nam, suggesting job creation in digital-intensive occupations (Figure 28B). However, the association is not significant in Malaysia and Philippines. Higher wages are likely to attract more workers to the digital occupations, but the shortage of demand (such as limited digital infrastructure and capable firms) and supply (skill shortage) may have inhibited workers from transitioning to higher-earning digital occupations.

Figure 27. The share of employment in digitally intensive occupations is lower in EAP countries than in advanced economies and in other EMDEs with similar incomes

Share of digitally intensive jobs



Source: Authors calculation based on LFS and ILOSTAT, ONET.
Note: A. Countries with more than 1 million population are shown. Digital score is calculated using occupational composition at 2-digit ISCO, and based on the methodology by Muro et. al (2017) using ONET. It ranks the level of digital activities and knowledge required for each occupation in the US.

Box 7. Measuring digital intensity of occupations

Digital scores measure the degree of digital-intensity across hundreds of occupations (Muro, Liu et al. 2017). The data comes from the Occupation Information Network (O*Net) database, which surveys workers in the US to obtain detailed task, skill, and experience related information in their job. Two technology-relevant variables: "knowledge-computer and electronics" and "work activity-interacting with computers" were used (equal weight, scale standardized) to score the digital-intensity of occupations, and converted to ISCO08 2-digit level (40 occupations). The calculated score applies to the US workforce but can be used as a benchmark to measure relative digital-intensity of occupations.

Table B7.1 shows EAP countries' occupational composition ranked by calculated digital score. Compared to advanced countries such as the US and Singapore, the share of IT-related occupations and high-skill professionals in EAP is smaller while the share of low-digital occupations such as agriculture, manufacturing, construction and sales workers is higher, reflecting the cross-country difference in the aggregate digital score (Figure B5.2).

(continued)

(Box 7. continued)

Table B7.1. Share of IT-related occupations and high-skill professionals in EAP is smaller than in advanced economies

digitalscore	Title of occupation	IDN	KHM	MNG	MYS	PHL	THA	VNM	SGP	USA
14	Market-oriented Skilled Agricultural Workers	18	17	23	4	10	24	9	0	0
18	Cleaners and Helpers	3	1	2	2	4	2	1	3	1
21	Building and Related Trades Workers (excluding Electricians)	2	7	4	2	3	3	5	1	3
24	Subsistence Farmers, Fishers, Hunters and Gatherers	3	13	1	0	0	3	5		0
27	Drivers and Mobile Plant Operators	4	3	9	5	6	5	4	5	4
28	Food Preparation Assistants	1	0	0	0	1	0	0	2	1
28	Labourers in Mining, Construction, Manufacturing & Transport	7	4	3	3	10	4	6	1	5
30	Food Processing, Wood, Garment and Other Trades Workers	6	12	3	2	2	3	4	1	1
31	Agricultural, Forestry and Fishery Labourers	6	5	0	4	11	3	15	0	1
32	Market-Oriented Skilled Forestry, Fishery & Hunting Workers	1	2	0	1	2	1	1	0	0
33	Personal Service Workers	5	2	4	5	3	5	4	3	5
34	Stationary Plant and Machine Operators	2	1	1	5	1	3	9	0	1
36	Refuse Workers and Other Elementary Workers	2	0	3	3	2	2	2	1	2
39	Metal, Machinery and Related Trades Workers	2	2	3	3	1	3	2	1	2
40	Personal Care Workers	0	2	1	1	1	1	0	1	2
40	Street and Related Sales and Service Workers	1	0	0	0	1	1	1		0
41	Assemblers	0	0	0	0	1	2	2	0	1
41	Sales Workers	19	16	8	15	16	14	14	5	6
44	Handicraft and Printing Workers	1	1	0	0	1	1	1	0	0
49	Protective Services Workers	1	0	2	4	2	1	1	2	1
50	Other Clerical Support Workers	0	0	1	1	0	0	1	0	1
50	Legal, Social, Cultural and Related Associate Professionals	0	0	1	1	0	0	0	2	2
53	Customer Services Clerks	1	1	1	1	3	1	0	2	4
53	Health Associate Professionals	1	0	1	2	1	0	1	1	5
53	Health Professionals	1	0	3	1	1	1	0	2	4
56	Legal, Social and Cultural Professionals	0	0	2	1	0	1	0	2	3
57	Chief Executives, Senior Officials and Legislators	0	0	2	1	1	1	0	3	1
57	Electrical and Electronics Trades Workers	0	1	1	1	1	1	1	0	1
58	Science and Engineering Associate Professionals	1	1	1	5	1	1	1	5	2
59	Numerical and Material Recording Clerks	1	0	1	2	1	1	1	2	1
59	General and Keyboard Clerks	2	2	0	6	2	2	1	4	2
60	Administrative and Commercial Managers	0	0	2	2	1	1		8	2
60	Business and Administration Associate Professionals	1	1	1	5	2	3	1	11	7
61	Business and Administration Professionals	0	1	3	2	1	1	2	10	5
61	Hospitality, Retail and Other Services Managers	1	0	1	1	2	1	1	2	5
61	Production and Specialized Services Managers	1	0	1	1	1	1	0	5	4
62	Teaching Professionals	4	1	6	5	3	2	2	3	5
69	Science and Engineering Professionals	0	0	5	2	1	1	1	7	3
79	Information and Communications Technicians	0	0	0	1	0	0	1	1	0
86	Information and Communications Technology Professionals	0	0	1	1	0	0	0	3	3

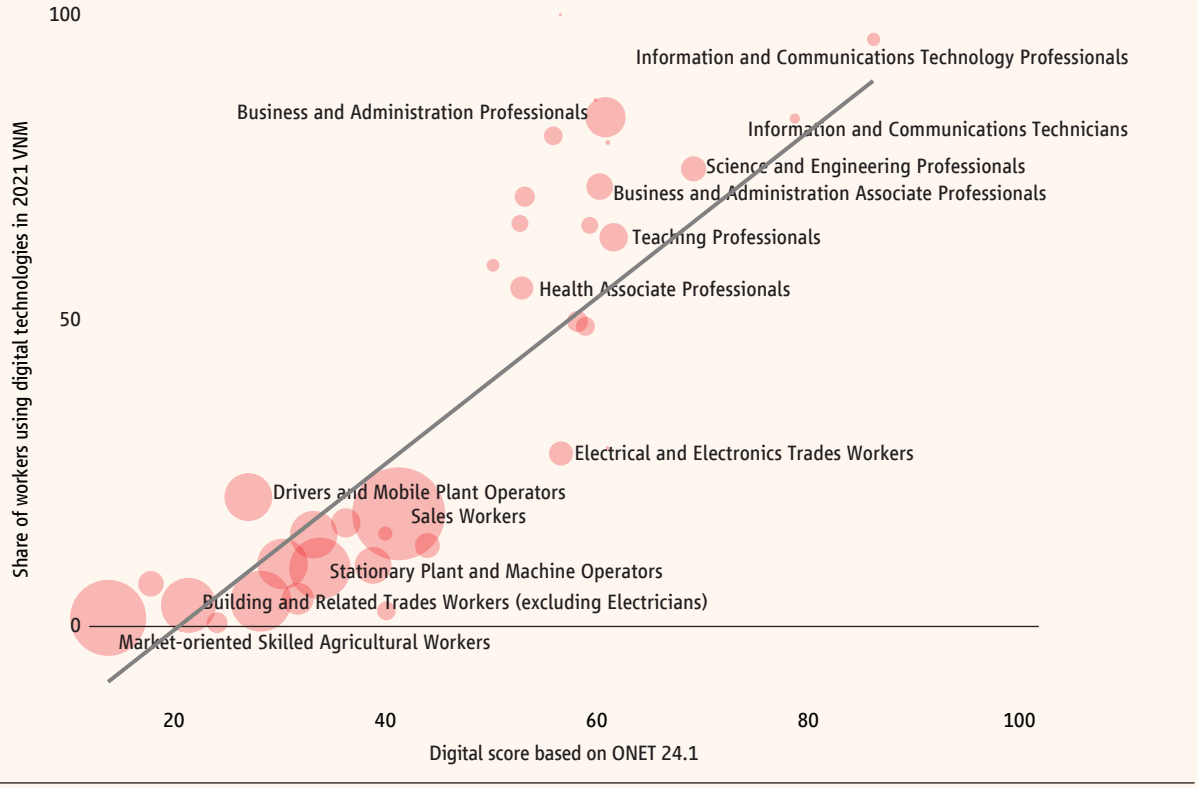
Source: Microdata, ILOSTAT.
Note: Table shows share of workforce at ISCO08 2-digit level ordered by digital score. Latest year data.

Although this measure relies on the digital intensity of occupations in the US, it can be used as benchmark to evaluate the occupational composition related to digital technologies. Also, there is high correlation between the digital score and the share of workers who use digital technologies for work (Figure B7.1). This suggests increasing the number of digital occupations is closely related to higher use of digital technologies in the country.

(continued)

(Box 7. continued)

Figure B7.1. Digital-intensity of jobs is highly correlated with the share of workers who use digital technology (Viet Nam, 2021)

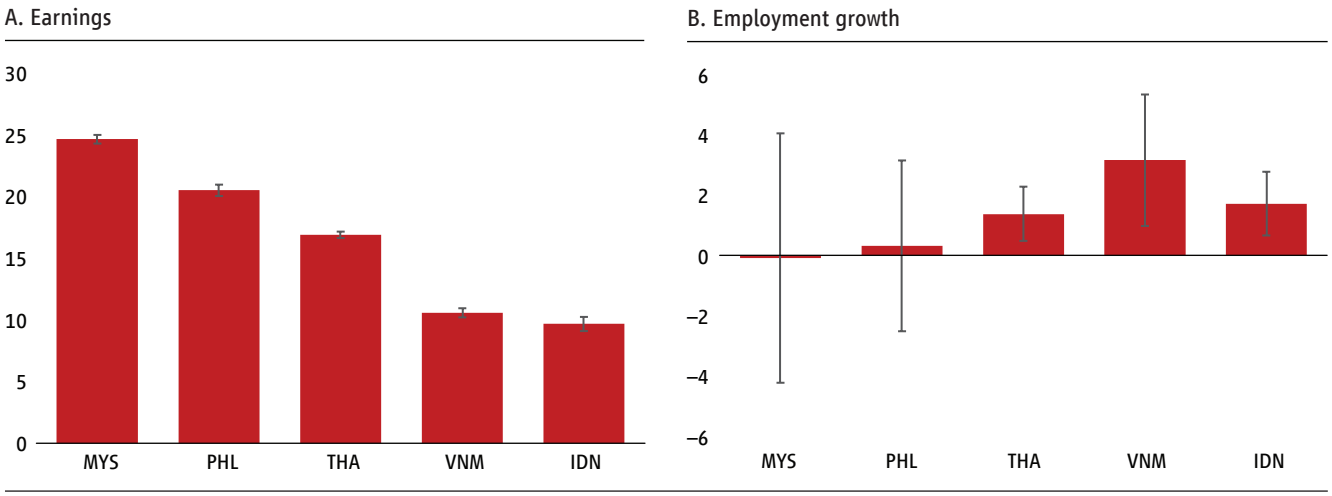


Source: Viet Nam Labor Force Survey 2021; ONET.
Note: Bubble size denotes relative size of employment of the occupation.

Working with digital technologies yields a higher wage premium for the more educated. Digital occupations exhibit heterogeneous wage premia across different education groups. Compared to workers with primary education or less, those who completed secondary education, and especially those who received tertiary education, experienced higher wage premia for more advanced digital occupations (Figure 29). The literature also suggests complementary skills such as socio-emotional skills, language proficiency, or critical thinking matter in digital occupations (Cunningham, et. al. 2022; Grundke et al. 2018; Deming and Kahn. 2018).

Women can benefit more from working with digital technologies than men. A heterogenous effect can also be observed in earnings and employment growth by different gender groups. In Viet Nam, Indonesia and Thailand, women who worked with digital technologies experienced higher wage and employment growth (Figure 30). Digital technologies also enabled those who were previously out of labor force, such as women and youth, to benefit from flexible work arrangement utilizing such e-commerce and digital labor platform. These new "informal" workers are better-off than traditional informal workers in terms of earnings and earning prospects (Box 8).

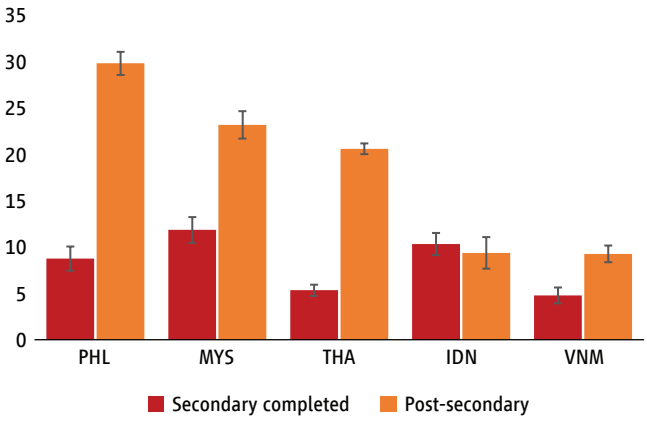
Figure 28. Digitally intensive occupations see higher wage premia in EAP and higher employment growth in some countries



Source: Own analysis using microdata, ONET.
Note: Regressor is standardized digital-intensity score (ISCO 2 digit level). A. Dependent variable is log annual earnings in the latest survey year. Regressions control for age group * gender * education, 1-digit industry fixed effect. B. Dependent variable is average annual earning/employment growth during 2010–2019 at 2-digit occupation level.

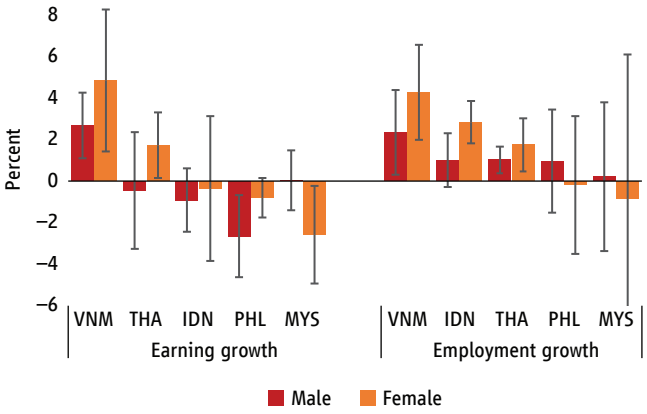
Figure 29. Working with digital technologies yields a higher wage premium for the more educated

Complementary effect of education to digital earnings premium



Source: Own analysis using microdata, ONET.
Note: Bar shows coefficient of the interaction term between educational attainment (base: primary or less education) and standardized digital-intensity score (ISCO 2-digit level). Dependent variable is log of annual earnings in the latest survey year. Regressions control for age group * gender * education, and 1-digit industry fixed effect.

Figure 30. Women working with digital technologies tend to have higher earnings and employment growth than men



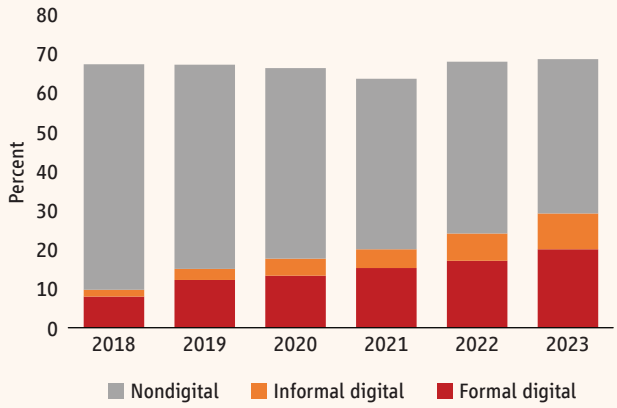
Source: Own analysis using microdata, ONET.
Note: Regressor is standardized digital-intensity score (ISCO 2-digit level). Dependent variable is median annual earnings growth/employment growth during 2010–2019 at 2-digit occupation level.

Box 8. Digital jobs, informality, and female labor force participation in Indonesia

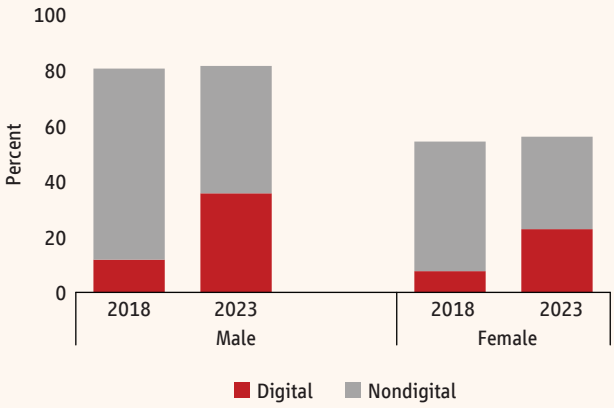
Digital technologies have become common in Indonesia's workplace. Defining digital workers as workers who use digital technologies and internet for their primary work, statistics indicate a rapid increase in the share of digital employment in Indonesia's labor force (Figure B8.1A). Digital workers accounted for less than 10 percent of working age population in 2018 (14 percent among employed) but increased to almost 30 percent in 2023 (43 percent). Within digital employment, a significant increase is noticeable in the informal sector and for women, which may be associated with the rise in digital platform-based jobs (gig works and e-commerce). At the same time, female employment-to-working age population rate increased by 1.7 percentage point in the past 5 years compared to the 0.8 percentage point increase for men. Evidence suggests that, among all women, the incidence of e-commerce engagement (selling) is highest especially among those who are primarily engaged in housework. E-commerce and other platform jobs could help expand opportunities for women in the labor market (World Bank, 2021).

