ASIAN DEVELOPMENT OUTLOOK 2018

HOW TECHNOLOGY AFFECTS JOBS

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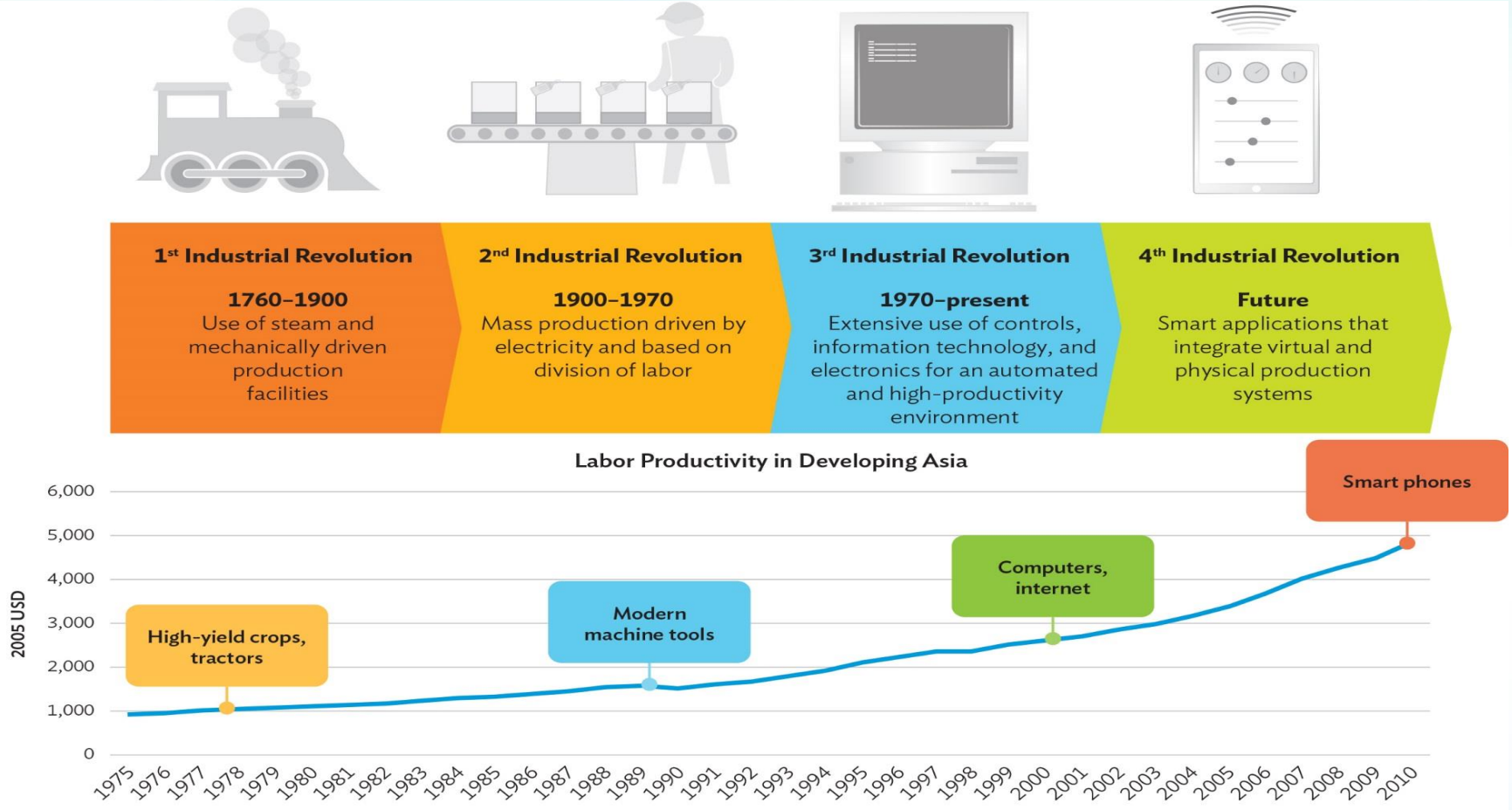
Outline

- Rising concern over technology displacing jobs
- Reasons for optimism on job prospects in Asia
- Negative consequences for some workers
- What government should do to harness technology for inclusive growth

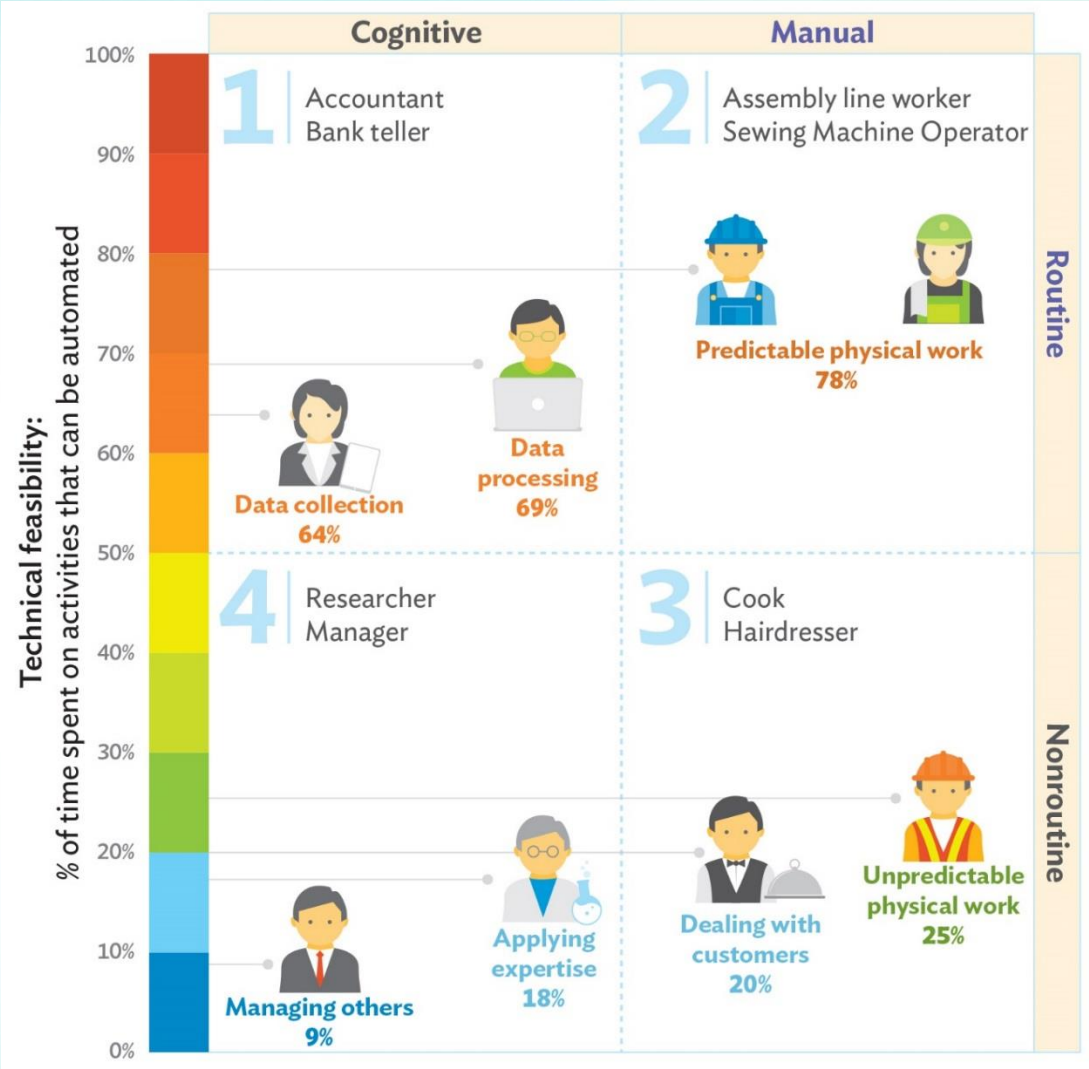
Technological advancement drives higher productivity, the foundation for better-paid jobs and economic growth



