

# Industrial Policy in an hyper-connected world

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# Outline

Waves of Industrial Policy strategies

A globalized and hyper-connected world

Global structural changes: GVCs and production strategies

Technological revolution: a new world for industries

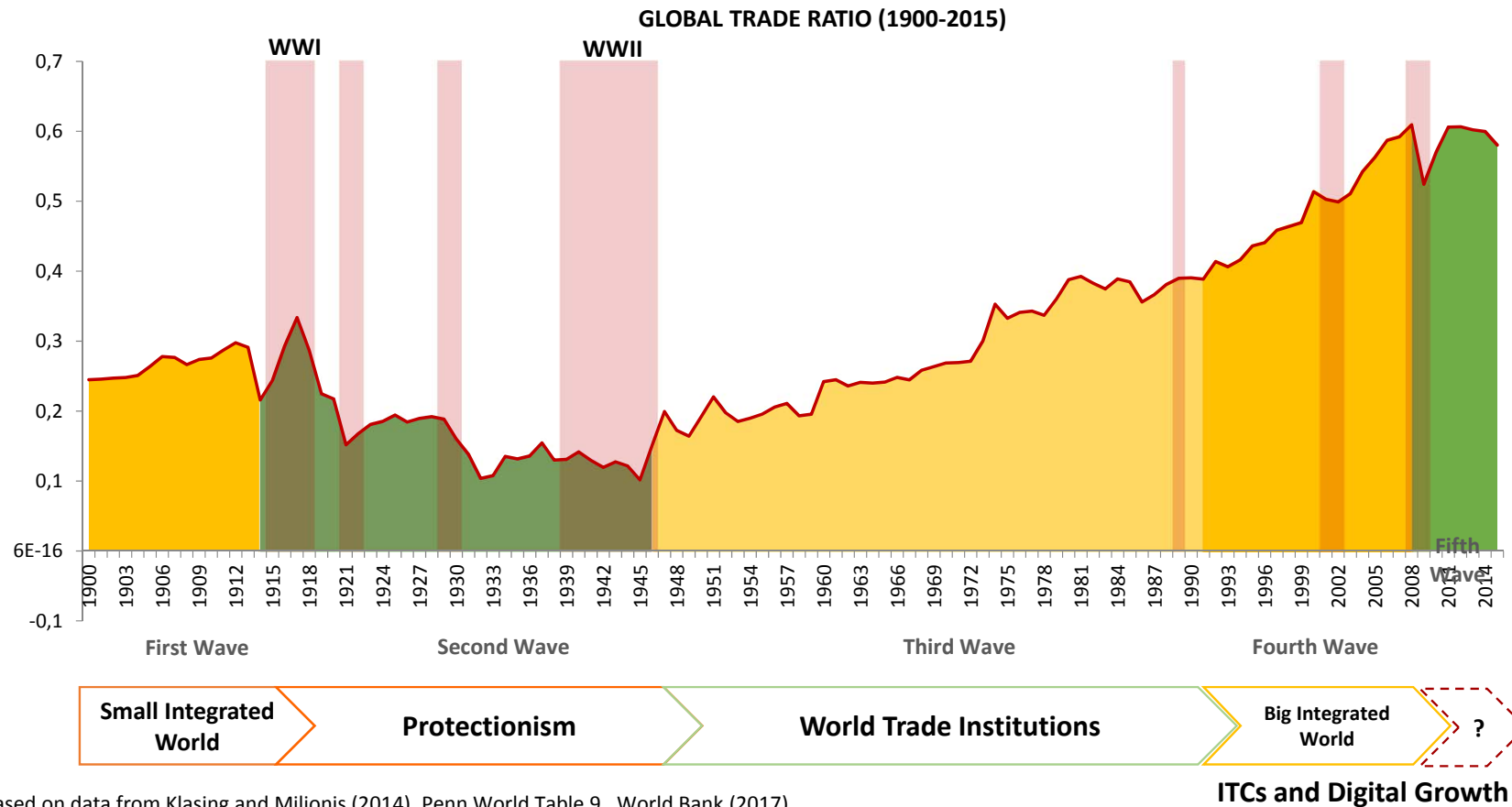
Is manufacturing still manufacturing?

Industrial Policy today: promoting technology-ecosystems

Learning from emerging trends: which industrial policy for LACs?

	1940s-1970s	1980s-1990s	2000s	2010s-2020s
<b>Economic Development</b>	Economic development through industrialization	Liberalization and poverty reduction key to economic development	ITC and Knowledge as key factors for development	Digital economy and innovation in production systems
<b>Rational for Policy</b>	Correct market failures through structural coordination	Market functioning determines countries' specialization	Increasing international competition. Systemic failures in global economy.	Global structural changes. Financial crisis highlighted systemic failures.
<b>Policy strategy</b>	Create new markets. Structural changes and diversification	The best industrial policy is no industrial policy.	Targeted strategies to increase productivity. Enabling institutional environment	Technological and industrial ecosystems development. Competences and capabilities strategic assets
<b>Policy level</b>	Vertical Industrial Policy. Focus on sectors. Gradual open to international competition. Import substitutions	No productive policies. Opening to international competition. Focus on human capital development.	Horizontal policies (entrepreneurship) and selective policies (strategic sectors). National competitiveness agendas.	Smart industrial policies (vertical but focused on technology trajectories and local opportunities). Public-private setting of national missions
<b>Instruments</b>	Protect Infant Industries. Hard Infrastructure. Public R&D. Structural funds.	Foster human capital accumulation. Horizontal innovation policies.	Public procurement. Incentives to innovation. Skills and capabilities development. Public procurement.	Technology development agencies. Smart public procurement. Multi-level public-private coordination
<b>Complementary Policies</b>	Capital movement management. Export-oriented productive policies.	FDI attraction as a strategy to national specialization. Modernization of the state	Management of FDI flows. Focus on national competitiveness.	Strategic management of FDI (assets protection). Strategic management of international trade (USA)

# A globalized hyper-connected world



Source: ECLAC based on data from Klasing and Milionis (2014), Penn World Table 9, World Bank.(2017)

# Properties of globalization

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**Agglomeration-fragmentation**

The internationalization of competition requires more and more scale to compete in the global arena. This generates agglomeration-fragmentation dynamics that affect productive and technological opportunities, the accumulation of capabilities and the structure of the labour market

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**Multi-polarity and Complexity**

Shift of economic and political power and new emerging actors, especially China. Interconnected economies deeply dependent and responsive to each other.

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**Interrelated Issues**

Problems and challenges are increasing borderless and tackling them usually requires coordinated actions.

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**Growing Imbalances**

Persistent trade and current accounts imbalances. Growing asymmetries in development and income distribution, between and within countries.

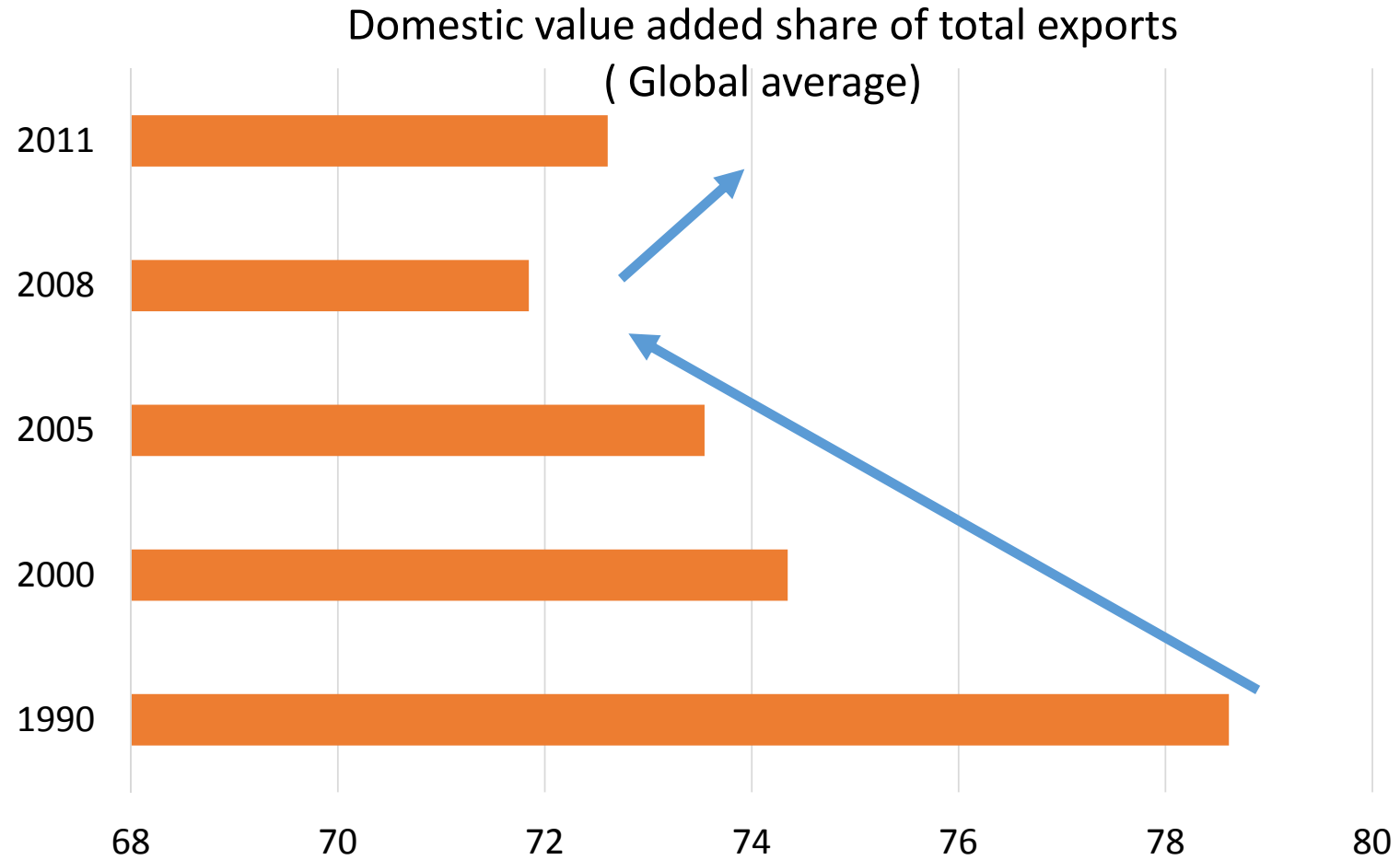
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**Crisis-prone context**

The world economy is much more vulnerable and subject to systemic shocks. Shocks' propagation scale has increased.

