
Panel Session on SDG8

Workshop on Science, Technology and Innovation for the SDGs

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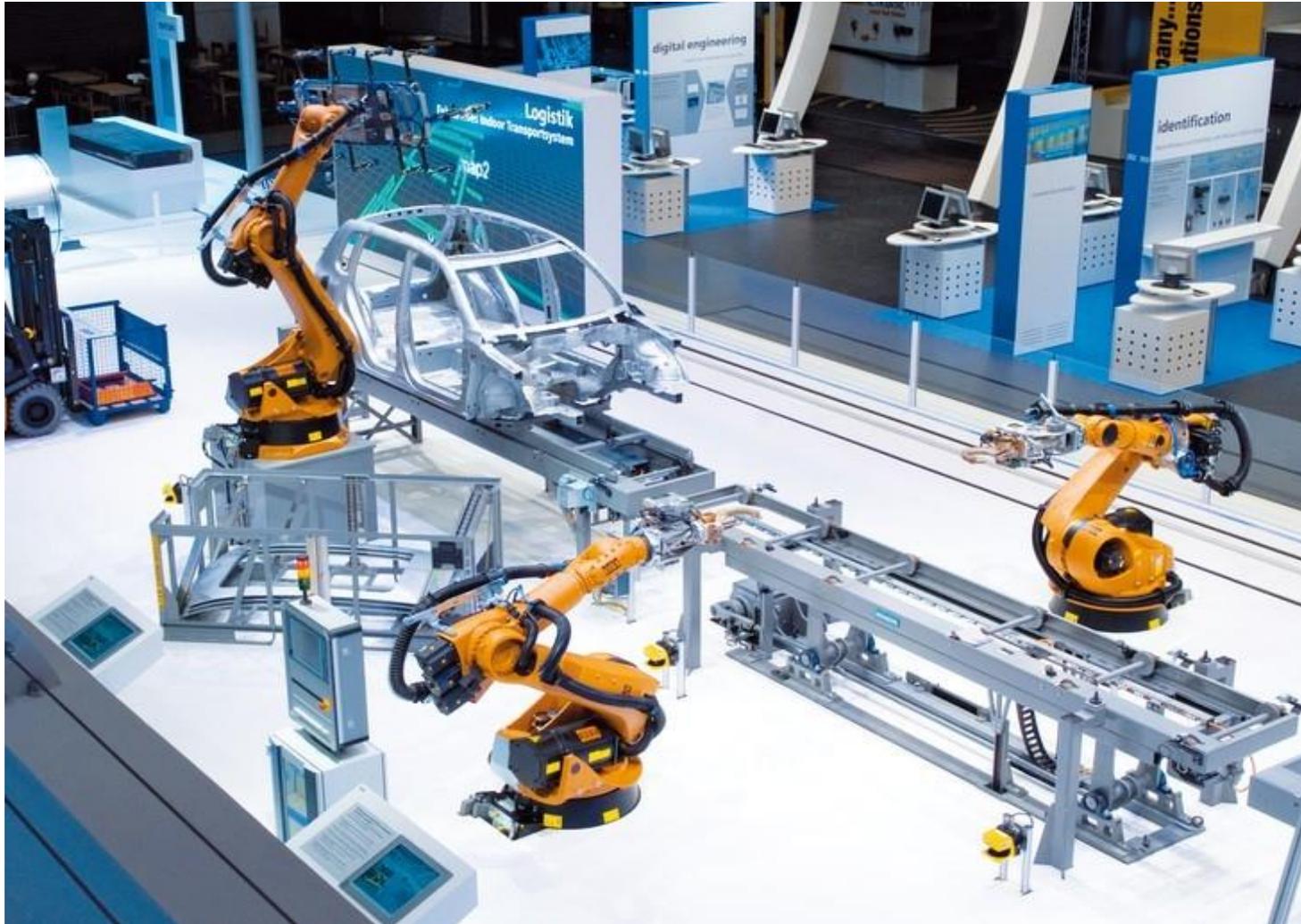
Outline