There are compelling reasons to remain optimistic about developing Asia's job prospects

1. New technologies often automate only some tasks of a job.
2. Technical feasibility does not guarantee economic feasibility.
3. Rising income and demand.
4. New occupations and industries.

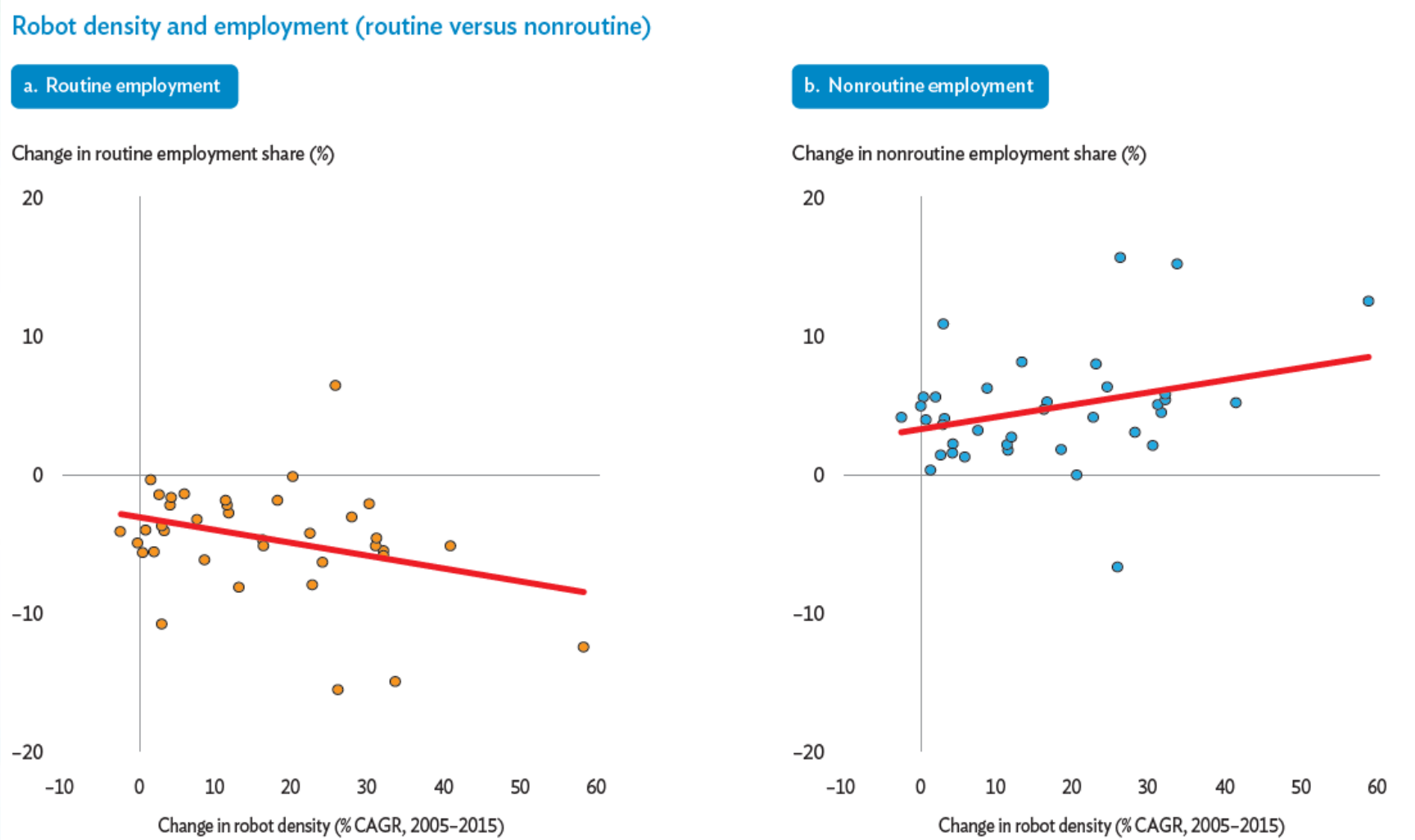
New technologies often involve automating specific tasks associated with a job, not the job in its entirety



Note: Percentages refer to Frey and Osborne (2017) estimates on probability of automation. Framework is based on Acemoglu and Autor (2011).