Figure B8.1. An increasing share of workers, both formal and informal, male and female, use digital technologies

A. Share of workers by status of employment and digital use



B. Share of workers by gender and digital use



Note: EAPCE analysis using Indonesia's LFS 2018–2023. Share of working age population (15–64). Digital workers are defined as workers who use internet & digital technology for work.

In both formal and informal sectors, digital workers earn significantly more than nondigital workers. Digital workers in the informal sector earn almost the same as nondigital workers in the formal sector, indicating digitization could shrink the gap between the formal and informal sectors (Figure B8.1B). Positive wage differential between the digital and nondigital sectors also increase with job tenure.

(continued)

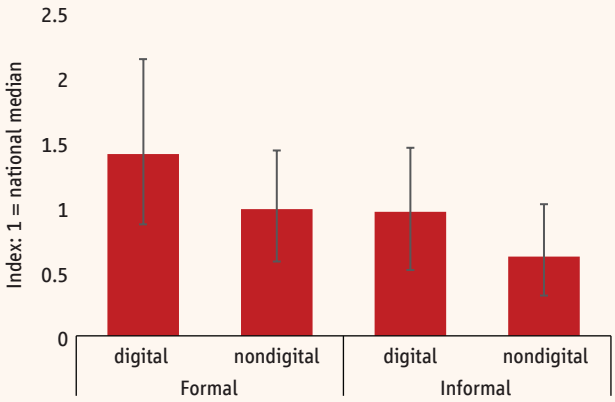
(Box 8. continued)

Despite the expansion and positive wage prospects of informal digital workers, most of them do not have insurance or pensions (Figure B8.2). Furthermore, digital gig works are available primarily to urban men and the workers put in 10 hours a week on average more than every other type of worker in Indonesia (World Bank, 2021).

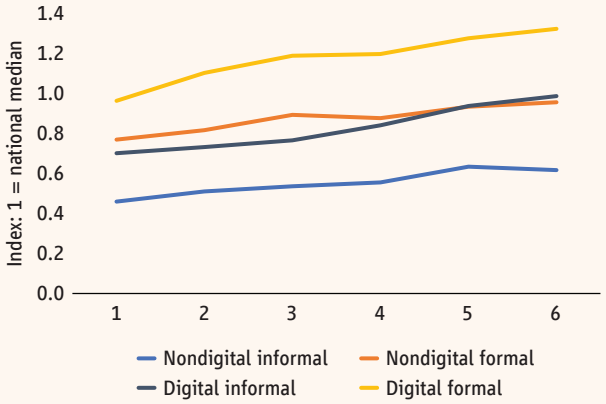
Figure B8.2. Digital workers in both the formal and informal sector enjoy a wage premium

The digital premium increases with job tenure

A. Median wage by type of workers

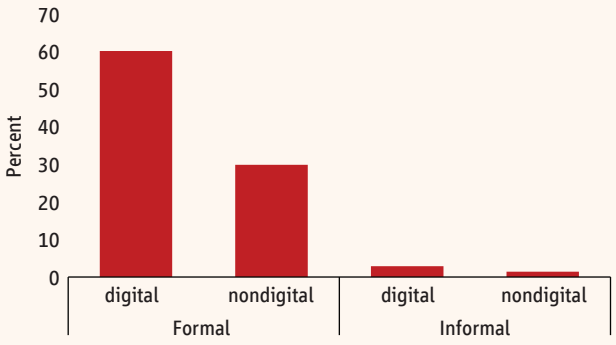


B. Wage profile by year of experience



Source: Indonesia's LFS.
Note: 2023 statistics. Figure shows real wages. A. Whiskers show 25–75 percentile range.

Figure B8.3. Most workers in the informal sector do not have insurance or pensions



Source: Indonesia's LFS.
Note: Figure shows the share of workers provided with any type of insurance or pensions in 2023.

Digital platforms

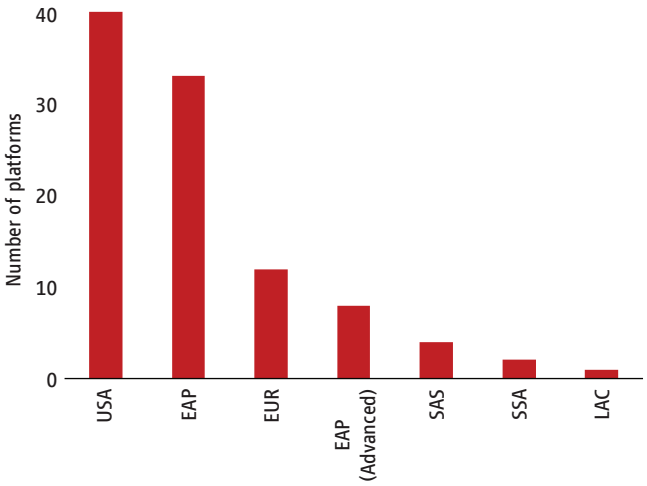
New technologies encourage the emergence of impactful new business models like digital platforms. These platforms affect labor markets through in at least two ways. Platforms operate on a large scale and therefore can accelerate automation and AI adoption and hence the effect of each on employment. In general, platforms enhance the efficiency of intermediation and therefore can also affect the number and nature of jobs through better matching and the emergence of new tasks.

Digital platforms include some of EAP's most valuable and fast-growing firms. China's Alibaba, Meituan and Tencent, Indonesia's GoTo and Singapore's Grab are major players in e-commerce, delivery and ride hailing, with revenues that rival those of Amazon, Uber and eBay. But the dynamism extends beyond these well-known examples. In fact, a third of the world's largest digital platform firms (top 100 companies) are from EAP, second only to the U.S. (Figure 31A).

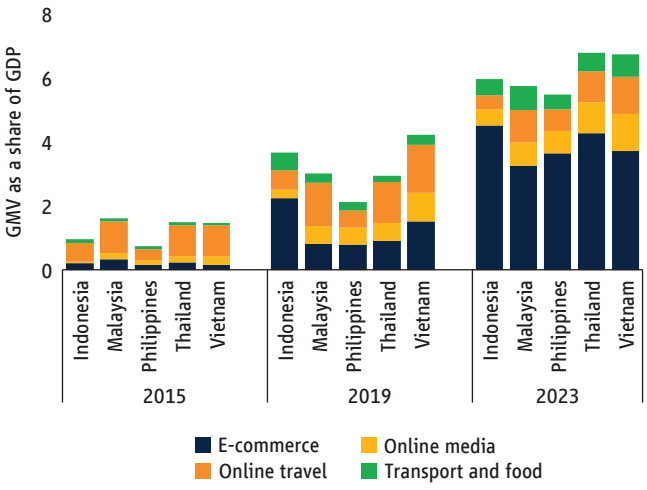
The size of the platform economy has been increasing rapidly across EAP countries. A way to visualize the rapid growth over time of the platform economy in EAP is to consider the evolution of its gross merchandise value (GMV). Estimates from Google, Bain and Temasek in their annual report on the digitalization of Southeast Asia shows a rapid growth in estimated GMV between 2015 and 2022 for all the EAP countries (Figure 31B). At current market rates, the size of the digital platform economy is between 5 and 7 percent of GDP in most EAP countries.

Figure 31. The size of the digital platform economy has been increasing rapidly and uniformly in EAP countries

A. Number of top 100 global digital platforms (including both public and private firms), by region



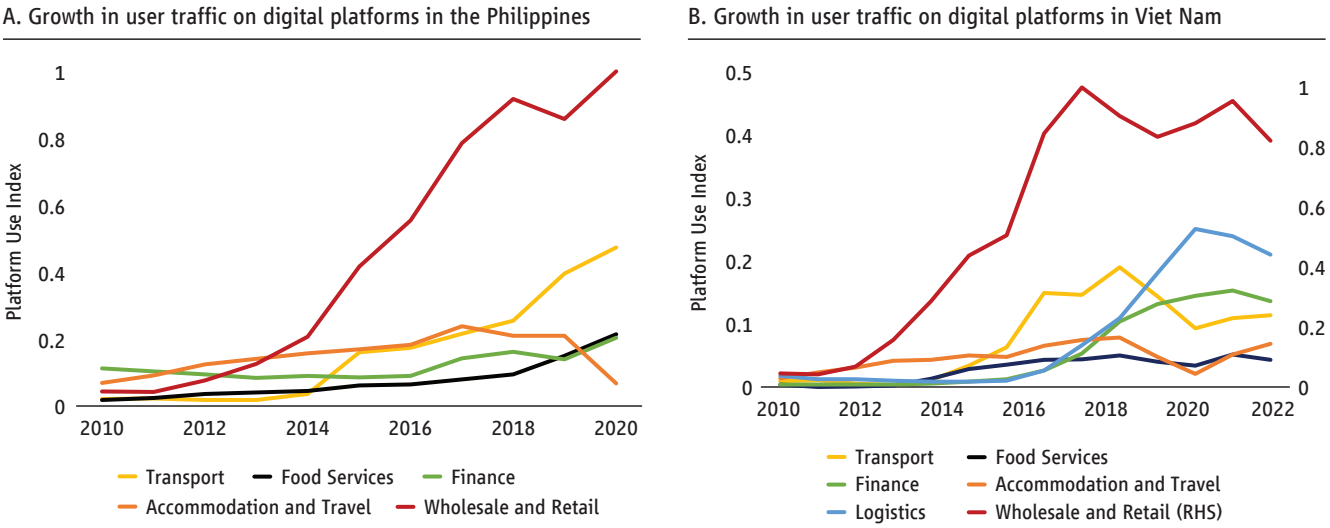
B. Changes in market value of EAP digital economy



Source: UNCTAD (2022), FactSet Fundamentals, CB insights, Google-Temasek-Bain (2022).

The rapid diffusion of digital platforms in EAP countries like Philippines and Viet Nam is observed from website traffic. Platform diffusion can be proxied by data on Google search trends for major platforms (Figure 32). There is a particularly rapid explosion in wholesale and retail in both countries, with major e-commerce platforms such as Grab, Lazada and Shopee appearing in the period 2012–2015, and to a lesser degree transport and logistics during 2015–2020. Digital platforms present a competition shock for incumbent firms in the sectors in which they operate, for example e-commerce platforms affect traditional wholesalers and retailers by offering customers new ways of connecting with suppliers, e.g., through online matching, review and rating systems (Rivares et al., 2019).

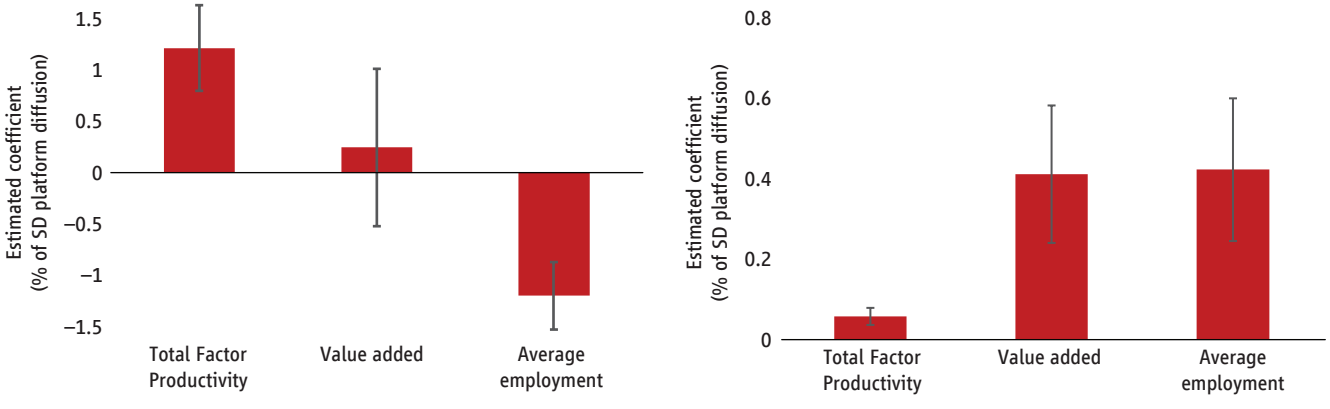
Figure 32. The rapid diffusion of digital platforms in Philippines and Viet Nam, especially in retail and logistics industries, can be observed from website traffic



Source: World Bank analysis, based on data from Google Trends and Semrush. Platform use is proxied using the frequency of Google searches - following Rivares et al. (2019). Major online platforms for each sector collected from web-traffic data from Semrush for Philippines and Viet Nam. Platform use index is normalized relative to retail platform use in 2020 for each country.

The growth of digital platforms in the Philippines and Viet Nam increases firm productivity in dependent sectors, but the firm employment effect is mixed. In both countries, platform diffusion is associated with gains in productivity and value-added of firms that use their services (Figure 33A). However, there is mixed evidence across these two countries in terms of the effect on firm's average employment (Figure 33B). Platform diffusion is correlated with a decline in an average firm's employment in the Philippines, suggesting a labor-saving effect, with firms likely to substitute internal employment with external services provided by platforms. In contrast, platform diffusion is associated with an increase in

Figure 33. Platform diffusion has positive effects on firm productivity and value added, but contrasting effects on employment in the Philippines and Viet Nam

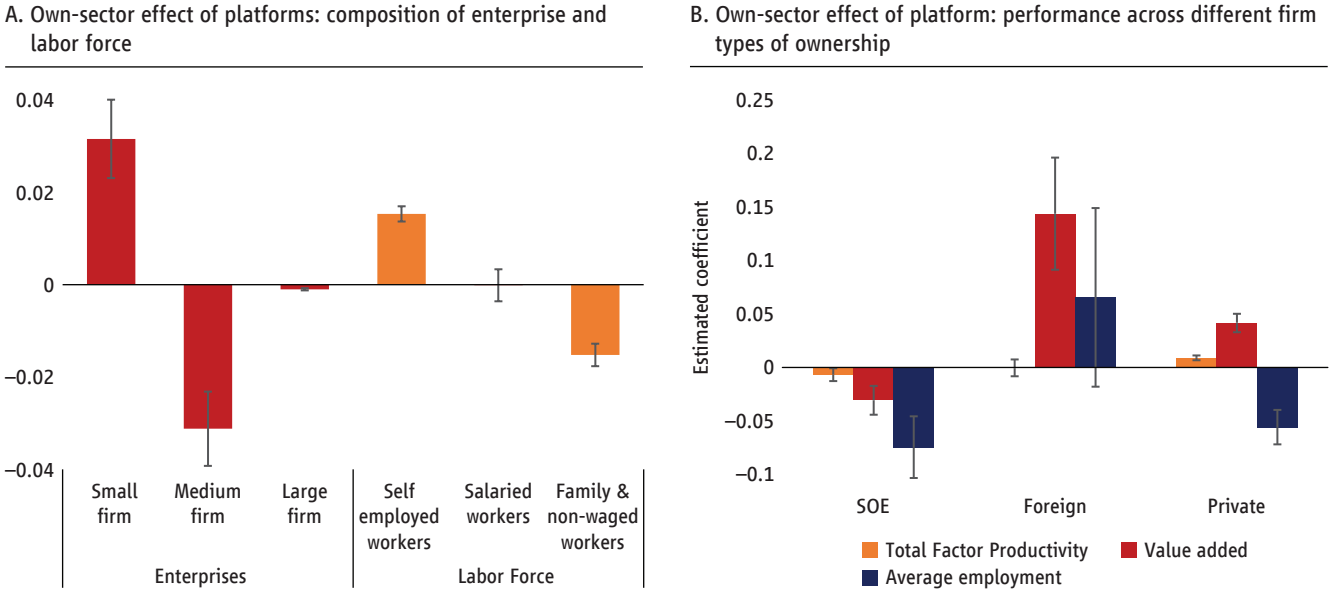


Source: World Bank estimation using Viet Nam Enterprise Surveys and Philippines' ASPI and CPBI Databases.
Note: Bars and whiskers present the estimated coefficients and 90-percent confidence intervals from regressions of firm performance metrics on measures of platform diffusion, including firm and year fixed effects. Own-sector results reflect the correlations between firm performance and platform diffusion in accommodation and Travel, Food Services, Transport and Wholesale and Retail. To aid comparison of effects, estimates in each country are rescaled and expressed as percent of standard deviation in average platform diffusion in that country.

firm's employment in Viet Nam, suggesting a positive scale effect wherein firms' increased productivity potentially led to greater firm growth and labor demand.

Digital platforms offer new entrepreneurial opportunities for small businesses and self-employed workers within the services sector where platforms operate. The existence of digital platforms has led to more efficient and lower cost of matching between buyers and sellers of products (e-commerce) and services (logistics, transportation, finance). Such technological disruption offers new business opportunities for those who previously could not have afforded them. Empirical analysis suggests that platform diffusion in Viet Nam increases the shares of small enterprises and self-employed workers in the economy (Figure 34A). However, the new competition that platforms have brought to traditional brick-and-mortal business models also implies a negative shock to the performance of less efficient existing enterprises such as some state-owned enterprises (SOEs) (Figure 34B). Empirical evidence shown in Figure 35B on the decline in average employment in formal enterprises in both the public (SOEs) and private sectors also suggests an informalization phenomenon brought about by digital platforms, as a significant share of salaried workers leave their blue-collar jobs to take up new employment opportunities in the informal sector offered through platforms. This informalization effect can be observed in the passenger-transportation industry following the rapid penetration of digital ride-hailing platforms within the last decade. Box 9 offers more nuanced evidence on such an effect.