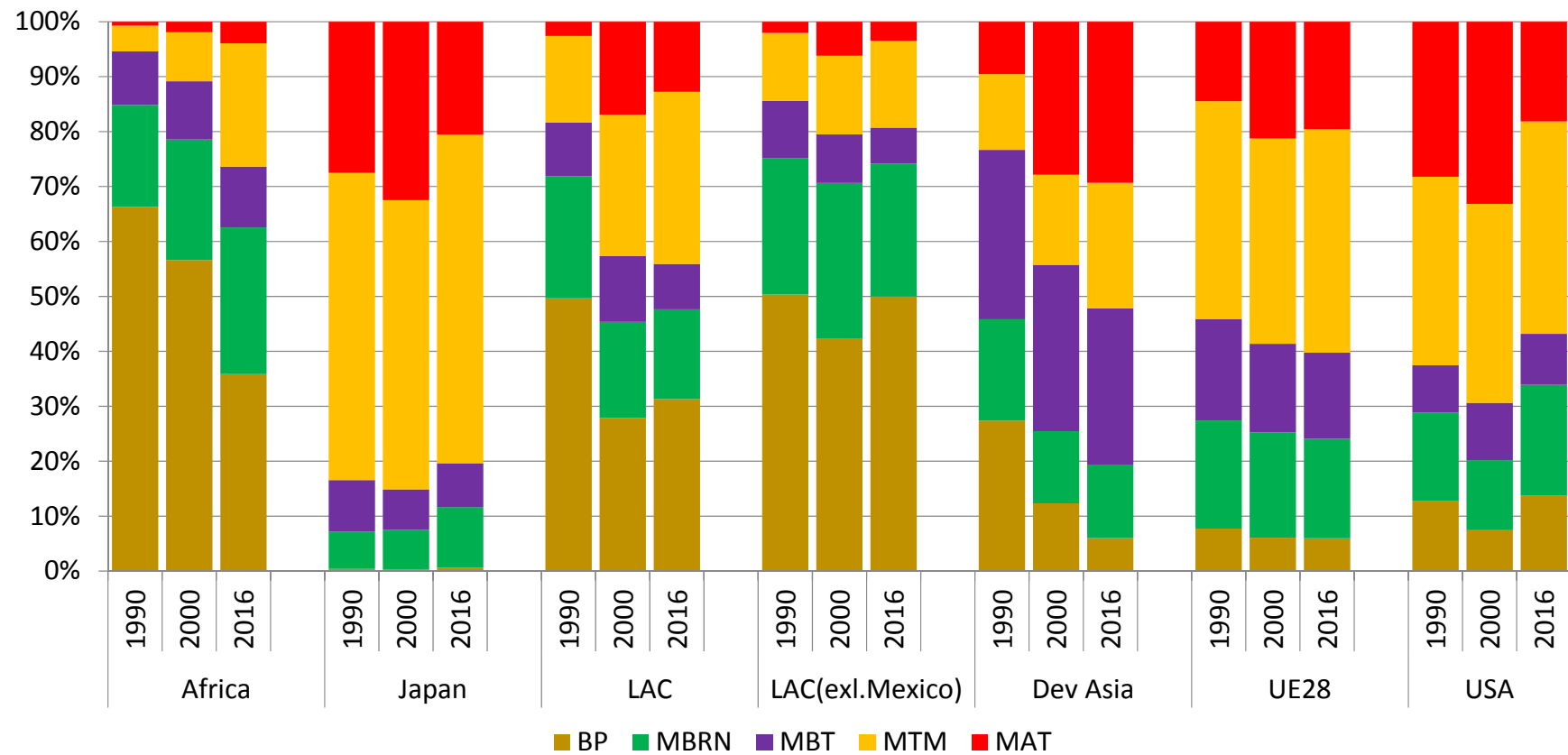
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# Reverting trends in production integration



# Global Structural Changes

Export structure by technology level, world regions (1990,2016)

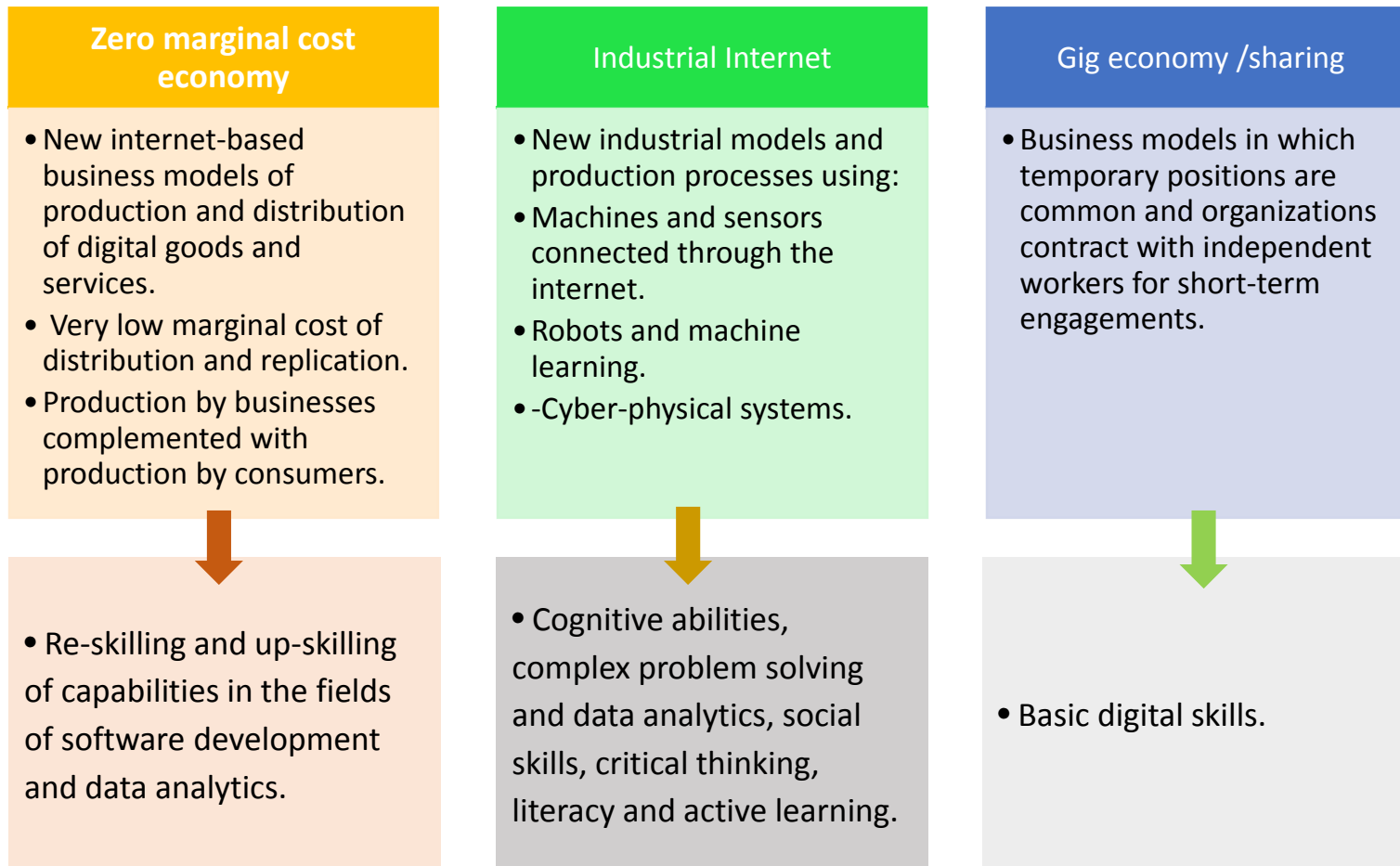


# Global Structural Changes

- Global Value Chains dominates international production networks
- Countries participate to GVCs according to their national production network
- The importance of national and regional industrialization strategies
- Specialization in specific segments of international production might cause lock in-effects
- Value captured by major companies in critical stages of the value chain (consequence: concentration of value in tech-intensive sectors)
- One question to think about: is this kind of development strategy working?