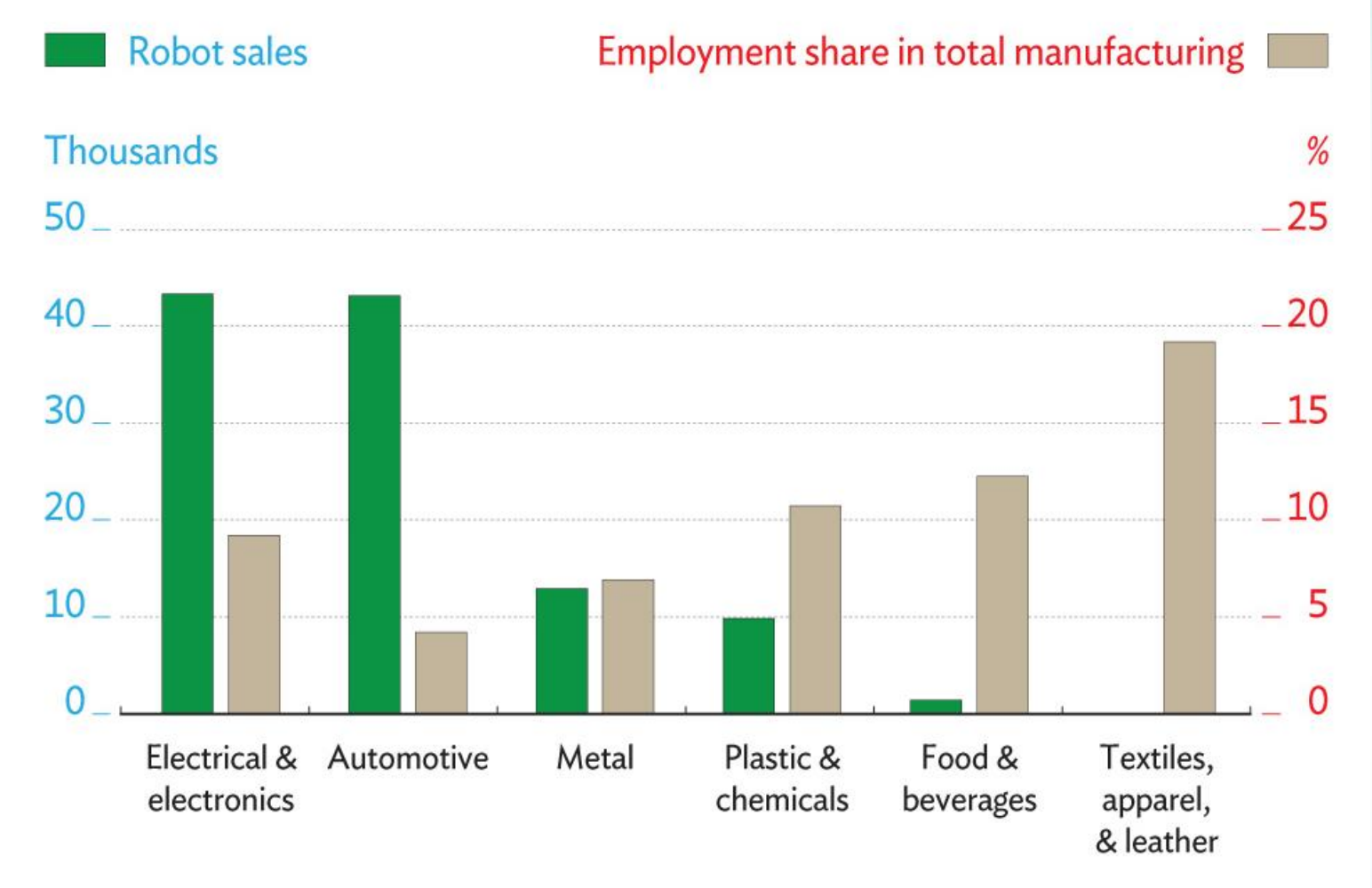
Source: *Asian Development Outlook 2018:* How Technology Affects Jobs.

Where robots are used, it is associated with a reduction in routine employment



Source: ADB. 2018. *Asian Development Outlook: How Technology Affects Jobs.* Manila.

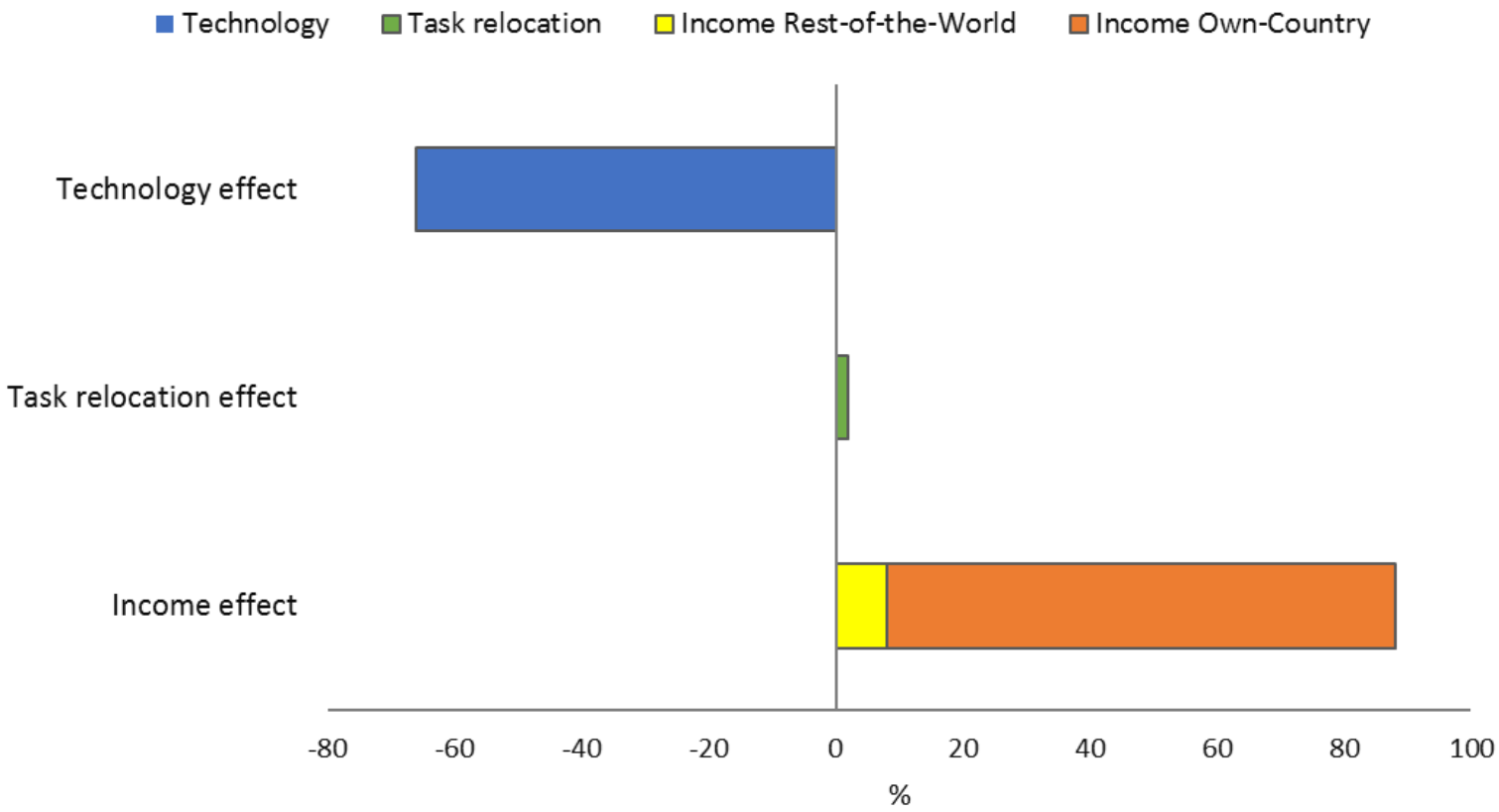
Industrial robots are concentrated in capital intensive sectors where employment shares are relatively small