Figure 34. Within the specific service sectors where digital platforms operate in Viet Nam, platforms generate both business-creation and competition effects

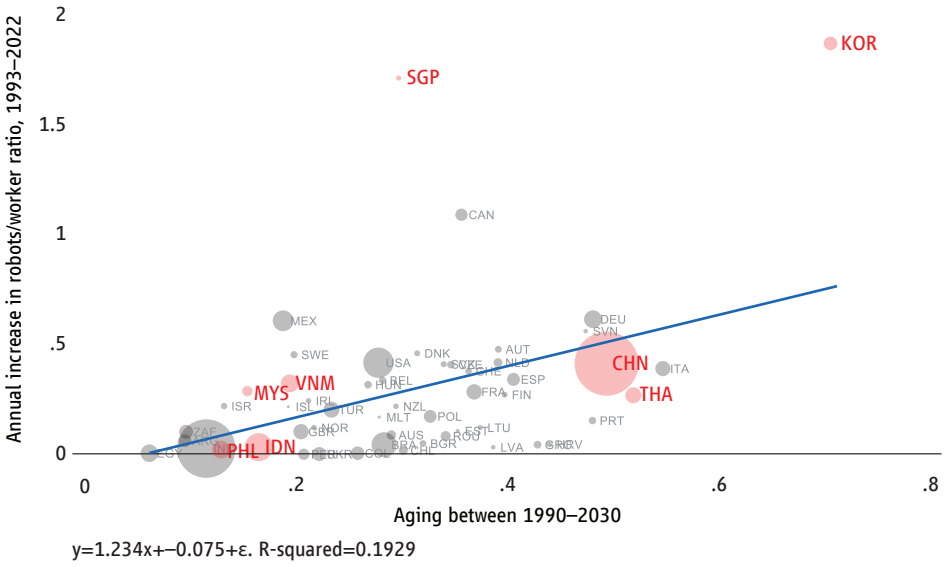


Source: World Bank estimation using Viet Nam Enterprise Surveys (2011–2021).
Note: Bars and whiskers present the estimated coefficients and 90-percent confidence intervals from regressions of firm and labor force compositions (Panel A) and firm performance metrics (Panel B) on measures of platform diffusion, including firm and year fixed effects. Own-sector results reflect the correlations between firm performance and platform diffusion in accommodation and Travel, Food Services, Transport and Wholesale and Retail. A. All variables expressed as shares of total enterprises or the labor force.

Spotlight: Aging and new technologies

Intensity of robot adoption is higher in countries where population is aging faster (Figure 34). A cross-country panel analysis shows that aging led to greater adoption of robots in manufacturing between 1993–2014, and that population aging alone accounts for 35 percent of the variation in robot adoption across countries (Acemoglu and

Figure 35. Aging is associated with greater robot adoption across countries



Source: Authors illustration following and extending Acemoglu & Restrepo (2022) using data from IFR, OECD, UN.
Note: Bubble size shows relative population; x-axis measures change in the ratio of workers above 56 to workers aged 21–55 between 1990 and 2030. The country sample is extended from Acemoglu & Restrepo (2022) to include other EAP and developing countries as well as more recent data.

Restrepo, 2022). These findings are consistent with robot adoption offsetting the labor shortages induced by population aging. In EAP, two advanced countries—Republic of Korea and Singapore—stand out as adopting robots much more intensively than predicted by their population aging. This is also true for Viet Nam and Malaysia but to a much lesser extent. Other EAP countries like Thailand, China, the Philippines, and Indonesia have adoption rates somewhat below what their population aging predicts (Figure 35).

Older workers in EAP countries are more exposed than younger workers to automation and less exposed to AI. Figure 35 shows the EAP levels of (i) automation exposure and (ii) AI exposure across age groups. There is a mild U-shape relationship between automation risk and age in EAP, suggesting that older workers are more exposed to automation than the middle-aged workers (except in the Philippines) (Figure 36A). At the same time, the intensity of AI exposure in EAP declines with age, as older workers tend to work less in AI-exposed occupations relative to younger and middle-aged workers in EAP. These findings could be attributed to a large proportion of older workers in EAP engaging in routine manual tasks, and a smaller share in cognitive tasks—a pattern opposite to that observed in more developed countries.

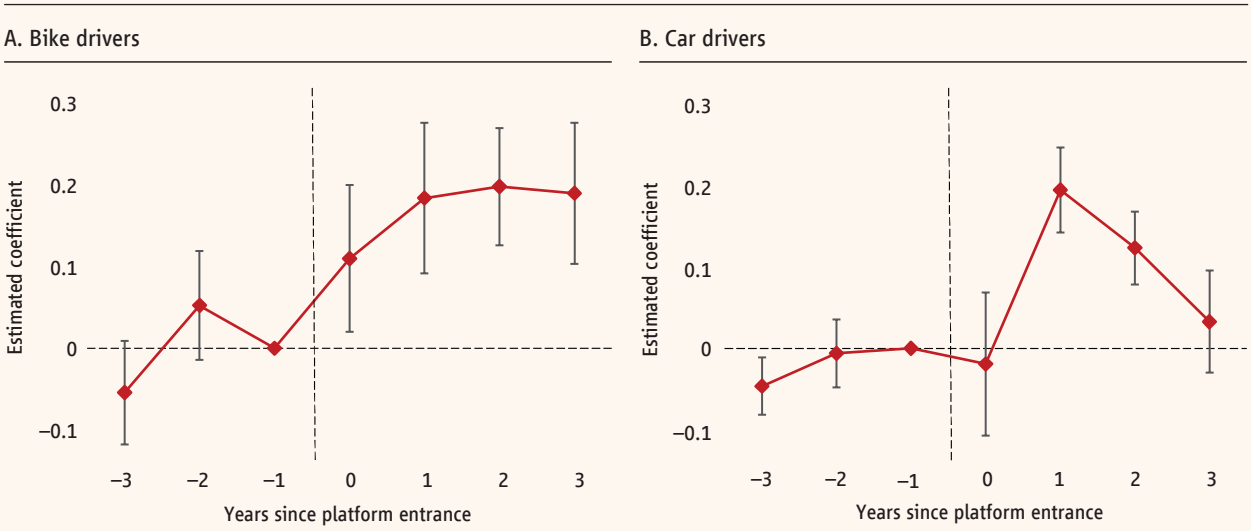
Older workers in EAP are less engaged in digital occupations and less likely to be equipped with digital devices than younger workers, and thus are less well-positioned to benefit from working with digital technologies. Across ASEAN-5 countries, the average digital-intensity score of workers also declines with age (if we exclude the youngest group of workers), which may be because older workers in the region are less digitally skilled (Figure 37A). An example from Indonesia shows that the usage of digital devices such as computers and smartphones also declines with age (again if we excluded the youngest workers) (Figure 37B). Overall, these patterns suggests that older workers in EAP are benefiting less from working with digital technologies.

Older workers in Viet Nam benefit less from robot adoption in terms of employment gain and labor productivity. Our empirical analysis for Viet Nam shows that employment gains are positive for all age groups, but weaker and less

Box 9. Income effect of ride-sharing platforms

In the last decade, the advent of ride-hailing platforms has established a new business model, offering new job opportunities and labor flexibility globally. Using the staggered introduction of leading ride-hailing platforms in Vietnamese provinces from 2014 to 2021 as a quasi-experimental setting, we investigate the effects of the arrival of digital platforms in a developing country characterized by a significant level of informality of labor. Analyzing two separate treatment groups representing distinct segments of Viet Nam's labor market, namely motorcycle and car drivers, we observe positive and substantial effects of platforms on workers' earnings. The rollout of ride-hailing apps resulted in a more durable impact on motorbike drivers, possibly due to productivity improvement in the ride-hailing system introduced to this previously highly informal sector (Figure B9.1A). In contrast, car drivers experienced a notable increase in hourly wages, but only shortly after the introduction of platform apps. This positive but short-lived impact is likely explained by the platforms' initial incentive schemes offered to attract drivers from traditional taxi companies (Figure B9.1B).

Figure B9.1. Platform entry has a positive and durable earnings effect on motorbike drivers thanks to the technology-driven productivity gain; but only a transient boost to earnings of car drivers possibly as a result of competition effect

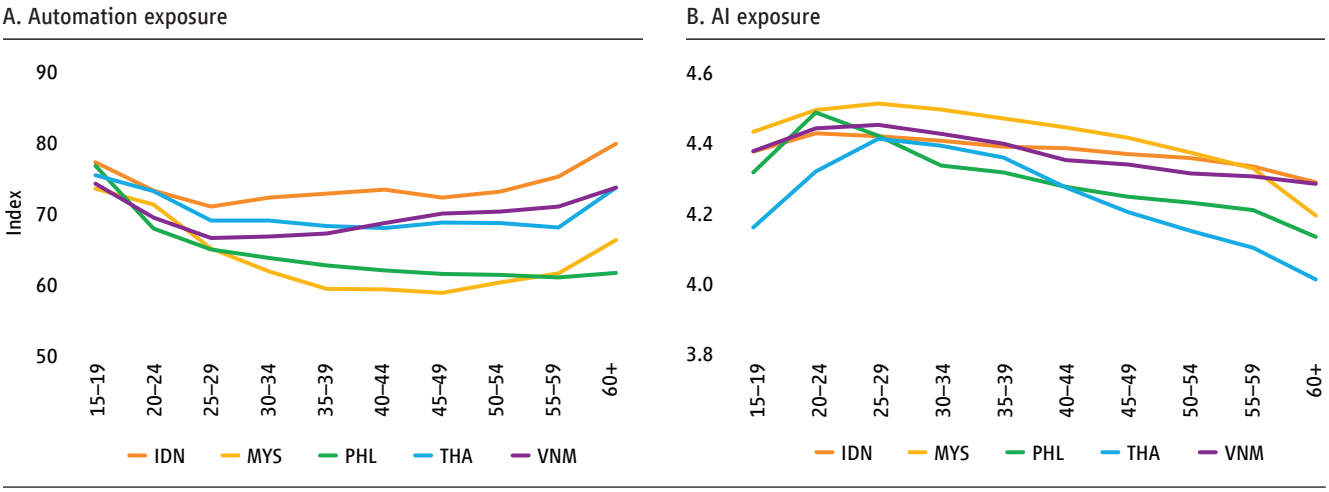


Source: Viet Nam Labor Force Surveys (2015–2021).
Note: Bars and whiskers present the estimated coefficients and 90-percent confidence intervals from a difference-in-difference regression analysis utilizing staggered ride-sharing platform rollouts across Vietnamese provinces since 2015. The outcome variable is average hourly wages for motorbike drivers (Panel A) and car drivers (Panel B). The sample is restricted to people aged 16 and above. The regression model controls for year and province fixed effects, individuals' age, gender, marital status, educational attainment, and provinces' population density, income per capita, and immigration rate. Standard errors clustered at the province level.

significantly so for older workers (Figure 38). The positive effect of robot adoption on worker's hourly wages, which is likely to reflect the impact on labor productivity, is statistically significant only for the young and middle-aged groups, and not for workers over 50 years old. This result is consistent with the fact that younger workers in Viet Nam tend to hold jobs intensive in tasks with a lower risk of automation, as shown in Figure 37A.

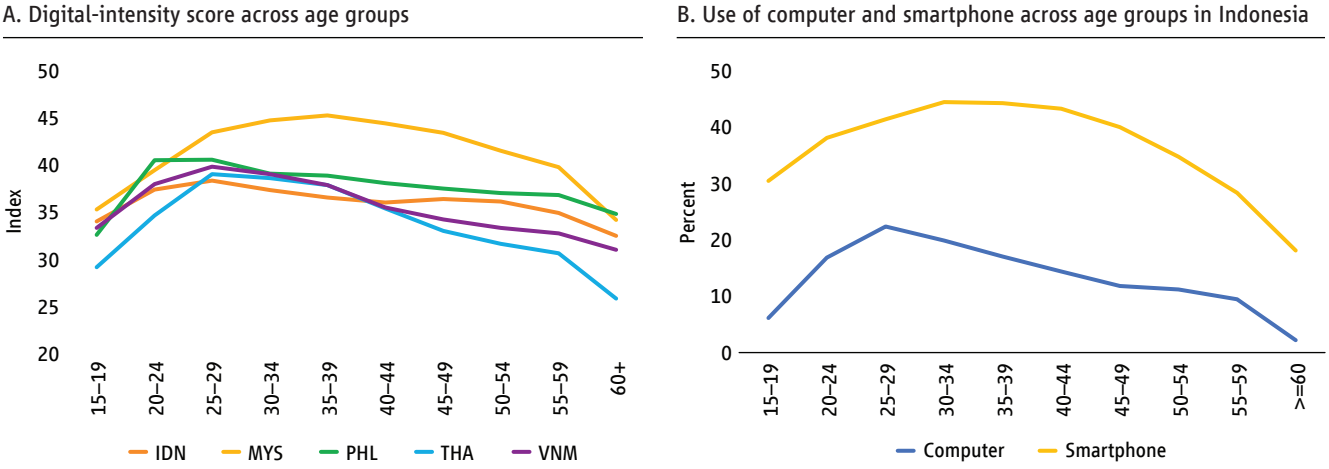
The result that older workers in Viet Nam stand to benefit less from automation also aligns with findings in other developing EAP countries. In China, robot adoption is associated with lower wages and greater employment loss

Figure 36. Older workers are more exposed to automation and less engaged in digital occupations relative to younger workers in EAP



Source: ILO, microdata, ONET25, Frey & Osborne (2017), and Felten et al (2021), Pizzenel,.et. al. (2023).
Note: Indexes are calculated by occupational composition (ISCO 2-digit level) in each age group. A. automationa exposure is based on Frey & Osborne (2017). C. AI exposure shows Complementarity-adjusted AI exposure.

Figure 37. Older workers in EAP are less engaged in digital occupations and less equipped with digital devices than younger workers



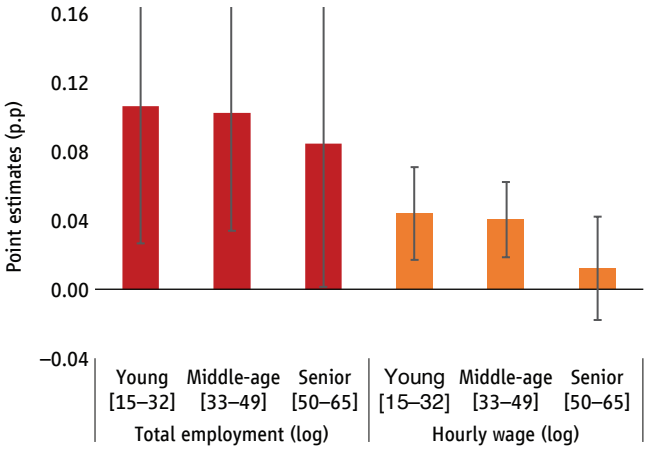
Source: ILO, microdata, ONET25, Indonesia Sakernas August 2019–2023.
Note: A. latest year statistics. B. 2023 statistics. Workers who use computer includes those who use both computer and smartphone.

among older workers, especially the lesser-skilled (Giuntella et al., 2022). Notably, these findings differ from evidence found in developed countries such as the U.S., which suggest that robot displacement effect is more pronounced among middle-aged workers, especially in manufacturing (Acemoglu and Restrepo, 2022). This difference could be attributable to the kind of tasks that older workers tend to perform in EAP, which are often performed by middle-aged workers in more developed countries: routine, manual tasks more amenable to automation. This difference could stem in part from the fact that the current cohort of older workers in EAP countries tend to be less educated than their counterparts in more developed workers. Finally, the finding that older workers in EAP tend to benefit less from automation also suggests

that robot adoption in the region could help remedy the problem of the declining work force in aging countries but could also magnify it by accelerating the exit of older workers from the work force.

Figure 38. Older workers in Viet Nam benefit less from robot adoption in terms of employment gain and labor productivity relative to younger workers

Estimated effects of robot adoption on districts' employment and wages across age groups in Viet Nam



Source: World Bank estimations, based on data from International Federation of Robotics (IFR), Viet Nam Labor Force Survey (2011–2020).
Note: 2SLS estimates of the effects of exposure to robots on local labor market outcomes in Viet Nam during 2014–2020. Exposure to robots is measured as the interaction between the 2011 employment composition by industry in each district and robot adoption by industry-year in Viet Nam, and it is instrumented with Exposure to robots (world) that uses the average robot adoption by industry-year across 54 countries. All regressions weighted by population in 2011 (baseline year) and controls for district, subregion × year fixed effects, baseline demographic characteristics of districts (log population; share in urban areas; share of migrants; shares of population with primary, secondary, and tertiary education; shares of population under ages 21–55 and older than 56; and share of females), baseline districts' industry shares (employment in primary, manufacturing, services, and the female share of manufacturing employment), and baseline districts' economic characteristics (employment rate, unemployment rate, labor informality rate, share of salaried employment, share of self-employment, female employment rate, exposure to job routinization, log average hourly wage, log average labor income, and log total labor income).

Policy

The EAP region needs to harness the productivity potential of new digital technologies while addressing the risks they pose to workers. Apart from the self-evident need to build the essential digital infrastructure, three areas deserve policy attention: equipping the workforce with the *digital, soft and technical skills* that complement the new technologies; removing *factor price distortions* that could lead to the adoption of inappropriate technologies; and expanding *social protection* to workers in the new digital informal economy.