# Technological Revolution is reshaping global production models



# Is manufacturing still manufacturing?

- Manufacturing goes **beyond the traditional industry definition** and **national borders**
  - Manufacturing involves activities across different sectors
  - Modern manufacturing has a global scale with local ecosystem contributing with components and materials at different production levels
  - Vertical analysis is not enough to understand manufacturing complex systems

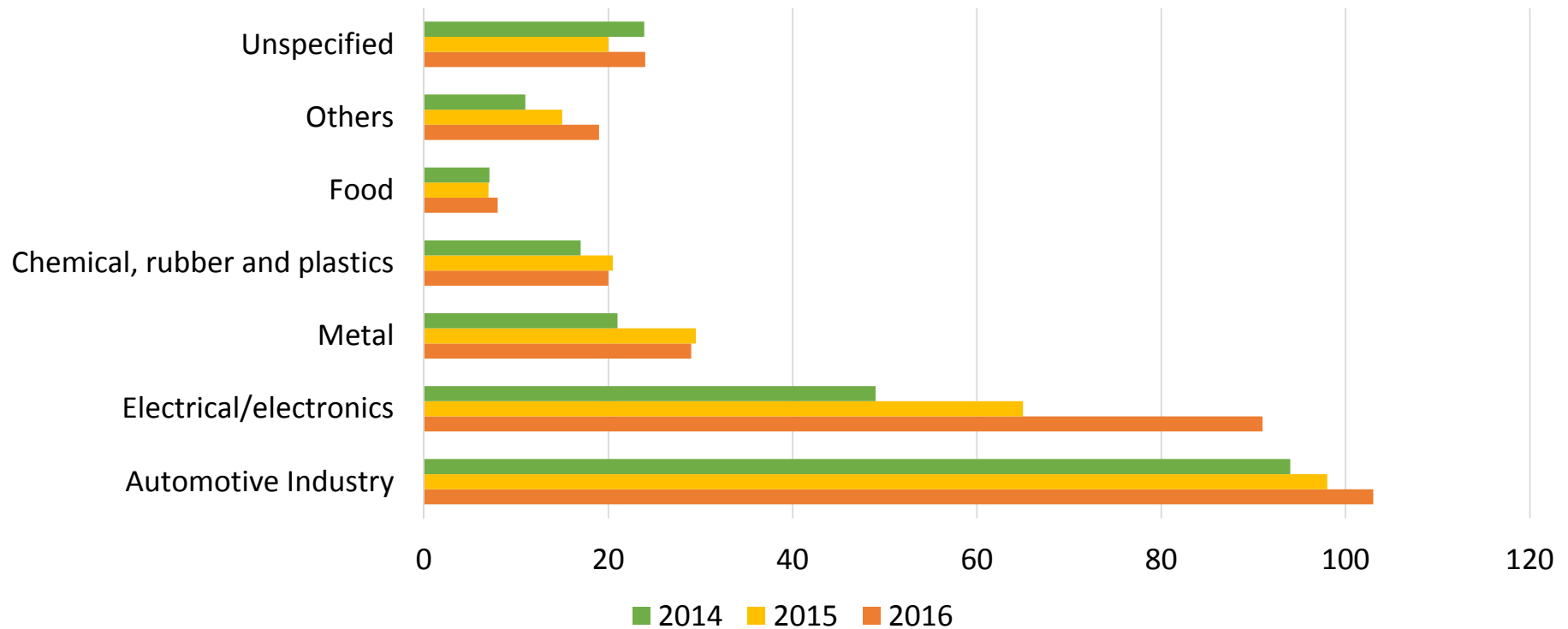
*“A proper understanding of the “portentously rapid” rate of technological innovation which accompanied American industrialization [...] requires that we focus attention on a particular aspect of the changing nature of manufacturing. For this purpose, it is necessary to discard the familiar Marshallian approach, involving as it does the definition of an industry as a collection of firms producing a homogenous product- or at least products involving some sufficiently high cross-elasticity of demand. For many analytical purposes it is necessary to group firms together on the basis of some features of the commodity as a final product; but we cannot properly appraise important aspects of technological developments in the nineteenth century until we give up the Marshallian concept of an industry as the focal point of our attention and analysis. These developments may be understood more effectively in terms of certain functional processes which cut entirely across industrial lines in the Marshallian sense.”*

(Rosenberg, 1963

“Technological change in the machine tools industry 1840-1910”)

# Is manufacturing still manufacturing? Supply of Industrial Robots

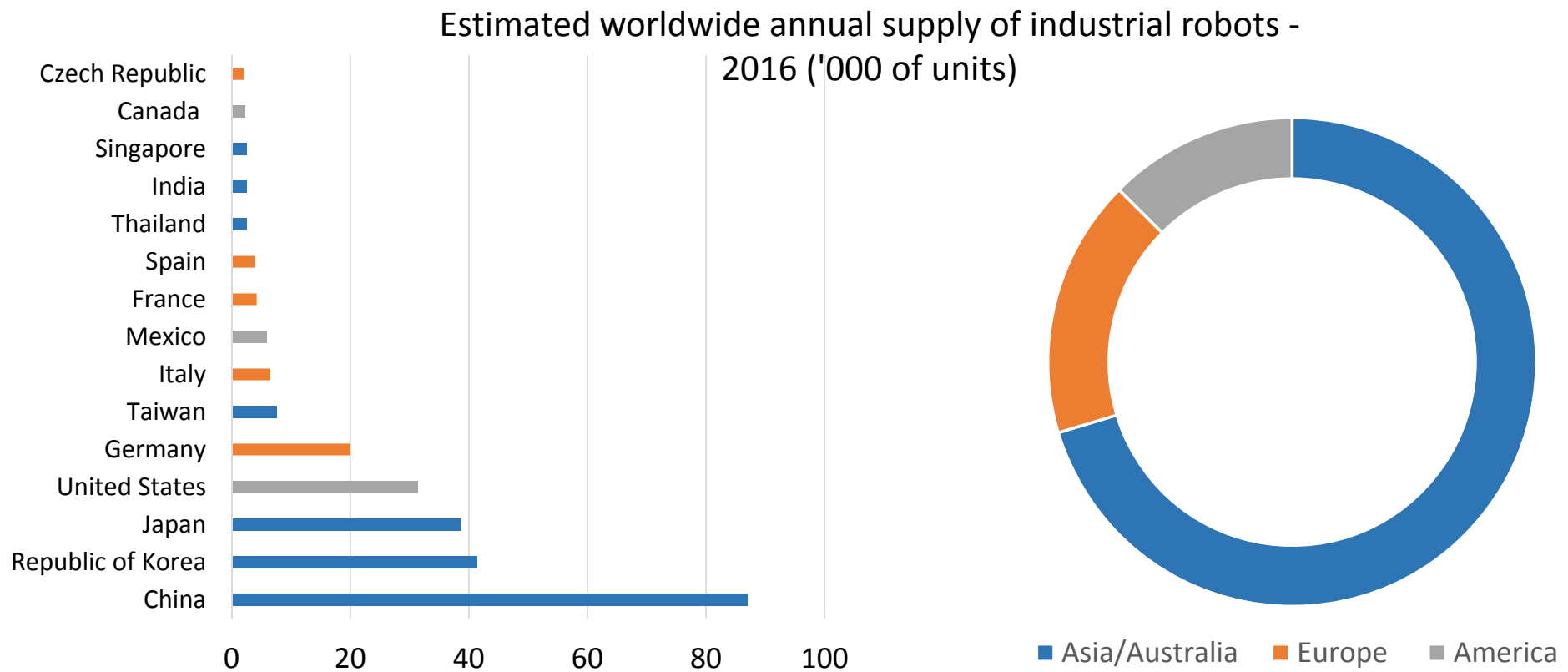
Estimated annual supply of industrial robots by industries worldwide  
('000 of units)



