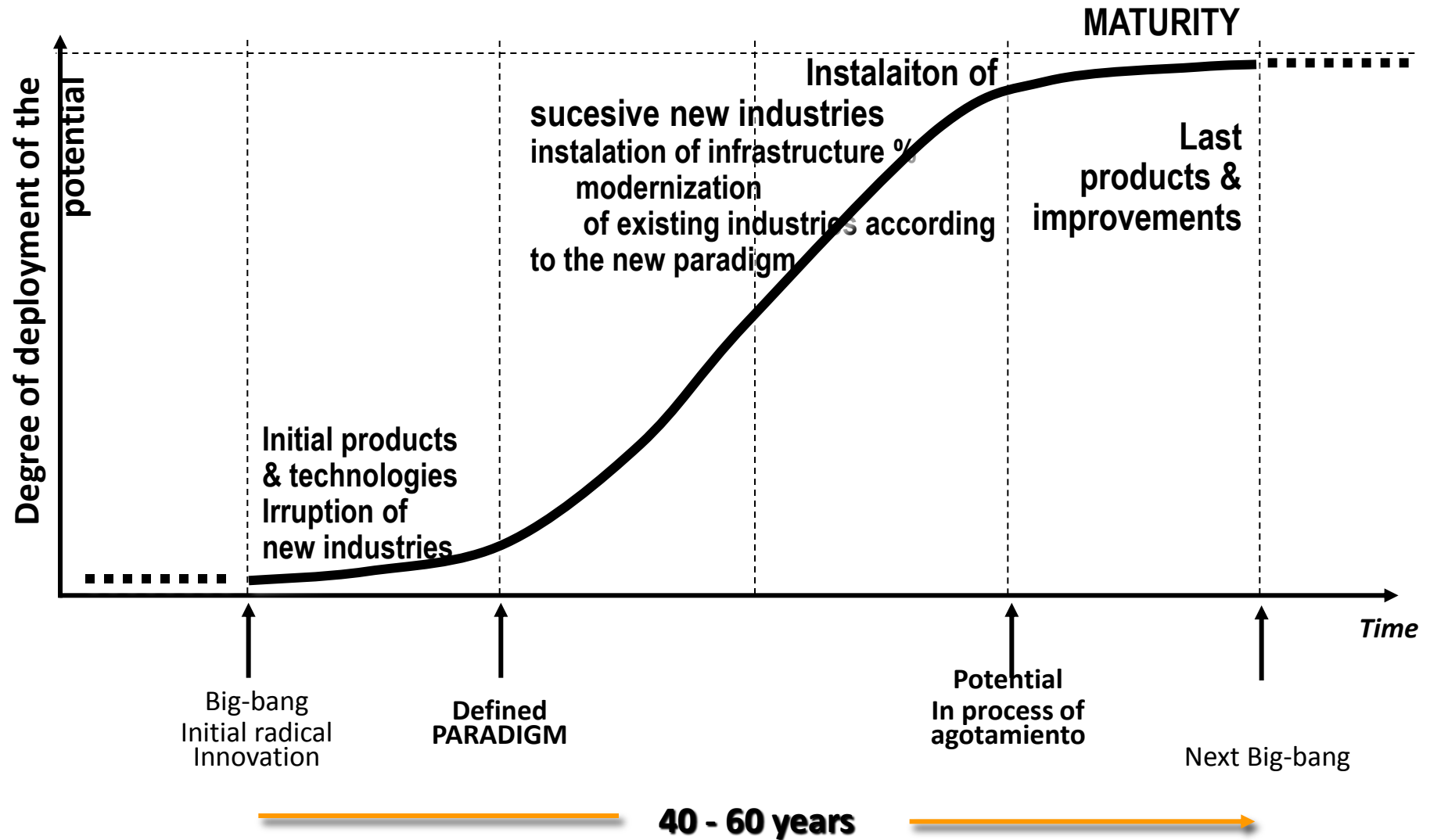


# **Expert Group Meeting on Exponential Technological Change, Automation, and Their Policy Implications for Sustainable Development**

## **SESSION 7 IMPLICATIONS FOR STRUCTURAL TRANSFORMATION, SUSTAINABLE INDUSTRIALIZATION AND CATCH UP**

**What are your views on the potential effects of emerging automation technologies on industrialization and structural transformation in developing and least developed countries, taking into account historical experiences?**

