



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION



**SUSTAINABLE DEVELOPMENT GOAL 9**  
INDUSTRY, INNOVATION AND INFRASTRUCTURE

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# Strategic approaches to Industry 4.0 in middle-income countries

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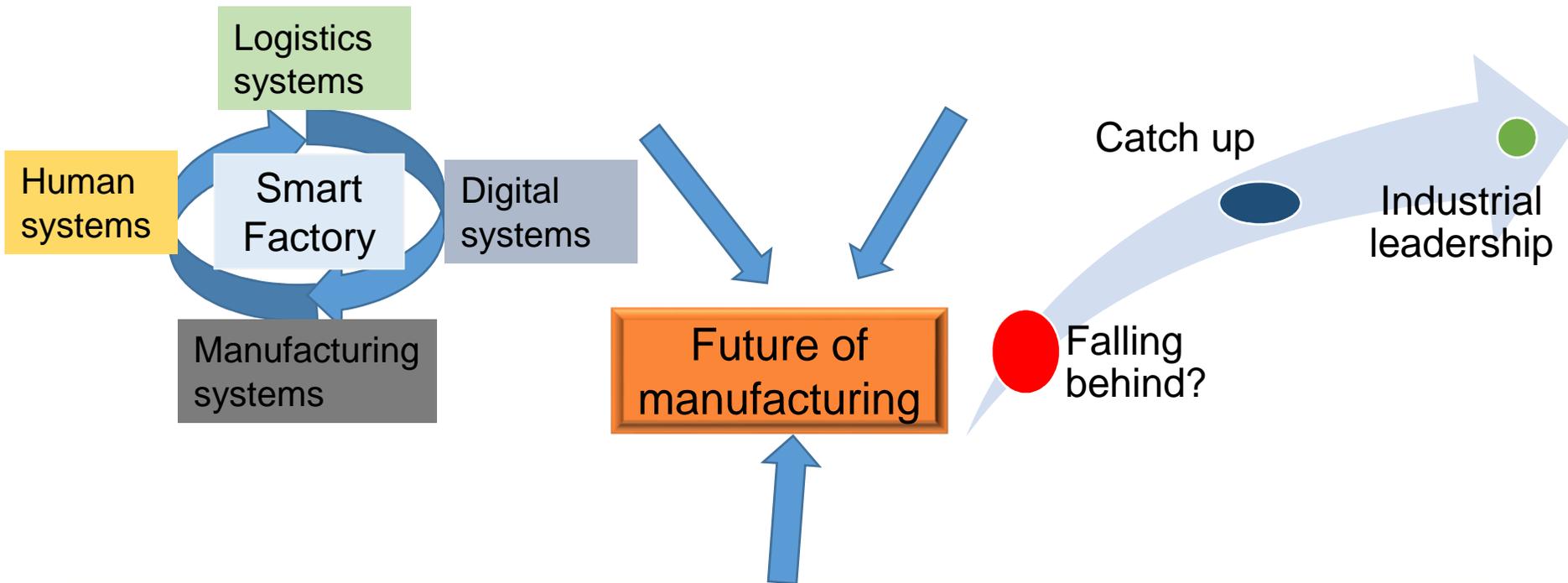
## Agenda

- Proposed dimensions to understand Industry 4.0
- Research questions
- Countries in study sample
- Policy responses to Industry 4.0: developing countries
- Final remarks



# Technological

# Developmental



# Policy strategies

- Learning and experimentation
- Multiple interactions / coordination
- Converging policy realms
- Distributed power
- Context specific



## The case of middle-income countries

- Are middle-income countries getting ready for I4.0?
- What basic principles of strategic policy approaches to Industry 4.0?
  - What concrete measures to facilitate readiness for I4.0?
  - What sectors are most targeted?
  - Is progress measured? How?
  - Are there opportunities for international policy coordination and collaboration?