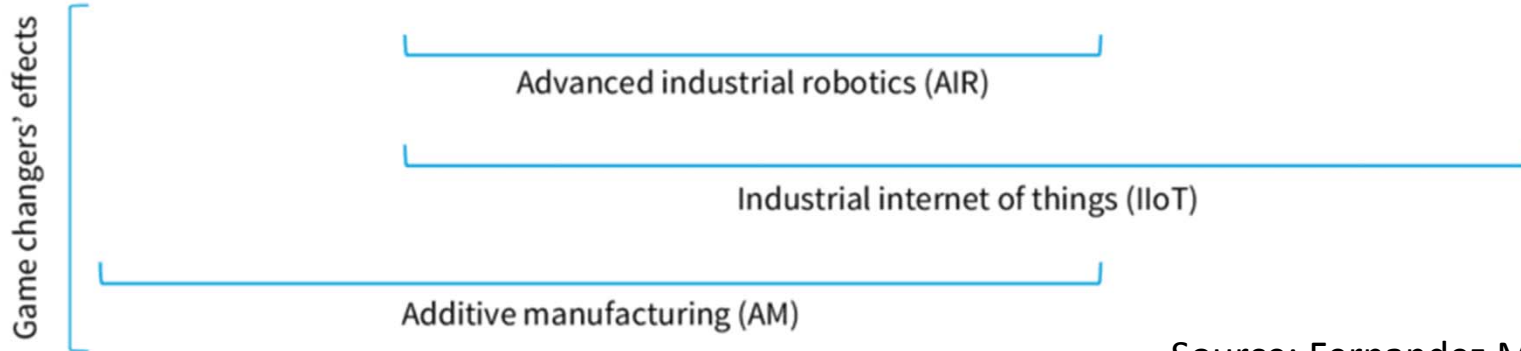
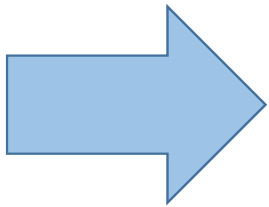
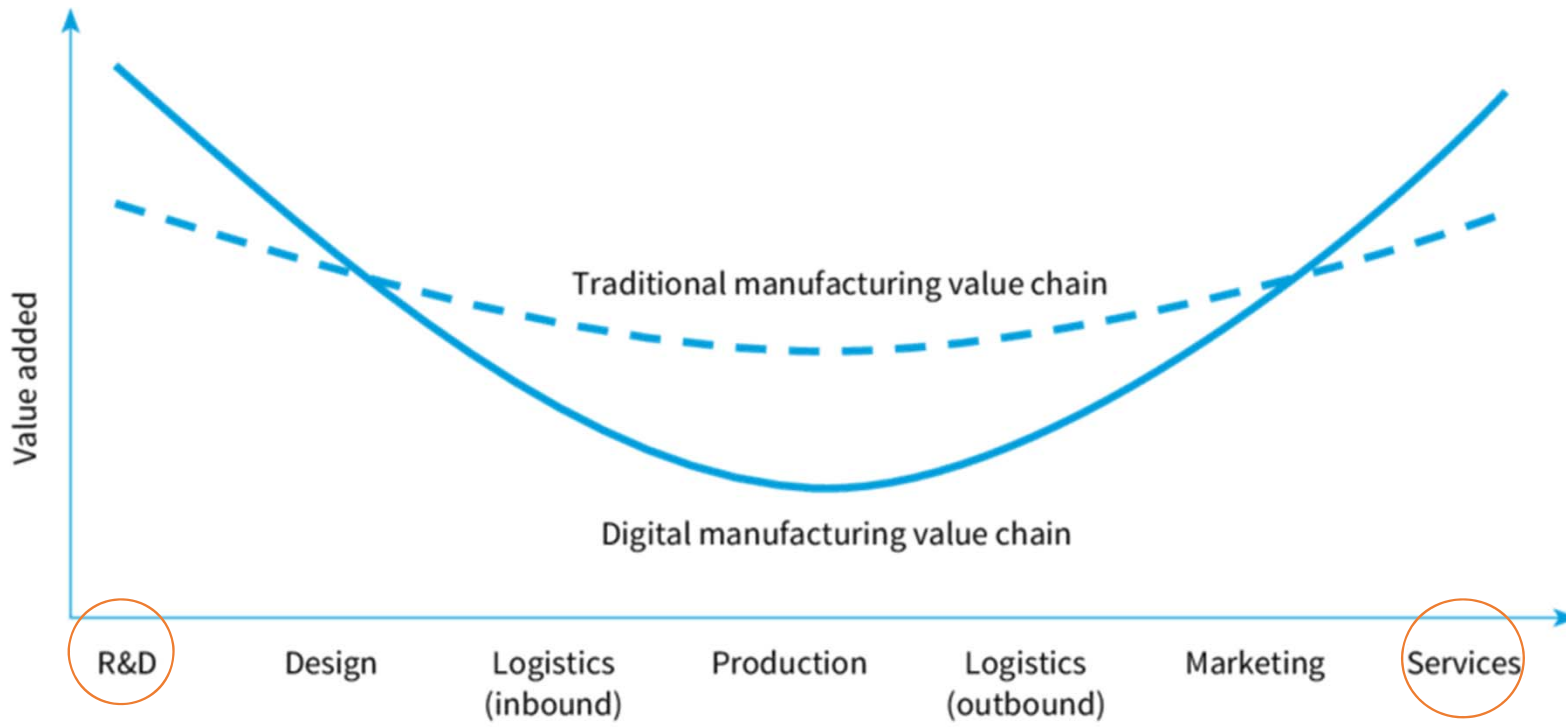
Source: IFR World Robotics 2017

# Is manufacturing still manufacturing?

## Supply of Industrial Robots

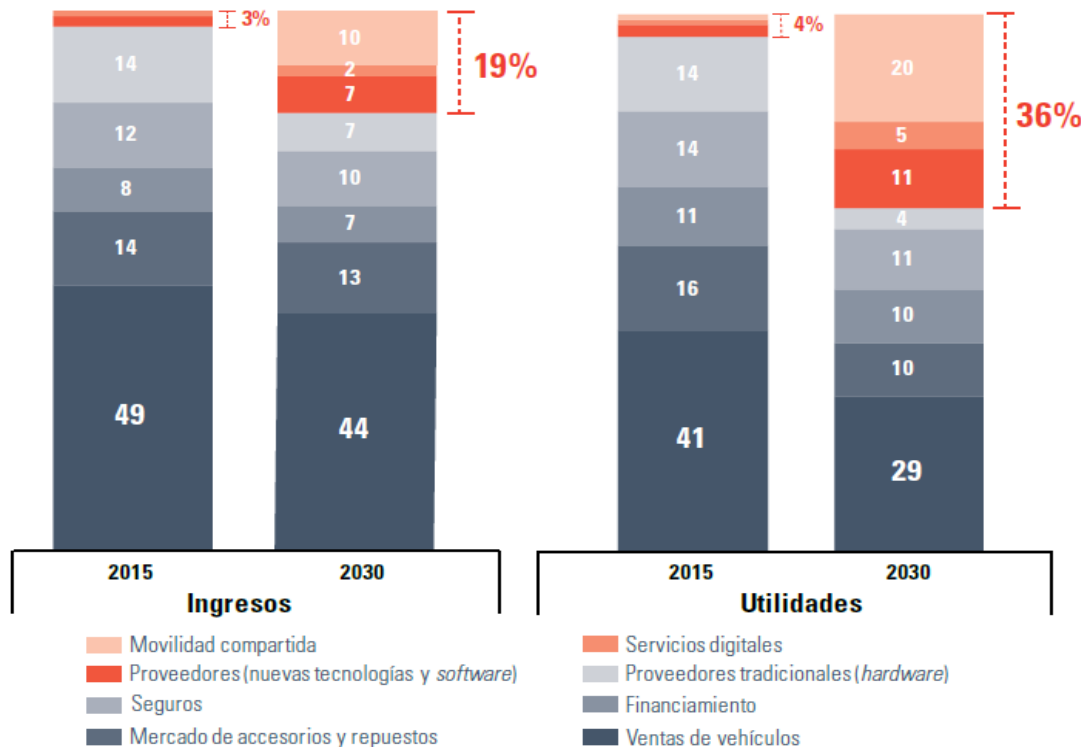


Source: IFR World Robotics 2017



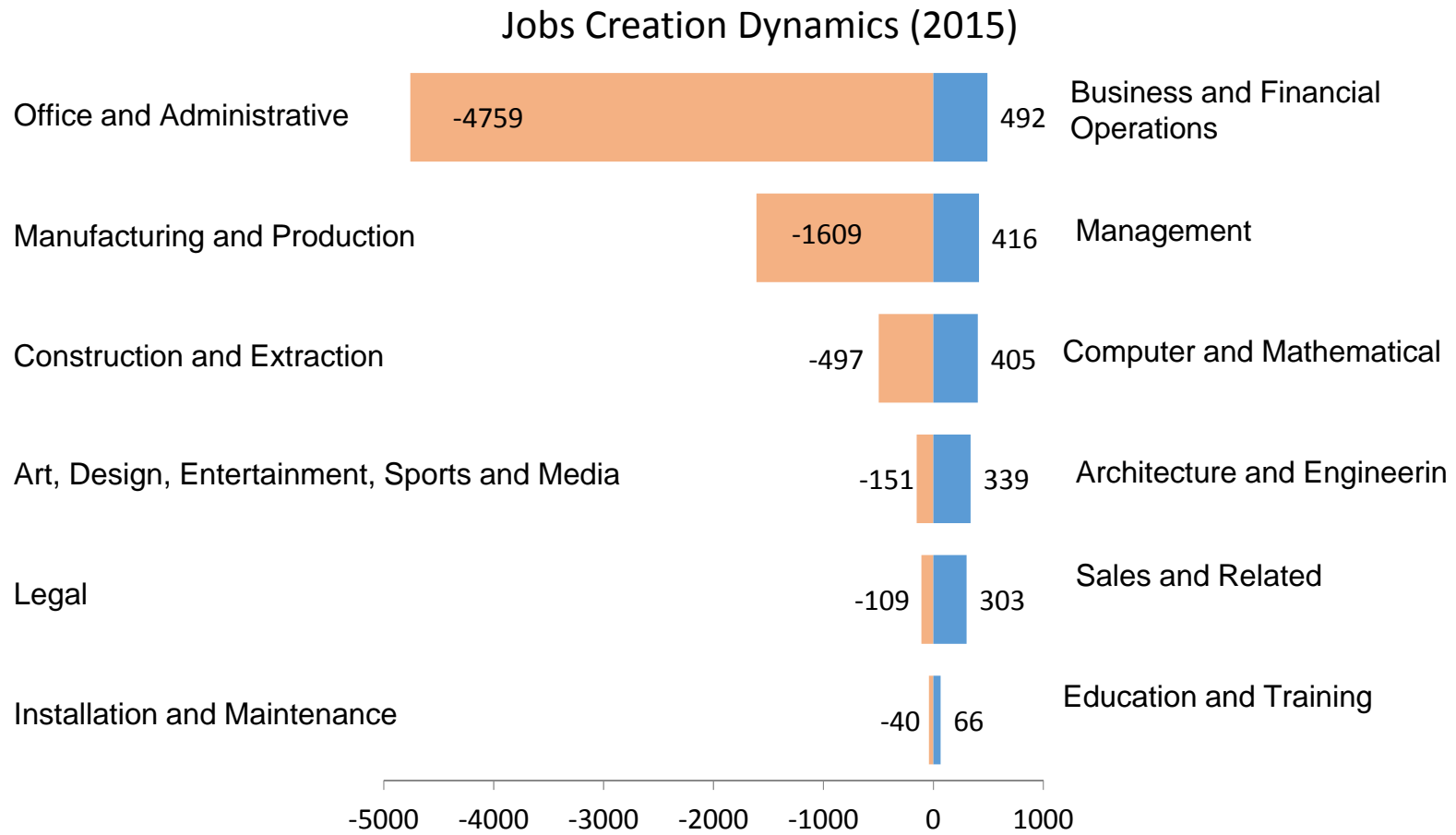
Source: Fernandez Maclas et al. 2018

# A new world for industries



- Technological revolution has redefined the locus of value creation
- Value is created by a recombination of complex technology ecosystems
- Diffused production technology and capabilities are key
- High degree of cross-sectoral spill-overs