Source: *Asian Development Outlook 2018:* How Technology Affects Jobs.

Rising demand offsets displacement driven by automation

Decomposing the percentage change in employment, 2005-2015



Note: Developing Asia in the decomposition analysis includes Bangladesh, India, Indonesia, Malaysia, Mongolia, the People's Republic of China, the Philippines, the Republic of Korea, Sri Lanka, Taipei,China, Thailand, and Viet Nam.
Sources: Decomposition result using ADB Multiregional Input–Output Database (accessed 20 November 2017); Labor force surveys, various countries; World Input–Output Database—Socioeconomic Accounts (Timmer et al. 2015).

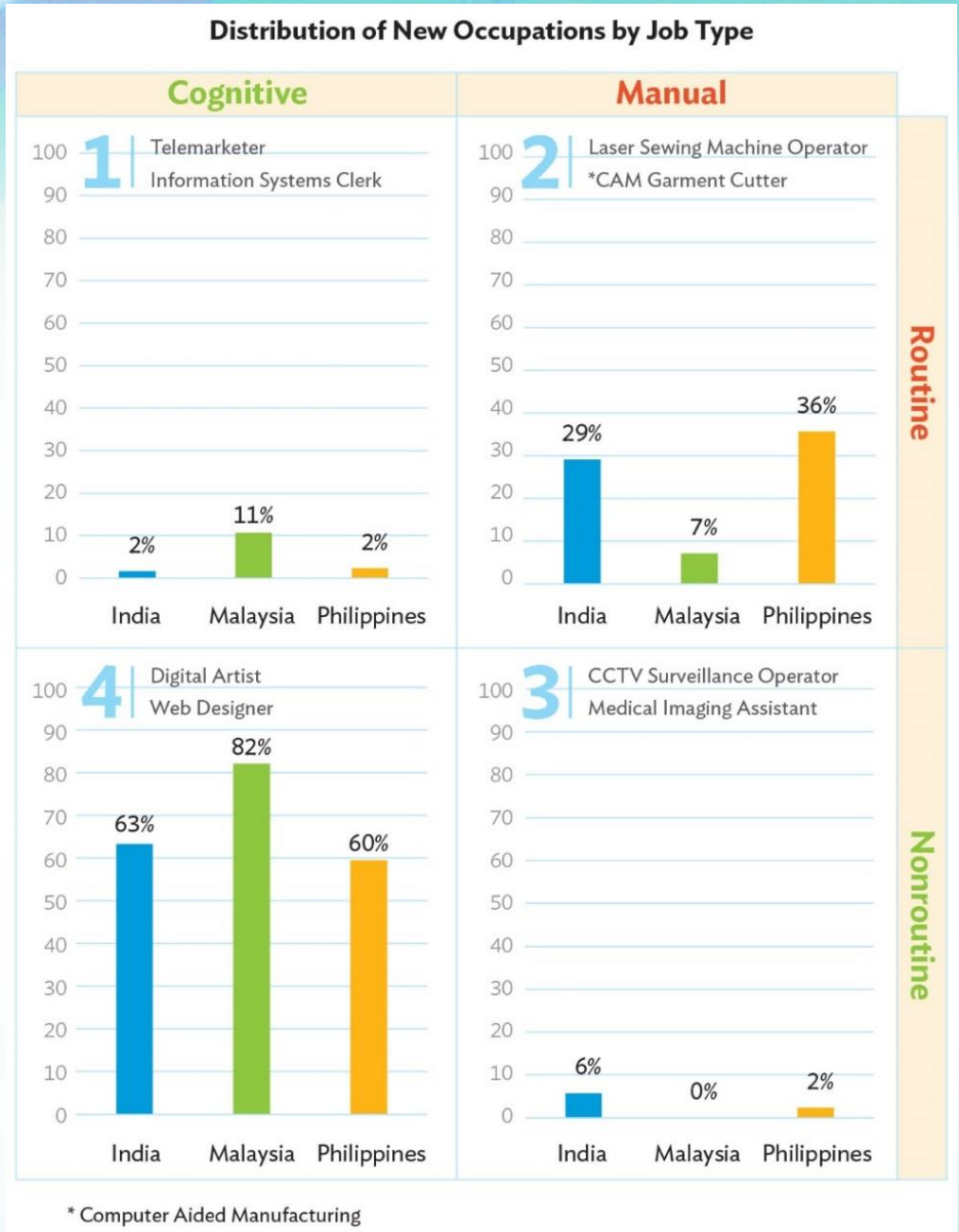
This countervailing force is at work across the region

Manufacturing

GVC = global value chain, PRC = People's Republic of China.