- Background: Industry 4.0
 - The impact of robotics and industrial automation on jobs and employment.
 - How can new and emerging technologies support industrial development in low-income countries
 - Implications for education and training policies
 - The need for more encompassing systems of unemployment protection
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Industry 4.0: Opportunities and Fears

- The term 'Industry 4.0' grew out a German federal government strategic initiative to increase computerization and the competitiveness of German manufacturing
 - The core of Industry 4.0 is the 'smart factory' based on robotics and automation integrated into cyber-physical systems where humans and machines communicate over the internet of things
 - Cyber-physical systems can support human workers by providing information for making informed decision and by carrying out onerous, difficult or dangerous tasks.
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The smart factory



2) Industrial automation and the robot scare

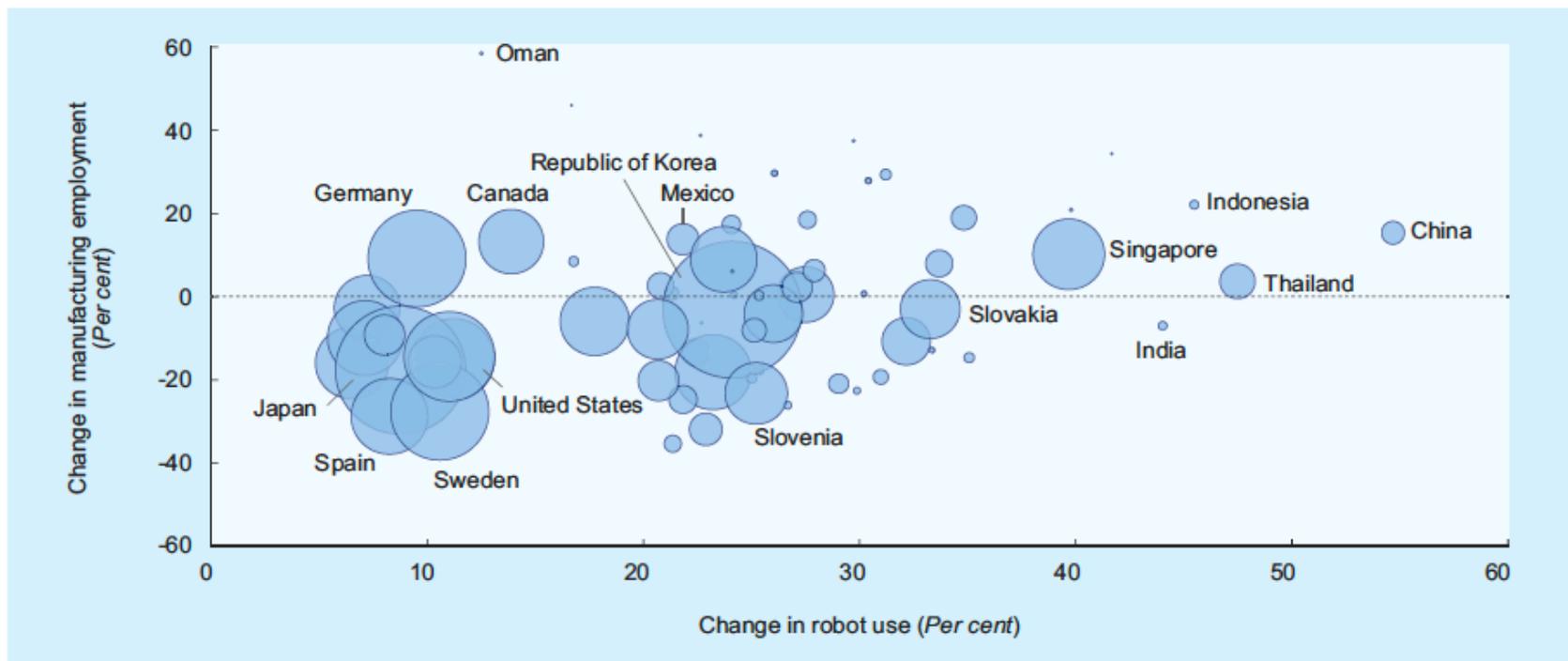
- The deployment of robots and other automation technologies has raised great concern about their possibly negative impacts on employment, as the scope for replacing the tasks of workers with new automation technologies based on robotics and artificial intelligence increase.
 - But little evidence to support this once we take into account the 'compensating' effects. Indeed, in several countries, including China and Mexico that have increased significantly their up-take of robots, the absolute level of manufacturing employment increased between 2005 and 2014.
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Industrial robots: Estimated annual installation and accumulated stock, selected economies and groups, 2010–2015

