

Multi-year Expert Meeting on
Enhancing the Enabling Economic Environment
at all Levels in Support of Inclusive and
Sustainable Development, and the Promotion of
Economic Integration and Cooperation

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Robots, Industrialization and Industrial Policy

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MULTY-YEAR EXPERT GROUP MEETING

Harnessing International Production Networks to Foster Inclusive Growth and Local Capacities

Session 3:

Using industrial policy to sustain inclusive growth

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Robots, Industrialization and Industrial Policy

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What is the issue?

- 2030 Agenda for Sustainable Development emphasizes link between technological innovation and industrialization on the one hand and industrialization and sustainable development on the other (Goal 9)
- But gaining productivity growth through automation that causes job displacement and wage erosion would compromise attaining this goal as the Agenda aims at tackling poverty and achieving inclusiveness through the creation of more and better jobs
- Some predict that about two thirds of all occupations in developing countries risk being automated; others estimate that displacement risks are highest in those developing countries that rely on low-wage, labour-intensive export-led manufacturing as a development strategy
- **Key questions:**
 - **Does emerging greater scope & speed of automation reduce effectiveness of industrialization as a development strategy?**
 - **How can industrial policy increase benefits?**

Outline

- 1) What are industrial robots?
- 2) Why has the scope and speed of automation increased?
- 3) Where have industrial robots been used most and how is this linked to industrialization?
- 4) What impact on industrial policy?
- 5) Summary and conclusions

1) What are industrial robots? Part of "industry 4.0"

- Industry 1.0 (late 18th century): mechanical production driven by steam and water power
- Industry 2.0 (late 19th century): electrification of machines and mass production
- Industry 3.0 (starting in 1970s): information-and-communications-technology-based production management; simple industrial robots
- Industry 4.0 (now): economy-wide digital interfaces linking Internet of Things, ICTs, Big Data, intelligent robots, etc.

1) What are industrial robots? Definition

- ISO 8373 : Industrial robots are automatically controlled, reprogrammable, multipurpose manipulators programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications
- Industrial robots are distinct from
 - Service robots for professional use deployed in, e.g., agriculture, professional cleaning, construction, logistics, medicine and defence; number of such units sold in 2015 was only about one sixth of that of industrial robots
 - Service robots for domestic/household tasks and entertainment and leisure robots: sold in large numbers but of little relevance here
 - Other forms of automation, such as Computer Numerical Control systems that have allowed for automation of machine tools since 1960s but perform very specific tasks and, even if digitally controlled, lack the autonomy, flexibility and dexterity of industrial robots

2) Why has the scope and speed of automation increased?

- Robot-based automation comes in addition to mechanization
- Increased speed of automation: power of computer software increases exponentially (Moore's law)
- Industrial robots replace specific tasks not entire jobs
- Industrial robots do not replace manual & repetitive tasks of low-skilled workers, but routine tasks:
 - Tasks that can be clearly defined and follow pre-defined patterns, so that they can be coded and translated into software that drives industrial robots

The task-based approach determines the technical feasibility of work place automation

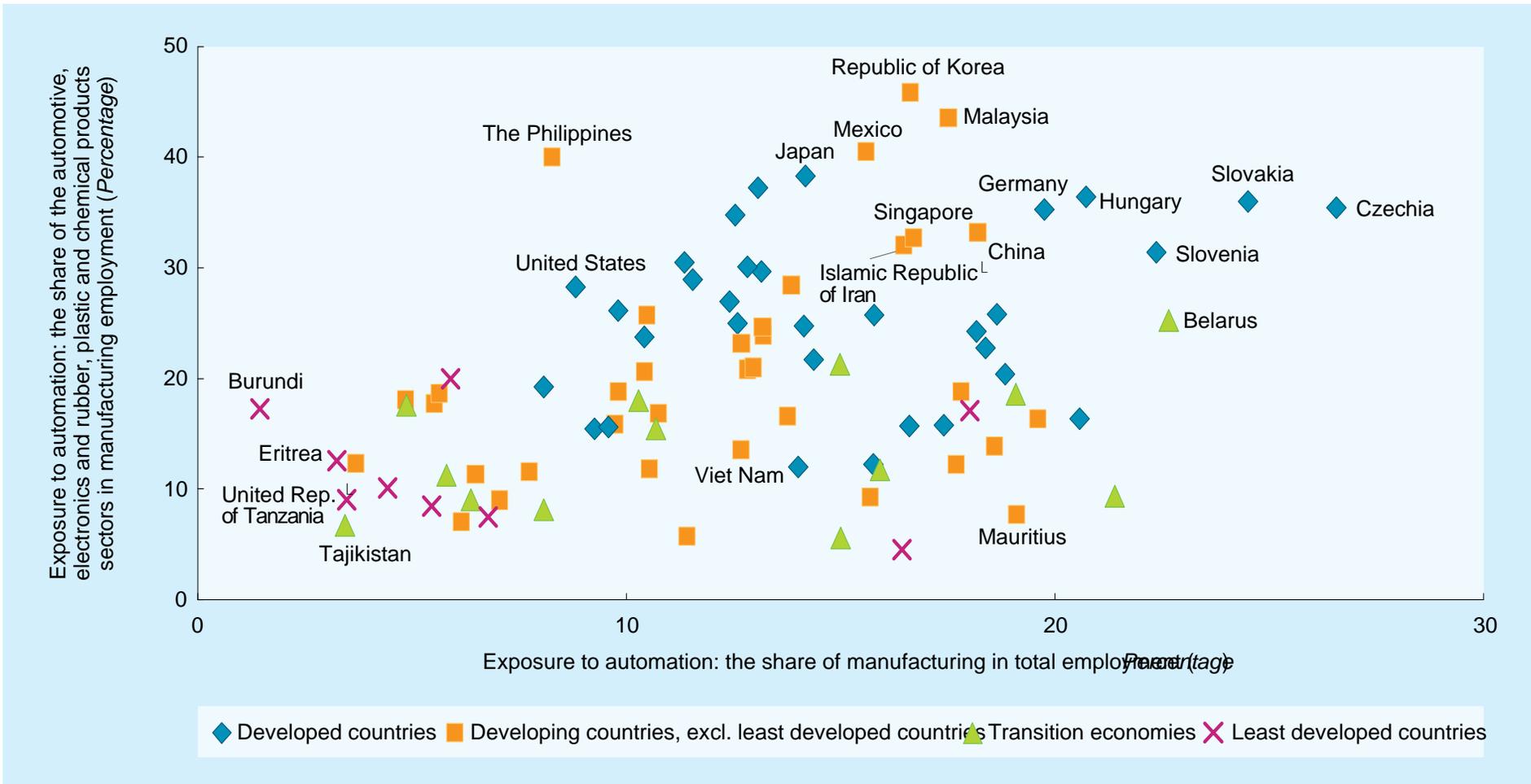
- Calculation of a routine-task intensity index, linking routine tasks to occupations that workers perform on their jobs
- Such indices indicate that routine-based tasks dominate in occupations that are typical for the manufacturing sector
- They more generally indicate the technical feasibility of work place automation
- Such calculations underlie the often dramatic predictions about work place automation