Note: Developing Asia in the decomposition analysis includes Bangladesh, India, Indonesia, Malaysia, Mongolia, the People's Republic of China, the Philippines, the Republic of Korea, Sri Lanka, Taipei,China, Thailand, and Viet Nam.

Source: ADB estimates using the ADB Multiregional Input–Output Database (accessed 20 November 2017); Labor force surveys, various countries; World Input–Output Database—Socioeconomic Accounts (Timmer et al. 2015).



Technology leads to new occupations…

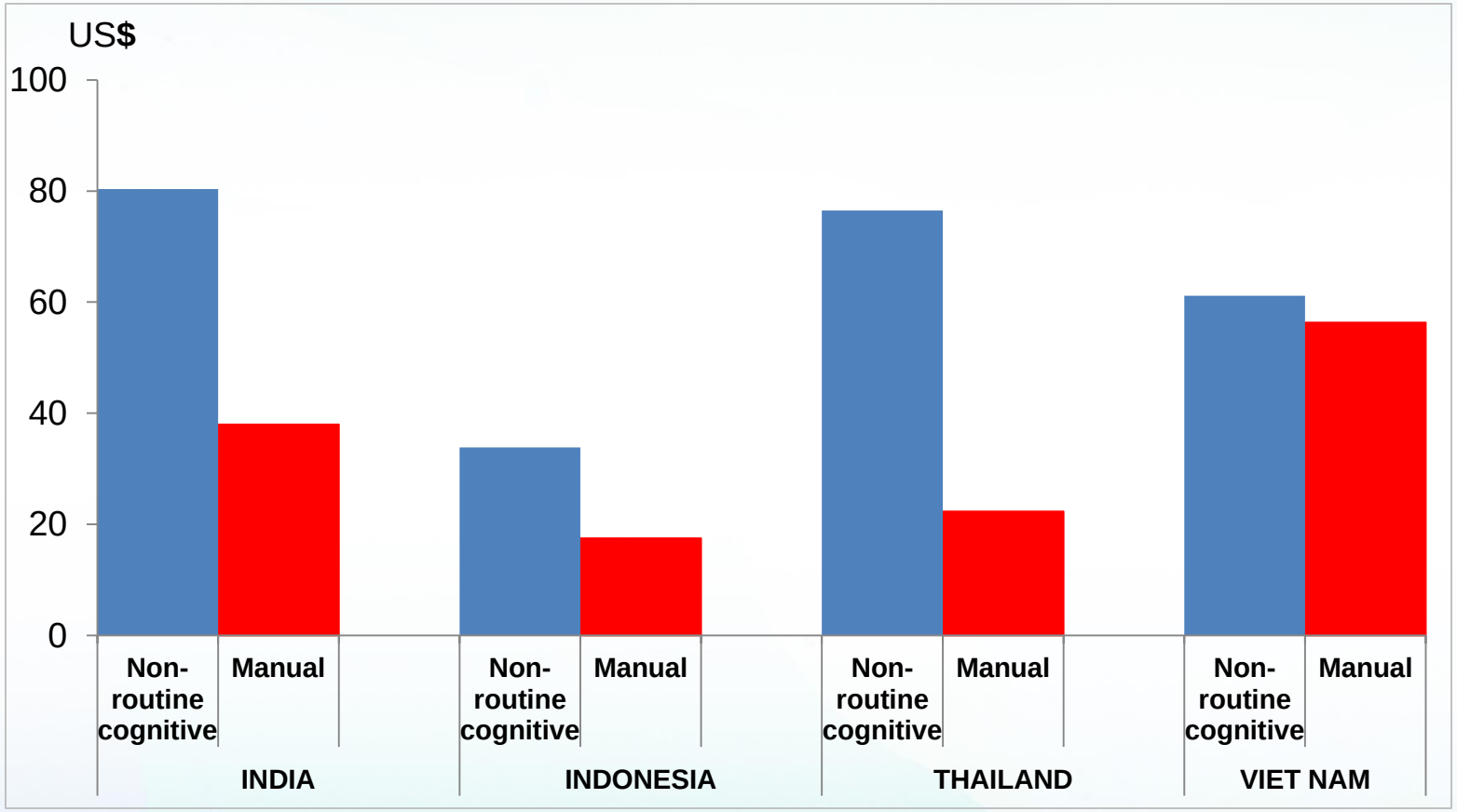
but these tend to be in non-routine cognitive category

	Total No. of Job Titles (latest year)	No. of New Job Titles	Share of New Job Titles
India	3,600	120	3.33%
Malaysia	2,338	28	1.20%
Philippines	3,698	42	1.14%

Notes: The figures are based on a comparison of National Classification of Occupations (NCO) for each country. Job titles presented in the 4 quadrants are actual new titles.
Source: *Asian Development Outlook 2018:* How Technology Affects Jobs

Wages have also grown more for these workers, leaving low-skill workers behind

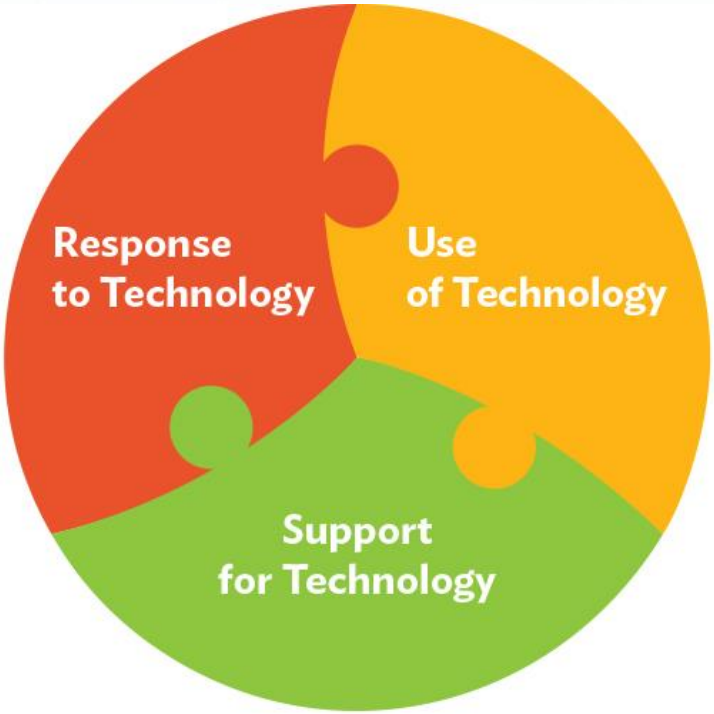
Change in average monthly wages, constant prices (in US$)