# DIFFUSION AND DEPLOYMENT OF A TECHNOLOGICAL REVOLUTION



- **We are at the installation stage of a new paradigm, still far from the deployment, but we are not yet sure what this paradigm is about and thus what is the big bang (radical innovation).**
- **We are discussing the potential effects of emerging automation technologies basically on production, even though they have impacts also on consumption, and this impact production.**
- **These technologies are based on the previous paradigm (ICT & electronics), in fact they combine technologies from the two previous (mass production and ICT & electronics), and in some way they grow a lot (or exponentially).**
- **These technologies are largely associated with affectation of the environment, they require compensatory actions.**

- **Different impact according to initial conditions (economic structure, specialization, level of formation of the workforce, institutional and regulatory framework, and how far the countries are from the frontier.**
- **Window of opportunity? Surely for some countries, but taking this window depends on the development strategy, the formulation of STI and other interconnected policies (industrial, social, environmental, etc.), the timing of the countries' administration.**
- **This is an opportunity for development and not only for employment.**
- **One challenge: how to move along a development trajectory based on these technologies reducing inequality**
- **Need of complementarities with systems of production, innovation, education & institutional development.**

# Different scenarios

- Countries that have an important manufacturing base and a developed scientific basis, perhaps they can move from adoption to creation
  - Mexico, Argentina, China, Malaysia
- Countries with better conditions to adopt even the scientific base is limited
- Countries that are far from the frontier or are based on other sectors and not the manufacturing sector

# The case of Advanced Manufacturing of Mexico

- Structural change towards manufacturing activities
- Window of opportunity: Mexico's potential for adding value to the manufacturing industry based on technological learning and technological capacities already available.
- Root map of AM elaborated by actors (public participation)

# The case of Mexico

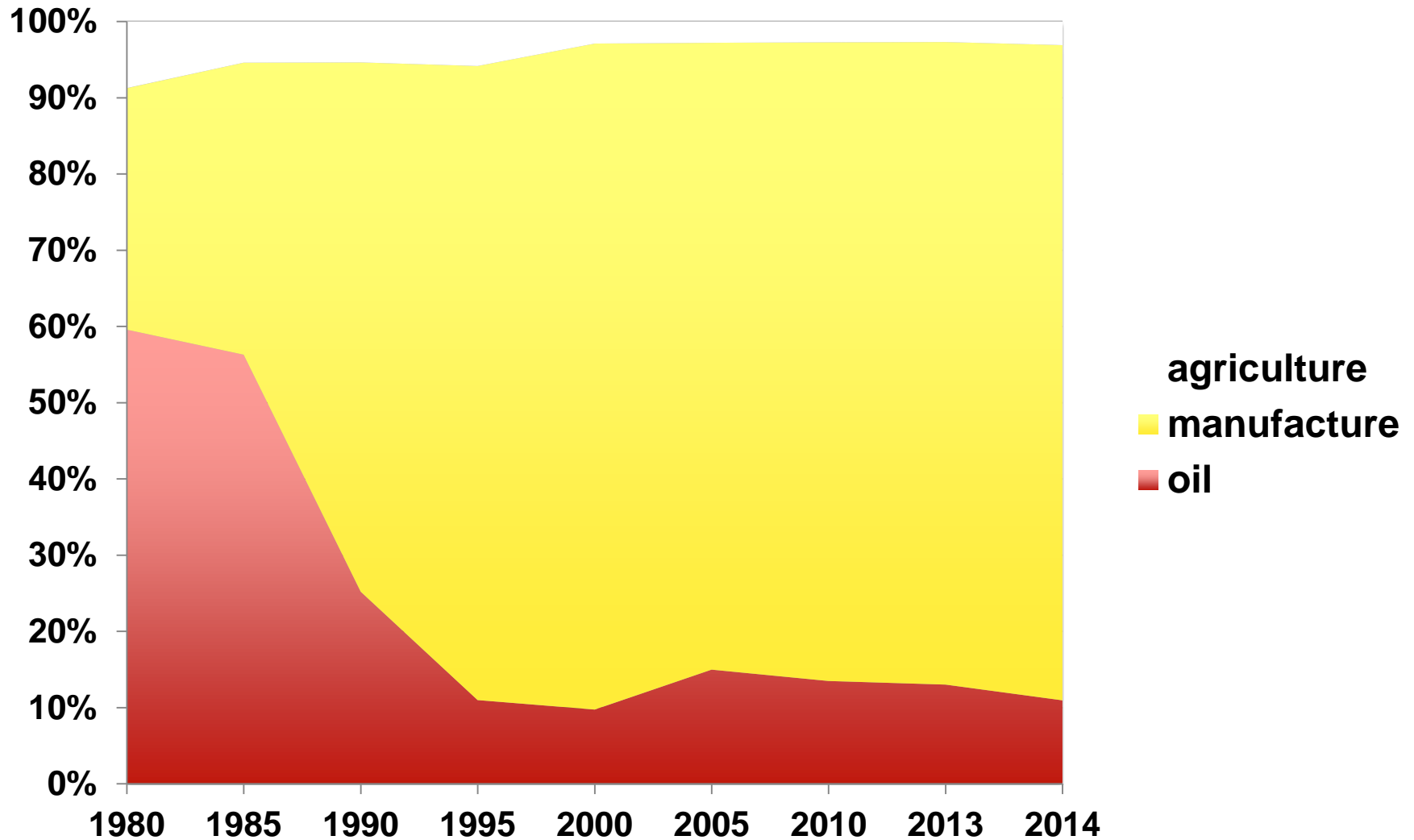
## Implicit strategy for development since the 1980s'