What is technically feasible to automate is not necessarily also economically profitable

Size of bullets reflects global use of robots



As of now, most developing countries are not overly threatened by robot-based automation



3. Where have industrial robots been used most: summary of cross-country and cross-sectoral evidence

- Robot deployment has been very concentrated
 - In a few countries, which are largely the same in which manufacturing output has become concentrated
 - In a few sectors, which are largely those demanding medium skills and those important for industrial upgrading
- Risk that robotics will eventually reinforce concentration of manufacturing activities
- But for now: initial stage of industrialization and establishment of labour-intensive manufacturing activities based on traditional labour-cost advantages seems still possible
- Further development in robotics, e.g. smaller robots affordable for SMEs, combined with 3D-printers, may make smaller production runs economically profitable, including in high-productivity sectors

4. What impact on industrial policy? (1)

- Digital technologies reshape production processes and business models, as well as trade flows: mainstream digital strategy across broader national development, i.e. including for industrial policy
- Objective: development-enhancing participation in digital economy
- Policy challenges, e.g. for robot use, include ensuring:
 - Efficient connectivity (digital infrastructure, broadband connectivity)
 - Effective participation (digitally-skilled labour force; industrial policy regarding technology or innovation hubs & incubators, and finance)
 - Broad-based benefits from participation by addressing winner-takes-all tendencies (competition rules and regulatory capacity)
 - Social protection

4. What impact on industrial policy? (2)

- Objective: participation in digital economy through trade and FDI, based on strong domestic digital firms
- Debate on potential inclusion of various issues related to digital economy in trade & investment agreements
 - Key issues are ownership of and access to data
 - Current multilateral trade rules allow policies (e.g. sometimes controversial limitations to cross-border data transfer; data localization; technology transfer requirements; customs duties or taxes on Internet traffic) to promote domestic digital firms

4. What impact on industrial policy? (3)

- Concentration (for now) of most robots in developed countries plus arising major end markets in developing countries may offer developing countries industrialization opportunities based on domestic innovation and manufacturing workers
- Policy objective: animate link between domestic innovation & domestic demand that uses low-wage labour to produce low-priced products in sectors, such as the automotive industry, which have been robotized only in high-wage countries
 - AI-driven design & 3D-printing-based rapid prototyping and machine tooling may allow domestic firms to compensate lack of skilled designers & of established machinery industry, and to produce cars from design to production
 - Domestic market data on design preferences etc. would enhance advantage of domestic producers over MNEs that adapt global models to local markets
 - What can standard setting, public participation in long-term finance, public procurement, bold demand policies, data localization and other policies achieve?

5) Summary and conclusions

- Robots mostly in higher-wage & higher-productivity sectors
 - These sectors may concentrate in a few countries
 - Others may be driven to lower-wage & lower-productivity sectors
 - Initial stage of industrialization and establishment of labour-intensive manufacturing activities seems still possible, but industrial upgrading may have become more difficult
- Further developments in digitization may create new jobs & manufacturing sectors, but macroeconomic expansion & increased real investment is required for these to arise
- Developing countries should embrace digital revolution with urgency, but not with alarmism – policies shape final outcome
- Digital industrial policy may be crucial for reaping benefits

Thank you !

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**Trade and Development Report 2017:
Chapter 3: Robots, industrialization
and inclusive growth**

<http://unctad.org/en/Pages/Publications/TradeandDevelopmentReport.aspx>