Note: The time frames vary across countries, with Viet Nam the shortest (2007–2015), followed by Thailand (2000–2010), India (2000–2012), and Indonesia (2000–2014). Developing Asia refers to the five countries included in this analysis. Source: *Asian Development Outlook 2018:* How Technology Affects Jobs

Government has an important role to play in leveraging technological advances for inclusive growth

The new industrial revolution and the role of government



- **Education and training**
- **Favorable labor regulation**
- **Social protection**
- **Tax policies**

- Facilitate skills development and job-matching
- Provision of public goods and services

- Investments in ICT infrastructure
- Antitrust and consumer protection
- Innovation and technology adoption

Key messages

- New technologies drive higher productivity, the foundation for better-paid jobs and economic growth.
- Despite concern about technology induced job losses, there is good reason to be optimistic about Asia's job prospects
- New technologies will alter skills requirements and may cause unemployment as some firms downsize or close.
- Government has an important role to play in leveraging technological advances for inclusive growth

- **Appendix**

Empirical analyses corroborate these descriptive trends

2.2.1 Change in robot inputs and impact on employment, 2005–2015 (OLS estimates)

a. Overall employment

	Change in employment		
	(1)	(2)	(3)
Robot adoption	−0.212 (0.37)	−0.212 (0.73)	−0.663 (0.61)
Country trends	Yes	Yes	Yes
Controls			Yes
Clustered standard errors		Yes	Yes
Observations	758	758	757

b. Routine employment

	Change in routine employment share		
	(1)	(2)	(3)
Robot adoption	-0.048*** (0.01)	-0.048*** (0.01)	-0.048*** (0.01)
Country trends	Yes	Yes	Yes
Controls			Yes
Clustered standard errors		Yes	Yes
Observations	777	777	776

c. Occupational employment shares

	Change in employment share of			
	(1)	(2)	(3)	(4)
	Routine manual	Routine cognitive	Nonroutine manual	Nonroutine cognitive
Robot adoption	−0.055*** (0.02)	−0.002 (0.00)	−0.004 (0.01)	0.061*** (0.01)
Country trends	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Clustered standard errors	Yes	Yes	Yes	Yes
Observations	776	776	776	776

d. Developed versus developing countries

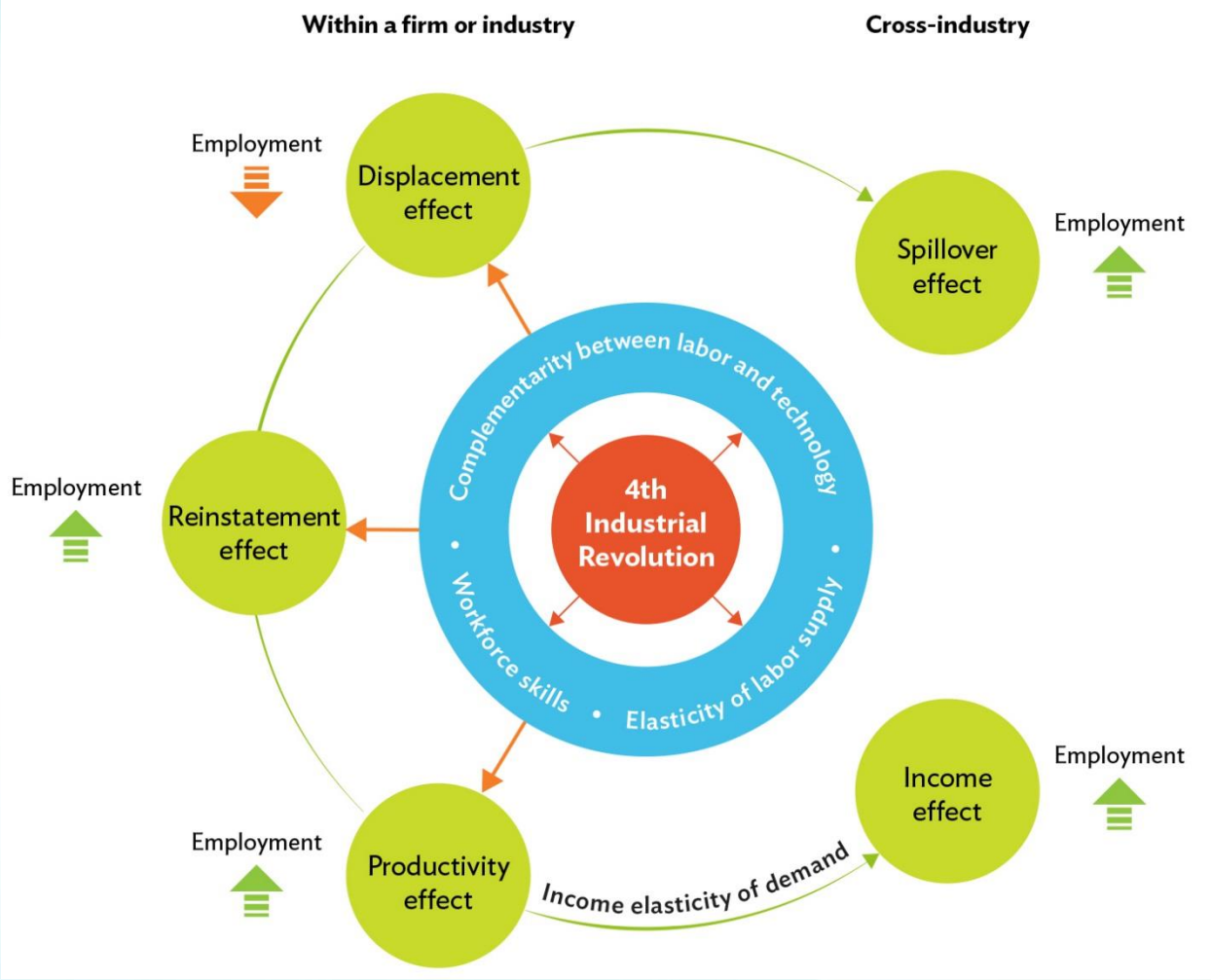
	Change in routine employment share		
	(1)	(2)	(3)
Robot adoption	−0.056*** (0.01)	−0.056*** (0.02)	−0.056*** (0.02)
Developing country x robot adoption (Interaction term)	0.038 (0.03)	0.038** (0.02)	0.036** (0.02)
Country trends	Yes	Yes	Yes
Controls			Yes
Clustered standard errors		Yes	Yes
Observations	777	777	776

* = p<0.1, ** = p<0.05, *** = p<0.01, OLS = ordinary least squares.