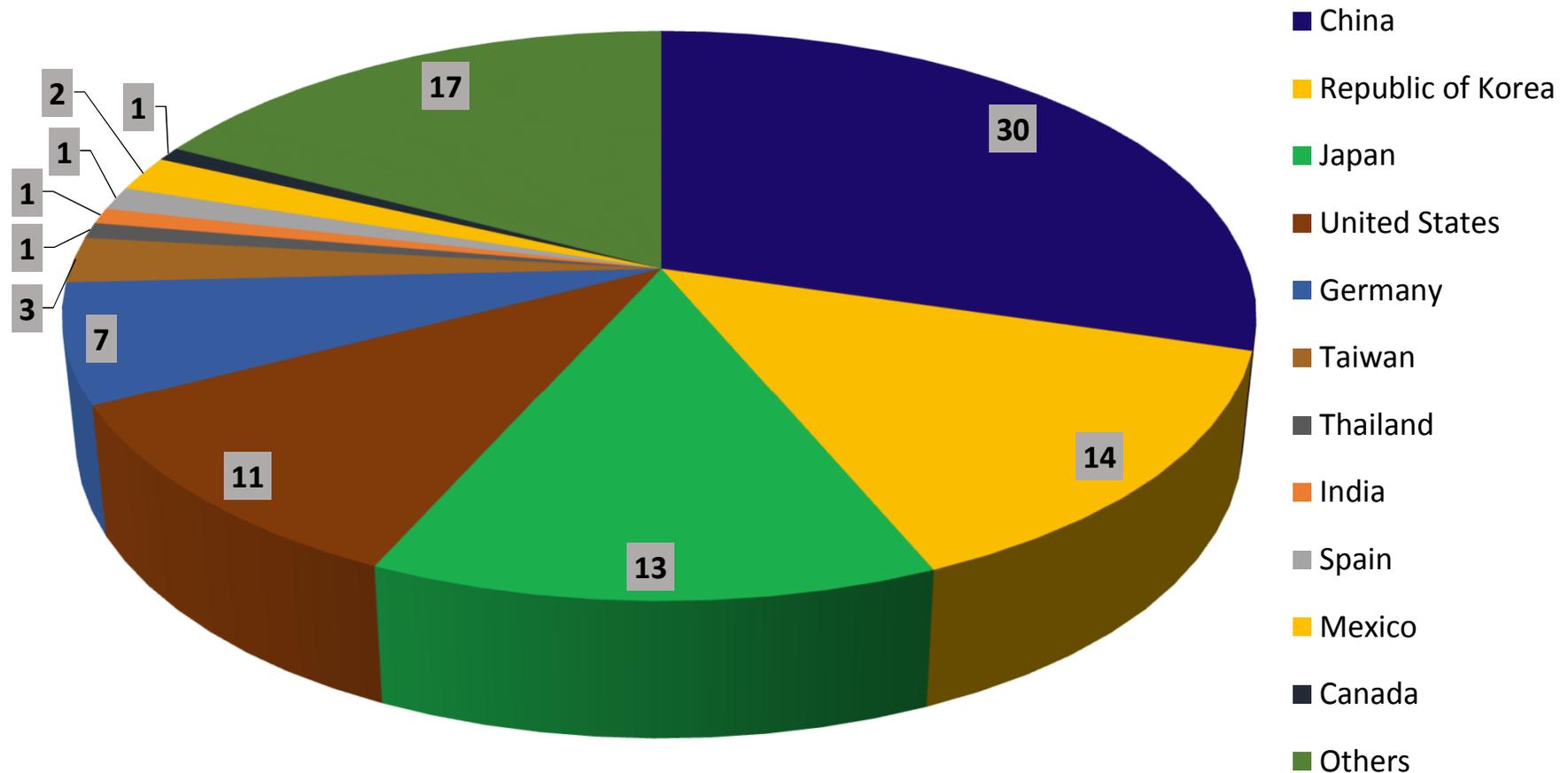
## Characterizing countries included in this study, 2016

	% World Pop	% World GDP	% Region GPD	GDP per capita	Industrial VA1	% World Ind VA	Internet use2	Secure Internet3	Mob phone4
<b>Argentina</b>	0.59	0.58	7.52	10,148.5	26.7	0.47	70	62	151
<b>Brazil</b>	2.82	2.91	38.01	10,826.3	21.2	2.20	60	79	119
<b>Chile</b>	0.24	0.35	4.55	15,019.6	31.3	0.41	66	152	127
<b>Mexico</b>	1.73	1.60	20.93	9,707.1	32.7	1.77	60	41	88
<b>India</b>	17.83	3.19	82.54	1,861.5	28.8	3.25	30	8	87
<b>Malaysia</b>	0.41	0.44	1.57	11,028.2	35.7	0.57	79	106	141
<b>Thailand</b>	0.92	0.53	1.85	5,901.4	35.8	0.68	48	33	173
<b>Viet Nam</b>	1.27	0.21	0.75	1,770.3	36.4	0.26	47	19	128
<b>Ethiopia</b>	1.37	0.07	3.0	511.2	21.3	0.04	15	0	51
<b>Kenya</b>	0.64	0.07	3.0	1,143.1	19	0.05	26	11	81
<b>South Africa</b>	0.74	0.54	25.0	7,504.3	28.9	0.49	54	125	142
<b>Egypt</b>	1.26	0.34	7.89	2,724.4	32.9	0.38	39	5	114
<b>Morocco</b>	0.47	0.15	3.47	3,196.0	29.7	0.13	58	7	121
<b>Kazakhstan</b>	0.24	0.24	0.8	10,570.5	33.5	0.30	77	31	150
<b>Turkey</b>	1.07	1.45	4.9	14,071.2	32.4	1.39	58	80	97
<b>Total</b>	31.6	12.7							