# A new world for workers



Source: WEF (2016)

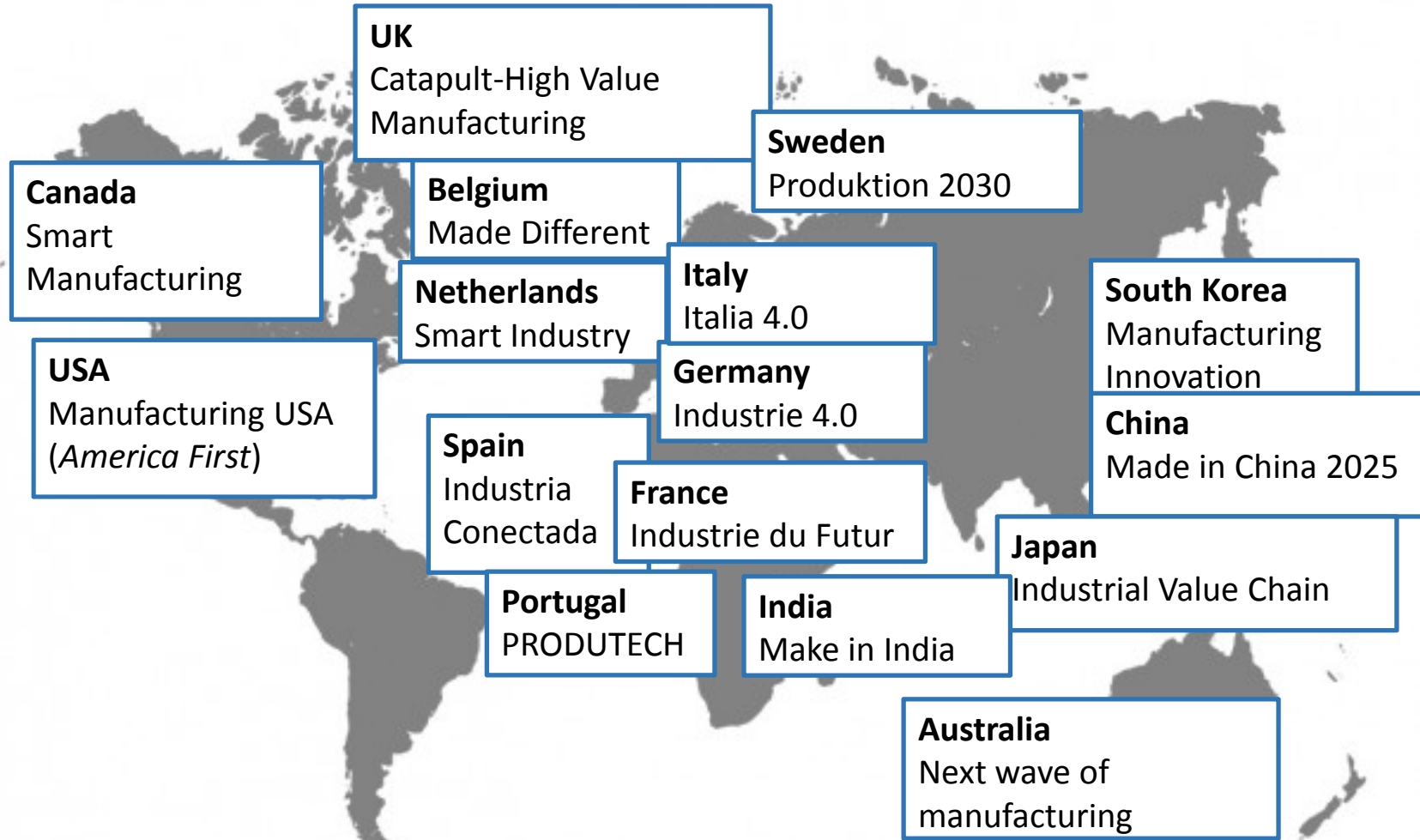


# Evidence of a paradigm shift

- Tendency to start the reshoring of some industries
  - Automation reduces the importance of labor cost
  - On-demand production
  - Transportation costs and logistics more and more important
  - Design and production proximity crucial to R&D
- Manufacturing is (and will be) the focus
  - Dominates trade balances
  - Foster technological development
  - Positive externalities for growth in other sectors
  - Determines *innovative advantages*

Which policies are then necessary to support a new competitive manufacturing sector?

# New Industrial Policy





# Smart Manufacturing USA (America First)

<p><b>Rational for Policy</b></p>	<p><b>Manufacturing Offshoring</b> of production and R&amp;D centres undermines competitiveness.</p>	<p>The historical trade surplus in <b>High-Tech products</b> has been converted in a <b>deficit</b> since 2001. Significant Job losses.</p>	<p>Changes in production processes and the emergence of <b>technological ecosystem</b> put US manufacturing under pressure</p>
<p><b>Policy strategy</b></p>	<p>Promote US-based manufacturing competitiveness</p>	<p>Create a business-friendly environment and improve international conditions</p>	<p>Boost advanced manufacturing R&amp;D and innovation</p>
<p><b>Policy level</b></p>	<p><b>Cross-cutting technologies initiatives</b> (Robotics, Bio manufacturing, Etc.)</p>	<p><b>Sectoral Policies</b> at the State level. Initiatives to boost international trade</p>	<p>Development of <b>technology infrastructure</b></p>
<p><b>Instruments</b></p>	<p>Incentives to SMEs, Manufacturing tax credit, reduction in energy costs</p>	<p>High-tech mission oriented initiatives.</p>	<p>Network of manufacturing innovation, Robotics initiatives and other high-tech initiatives</p>
<p><b>Complementary Policies</b></p>	<p>Tax benefits as a mean do incentivize US-based production</p>	<p>Input-technology strategies: skills, education and energy Renegotiation of FTA</p>	<p>High risk investments to help the development of new technologies. Federal investments (mainly defence)</p>



# Concrete Initiatives in the US

<b>Initiative</b>	<b>Goal</b>	<b>Implemented by</b>
Industrial Internet Consortium (IIC)	Input on standardization; new business models	Business Sector
Smart Manufacturing Leadership Coalition (SMLC)	Joint pre-competitive research on an open platform	Business Sector
AllSeen Alliance	Consumer electronics	Business Sector
Open Connectivity Foundation (OCF)	Inter-system communication	Business Sector
National Network for Manufacturing Innovation (NNMI)	Innovation centre, not specifically focused on Industrie 4.0 (DMDI)	Government



# Made in China 2025

<b>Rational for Policy</b>	China aims to be the <b>manufacturing superpower</b> in the world by 2025	Increase quality of Chinese manufacturing and <b>reducing dependence on international trade for high-tech</b>	Broad-scale <b>industrial upgrading as a strategy to escape income-trap</b>
<b>Policy strategy</b>	Increase <b>import-substitution</b> in high tech	Develop national technological ecosystem	Local government strategies to upgrade the industrial system all over the country
<b>Policy level</b>	<b>Top-down approach:</b> the government sets objectives and time horizon	<b>Huge investments in technology and industrial development,</b> specifically targeted to development of more competitive technologies (automotive and energy)	<b>Subsidies to indigenous IP development and localization.</b> Public fund to R&D and innovation in strategic industries (semiconductors, robots, batteries)
<b>Instruments</b>	Financial Policies, Technological and Sectoral funds and business subsidies	<b>Preferential access to capital to domestic companies to enhance their capacity to acquire technology</b> and promote their indigenous R&D capabilities	<b>Investment libraries</b> to promote investments in MCI2025 sectors and technology
<b>Complementary Policies</b>	<b>International FDI strategy,</b> targeting high-tech enterprises all over the world to acquire technological capabilities	<b>Pre-establishment restriction</b> to protect MIC2025 sectors from foreign competition	Diffusion of <b>State Owned Enterprises</b> in high tech all over the country – technological network



# Concrete Initiatives in China

<b>Initiative</b>	<b>Goal</b>	<b>Implemented by</b>
Internet of Things Center Shanghai	ITC Development	Government
Internet Plus	Industrial Internet	Government
Digital Infrastructure	Enabling system transformation	Government
Smart Factory 1.0 Initiative	Industrial ecosystem transformation	Business Sector



# Industrie 4.0

## Rational for Policy

Maintaining **Germany** unconditional **strong position in manufacturing**

Development of **foreign market**

Industrie 4.0 policy as result of coordination of different national policies (climate, communication, energy)

## Policy strategy

Increase excellence and high-tech in German manufacturing industry

Develop **national technological ecosystem** – industry networks

Sector and technology focused institutional infrastructure

## Policy level

**Multi-level approach:** Government guidelines and sectorial initiatives

Large scale **bilateral programs with other countries:** EU, Japan, USA, South Korea

**Decentralized institutional structure co-funded by the government.** Support for industry transformation (skills, financial conditions, technological assistance)

## Instruments

R&D technology oriented and R&D and **innovation institutions networks**

**Institutional networks** to increase access to R&D founding and **bear initial R&D costs**

**Subsidies to SMEs** (Mittlestand), stable access to finance

## Complementary Policies

Education and skills programmes

Policies to ensure the increase in private investment and the commitment of the private sector

**Selective control of technology market by high standards for public interventions**



# Concrete Initiatives in Germany

<b>Initiative</b>	<b>Sector</b>	<b>Implemented by</b>
Plattform Industrie 4.0	General framework coordinated by government	Government
BDEW	Industrial Internet	Industrial Association
BDI	Cross-sectorial manufacturing initiatives	Industrial Association
Bitkom	ITC	Industrial Association
VDA	Automotive Industry	Industrial Association
ZVEI, VDMA, et al.	Sectorial engineering industry	Industrial Association