Note: Robot adoption is the percentile in the weighted distribution of changes in robot density. Controls include real changes in gross fixed capital formation share in value added and changes in value added. Robust standard errors in parenthesis. Regressions are weighted by 2005 within-country employment shares.

DB

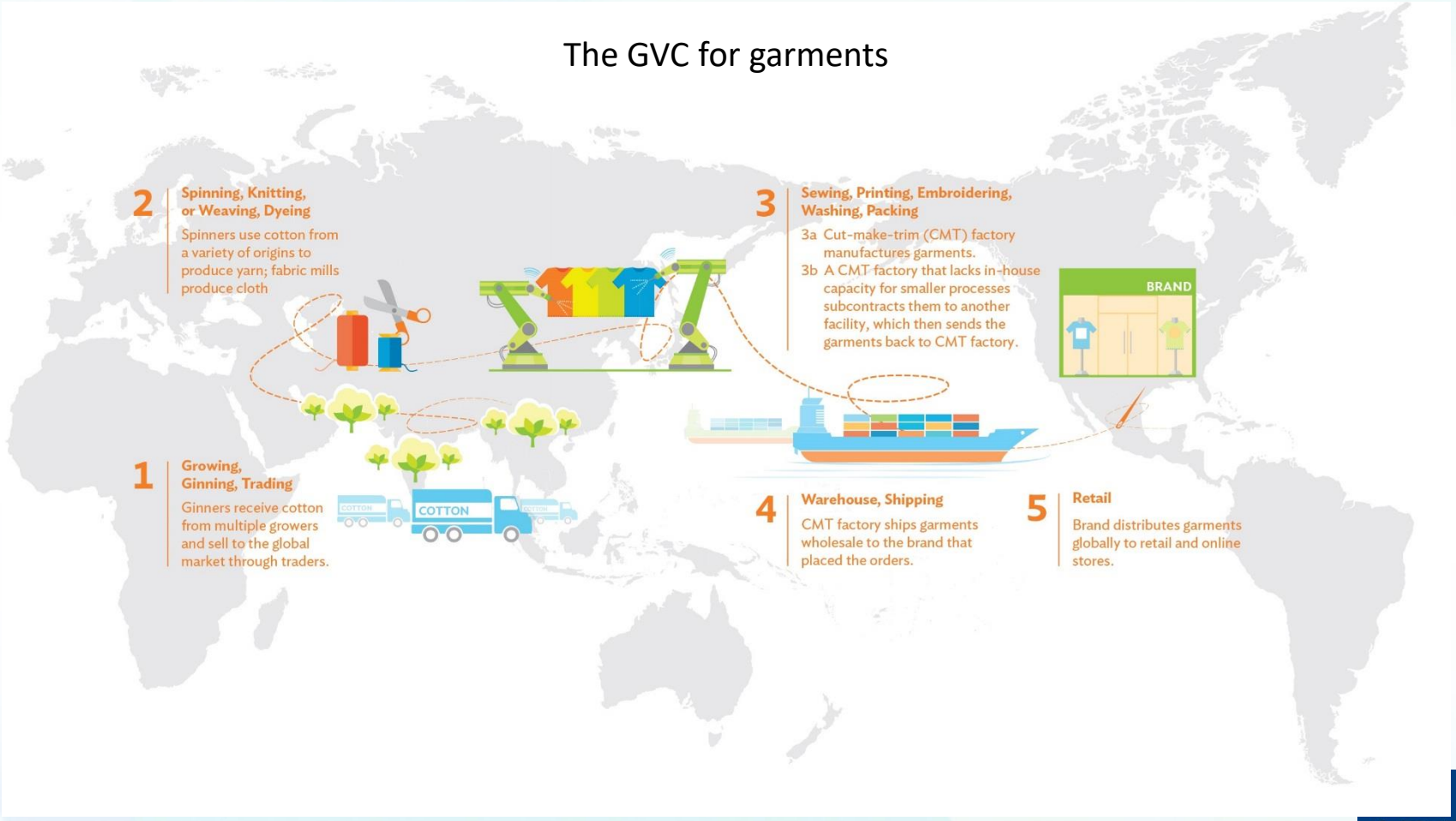
There are different channels at play that determine employment outcomes