- Opening up
- Privatization
- Orientation towards external markets, regional integration (NAFTA, OECD),
- Leaderships of large industrial groups
- Transnacionalization - 50 multilatinas
- Attraction of subsidiaries of EMN (CGV)

## Structural Change

- Changes in economic structure
- increase of exports
- Increase of the non oil exports and change in the composition of the exports

# ¡Evolution of the Mexican exports!





## More detailed data....

### Non oil exports

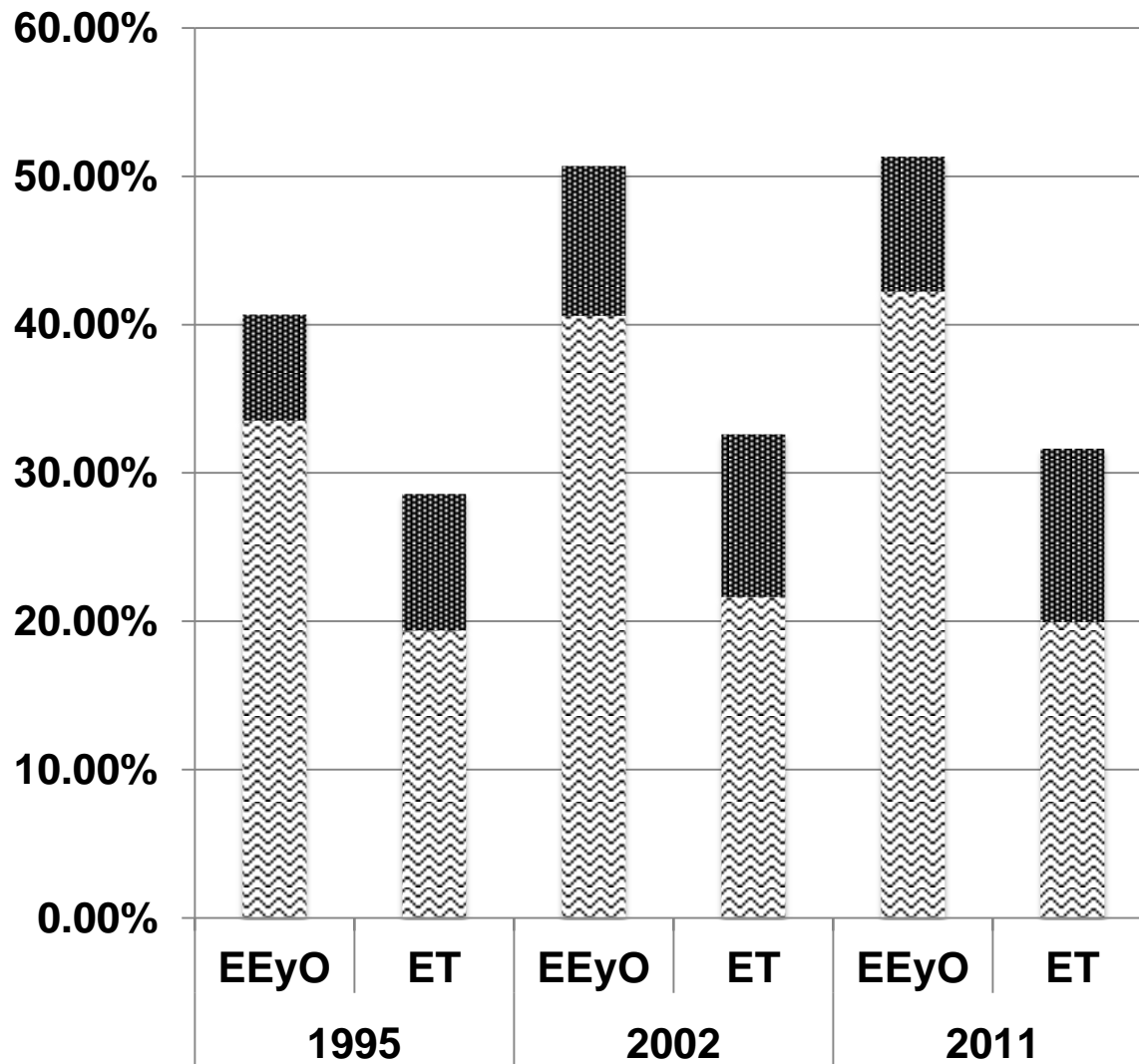
- 30% automotive sector
- 20% electronics industry
- More than 20% of products: high & mid-high technological content