Skills

The earlier evidence suggests that workers need skills complementary to digital technologies to be shielded from displacement and to reap the benefits of these technologies. While it is hard to predict the evolution of technologies, three broad types of skills would seem to be relevant. First, digital skills would equip people to engage with an increasingly digitized workplace, using digital devices, applications, and digital platforms. Social and emotional skills would give people a comparative advantage over machines in tasks that involve social interactions, from education to healthcare. Third, advanced technical skills would enable people to work in creating and working with these new technologies.

As countries grow, the variety and complexity of the skills they need expand, especially as they move to upper-middle-income and high-income status. All countries in the region, from Myanmar to Malaysia, require a broad base of foundational skills, through universal access to quality basic education, which can be foundation for building diversified talent. Even the relatively advanced countries in the region have significant weaknesses in reading and numeracy (Afkar et al., 2023). Furthermore, the notion of foundational skills needs now to encompass digital and socio-emotional skills which are rarely the focus of schools. For middle-income countries, like Indonesia, the Philippines and Viet Nam, to adopt and learn from existing technologies, they need an adequate supply of technically skilled workers, from mid-level technicians to engineers and managers, and mid-level and advanced digital skills (Asian Development Bank and LinkedIn 2022). As economies aspire to and reach high-income status, lie China, Malaysia and Thailand, they need a workforce with more advanced skills –including scientists and other highly skilled professionals—to become innovation-driven economies.

The development of workforce skills can be hindered by both market and government failures which penalize the underprivileged. Governments need to ensure equitable access to skills development for all sections of society, especially women, the young and elderly, and those from lower income groups,. They can remedy some of the market

failures such as credit constraints and information asymmetries, through financing, regulation or direct provision. At the same time, they must guard against policy failures, such as when political influences aggravate adverse selection and moral hazard in teacher selection and performance. The rapid, unpredictable evolution of digital technologies and require close cooperation between the public and private sectors.

Digital skills

Japan, Singapore and the Republic of Korea have implemented comprehensive digital education strategies that other countries can seek to emulate. These strategies include digital skills in the curriculum, the use of digital textbooks, online learning platforms, and coding classes. Schools are equipped with high-speed internet and digital devices - for instance, Japan's "GIGA School Program" aims to provide every student with a personal digital device and high-speed internet access. Teachers receive continuous professional development to enhance their digital pedagogic competencies. In Singapore, the "SkillsFuture for Educators" program develops teachers' digital competencies and helps them to adapt to changes in digital technologies. In EAP, the Philippines have made important reforms to address gaps in digital skills. The reforms also foster access to digital infrastructure and devices, as part of a comprehensive digital strategy. These efforts are implemented in cooperation with the private sector (Box 10). A comprehensive digital strategy inclusive of improving both digital skills and backbone digital infrastructures such as internet connection would also yield greater impacts in the Pacific Islands, where the majority of countries are not yet ready to capitalize on cutting-edge digital technologies such as robots and AI. Having reliable internet connections will open the opportunity for the island countries to provide remote labor-intensive services (e.g., call centers, basic professional services) that make the most of PICs' advantageous time-zone between Asia and the U.S., as well as the region's widespread English fluency.

Box 10. Policy responses to the emergence of AI in the Philippines

The digital economy continues to become an increasingly important source of income and job creation for the Philippines. In 2023, the digital economy accounted for a fifth of total employment. The Philippines defines the digital economy to include the e-commerce, digital media and content, digital enabling infrastructure, and government digital services.

Rapid technological advances, particularly in the areas of automation and digitalization, present both opportunities and risks. In sectors like Business Process Outsourcing (BPO), which is a key source of growth and jobs in the Philippines, AI could either augment or undermine the country's competitive edge. AI can be used to complement worker's skills and increase productivity, or it could substitute jobs that involve routine, low-skill tasks. The impact of AI will depend on how policymakers and businesses respond. The impact of AI will depend on how prepared firms, workers and public policies are to face it, making policymakers' and businesses' response crucial. As of 2023, the Philippines ranked 65 out of 174 countries in the IMF's AI preparedness index, and ranked below most of its peers in ASEAN-5. In addition, 26 percent of the country's workforce are considered high exposure, with low complementarity.

(continued)

(Box 10. continued)

Short-term responses

The government continues to support the development of the digital economy. In 2023, the Digital Workforce Competitiveness Act was passed to address gaps in digital technology and skills for the Filipino workforce (DICT, 2023). Last July, the Philippine government launched the National Artificial Intelligence Strategy Roadmap (NAISR) 2.0 and the Center for Artificial Intelligence Research (CAIR) (DTI, 2024). The NAISR 2.0 reinforces the previous roadmap issued in 2021 and upgrades national development strategies in view of recent technological advancements (DOST-PCIEERD, 2020). Meanwhile, the CAIR aims to position the Philippines as a global leader in AI-driven innovation and is set to open in September (ECCP, 2022).

The government also recognizes the potential impacts of AI on jobs and the importance of skills development. It is preparing a national jobs masterplan for generating high-quality employment with a key focus on skills development and training in line with emerging technologies (NEDA, 2024; Cruz, 2024). Meanwhile, the legislature is currently reviewing potential legislationseveral proposals on the development, responsible use, economic and social impacts of AI and howinstitutional arrangements to address such impacts onthe impact on government services, innovation, labor markets and the future of jobs (Senate of the Philippines, 2023).

The private sector acknowledges the potential disruption from AI particularly for lower-skilled workers and see upskilling as a crucial response (CIPD, 2017). The business process outsourcing industry has updated its industry roadmap and aims to leverage AI to enhance the productivity of its workers (IT-BPM, 2024; Talavera, 2024). Industry associations also developed common standards for skills development such as the Philippine Skills Framework (including for Analytics and AI) as well as partnership templates for industry-academe collaboration (IBPAP, DCIT-AAP).

Addressing longer-term challenges

Poor quality of education hinders the potential of technology to improve the productivity of Filipino workers. Reading proficiency and numeracy skills are necessary to effectively utilize AI and automation, but an estimated 91 percent of children in the Philippines at late primary age cannot understand an age-appropriate text. Weak teacher capacity impedes student learning in the country. Low salaries, poor working conditions, poor selection processes, and ineffective teacher's professional development must be addressed to improve teaching in the country.

Apart from teacher quality, curriculum reform can also play an important role in improving education outcomes. A streamlined curriculum hopes to help both teachers and students struggling with having too many subjects. The new curriculum has been decongested to focus on foundational areas such as literacy and numeracy and clearer articulation of 21st century skills. The government plans to make the implementation an iterative process, amending the program based on the experience of stakeholders. At the tertiary level, similar reforms to that include a curriculum update, training of faculty, research and development, and industry partnerships could help strengthen the readiness of Filipinos to technological change and A.

Weaknesses in the digital environment hinder digitalization and the adoption of new technologies. The Philippines lags its peers in terms of affordability, availability, and speed of internet access. Over 58 million Filipinos (52 percent of the population) are "internet poor" and find it challenging to afford a basic package of mobile internet.

(continued)

(Box 10. continued)

The government has initiated several programs to address digital infrastructure gaps. It has lifted foreign ownership restriction in services including telecommunications, made construction and sharing of mobile towers easier, and adopted the National Digital Connectivity Plan (NDCP) that aims to deploy broadband infrastructure in remote and isolated communities across the country. The World Bank is closely engaged with the government to support digital infrastructure initiatives by providing financing for policy reforms to promote competition and investment for better access and lower cost of broadband services, and for public investments in rural connectivity.[3]

Private sector initiatives: spotlight on BPOs

The Philippines' BPO industry is taking the lead in adopting AI and using it to augment worker capabilities. Around two-thirds of the BPO membersmember firms have adopted or piloted AI initiatives (, according to IBPAP (an industry association). Popular use-cases include Agent Assist that helps agents resolve queries and various types of document AI functions such as summarization and content templating. Most of these applications skew towards augmentation and decision support instead of outright automation. However, IBPAP notes there have also been failed AI implementations. Meantime, accounts of job displacement due to AI remain rareanecdotal.

Greater adoption of AI will depend on enhancing security and the necessary talent. In terms of individual adoption of AI, a recent survey by IBM and LinkedIn found an 86 percent adoption rate among Philippine knowledge workers (compared to a global average of 75 percent). The country also leads web traffic to AI-related sites per capita. However, institutional adoption is hampered by concerns on data privacy and security, and a lack of talent to support AI projects. IBPAP is focusing on upskilling academic faculty which is an often-ignored sector among such initiatives. By partnering with schools, it hopes to leverage the multiplier impact of upskilling faculty and has started dialogues with industry partners such as Google and NVIDIA.

4 Philippines Second Digital Transformation DPL (P181127) provides USD700 million in financing to support Government reforms to foster an enabling environment for greater digital technology adoption by (a) improving digital transformation of government and digital infrastructure policies, (b) expanding financial inclusion through digital finance and (c) boosting business growth in digital services. Philippines Digital Infrastructure Project (P176317) provides USD287 million to improve climate resilient, secure, and inclusive broadband connectivity

Social and emotional skills

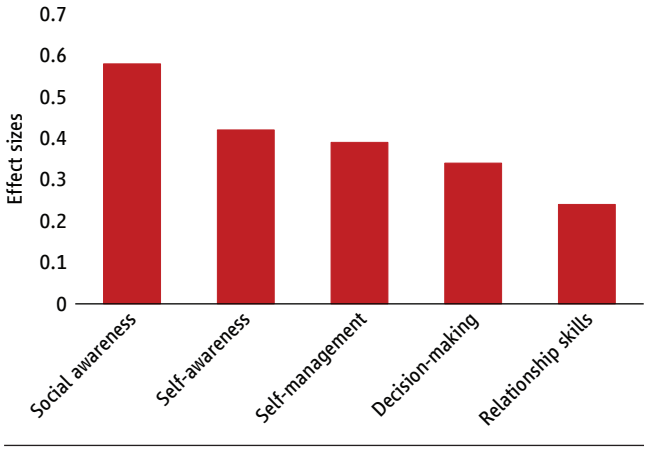
Research supports the notion that social and emotional skills are malleable and teachable through school interventions (Steponavičius, Gress-Wright and Linzarini, 2023). Multiple meta-analyses of rigorous evaluations of programs of socio-emotional learning (SEL) show improvement from preschool to secondary school and across various national contexts (CASEL, 2023; Grant et al., 2017; Jones et al., 2021). The OECD's latest review of recent studies found that not all social and emotional skills are equally teachable and that the effectiveness of SEL programs vary with the quality of implementation and context (Steponavičius, Gress-Wright and Linzarini, 2023. For instance, skills like empathy, cooperation, self-control, assertiveness, emotional control, social problem-solving and self-efficacy are the most teachable skills (Figure 39).

Various countries have implemented programs to integrate socio-emotional learning (SEL) into their basic education systems, demonstrating different approaches and impacts (Box 11). Social and emotional skills are now included in the curricula of most OECD countries and other developing economies like India and Colombia. Other

countries have implemented stand-alone programs to develop specific socio-emotional skills, which allows for rigorous evaluation of impacts. In EAP, efforts in this area are nascent. Recently, Malaysia started integrating SEL implementation in schools with a strong focus on providing teachers with training and resources to deliver SEL lessons effectively.

Figure 39. Socio-emotional skill can be developed in schools

Average of impacts from meta-analysis of SEL programs



Source: van de Sande et al. (2019).
Note: Meta-analysis covers 40 RCT and QE studies in 12 countries, ages 11–19. *Self-awareness* is the abilities to understand one's own emotions, thoughts and values and how they influence behaviour in across contexts, including recognising one's strengths, limitations and possessing well-grounded confidence and purpose. *Social awareness* is the abilities to understand the perspectives of and empathize with others, including those from diverse backgrounds, cultures, & contexts. *Self-management* is the abilities to manage one's emotions, thoughts, and behaviours effectively in different situations and to achieve goals and aspirations. *Relationship skills* is the abilities to establish and maintain healthy and supportive relationships and to effectively navigate settings with diverse individuals and groups. *Decision-making* is the abilities to make caring and constructive choices about personal behaviour and social interactions across diverse situations.

Advanced technical skills

To reap the benefits of new technologies, EAP countries need a larger pool of talent with diversified and more advanced technical skills. Research shows that higher-level technical skills, usually acquired through STEM education, are critical enablers of technology diffusion and subsequent innovations (World Bank 2024). These skills are thus essential for invigorating productivity growth that will sustain economic growth, job creation, and gains in labor incomes. Workers need to be equipped with these skills to benefit from working with these technologies.

However, the supply of graduates in STEM fields is low in many EAP countries. As shown in Figure 40, except in Malaysia, the share of STEM graduates in all tertiary graduates is much smaller than in countries like the Republic of Korea and Singapore. This combined with a low fraction of tertiary educated workers (under 30 percent of the labor force) results in a short supply of talent to reap the productivity and labor market benefits of new technologies.

There is evidence that engineers play a crucial role in driving technology adoption and innovations that spur productivity growth. Countries that have successfully increased their engineering workforce are better equipped to adopt have reaped economic and technological benefits. Maloney and Cacedo (2022) use long-term historical data in the US to show that counties with a higher relative supply of engineers in 1880 experienced subsequent faster technology adoption (including ICT) and skills-based and knowledge-intensive economic activities nearly a century later (Figure 41). They also show that large differences in engineer densities across Latin American countries with similar income in 1900 predict their divergent growth trajectories over the next century, and hence the growth of jobs and wages.

Countries like the Republic of Korea, China, and India, provide valuable examples of how to boost STEM technical education and the engineering workforce (Box 12). These countries showcase how policy reforms, targeted educational policies, and strong government-industry collaboration can work more effectively. The success of these countries in building the technical skills of their workforce highlights three key principles: (i) building a strong foundation of literacy and numeracy in basic education enable more advanced skills acquisition later on; (ii) promoting industry participation in curriculum design and providing work-based learning opportunities is key to building skills the market needs; (iii) governments need to foster the creation of opportunity and capacities in tandem: a ready supply of technical skills in digital fields helped to spur the growth of the technology-intensive sectors that expanded opportunities for skill-based growth in these economies.

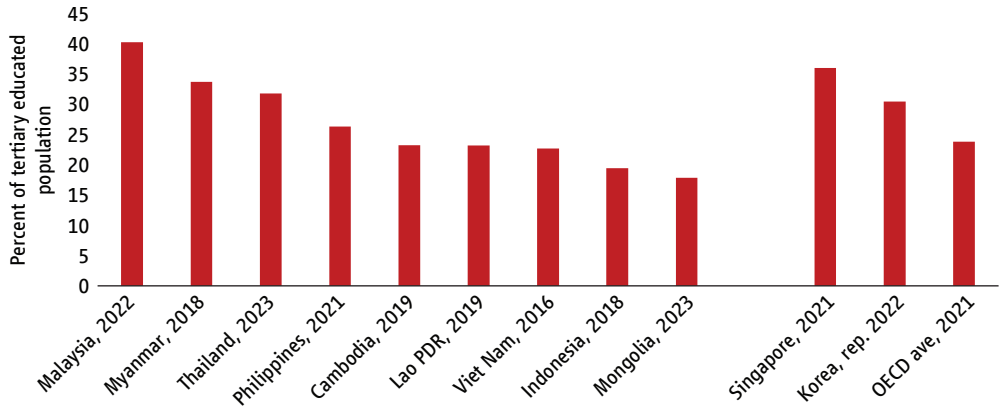
Box 11. Fostering socio-emotional skills of children

Countries like Colombia and the Republic of Korea have implemented comprehensive programs to integrate SEL into their regular curricula and teaching in basic education. Colombia has integrated into the basic education curriculum and teachers are trained to deliver structured lessons and activities that encourage students to develop empathy, positive social interactions and emotional regulation. The Republic of Korea has integrated SEL and creativity as cross-curricular themes in all subjects. For instance, socio-emotional skills are embedded in the teaching of mathematics and science through activities that encourage initiative-taking, decision-making, and collaboration. This integrated approach aims to develop socio-emotional skills alongside cognitive skills.

Indonesia implemented a large-scale intervention to develop a Growth Mindset –beliefs that intelligence and other socio-emotional qualities are not fixed but develop with effort – across 2,404 public junior secondary schools and 160,000 students. The intervention included structured lessons delivered in schools by teachers. A rigorous evaluation found positive impacts on growth mindset and test scores on the national standardized exam of mathematics, as well as gains in Science and English language in schools with a higher quality of implementation of the program (World Bank, 2019). The intervention was very cost-effective at an average cost of 25 cents of US dollar per student.

In Turkey, a pedagogical intervention was implemented in 134 primary schools, covering about 11,000 students and 425 teachers. It aimed at improving learning in elementary school children by fostering their curiosity. The intervention involved creating a sense of information deprivation and quantifying children's urge to acquire information and their retention ability. A rigorous evaluation found significant positive impacts on curiosity, knowledge retention, and science test scores, which persisted into middle school years (Alan and Mumcu 2024). Also in Turkey and Macedonia, two separate at-scale interventions (in the latter case nation-wide), were shown to develop socio-emotional skills related to Grit – the ability to persevere and sustain interests over time-, and improve academic achievement among elementary and middle-school children, especially the disadvantaged (Alan, Boneva, and Ertac 2019; Santos et al 2024).