	<i>Annual installation</i>						<i>Stock of operational robots</i>	<i>Change in stock of operational robots</i>
	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2015</i>	<i>2010–2015</i>
	<i>('000 of units)</i>						<i>(Per cent)</i>	
World	120.6	166.0	159.3	178.1	220.6	253.7	1 631.7	54.1
	<i>(Percentage shares)</i>							
Developed economies	56.6	56.4	58.9	52.0	46.3	45.2	58.7	15.3
France	1.7	1.8	1.9	1.2	1.3	1.2	2.0	-6.8
Germany	11.7	11.8	11.0	10.3	9.1	7.9	11.2	23.3
Italy	3.7	3.1	2.8	2.6	2.8	2.6	3.8	-1.8
Japan	18.2	16.8	18.0	14.1	13.3	13.8	17.6	-6.9
United Kingdom	0.7	0.9	1.8	1.4	0.9	0.6	1.1	29.2
United States	11.9 ^b	12.4	14.1	13.3	11.9	10.8	14.4 ^b	42.4 ^b
Developing economies	41.0	39.2	37.7	44.8	50.1	52.9	39.1	185.7
Africa	0.2	0.2	0.2	0.4	0.2	0.1	0.3	84.3
Latin America and the Caribbean	1.4 ^b	2.3	2.5	2.5	1.9	2.8	2.0 ^b	162.2 ^b
Mexico	0.7 ^b	1.2	1.3	1.5	1.1	2.2	1.2 ^b	234.7 ^b
Asia	39.4	36.7	34.9	42.0	48.0	49.9	36.8	188.2
China	12.4	13.6	14.4	20.5	25.9	27.0	15.7	390.5
NIEs	22.9	18.5	15.1	15.9	14.9	19.0	16.7	106.1
Republic of Korea	19.5	15.4	12.2	12.0	11.2	15.1	12.9	108.2
Taiwan Province of China	2.7	2.2	2.1	3.1	3.1	2.8	3.0	83.0
Developing economies, excl. China	28.6	25.6	23.2	24.3	24.2	25.9	23.3	123.0
Developing economies, excl. NIEs	17.9	20.1	22.0	28.1	34.6	33.2	22.4	300.7
Transition economies	0.2	0.2	0.3	0.4	0.2	0.1	0.2	172.9
Other economies	2.2	4.2	3.1	2.8	3.4	1.8	2.0	n.a.

Source, UNCTAD, 2017

FIGURE 3.11 Robot use and manufacturing employment in selected economies: Changes between 2005 and 2014