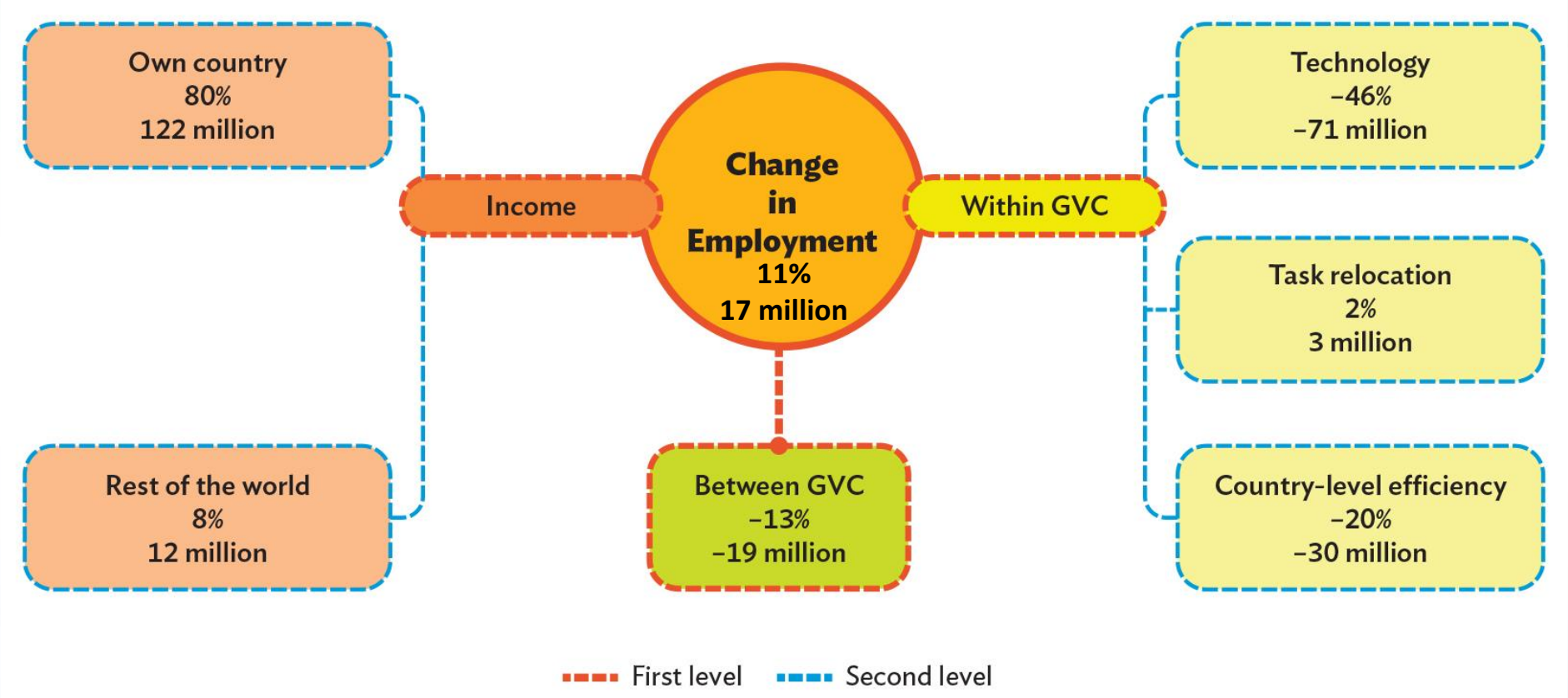
Notes: Arrows indicating a rise or fall in employment or wages reflect empirical findings from existing studies, but they do not necessarily mean the result is obtained each time the effects are studied.
Source: ADB. 2018. *Asian Development Outlook: How Technology Affects Jobs.* Manila.

Technology and employment in global value chains

The GVC for garments



Decomposition of labor demand shows that employment increase from rising incomes overshadow reduction from technology



Structural decomposition of change in employment

$$x_{i1} - x_{i0}$$

change in employment

$$u_k' \hat{\pi}_1^{-1} R_{i1} \hat{l}_{i1}^* [T_1^* \circ (S_1^* \cdot \hat{c}_1)] u - u_k' \hat{\pi}_0^{-1} R_{i0} \hat{l}_{i0}^* [T_0^* \circ (S_0^* \cdot \hat{c}_0)] u$$

$$\tfrac{1}{2}\{u_k' \hat{\pi}_0^{-1} R_{i0} \langle \hat{l}_{i1}^* - \hat{l}_{i0}^* \rangle [T_1^* \circ (S_1^* \cdot \hat{c}_1)] u + u_k' \hat{\pi}_1^{-1} R_{i1} \langle \hat{l}_{i1}^* - \hat{l}_{i0}^* \rangle [T_0^* \circ (S_0^* \cdot \hat{c}_0)] u\}$$

technology within GVC

$$\tfrac{1}{2}\{u_k' \hat{\pi}_0^{-1} \langle R_{i1} - R_{i0} \rangle \hat{l}_{i1}^* [T_1^* \circ (S_1^* \cdot \hat{c}_1)] u + u_k' \hat{\pi}_1^{-1} \langle R_{i1} - R_{i0} \rangle \hat{l}_{i0}^* [T_0^* \circ (S_0^* \cdot \hat{c}_0)] u\}$$
$$+ \tfrac{1}{2}\{u_k' \hat{\pi}_0^{-1} R_{i0} \hat{l}_{i0}^* [\langle T_1^* - T_0^* \rangle \circ (S_1^* \cdot \hat{c}_1)] u + \tfrac{1}{2}\{u_k' \hat{\pi}_1^{-1} R_{i1} \hat{l}_{i1}^* [\langle T_1^* - T_0^* \rangle \circ (S_0^* \cdot \hat{c}_0)] u\}$$

task relocation

$$\tfrac{1}{2}\{u_k' \langle \hat{\pi}_1^{-1} - \hat{\pi}_0^{-1} \rangle R_{i1} \hat{l}_{i1}^* [T_1^* \circ (S_1^* \cdot \hat{c}_1)] u + u_k' \langle \hat{\pi}_1^{-1} - \hat{\pi}_0^{-1} \rangle R_{i0} \hat{l}_{i0}^* [T_0^* \circ (S_0^* \cdot \hat{c}_0)] u\}$$

country-level efficiency

$$\tfrac{1}{2}\{u_k' \hat{\pi}_0^{-1} R_{i0} \hat{l}_{i0}^* [T_0^* \circ ((S_1^* - S_0^*) \cdot \hat{c}_1)] u + u_k' \hat{\pi}_1^{-1} R_{i1} \hat{l}_{i1}^* [T_1^* \circ ((S_1^* - S_0^*) \cdot \hat{c}_0)] u\}$$

between GVC

$$\tfrac{1}{2}\{u_k' \hat{\pi}_0^{-1} R_{i0} \hat{l}_{i0}^* [T_0^* \circ (S_0^* \cdot \langle \hat{c}_1 - \hat{c}_0 \rangle)] u + u_k' \hat{\pi}_1^{-1} R_{i1} \hat{l}_{i1}^* [T_1^* \circ (S_0^* \cdot \langle \hat{c}_1 - \hat{c}_0 \rangle)] u\}$$

income

Source: ADB. 2018. *Asian Development Outlook: How Technology Affects Jobs.* Manila.