Figure 40. Supply of STEM graduates is limited in EAP



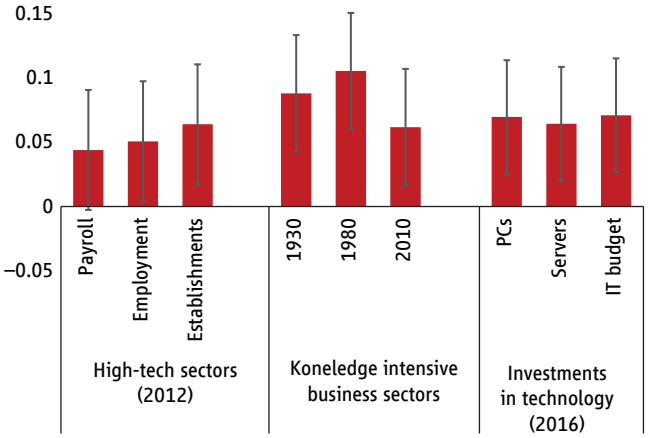
Source: UIS Statistics.

As argued in World Bank (2024), it is essential that skills development goes hand in hand with policy reforms that create job opportunities and foster a virtuous cycle between capacities and opportunities. The experiences of countries like the Republic of Korea, Malaysia, and China illustrate how expanding the supply of technical skills can enable a transition to higher value-added manufacturing and services when countries create an environment that sustains strong demand for skilled workers.

In several EAP countries, the expansion of tertiary enrollment has been associated with the supply of college-educated workers outpacing the demand. Some countries have also seen a decline in college premia and higher unemployment rates among college graduates, for example in China, Indonesia, and Malaysia. The findings in this report indicate that digital technologies have a pro-young and skill-bias. Thus, they may help narrow the employment gap between youth and older workers, provided younger cohorts are equipped with skills complementary to these technologies.

Figure 41. The supply of engineers in the US is positively correlated with long-term technology adoption and innovation including in the digital sector

Correlation coefficient with engineering density



Source: Authors calculations based on Maloney and Cacedo (2022).
Note: Regression results including engineers per 100,000 male workers at the county level as independent variable and other controls.

Box 12. Building advanced technical skills to harness digital technologies

Korea, Rep. has made significant strides in fostering STEM education geared to engineering and digital technologies. The country has promoted industry participation in skills development by involving leading companies in curriculum design and providing work-based learning opportunities. The Meister high schools address critical technical skill needs in priority sectors, including ICT, semiconductor manufacturing, and biotechnology. These schools offer a customized vocational training curriculum developed in collaboration with industry to ensure alignment with technology evolution and labor market demand. Meister schools have partnered successfully with companies like Samsung Electronics and Hyundai Motor Company to secure placement of graduates, support for curriculum development, and mentorship programs. For example, a survey of graduates from the Busan Meister Technical High School found that 72 percent felt adequately prepared to find a job and 78 percent took additional training beyond the regular program.

China and India have achieved a remarkable expansion in STEM tertiary education—now producing the largest pool of engineers globally—through substantial investments in higher education. In China, the prioritization of STEM education has led to a rapid increase in university enrollments in engineering programs and the establishment of numerous research and development centers by multinational corporations. China's surge in engineering graduates has fueled the country's growth in medium- and high-technology industries, such as electronics, green technologies and telecommunications. In India the expansion is driven by government initiatives and close private sector involvement, and has supported the booming software and business process outsourcing services.

New technologies have proven effective in teaching basic skills (Afkar et al., 2023) and show promise for developing technical and socio-emotional skills. Computer-assisted learning (CAL) can address gaps in adult numeracy and literacy skills necessary for acquiring technical skills (World Bank, 2021). AI-powered Virtual Reality (VR) is increasingly used in tertiary education and technical training to simulate real-world scenarios and provide immersive, hands-on interactive experiences. Emerging evidence demonstrates its effectiveness in developing technical competencies and socio-emotional skills such as collaboration and problem-solving in STEM and related technical fields (Angel-Urdinola et al., 2021). VR-aided training offers a more cost-effective alternative for delivering hands-on learning experiences in programs that typically require costly lab infrastructure. Additionally, online learning platforms expand training and education resources, enabling workers to continuously update their skills to meet the evolving demands of the digital economy.

Facilitating labor and capital mobility

Labor and capital mobility is crucial for the resource reallocation that accompanies technological advancements. Workers, including those displaced by automation, would ideally move to firms, locations, and jobs where their skills can be more productively utilized. At the same time, high labor mobility fosters economic agglomeration, helping firms secure the necessary skills to adopt new technologies and grow to their optimal scale. Capital also needs to relocate to sectors, firms and locations where it can earn the highest returns. The agglomeration of firms and workers can enhance the quality of labor market matches, boosting productivity and job creation opportunities.

Impediments to capital mobility in EAP countries have been analyzed in our previous Economic Updates (e.g. World Bank 2024). These include restrictions on firm entry and exit in the form of burdensome licensing requirements and bankruptcy procedures. Also relevant are policies that lock resources in inefficient firms, such as support for loss-making state-owned enterprises and lending directed towards zombie firms. Reforms to enhance the contestability of markets and ensure a level-playing field would ensure that capital is allocated efficiently and can gravitate to the most innovative firms and sectors.

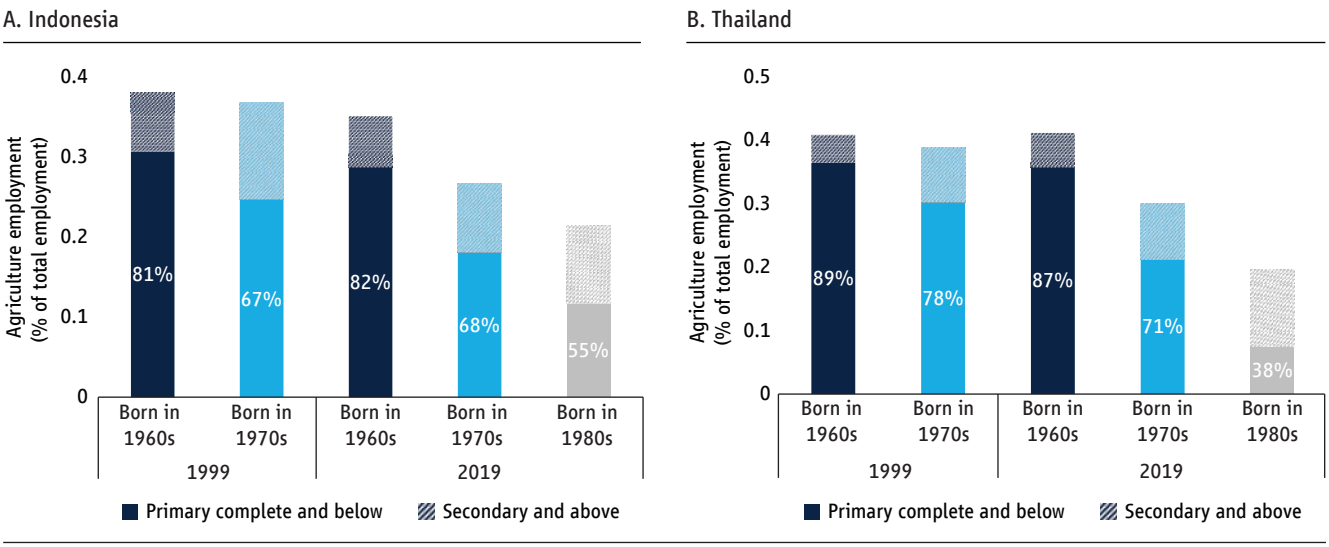
Labor mobility can be impeded by both market failures and policy distortions. The former include poor information about job opportunities, underdeveloped housing markets, inadequate connectivity and basic services in lagging areas; the latter include rigid labor market institutions and inadequate portability of benefits (OECD, 2018; Nayyar and Kim, 2018; Bryan and Morten, 2018; Deininger and Goyal, 2024; Lagakos et al. 2018). These frictions hinder worker reallocation, negatively impacting productivity, employment, and earnings (Donovan and Schoellman, 2023).

Evidence suggests that labor market frictions are significant in EAP countries. In China, the hukou system, which restricts spatial movement by regulating access to publicly financed services in urban areas for migrants, has hindered efficient labor relocation and negatively impacted labor market outcomes (Ngai et al., 2019; Tombe and Zhu, 2019). In Viet Nam, the household registration system (ho khau) that regulates access to housing and public social services has curtailed rural-urban migration, trapping many farmers in low-productivity agricultural jobs (Liu and Dang 2019).

These barriers to labor mobility can trap entire cohorts of workers in low-productivity employment. In Indonesia and Thailand, for example, the share of the population born in the 1960s that work in agriculture barely changed between 1999 and 2019 (or even increased slightly in Thailand) (Figure 42). Around 30–35 percent of this cohort still work in agriculture. In contrast, the share of agricultural employment has fallen among youngest cohorts. In fact, most of the decline in the share of agricultural employment share over the last two decades come from cohorts born in the 1980s entering employment in manufacturing and services. While an important part of this shift reflects improvements in education, still an important fraction of the more educated in younger cohorts still remain employed in agriculture. A recent study for Indonesia shows

that even accounting for improvement in the skills of the population, reducing other barriers to internal mobility could lead to productivity and labor income gains of around 20 percent (Bryan and Morten, 2019).

Figure 42. Barriers to labor mobility can trap generations in low-productivity employment (share of workers employed in Agriculture by birth cohort, 1999–2019)



Source: World Bank staff estimates using data from National Labor Force Surveys, extending analysis from World Bank (2024).
Note: The Figure shows the percentage of agricultural employment in total employment by birth cohorts in 1999 (bars on the left) and 2019 (bars on the right). Sample includes wage employees, self-employed, employers and unpaid employees in Indonesia and Thailand.

Policy reforms that remove these and other barriers to labor mobility can facilitate better job transitions during technological upgrading (Basso, D'Amuri, and Peri 2019). Recent reforms to the hukou system in China and the *ho khau* system in Viet Nam have eased residence requirements and improved worker mobility, especially to booming areas with more technology-intensive and export-oriented firms, although migrants still face restricted access to basic services (World Bank 2014, 2019; World Bank and Viet Nam Academy of Social Sciences 2016).

Reforming labor market regulations that increase labor costs and restrict occupational mobility can help harness the benefits of technological change. In Europe, the adoption of automation technologies is associated with better employment outcomes in countries with low to modest labor costs, mainly due to lower labor displacement and, to a lesser extent, higher labor reinstatement (Bachmann et al. 2024). In the US, high labor mobility, stemming from more flexible labor and occupational regulations, has helped realize productivity gains from automation and facilitated the relocation of displaced workers to other jobs (Dvorkin and Monge-Naranjo, 2019).

Targeted active labor market policies can also smooth the transition of workers displaced by new technologies to other jobs. Emerging evidence from evaluations of training programs targeting automation-displaced workers suggests they can be effective. In Denmark, retraining subsidies mitigated the adverse employment and income effects of automation (Humlum 2020). A training program in Austria was also effective in helping workers relocate to new jobs, especially workers who previously held more routine-intensive jobs (Schmidpeter and Winter-Ebmer, 2021). These programs can be most effective by equipping displaced workers with skills required in non-routine work and complementary to new technologies, including basic digital skills and socio-emotional skills such as communication and collaboration (Bürgisser, 2023).

Furthermore, the agglomeration economies resulting from labor and capital moving to locations with a higher concentration of technology-intensive industries can generate spillovers that benefit workers in other sectors. The higher wages of more skilled jobs in technology-intensive industries can increase demand for local goods and services, creating additional demand for workers in services and other sectors. This multiplier effect means that each new high-tech job in cities with dense innovation clusters creates five additional jobs in the local service economy, both in skilled occupations (lawyers, architects, and nurses) and less skilled ones (waiters, hairdressers, handymen) (Moretti, 2012). Barriers to labor mobility reduce the elasticity of labor supply and lead to smaller job multipliers (Bartik and Sotherland 2019).

Finally, the evidence in this report shows that digital technologies can help overcome barriers in accessimprove the productivity and earnings of workers who cannot easily move physically to employmentbetter opportunities. In addition to gig economy apps, digital job intermediation platforms like online job boards and freelance marketplaces have expanded access to job opportunities for workers, including women and youth. Platforms like Upwork and Freelancer have enabled skilled workers in developing countries to offer their services in a global labor market. These platforms provide flexible work arrangements that allow individuals to balance work with other personal and family responsibilities, such as caregiving or education. Evidence shows that workers using these platforms can earn significantly more than they would earn otherwise in the local economies, including women who achieve greater financial independence (Kuek et al., 2015; World Bank, 2019). Digital technologies can also help improve the productivity and earnings of small farmers trapped in low-productivity agriculture (Box 13). Rigorous evaluations show that disseminating information on prices and effective harvesting practices through mobile phones led to a 4 percent increase in yields and a 22 percent increase in the adoption of effective inputs in sub-Saharan African countries and India (Fabregas et al., 2019).

Box 13. Using Digital Technologies to improve productivity of self-employed smallholder farmers

Agricultural employment in the EAP region includes many smallholder farmers. Small farms are often poorly integrated into markets to sell their products and lack information on effective harvesting techniques and inputs. Traditional agricultural extension services have not proven cost-effective at scale to provide information and support to improve the agricultural practices of smallholder farmers.

The productivity of and the returns to the self-employed farmer are being enhanced by new digital technologies. Mobile technology is now being used regularly to provide smallholder farmers with timely, relevant, and actionable information at a lower cost than traditional agricultural extension services. Research in Bangladesh, China, India, and Viet Nam found that 80 percent of farmers regularly used mobile phones to connect with agents and traders to estimate market demand and prices (Reardon et al., 2012). Organizations such as Digital Green, the Grameen Foundation, ReutersMarket Light, and Technoserve are using digital tools (like voice, text, videos, and the internet) to provide farmers with such information and support in South Asia, Latin America, and Sub-Saharan Africa (Nakasone et al., 2014). Similarly, governments are partnering with mobile operators to use phones to manage the distribution of improved seeds and subsidized fertilizers in remote areas and to coordinate and relay information on transport and logistics (van Rensburg, 2004), as exemplified by Nigeria's large-scale e-vouchers initiative and Zambia's SMS-based service that provides information on arrival and delivery times of transporters.

(continued)

(Box 13. continued)

Evidence shows positive impacts of the use of mobile technology to improve the productivity and earnings of small farmers. For instance, Jensen's (2007) study of sardine fishermen and wholesalers in Kerala, India, revealed that such mobile phone use significantly reduced product price discrepancies and waste, thereby improving earnings. Similar impacts have been found for other commodities such as cereals and cash crops using different communication platforms, including Esoko in Ghana (Nyarko et al. 2013), e-choupals in India (Goyal, 2010), telecenters in Peru (Beuermann et al., 2012), grain traders in Niger (Aker, 2010) and farmers in the Philippines (Labonne and Chase, 2009).

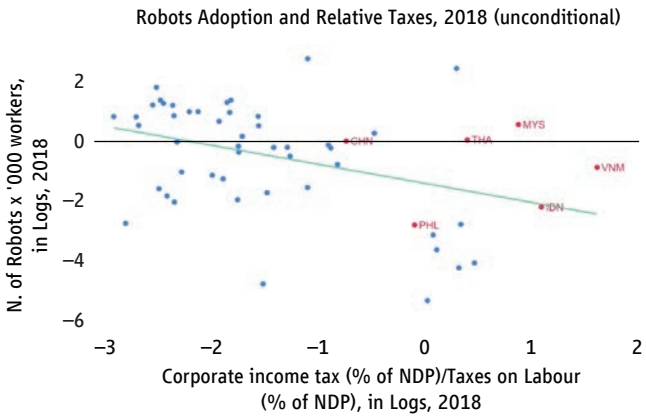
Removing factor price distortions

Taxation policies and subsidies are regularly used to stimulate private investment and innovation. They can alter the effective cost of capital and labor, thereby affecting choices related to factor use, inputs, technology, and capital investments. If capital and labor taxes are set optimally, firms' decisions on technology adoption are socially optimal, and policies can then focus on supporting those who lose out through transfers or skills training. However, suboptimal taxes and subsidies lead to distorted firm decisions and potentially suboptimal technology adoption.

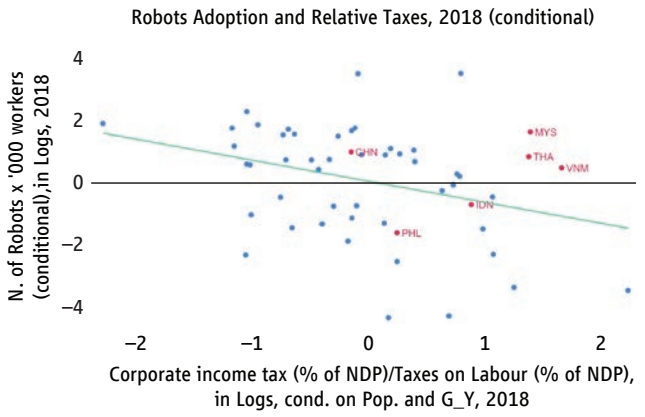
Figure 43 shows the ratio of taxes collected from capital and labor and the stock of industrial robots (per thousand workers) in 2018 for several developed and developing economies. There is a negative correlation between the two measures, even after controlling for country GDP (to proxy for domestic market size) and the share of government expenditures in GDP (to proxy for provision of global public goods). This negative association suggests that countries where taxes favor capital relative to labor experience greater adoption of automation technologies. The caveat to this analysis is that taxes on capital -which include corporate income taxes - are not a close proxy for the taxation of robots. Nevertheless, Figure 43 provides suggestive evidence that tax systems can in fact shape the extent of technology adoption. EAP countries ideally need to avoid policy distortions that favor suboptimal excess adoption of labor-saving technologies. A first step would be to examine current tax and subsidy schemes to remove any provisions favoring technologies that displace labor.