### 2014: Mexican position:

- 8th largest producer (2.9 million vehicles) & 4th largest exporter of light vehicles (2.4 million vehicles)
- 6th largest producer and 5th largest exporter of auto parts
- 4th largest exporter of computers,
- 1st largest exporter of flat screen televisions



# Participation of the Electronic and Optical Equipment and Transport Equipment Sectors within Global Value Chains, 1995, 2002, and 2011

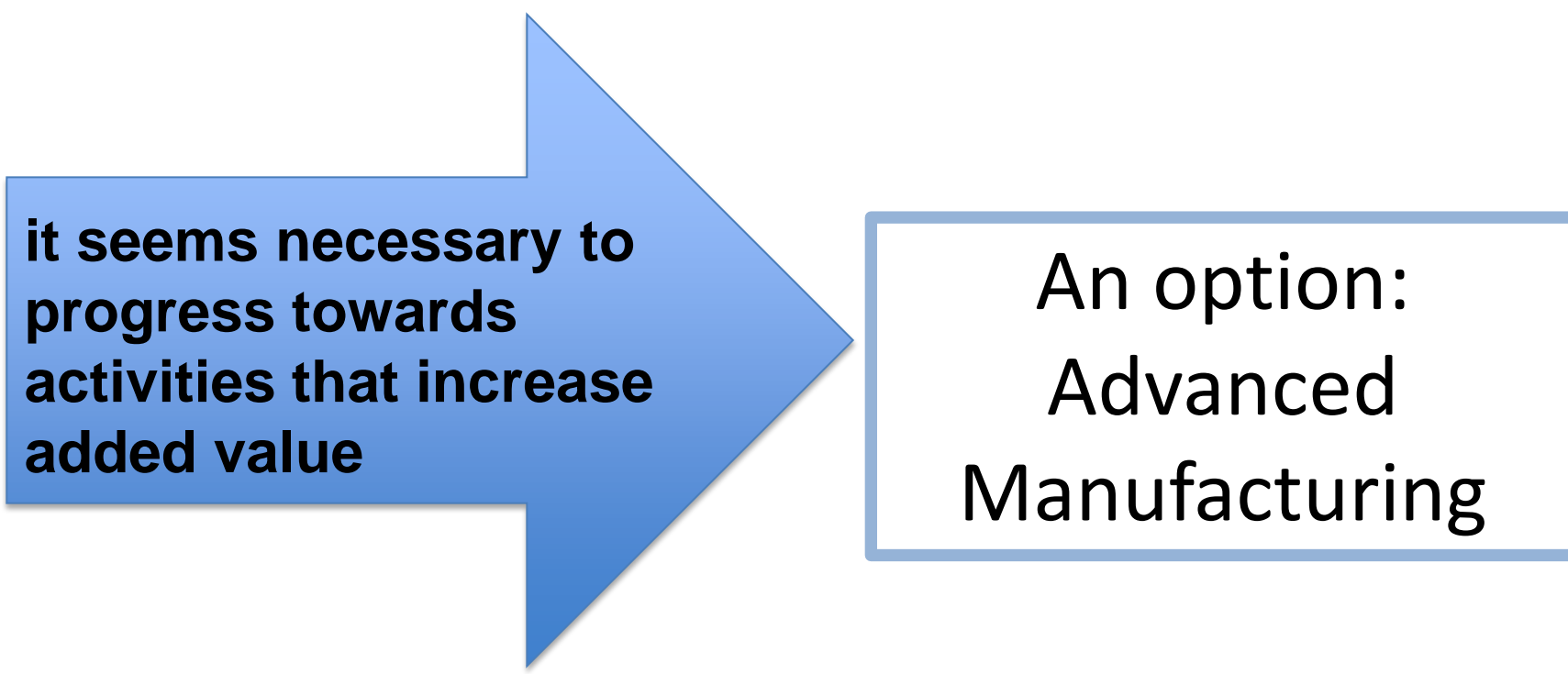


- Downstream component
- upstream component

¡Mexico has become an international-level manufacturing centre!