	<b>Target</b>	<b>Technology/Sector</b>
<b>France</b>	Industry & production base, SMEs & mid-caps	Transport, IoT, artificial intelligence, Big data, HPC, Digital trust, healthcare, smart cities
<b>Italy</b>	Large companies, SMEs, universities, research centres	Generic R&D promotion with focus on digital and AM industrial transformation
<b>Spain</b>	Industry: focus on SMEs & micro-enterprises	Digital platforms, Big data, Collaborative applications
<b>Uk</b>	Business, industry & research organisations	Aerospace, Automotive, Chemicals, Nuclear, Pharma, Electronics
<b>Czech republic</b>	Industry & service sector companies, trade unions	No specific focus
<b>Sweden</b>	Research, academia & industrial & service SMEs	No specific focus
<b>Netherlands</b>	General Business Community	No specific focus

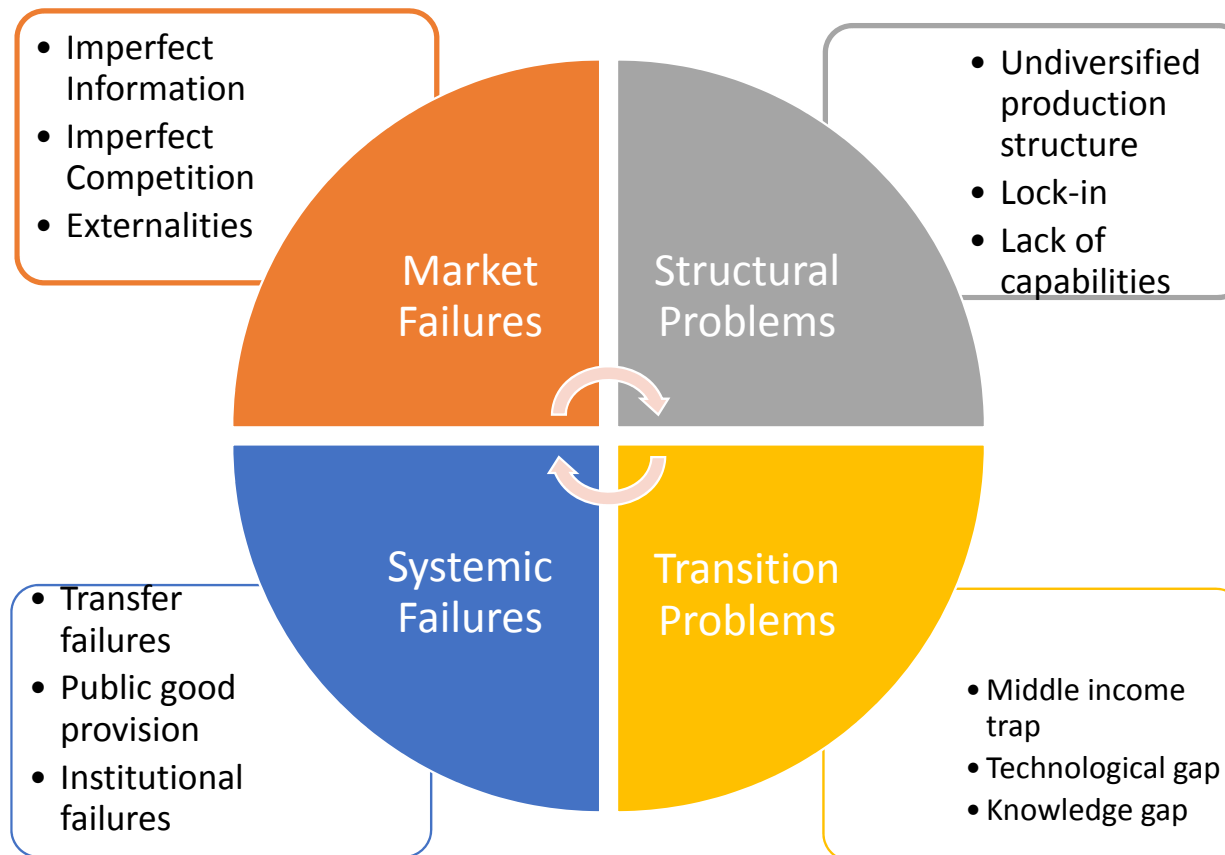


Application Public-Private Partnerships  
ICT Innovation Manufacturing for SMEs  
Digital Sector Partnerships  
Vanguard Program (Regional Excellence in Manufacturing)

# New Industrial Policy: Promoting technology ecosystems

- **Explicit policies:** Renewed interest in manufacturing policies; the main approach is **cross-sectoral** and is aimed at promoting technology ecosystem
- **Major focus on:** advanced manufacturing, IoT, platforms development and the development of enabling technologies
- Increasing awareness that **geographically concentrated manufacturing systems** (all along the smiling curve) **can be a competitive advantage** in the technological revolution
- Skills and infrastructure development have a key role in all the political packages
- **Main challenge:** transition from traditional manufacturing oriented policies to long-run policies for technology-ecosystem development

# New Industrial Policy: a multi-level approach



# Is LAC ready?

ECONOMÍA/FINANZAS 14-03-2018 23:51 Hs.

## BNDES recurre a blockchain para aportar transparencia tras los casos de corrupción

NEGOCIOS 11/01/2018 5:01 AM CST

## ¿Una nación blockchain? Esto es lo que el gobierno mexicano tiene entre manos

## El BCRA, las fintech y los bancos se unen para innovar

Se trata de la mesa de in  
bancos a usar servicios e  
realizar pagos

NEGOCIOS 27-02-2018 23:36 Hs.

## La tecnología 5G empezará a desplegarse en América latina a mediados de 2020

La cobertura en dispositivos móviles llegará al 50% en 2025

## Prueban sistema electoral con tecnología blockchain en Colombia

publicado 6 días antes el 13 Marzo, 2018  
Por **Francisco Mayorga**

## Tecnología blockchain disponible en Colombia



Fuente: A+ A-

Por Corporación Colombia Digital | Abril 19, 2017



Los sectores financiero, gobierno y salud serán los primeros en hacer la transición y rentabilizar sus beneficios.

PRESS

## Plan Nacional IoT de Brasil realizará primera convocatoria para salud

MÉXICO

## Diputados mexicanos aprueban la Ley Fintech

El Ministerio de Tecnologías de la Información de Colombia anuncia el borrador de su política de Ciudades Inteligentes

Publicado: 07/03/2018

Forbes

ÚLTIMAS NOTICIAS SEI

Portada / Tecnología /

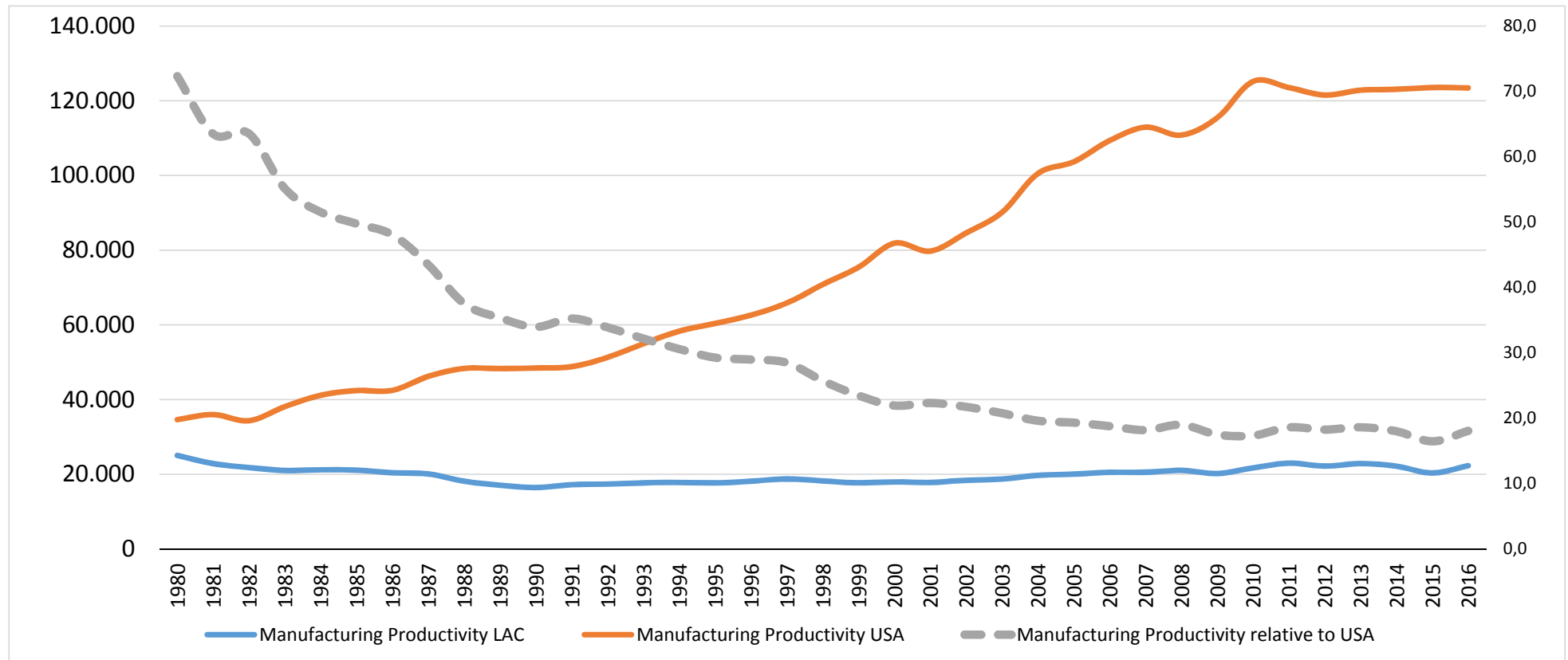
**Uriel Naum**  
marzo 15, 2018 @ 6:40 am

## El blockchain podría colaborar en el combate a la corrupción

La manera en que la tecnología ofrece visibilidad a los procesos puede hacer más transparentes las elecciones, los presupuestos gubernamentales y las asignaciones a proveedores, asegura experto.