Figure 43. Higher taxation of capital relative to labor is associated with lower robot adoption

A. Unconditional correlation



B. Conditional correlation



Source: World Bank staff estimates using data from Bachas et al (2022) and IFFR data 2024.
Note: The relative tax rate is computed as the ratio of corporate income taxes and labor taxes collected in each country. The line corresponds to a regression fit, unconditionally (LHS) and controlling for total population (proxy for domestic market size) and the share of government expenditures in GDP (proxying provision of global public goods).

Empirical evidence from advanced economies shows that inadequacies in the tax system can lead firms to adopt automation technologies beyond the socially optimal. Acemoglu, Manera, and Restrepo (2020) showed how the US tax system has evolved to favor "excessive automation" and suboptimally lower employment. Generous exemptions and allowances (e.g, for depreciation) lead to higher effective tax rates on labor than on capital complementary to automation technologies, such as software and computer equipment. There is evidence that the tax systems of other advanced economies also favor investments in labor-displacing technologies (Brollo et al 2024). Removing these distortions would bring the adoption of automation technologies closer to what is socially optimal and raise employment levels.

Furthermore, countries like China could play a role in steering technological change towards more labor-augmenting technologies. The history of technology development, including recent green technologies, offers examples of how public policy and economic incentives can steer innovation to achieve more socially optimal outcomes (Mazzucato, 2011; Hémous and Olsen, 2021). Similarly, countries can direct funds into research and development to steer innovation away from pure labor-substituting technologies (Acemoglu et al. 2020; Rodrik and Stantcheva 2021; Autor, 2024).

Expanding social protection for the new informal

The need to develop schemes to offer social protection for workers outside of regular social insurance systems has become more pressing given the growing prevalence of gig work. Lessons can be drawn from several country experiences on the design of social insurance schemes for gig workers (Box 14). These schemes range from the public (in Indian and Colombia), public-private partnerships (in Malaysia), and purely private initiatives (in Denmark). The interventions range from remedying informational asymmetries by informing workers about the existence and benefits of schemes (as in India), financial incentives (as in Colombia and Malaysia) and behavioral nudges in each case.

A study for Malaysia finds that self-employed workers are willing to accept a slight reduction in their income in exchange for regular contributions to social insurance schemes such as unemployment insurance and pensions (Ghorpade et al., 2023). As shown in Figure 44, their findings underscore the importance of designing social insurance programs that align with the financial realities and preferences of self-employed workers. By incorporating behavioral nudges, such as default enrollment options and regular reminders, countries can enhance the uptake of social insurance schemes among its self-employed population.

Box 14. Innovative approaches to foster social insurance for gig and self-employed workers

India illustrates how national platforms can be leveraged to facilitate the take-up of social insurance for informal workers. The government uses the e-Shram portal, comprising a comprehensive national database for self-employed and informal workers, and behavioral nudges to encourage workers to register and participate in social insurance schemes. For example, the platform sends regular reminders and provides easy-to-understand information about the benefits of enrolling in social insurance. By making the process simple and accessible, the e-Shram portal has increased the visibility and participation of informal workers in social insurance programs.

(continued)

(Box 14. continued)

Colombia illustrates the rollout at-scale of voluntary public pension schemes targeted to low-income informal workers and those in the gig economy. Colombia offers a 20% subsidy on an individual's accumulated contributions to incentivize workers earning less than the minimum wage to participate. A SMS-based behavioral nudge pilot with affiliates of this scheme increased savings of both non-savers and already active savers (Azuara et al., 2021). After 15 months, affiliates who were not saving before the intervention saved 14% or 12.4% more than the control group depending on whether they received the SMS for 10 or 15 months.

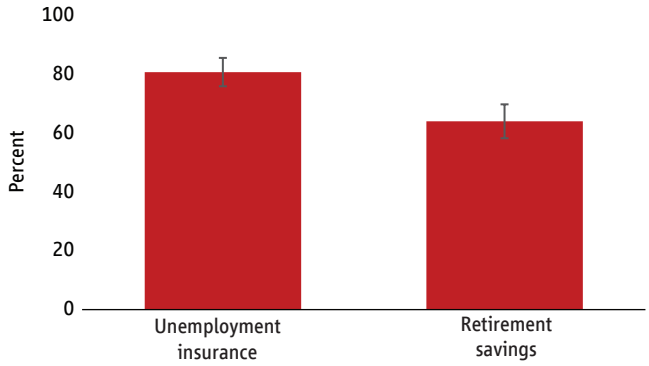
Malaysia illustrate effective government-industry collaboration to extend social insurance to gig workers. The Government worked with Grab, a major ride-hailing platform, to provide social insurance to gig workers. The i-Saraan program allows self-employed individuals, including gig workers, to contribute to a retirement savings scheme. Grab incentivizes its drivers by offering an additional 5 percent matching contribution for those who register with i-Saraan. This partnership leverages the digital communication channels of the Grab platform to send reminders and nudges to drivers, encouraging them to save for retirement. The approach has increased participation rates among gig workers, demonstrating the potential of behavioral nudges when delivered with digital platforms.

Denmark offers another example of how industry can lead the way to extend social insurance to gig workers. Hilfr, a platform offering house cleaning services, has leveraged its digital platform to create a tiered system for its workers. Those who work long enough on the platform are awarded the status of employees, granting them access to benefits such as pensions and paid leave. This provides a pathway for gig workers to receive the social protections typically reserved for traditional employees. This approach highlights the potential for private industry to leverage platforms themselves to incentivize social insurance coverage for gig workers.

Source: Datta, Chen et al 2023.

Figure 44. Gig workers are willing to pay for social insurance

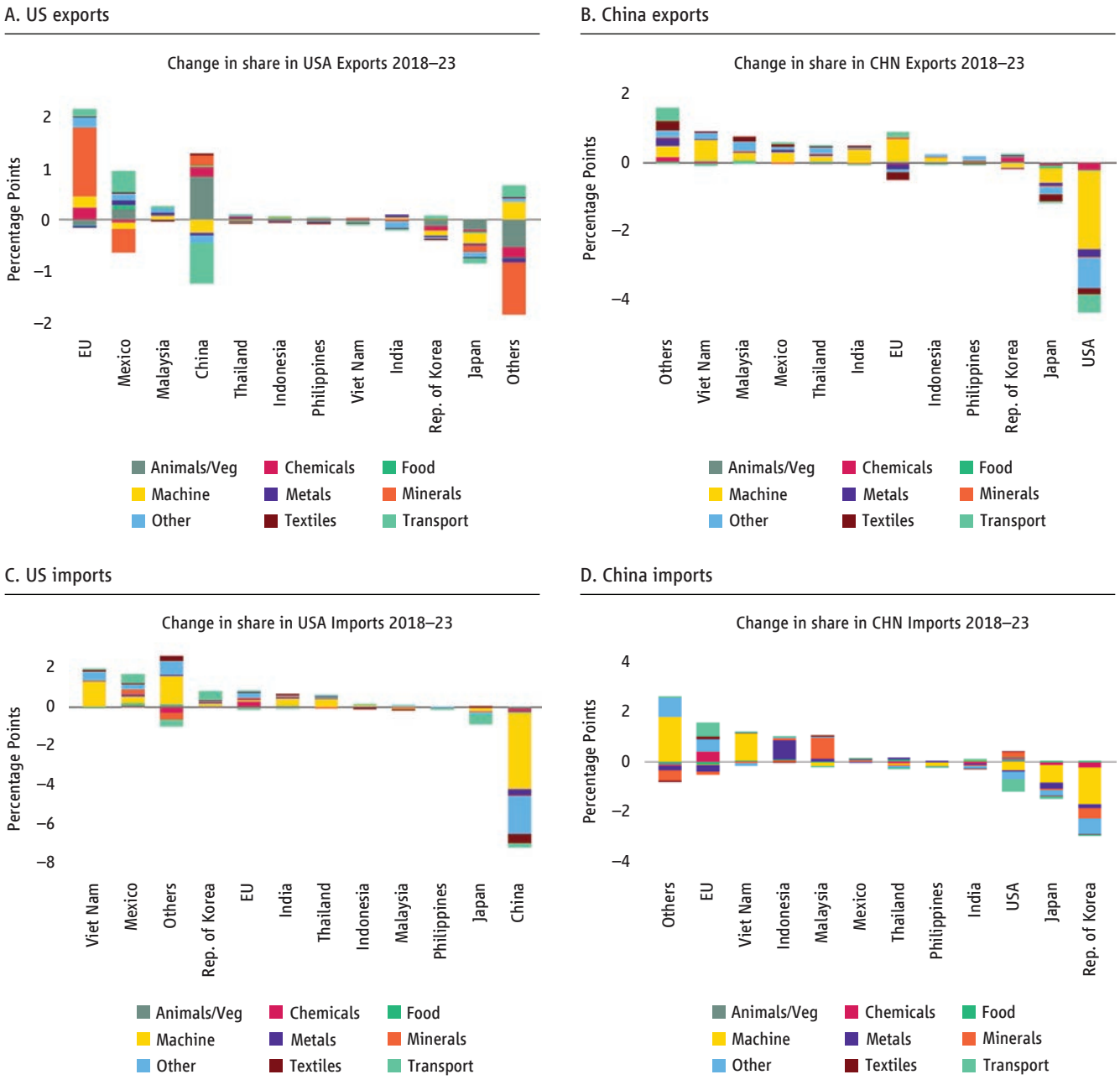
Likelihood of choosing the social insurance package compared to the base package (Malaysia)



Source: Author's illustration based on Ghorpade, et. al. 2024.
Note: Figure shows coefficient estimate from a discrete choice experiment in Malaysia, where a choice of interview answers is randomly allocated. Samples include 1038 gig workers. "Unemployment insurance" shows likelihood of workers choosing "Payment of RM 800 per month for 6 months, 0.5% lower income" compared to "no unemployment insurance and earnings equal to current income". "Retirement savings" shows likelihood of workers choosing "Monthly pension upon retirement based on contribution, 5% lower income" compared to "standard/current EPF pensions coverage features and earnings equal to current income". Whiskers show 95% confidence intervals.

Appendix

Figure A1. US and China decreased their reciprocal shares of imports and exports. China's share of exports to Mexico, Viet Nam, Thailand and Malaysia increased, and so did the share of imports of the US from those countries

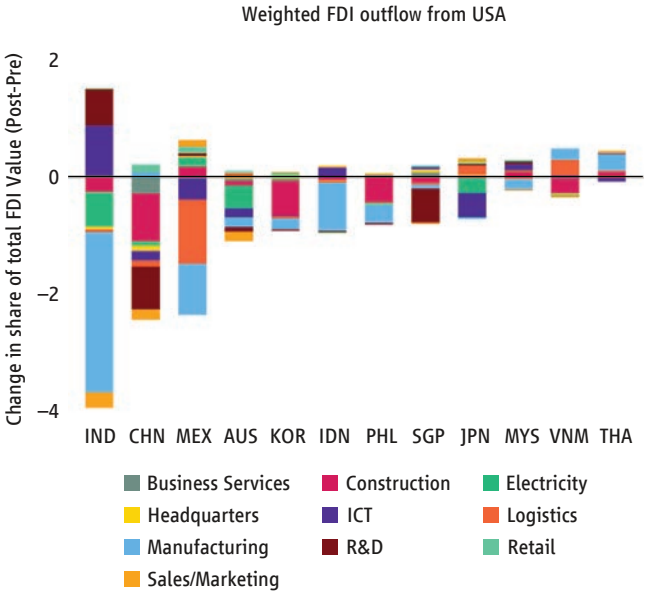


Source: World Bank staff illustration using UN-COMTRADE data.
Note: Panels A and B: The bars show the change in share of a country in US/China's total exports from 2018–2023. For instance, the share of US in Chinese exports has fallen by over 4 percentage points from 2018–2023. Panels C and D: The bars show the change in share of a country in US/China's total imports from 2018–2023. For instance, the share of China in US imports has fallen by around 8 percentage points from 2018–2023.

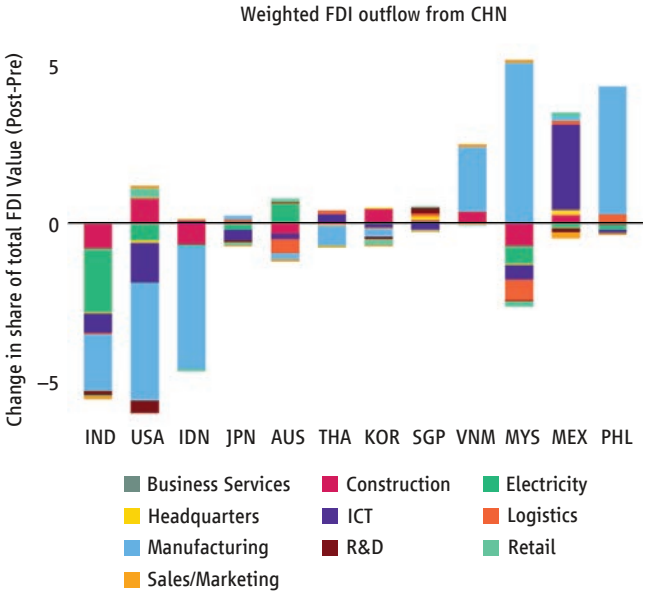
What follows repeat the analysis reported in Figures 29 and 30 but using the estimated values of investments as opposed to the number of announcements. Some relevant differences stem from the existence of sectors (such as electricity) where a small number of investments can represent large figures in terms of invested dollars. The main results of the analysis presented in the text are preserved. However, some differences are also noticeable. For instance, the share of Mexico in US outward investment is declining using values and increasing using numbers.

Figure A2. US and China decreased their reciprocal share of FDI in manufacturing and R&D. China increased its share of FDI to Mexico and Viet Nam.

A. US investment outflows

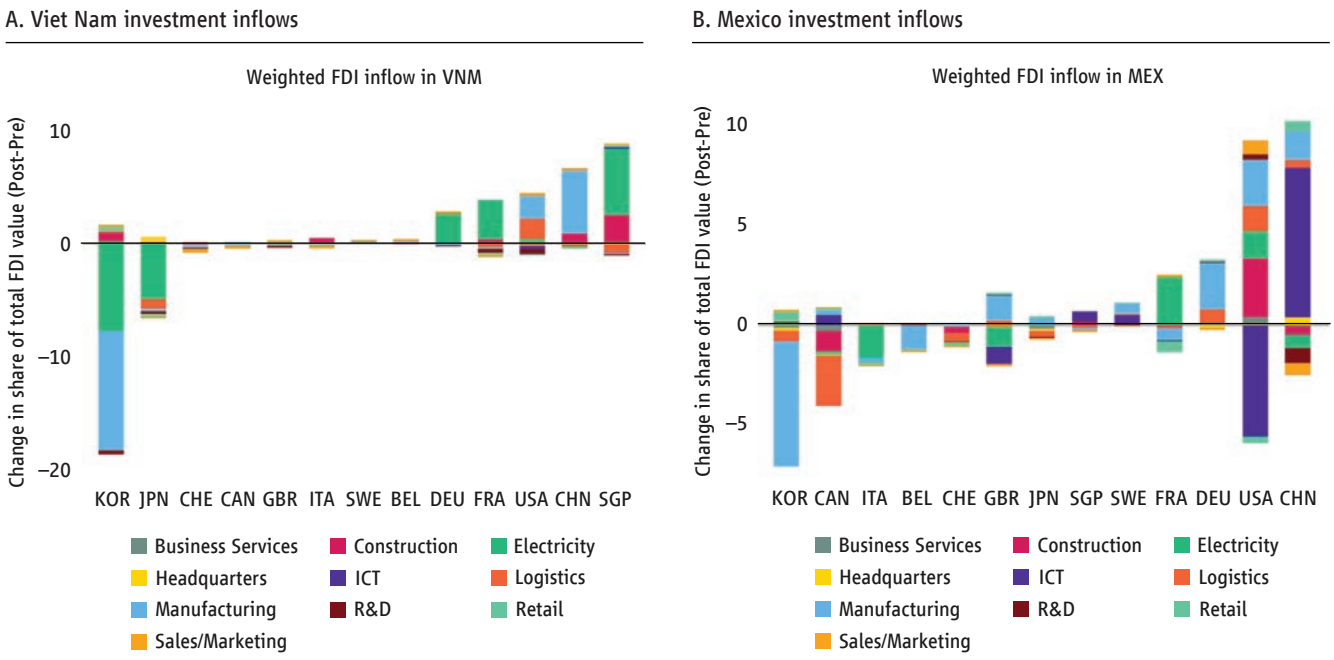


B. China investment outflows



Source: World Bank staff illustration using data from fdiMarket
Note: Panel A, B: The bars show the change in share of a country in US/China's total estimated investment values from announcements of FDI projects abroad, pre and post US-China trade war. Pre = May 2014–May-2018; Post = June 2018–June 2022.