Notes: GDP values at constant 2010 prices in US\$; 1 Share of GDP; 2 % of population; 3 Number of servers per million people; 4 per 100 people

Source: UNIDO Statistics Unit and World Bank Databank

## Distributions of global sales of robots by country, 2016



Source: International Federation of Robotics (2017)



# Are middle-income countries getting ready for Industry 4.0?





## Establishing a strategy and an implementation entity signals readiness

- Development plans generally at initial stages of discussion, consultation, planning

<u>Working group / consultations</u>	<u>Leveraging existing policies</u>	<u>Roadmaps</u>	<u>Strategies</u>
Argentina, Brazil, Malaysia, Turkey	<b>India:</b> Make in India initiative + 'Smart Cities Mission' projects + Digital India programme	<p><b>Mexico:</b> Crafting the Future. A Roadmap for Industry 4.0 in Mexico (2016)</p> <p><b>Vietnam:</b> Directive (16/CT-TTg) "Strengthening the country's capacity to address I4.0 (2017)</p> <p><b>Kazakhstan:</b> Expected end-2017</p>	<p><b>Chile:</b> Strategic Program Smart Industries 2015-2025</p> <p><b>Thailand:</b> Thailand 4.0</p> <p><b>South Africa:</b> Industrial Policy Action Plan 2017/18-2019/20</p>

- Need better articulated milestones, resources and pathways towards outcomes
- Difficult to determine impacts of I4.0 on manufacturing and society at large



# What are the basic tenets of strategic policy approaches to Industry 4.0?





## Policy efforts involve multiple stakeholders, distributed leadership and synergies across policy areas

- Leadership falls on ministries of industry or economy or science and technology
- Collaboration with sectorial and regional initiatives and authorities (Chile, Mexico, Vietnam)



Innovation-driven economies, away from commodities and traditional industries and increasingly into higher value added sectors



## Private sector plays a key role both as driver and as partner

- Participates in design, implementation and follow of national strategies
- Contribute to awareness building strategies
- Provides knowledge inputs for national or sectorial development strategies

Strategy development processes lend themselves to experimentation, learning from past experience and leveraging knowledge from multiple actors

- Leverage on ongoing initiatives and tested tools that can be scaled up
- Expected outputs: sectoral “white papers”, proposals for concrete policy interventions, strategies to develop particular technologies in the I4.0 suite (Argentina, Chile, Mexico, Malaysia)



## Strategies pursue heterogeneous objectives, often not explicitly recognized

- Creating framework conditions
- Promote specific behaviors
- Enhance performance
- Develop policy tools
- Offsetting negative effects (South Africa)



## Strategies target diverse sectors



Source: Author based on policy documents included in this study



## Strategic partnerships with foreign agents to speed up learning curves

- Boosting STI capacities (Brazil)
- Facilitating industrial promotion initiatives (India)
- Setting up technology transfer offices to become major regional provider of I4.0 technologies and services (Mexico, Malaysia)
- Institutionalizing collaboration (signing MoU around I4.0 -Egypt).
- Jointly organizing awareness raising activities targeting domestic agents (firms).





# Final remarks





### Be wary of one-size-fits all solutions!

- Determining impacts on industry and society remains problematic, yet I4.0 can alter industrial leadership and catching up prospects.
- Policy initiatives remain at initial stages of implementation even in pioneering countries.
- Approaches to Industry 4.0 are highly contextual.

### Developing countries: Forging ahead but not quite there yet!

- Searching practical actions connected to broader national development strategies
- Need clear, measurable milestones, outcomes and resources. Culture of M&E!
- Looking for exemplar experiences, domestically and abroad.
- Multi-stakeholder participatory processes are core for strategic responses, but success cannot be guaranteed: prevent capture from vested interest!



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# Thank you