# Low productivity persists...

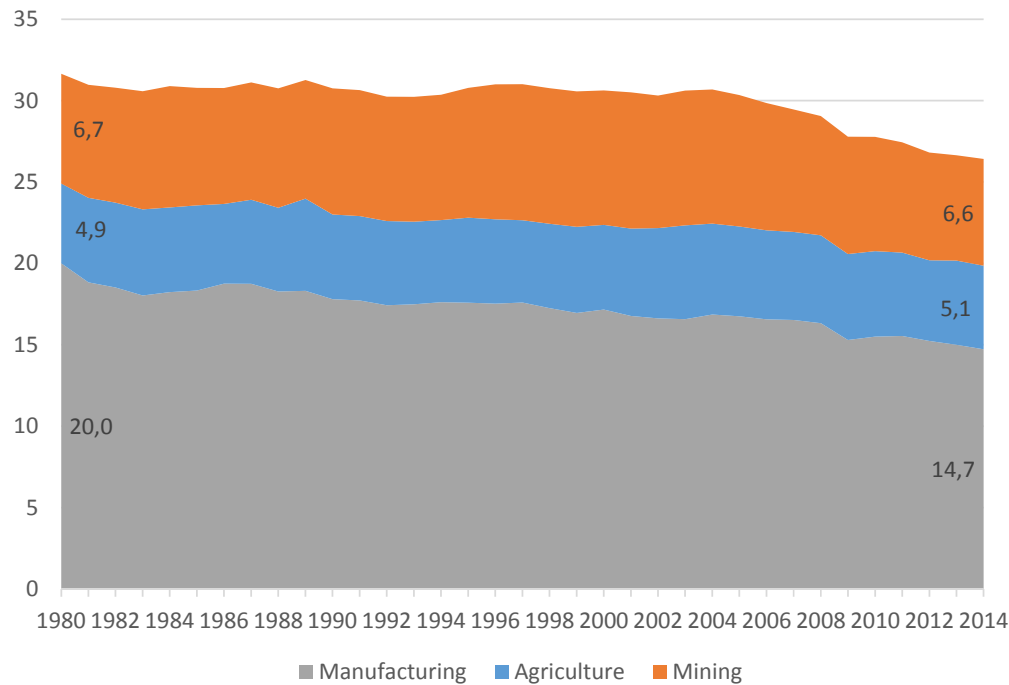
LATIN AMERICA: RELATIVE LABOUR PRODUCTIVITY WITH RESPECT TO THE UNITED STATES  
AND UNITED STATES' LABOR PRODUCTIVITY INDEX, 1980-2016