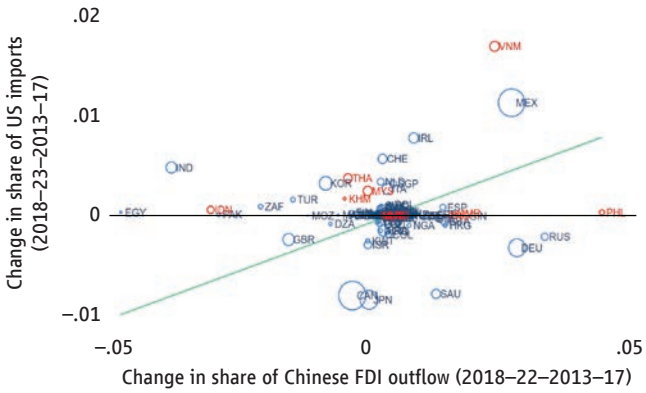
Figure A3. Viet Nam and Mexico emerged as "connector" countries, especially in the manufacturing sector



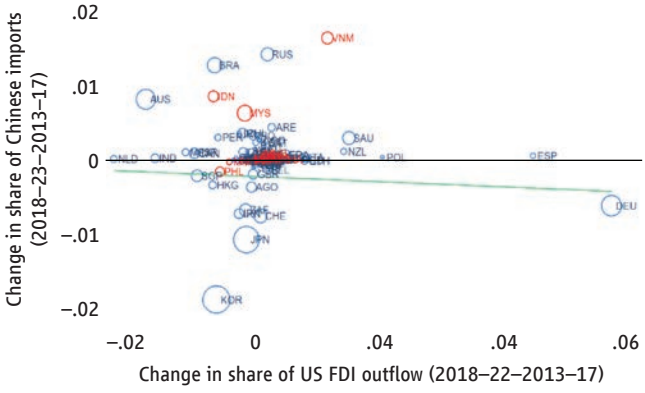
Source: World Bank staff illustration using data from fdiMarket.
Note: The bars show the change in share of a country total estimated investment values from announcements of FDI projects in Viet Nam, Mexico, pre and post US-China trade war. Pre = May 2014–May-2018; Post = June 2018–June 2022.

Figure A4. A surprising asymmetry: an increase in the share of Chinese (US) FDI outflows to a country is positively (weakly negatively) correlated to increase in its share of US (China) imports. Less surprisingly, an increase in the share of Chinese (US) FDI outflows to a country is positively correlated to increase in its share of Chinese (US) imports

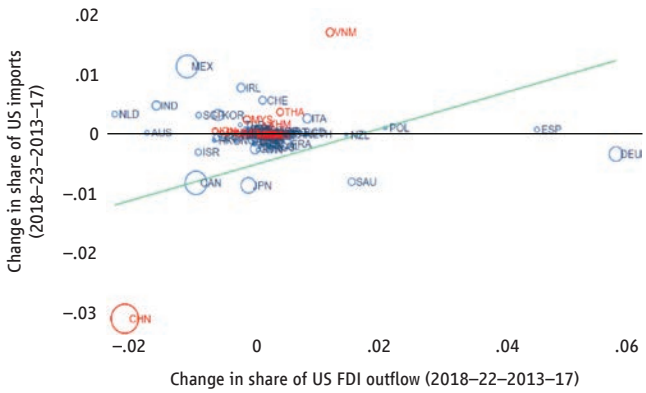
A. Δ share in US imports vs Δ share in Chinese FDI



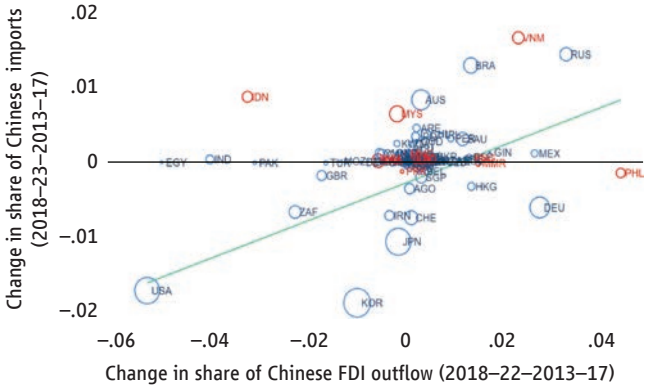
B. Δ share in Chinese imports vs Δ share in US FDI



C. Δ share in US imports vs Δ share in US FDI



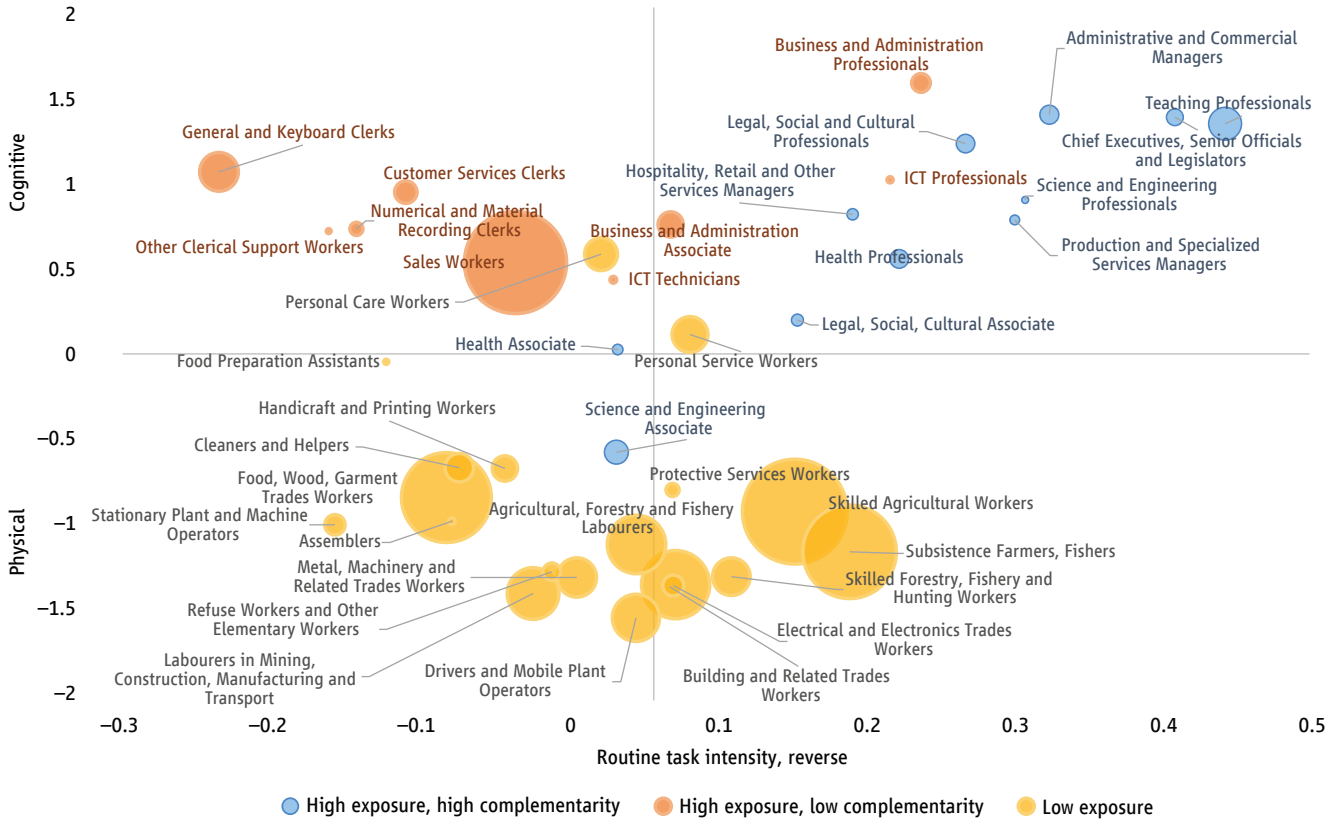
D. Δ share in Chinese imports vs Δ share in Chinese FDI



Source: World Bank staff illustration using data from fdiMarket and UN-COMTRADE.
Note: Relationship between the change in a country's share in Chinese/US FDI outflows, measured as total estimated investments abroad, and its change in the share of US/Chinese imports. The fitted line is the linear fit from a weighted regressions with total imports in 2013-17 as weights.

Figure A5. EAP country-specific task intensity and AI exposure

A. Cambodia



(*continued*)

Figure A5. Task intensity and AI exposure (*Continued*)

B. Indonesia

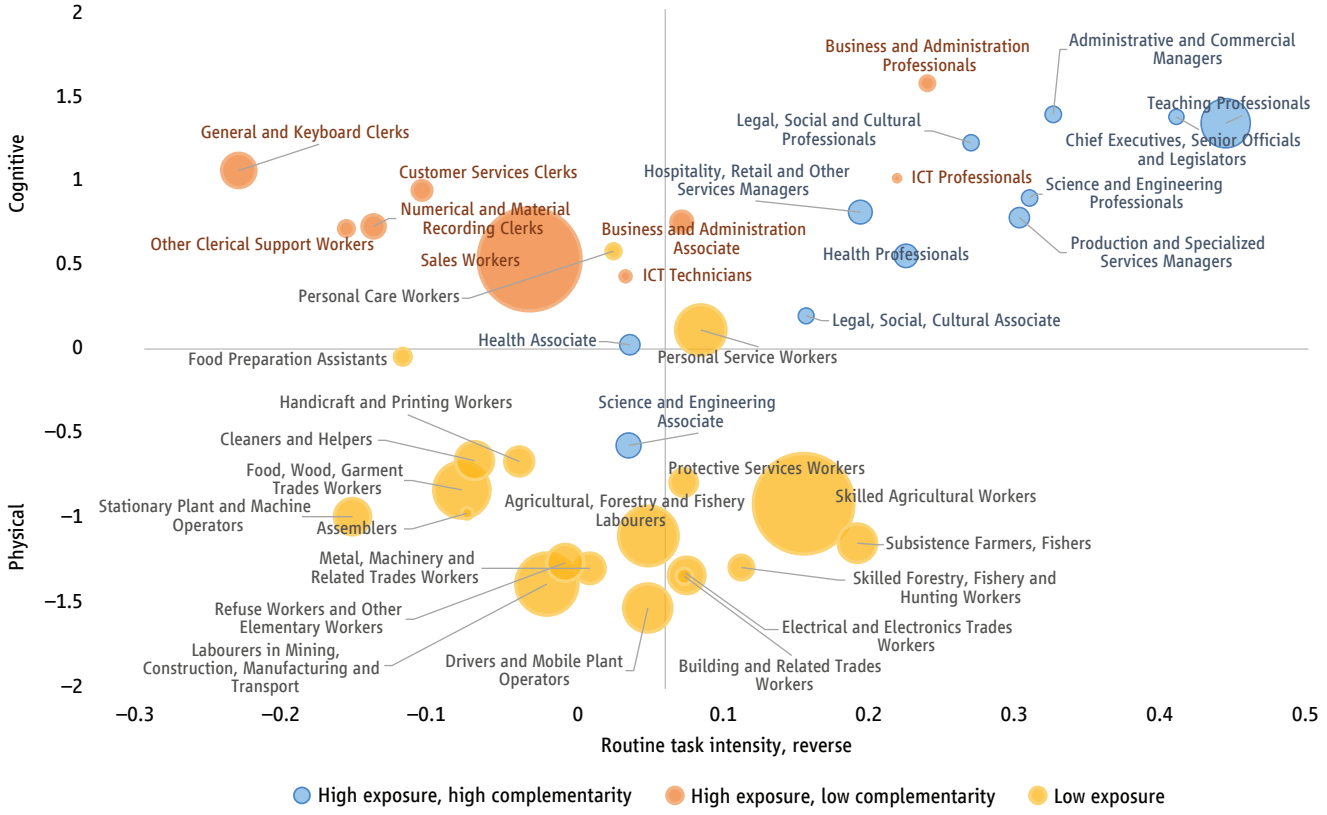


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Figure A5. Task intensity and AI exposure (*Continued*)

C. Malaysia

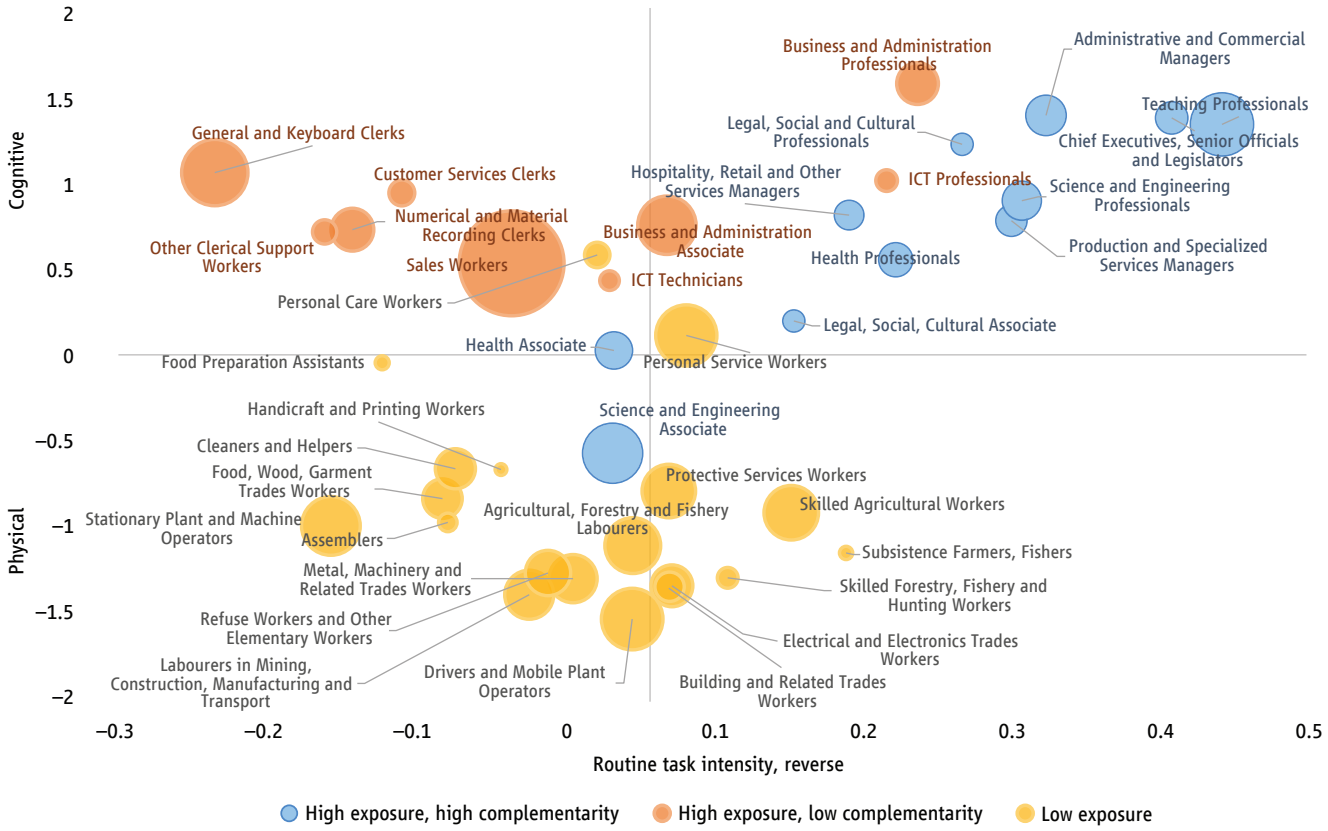

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Figure A5. Task intensity and AI exposure (*Continued*)

D. Mongolia

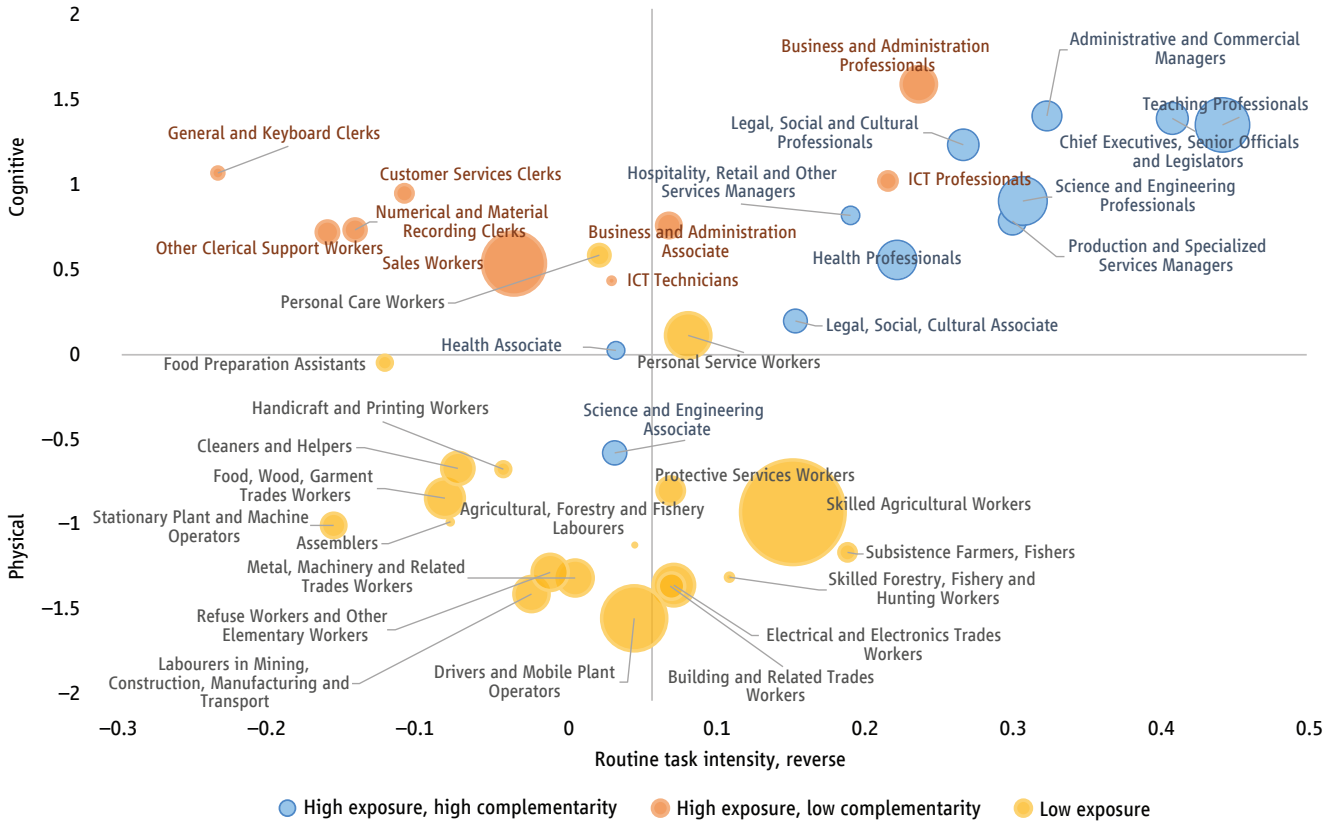

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Figure A5. Task intensity and AI exposure (*Continued*)