Source: UNCTAD 2016

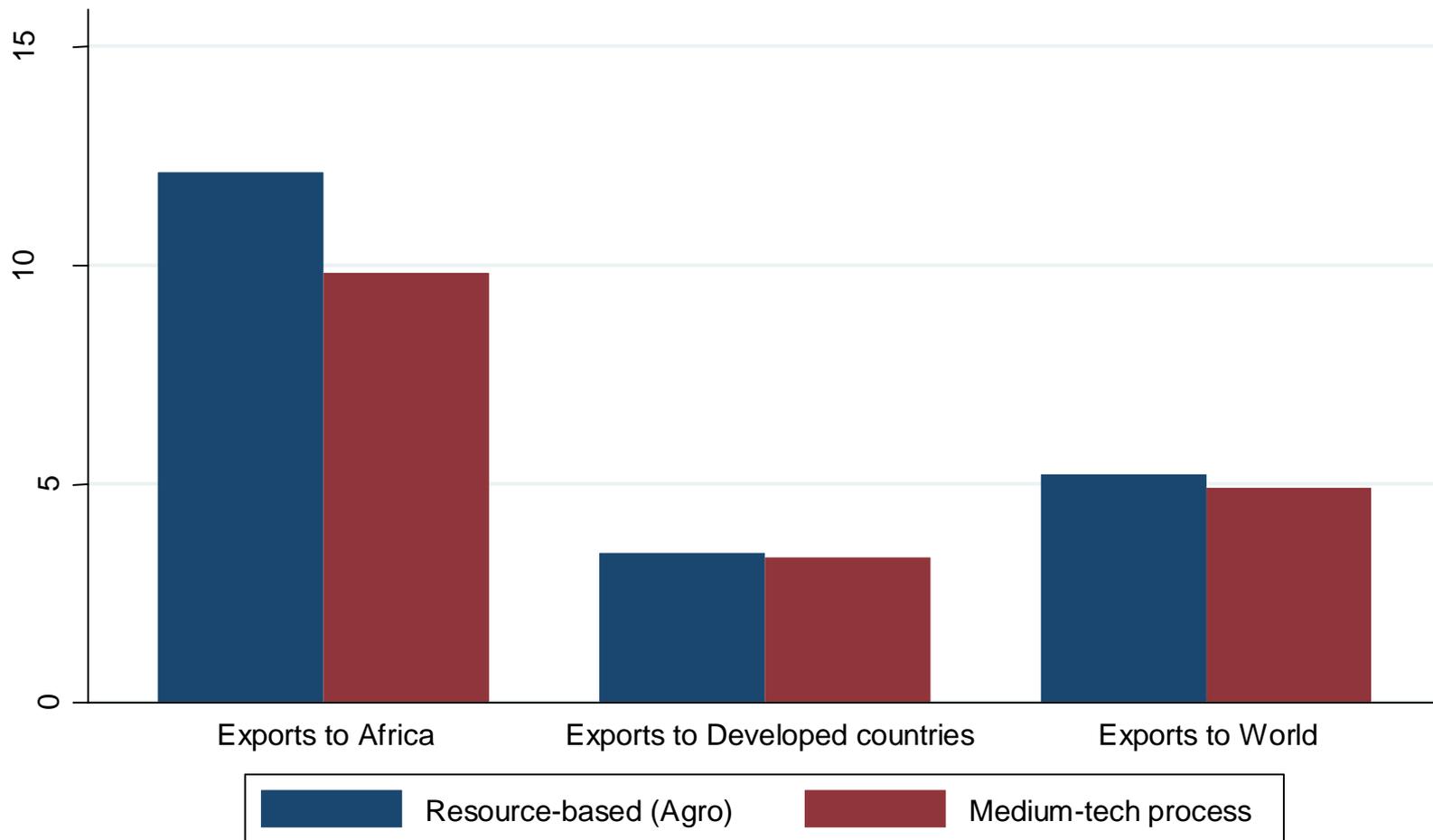
Implications for industrial development in low-income countries

- Robot installations in manufacturing are weighted towards highly traded and GVC intensive sectors (automotive, electronics and electrical appliances) where trade is relatively concentrated and dominated by HIC and increasingly China.
 - While there is little evidence of significant reshoring to HIC linked to robot installations, the increasing automation of these sectors is raising the bar for being an attractive location for production and is likely to make it increasingly difficult for low and low middle income countries to integrate into these GVC at the low value added end of the chains.
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Implications for industrial development in low-income countries