**Still predominate the old model:**

- ✓ **Labor market cost**
- ✓ **Proximity**
- ✓ **Some cases of transit toward design capacities**



**it seems necessary to  
progress towards  
activities that increase  
added value**

**An option:  
Advanced  
Manufacturing**

# Advanced Manufacturing?

**Opportunity**

- **Local capacities of engineering and design**
- **Experiences in machining and transformation processes**
- **Experiences of moving from manufacturing parts towards system assembling**
- **Thousands of workers with labour competences competencies**
- **Demographic bonus**
- **Lack of engineers in US**

# Oportunities in the automotive chain, 2013

Processes	Market demand	National procurement		Current imports (market opportunities)
		amount	% demand	
Die cutting and stamping	17.0	6.0	35.3	11.1
Casting	14.6	3.6	24.7	10.9
Forging	12.7	2.5	19.7	10.1
Machining	12.3	3.7	30.1	8.6
Semiconductors	8.6	0.0	0.0	8.6
Injection of plastics	7.7	2.7	35.1	5.0
Design and engineering	6.5	0.3	4.6	6.2
Carpets and garments	3.7	1.3	35.1	2.4
Die casting	3.7	0.7	18.9	2.9
Cable and/or wire	3.1	0.8	25.8	2.3
Electrical components	2.9	1.4	48.3	1.4
Other parts and components	2.8	0.8	28.6	2.0
Total	95.6	23.8	24.9	71.5

Source: Promexico (2015).

# Two strategic options:

## **(i) attracting GVC R&D centres**

- MNE have been relocating R&D activities, but cautious
- It depends on their strategy of generating or exploiting knowledge by subsidiaries
- Perception on local capabilities, political context, etc.

## **(ii) progressing towards AM activities and products**

- Easier to be controlled and adapted to local needs
- International trends suggest that it is a more viable alternative (3<sup>rd</sup> revolution)
- Opportunity for policy strategy and design

# A Bottom-up exercise to identify a set of "Strategic Initiatives for STI to Solve National Priority Problems"

## Premises

- Creation of economic and social value through STI
- Multidisciplinary approach
- Market potential
- Time period (implementation before the current administration ends)
- A government-academia-business alliance from the outset
- Use of cutting-edge, internationally-competitive S&T
- Connection with national science and technology infrastructure
- Driving and/or strengthening regional development
- Taking advantage of existing or potential opportunities

**→ One of the strategic initiative: Design and Development of High Added-Value Products and Processes**



# **Design and Development of High Added-Value Products and Processes**

- **Update the Technological Route Map for Advanced Manufacturing prepared by ProMexico (2011)**
- **Participation of entrepreneurs, researches and officials**
- **Proposal:**
  - **Strengthen and broaden human resources training programmes in Advanced Manufacturing**
  - **Integration of a network of specialised AM centres that may support businesses' specific initiatives.**
  - **Integration of a public-private consortium that supports the development of business innovation projects**
  - **Integration of a portfolio of new technological development necessary to bridge gaps in the AM Route**
  - **A proposal of financing, including self-financing over time**

# **Challenges for the STI policy and industrial policy**

- **Difficulties in agreeing priorities**
- **Lack of definition of responsibilities on STI by other ministries**
- **Failures of policy coordination**
- **Differences between the laws and regulations that make up the institutional framework and the rules that govern STI processes (governance)**
- **Power groups in several of the decision-making spaces**
- **Agency problems**
- **Timing: a strategy of this nature has to be included from the beginning of the administration**

# Final remarks

- **Adding value to manufacturing is an option for some countries, like Mexico**
- **It has to be implemented by means of the market with a bottom up focus, but it requires strong governmental leadership**
- **Challenge: the definition of priorities and focus on strategic sectors**
- **A dual strategy may be needed:**
  - **Strategic component: encouraging competitiveness in global markets (e.g. AM)**
  - **Incremental component: support wealth creation activities at a local level**

# Is this possible to have a different development path?

- Manufacturing employment has contributed to improve life conditions of many people in the last paradigms. Will this contribution continue for the future or improvement will come from other activities? Services?
- These technologies are associated with affectation of the environment, then compensatory actions are required
- Can we think in a development path that approach sustainability from the very beginning and not after?
  - Bioeconomy?
- If countries did not enter the present paradigm,
  - Can they jump to the next paradigm?
  - Can they find a window of opportunity?
  - May be they have to develop a dual strategy