E. Philippines

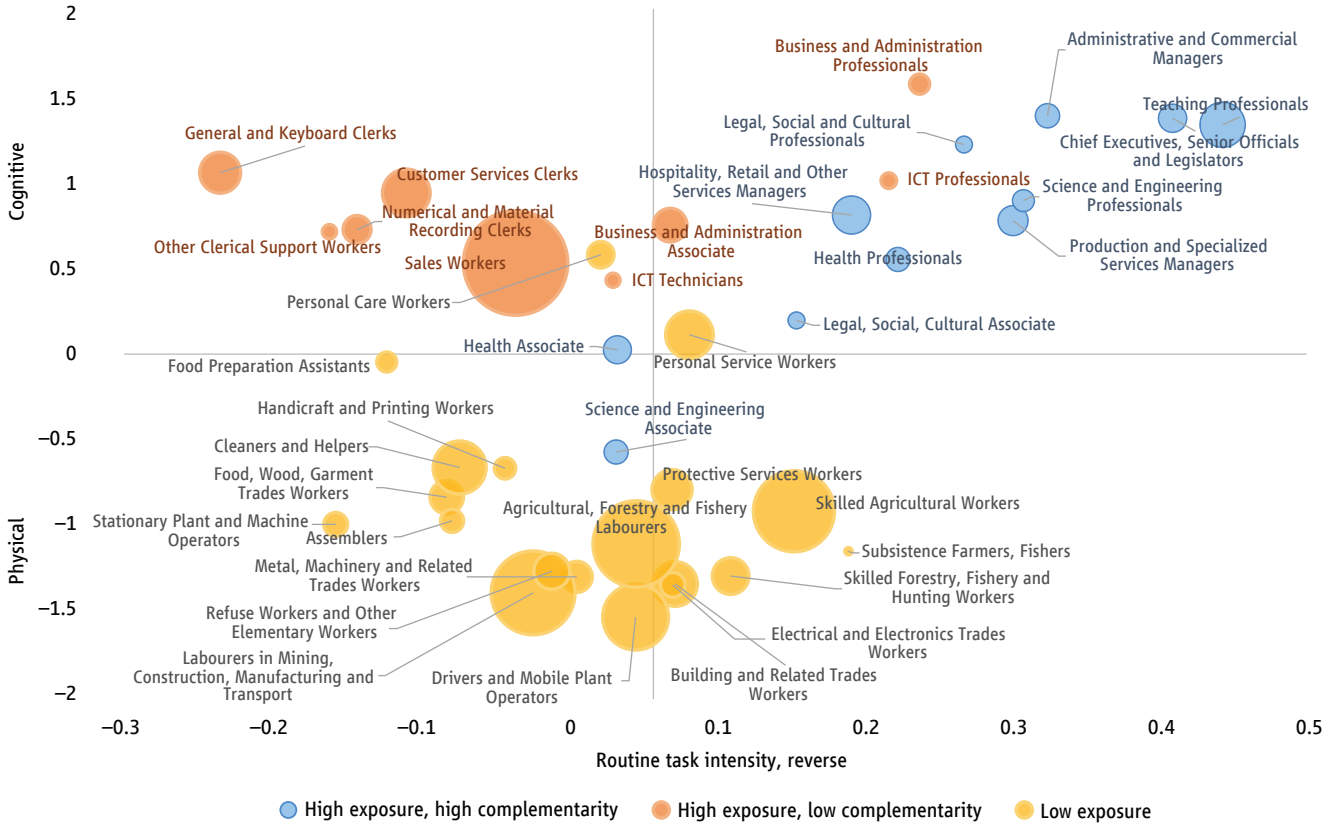

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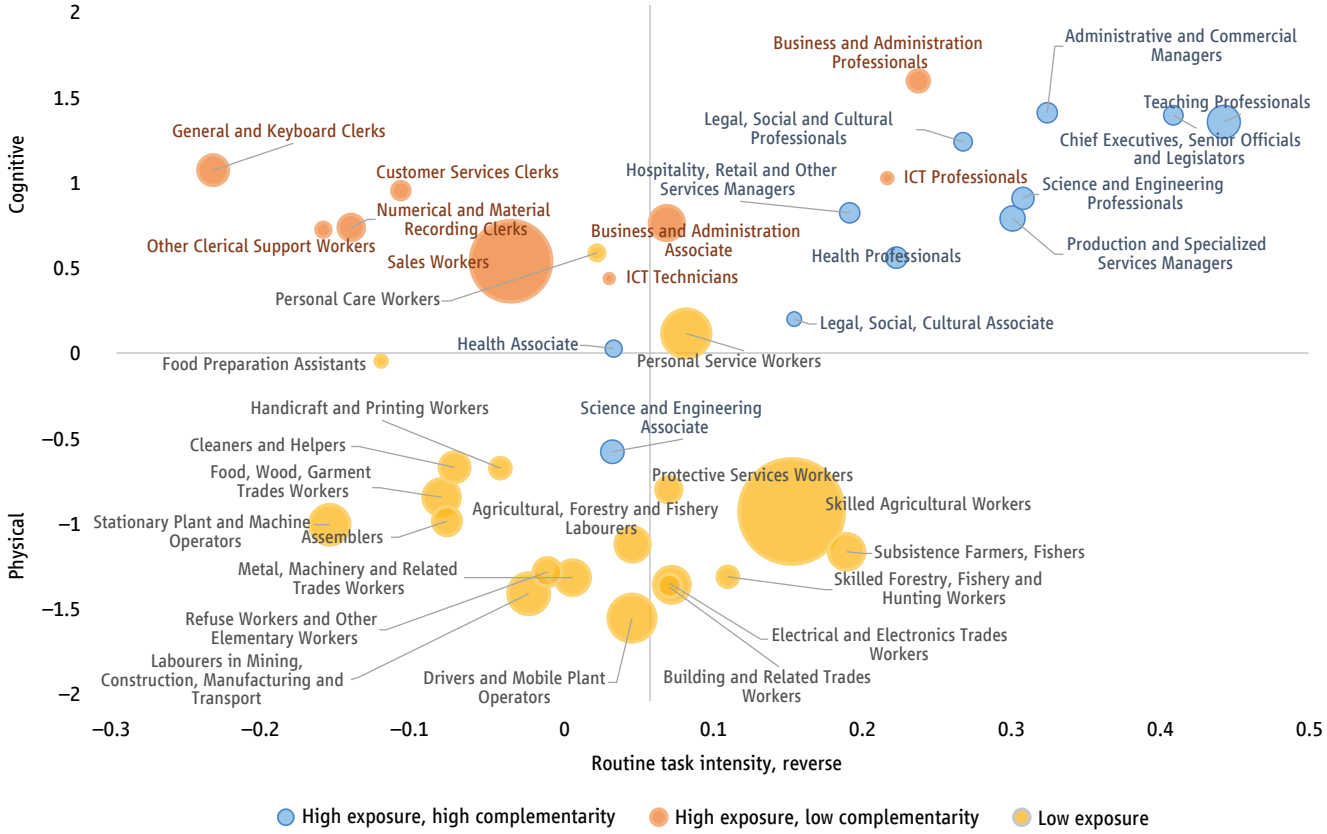
Figure A5. Task intensity and AI exposure (*Continued*)

F. Thailand



(*continued*)

Figure A5. Task intensity and AI exposure (*Continued*)

G. Viet Nam

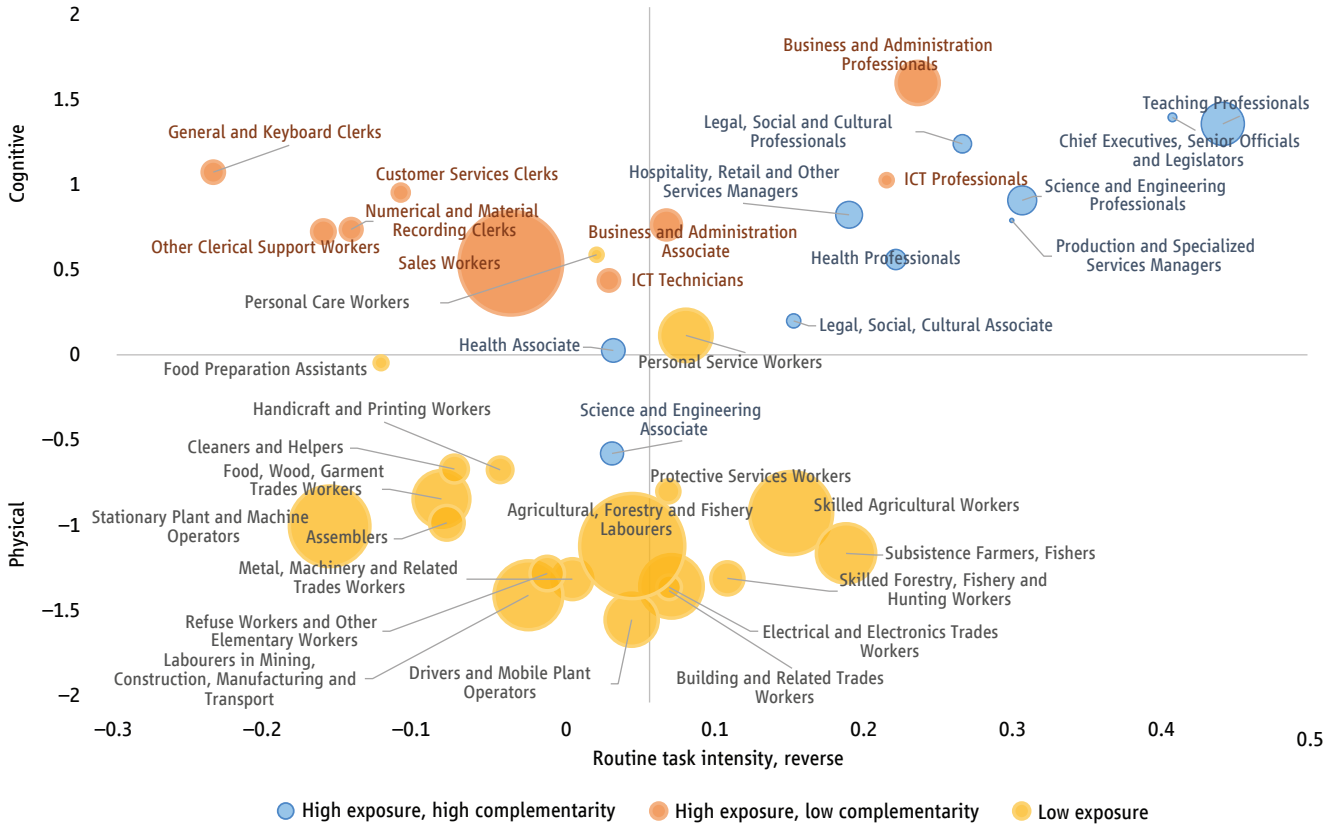


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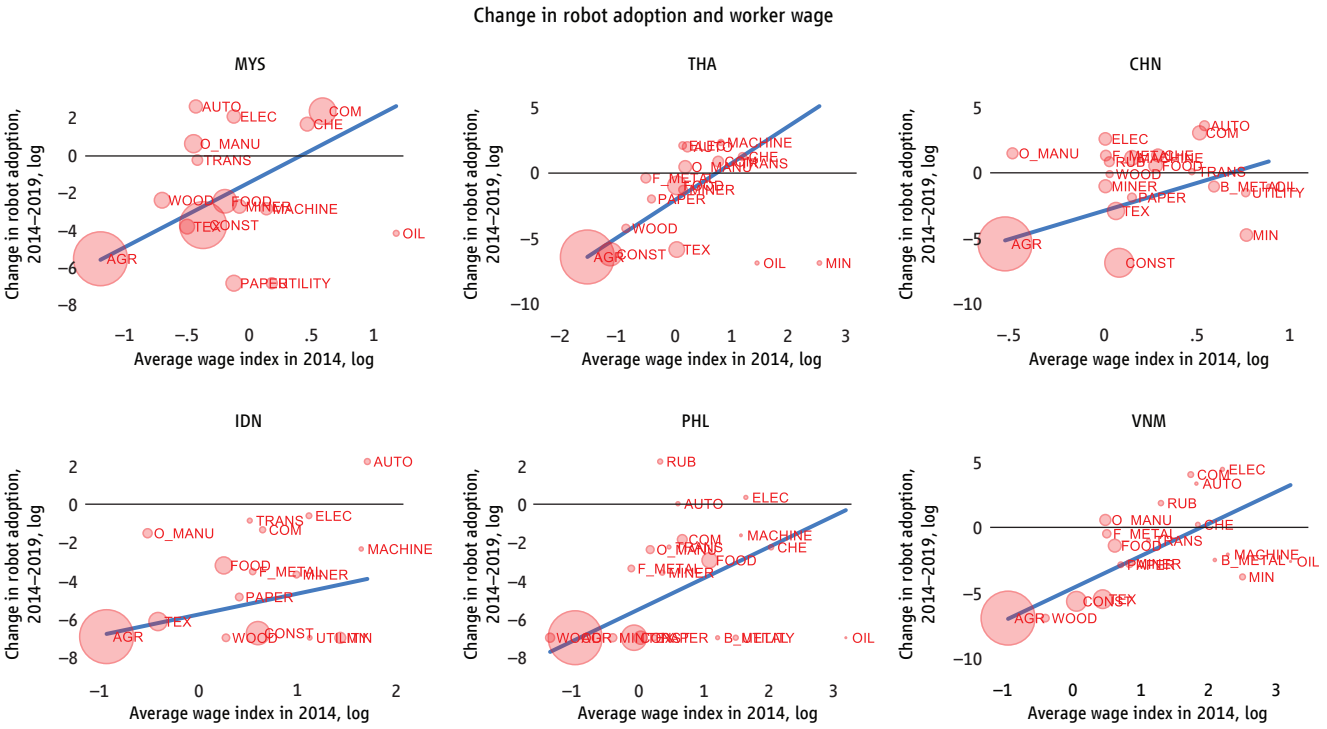
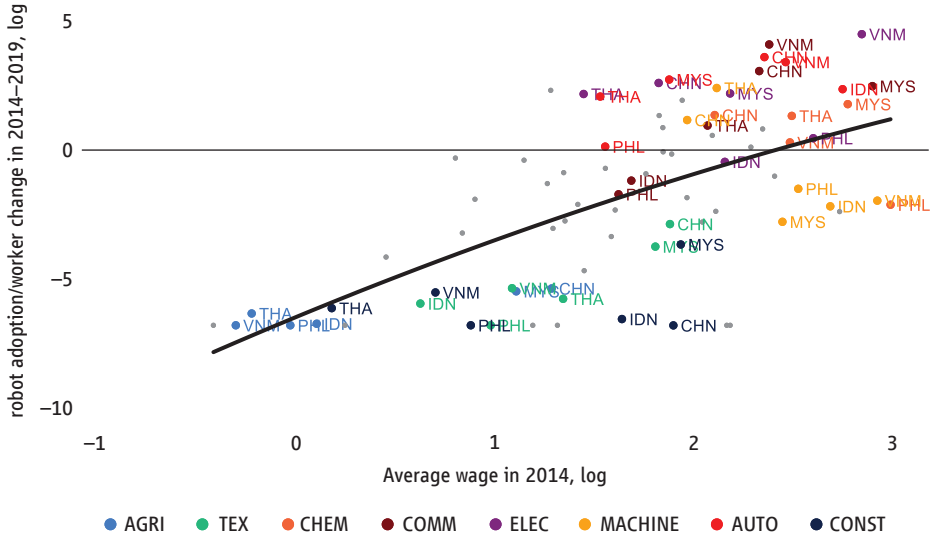
Figure A6.A. Change in robot adoption and worker wage



Source: OECD, IFR.
Note: X axis shows log of annual wage index, where 0 denotes national average wage. Y axis shows log of change in robot stock. In order to include 0 changes, 0.001 is added to the change in robot stock.

Figure A6.B. Change in robot adoption and worker wage



Note: X axis shows log of annual average wage of a worker in 1000USD. Y axis shows log of change in robot stock. In order to include 0 changes, 0.001 is added to the change in robot stock.

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