- These evolving market and technological constraints imply that a promising and more inclusive way towards industrial development for low-income countries and in particular for Sub-Saharan Africa is to focus on developing capabilities for expanding local and regional markets in relatively labor intensive commodity processing industries, (food processing, wood, paper, pulp, rubber, etc.) which are less GVC intensive, less automated and smaller in scale.
 - Intra-African trade is not only relatively weighted towards these sectors compared to African trade with developed countries or the rest of the world, but the share of these sectors in intra-African trade has increased over time.
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Share of Agro-industry and Medium-tech process manufacturers in Africa's exports Lall classificaton



(UNCTAD database and Lall classification, 2000)

4th Industrial Revolution in support of inclusive industrial development

- The 4th Industrial Revolution extends beyond the factory gates to and there are wider and interconnected impacts of digitization and smart technologies. There is considerable scope for these technologies to be harnessed to support commodity-based regional production and agricultural transformation adapted to the realities of economies with often big infrastructural gaps and a dominance of micro and small enterprises that typically face significant financial constraints as well as important skills gaps.
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4th IR technologies for inclusive development

- Mobile money platforms for financial inclusion (e.g. M-PESA)
 - Linked services for micro-credit (M-Shwari) and for pay-go durable goods purchases (M-Kopa for solar panel kits)
 - Digital integration of agricultural supply chains through mobile phone apps linking farmers with SME agro-processors.
 - Use of satellite imagery to provide irrigation advice to farmers via mobile phone apps.
 - Green infrastructure developments in electricity (green mini grids)
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Education and training systems need to better respond to skills needs and gaps

- Education and training systems play an essential role in terms of developing both the high-level STEM skills and the intermediate level professional and technical skills needed for the effective use of both traditional and new digital technologies.
 - The recent World Bank STEP survey focusing skills gaps and needs across 6 low and medium-income countries found that:
 - Large shares of employers find that the general education and TVET system does not provide individuals with the required 'practical' skills.
 - Employers rely to a large extent on in-firm training rather than external training
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A need for critical thinking and computer skills

- The STEP survey results also showed that workers tend to use computers more regularly in innovative firms and more of the use is typically for specialized and complex tasks, as compared with traditional firms which report moderate complexity.
 - For white-collar workers, innovative firms attach importance to technical skills, team work, and critical thinking. Similarly, for blue-collar workers, the skills these firms generally value more are critical thinking and leadership.
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Getting the right balance between formal academic skills and experience-based skills

- Educational institutions, and universities in particular, need to make education more relevant by connecting curricula and degrees more closely to professional working experience. One way to do this is to make student internships and work/study contractual arrangements the norm rather than the exception.
 - Professionals from both the public and private sectors can contribute directly to the provision of class-room education and training, thus fostering better links and exchange between universities and local/regional industry and government.
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Investing in life-long learning

- A well-developed system of life-long learning contributes to inclusiveness both through the up-grading of skills and by providing persons with a low level of initial education second chance opportunities for skills development.
 - While much of adult education and skills development will be carried out by employers on-the-job or by specialized VET providers, it is important that universities expand their role in providing continuous adult education and training.
 - One way to do this is to develop specialised professional diplomas open adults and that respond to gaps in existing curricula (eg. diplomas for smart city engineers or diplomas in Edtech.)
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Labour market polices and regulations

- With respect to labour market policies, national systems are often contrasted according to the relative importance given to job protection vs. unemployment protection. I see a number of advantages in instituting relatively strong systems of unemployment protection complemented by expenditures on retraining and assistance in finding jobs.
 - Strong employment protection legislation tends to reinforces cleavages between 'insiders' who have formal and possibly indefinite employment contracts and 'outsiders' working on limited duration or seasonal contracts.
 - In low-income countries a large share of workers work in the informal economy without a formal labour contract. Systems based employment protection legislation cannot respond to the needs of workers of these workers
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Encompassing unemployment protection

- A national-level system of unemployment protection accessible to all persons looking for work regardless of the the nature or duration of their previous employment could go a considerable ways towards providing more encompassing protection.
 - If combined with significant expenditures on training and retraining it could form a important component of an inclusive system of of life-long learning
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