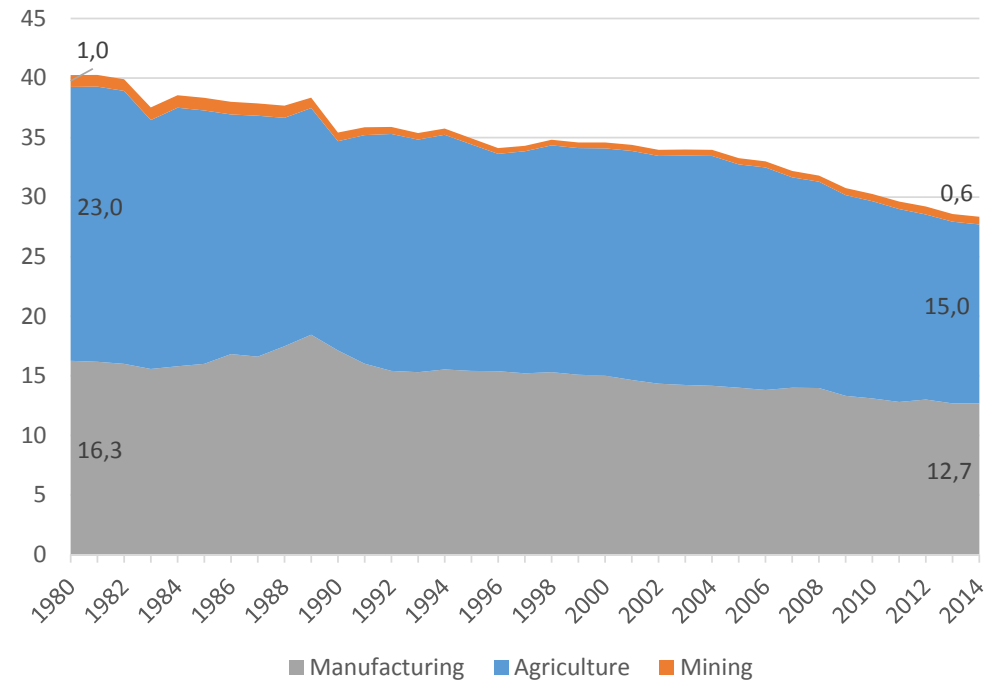
Source: ECLAC on CEPALSTAT and ILO

# As does the old undiversified productive structure

A. Value Added



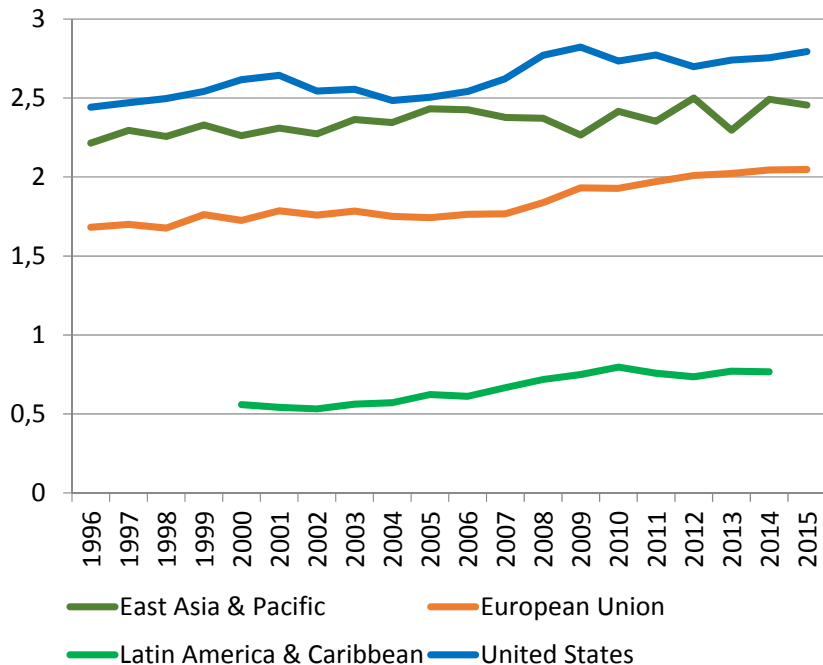
B. Employment



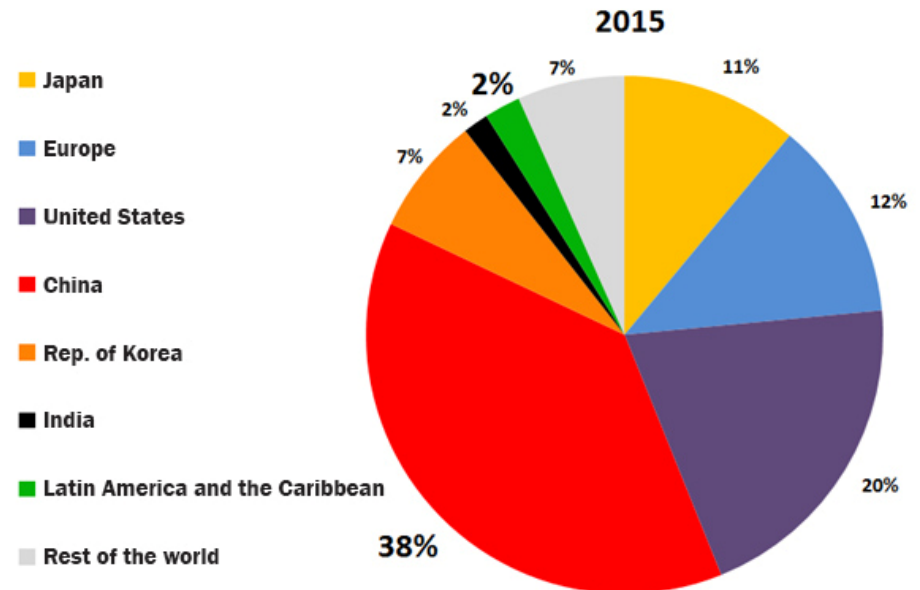
Source: ECLAC on CEPALSTAT and ILO

# With little innovation and technological progress

RESEARCH AND DEVELOPMENT EXPENDITURE AS PERCENTAGE OF GDP, SELECTED COUNTRIES 1996-2012



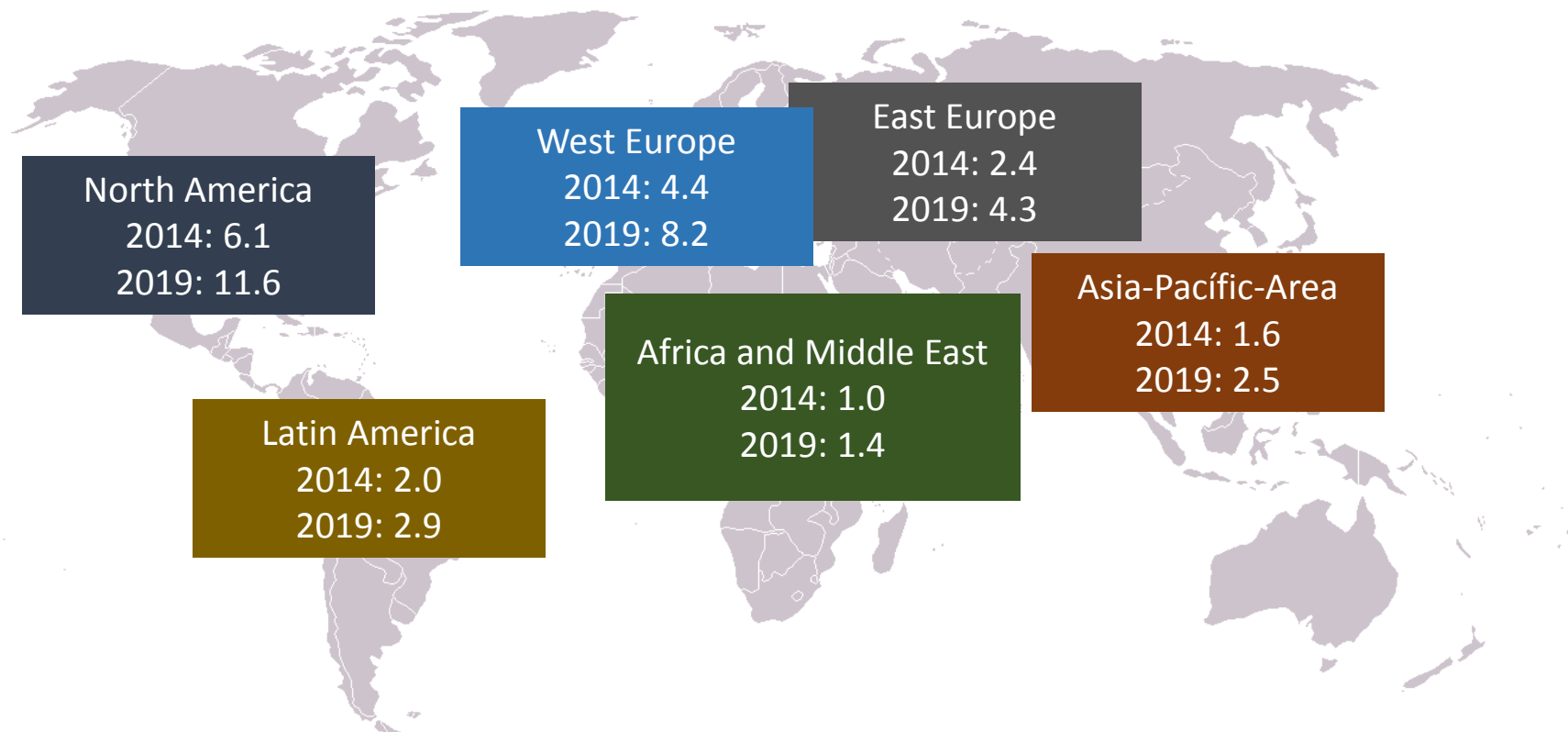
SHARES OF TOTAL WORLDWIDE PATENTS, RESIDENTS AND NON-RESIDENTS, SELECTED COUNTRIES 2015



Source: ECLAC, on the basis of UNESCO and WPO

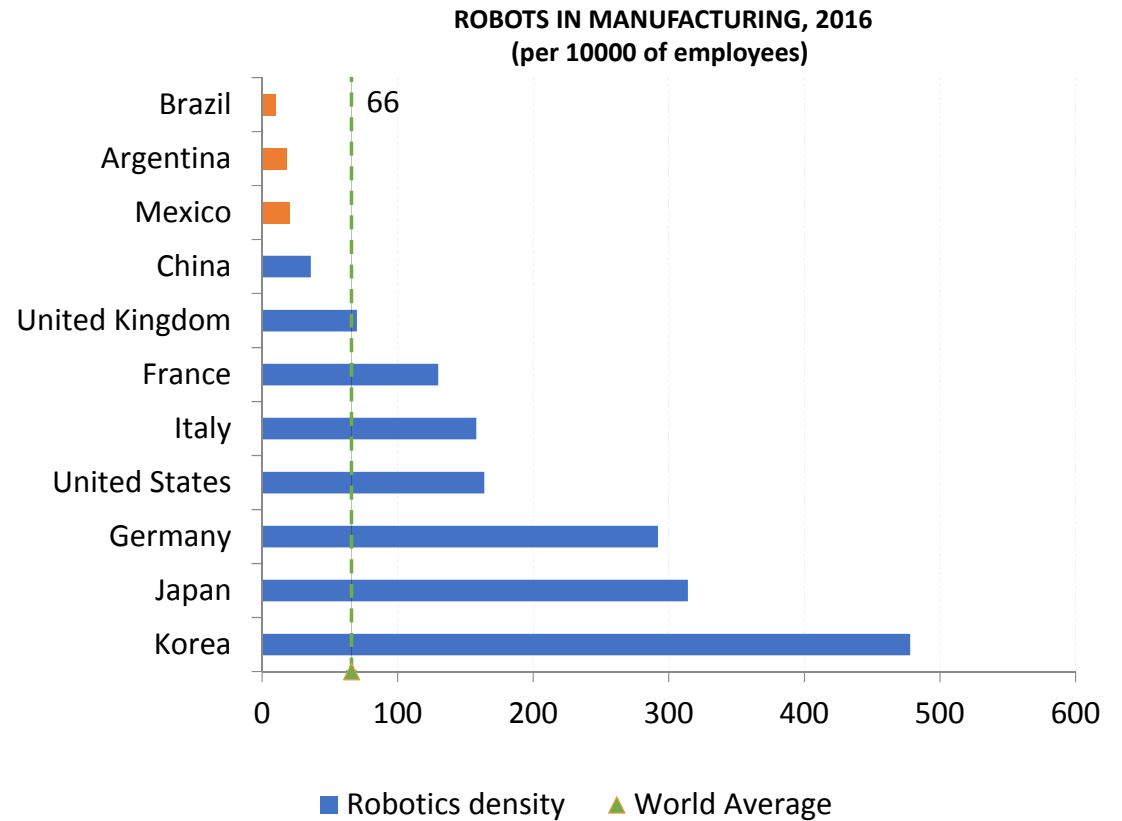
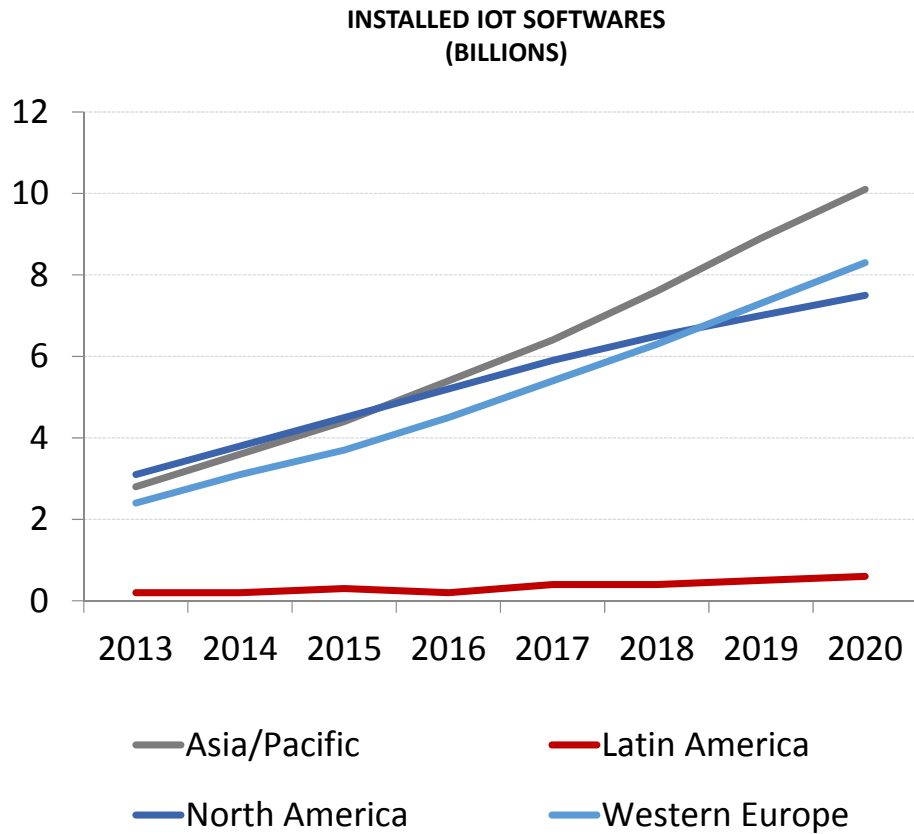
# Gap in adoption of new technologies

NUMBER OF ACTIVE SENSOR, per capita (2014, 2019P)





# Industrial Policy are necessary for regional catching-up



# Learning from emerging trends: which industrial policy for LACs?

- Horizontal policies are not sufficient
- Selective policies are designed to rebuild the foundation of industrial commons (innovative capacity)
- Focus on new technologies: knowledge and data key assets
- Technical-scientific know-how (**knowledge generation**)
- Specialized human capital (**skills formation**)
- Approach similar to vertical policies but focused on skills development
- **No dichotomy between market and State**

# Industrial Policy effectiveness

- Industrial Policy do not work alone
- Capabilities and technological infrastructure matters
- **Regional Scale can offer a competitive advantage**
- Institutional features are key to long run coordination