Varieties of Industrial Policy:
Models, Packages and Transformation Cycles

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Outline

1. Industrial policy revolutions: turning points, rationales and variety

2. Varieties of industrial policy: models, packages and transformation cycles – country cases

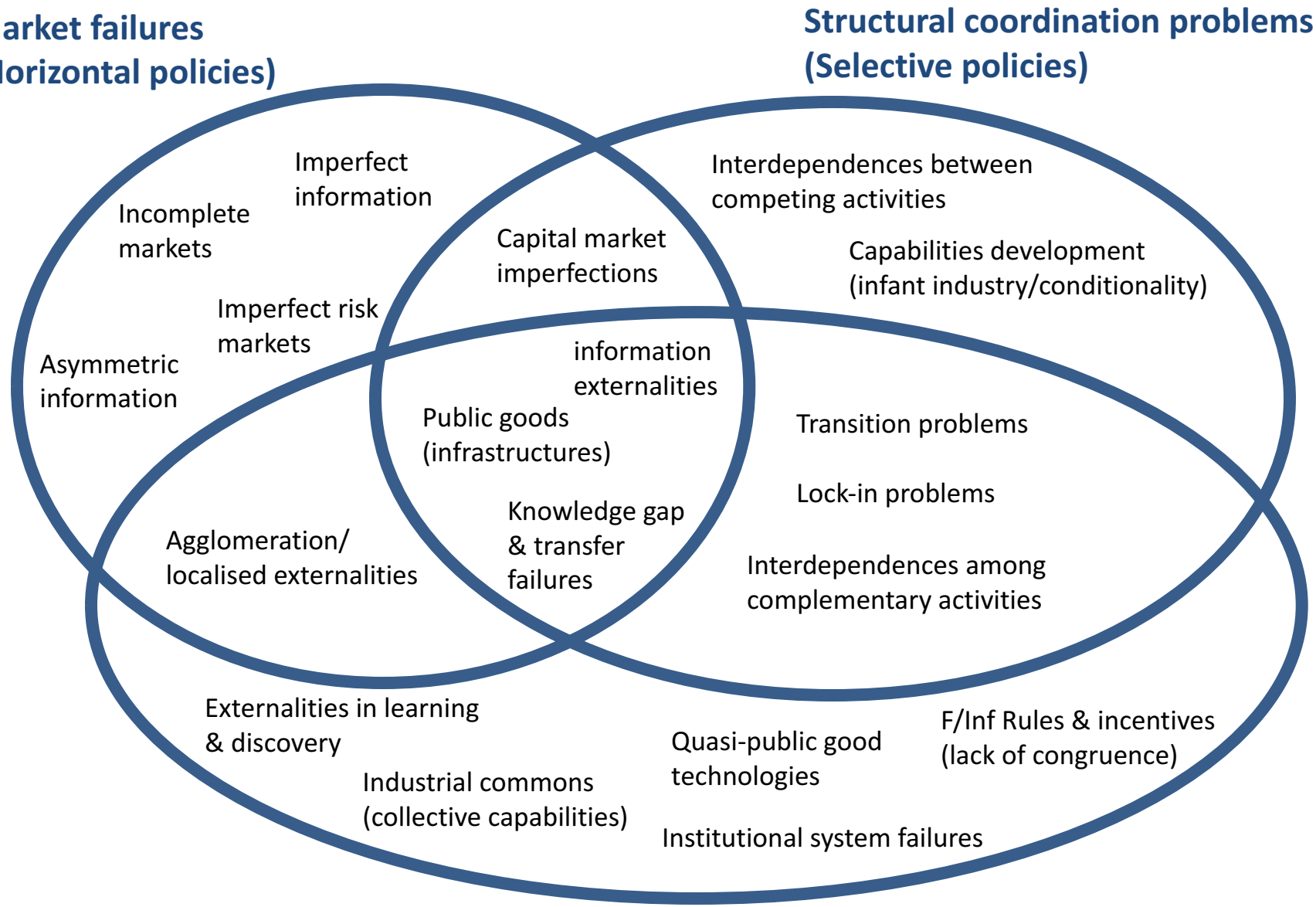
3. The future of industrial policies: emerging trends and practices for value creation and capture

Industrial Policy Revolutions: Turning points, rationales and variety

Industrial policy waves and turning points

Main features	First wave 40s to mid-70s	Second wave Mid-70s to 90s	Third wave 2000s	Emerging themes 2010s
Development as/through	Industrialisation and structural change	Stabilisation, liberalisation, and poverty reduction	Global knowledge economy	Learning economy and Innovation in production
Policy target/s	Creating markets Structural change and diversification	Specialisation and modernisation (Market-led)	Innovation Increasing productivity Diversification and specialisation	Industrial ecosystem development
Policy framework	Import Substitution/Export oriented Selective industrial policies Sectors development Gradual opening to competition	The best industrial policy is “no industrial policy”. Horizontal policies Exposure to competition FDI attraction	Targeted strategies in open economies Increasing national competitiveness Enabling business environment Strategic management of FDI	Smart (new selective) policies Value creation in glocal systems Value capture in production networks Competences/capabilities
Policy model	Top-down Centralised system National agencies/councils Developmental institutions	Minimal state (Weakening and/or dismantling of national institutions)	Multi-layered (Top-down/Bottom-up) Public-private identification of priorities. Science institutions	Multi-layered Institutions for public-private coordination Multi-level implementation Regional/cities clusters development
Policy package/s	Capital movement management Production-oriented finance National champions development Infant industry protection Hard infrastructure development Public funded research Compensation policies for lagging areas.	Innovation policies ICT diffusion Competitiveness programmes Human capital SMEs support (regional level)	Credits and grants for production development and innovation Public procurement Promotion of entrepreneurship (venture capital, angel investors and support to business capabilities) Hard and soft infrastructure Technical competences and skills development	Technology infrastructure & intermediate R&D&M institutions Manufacturing research Scaling up Strategic public procurement General purpose technologies Key enabling technologies Risk reduction Manufacturability challenges
Policy rationales	Market failures Structural coordination	Government failures > Market failures	Market failures System failures	Learning and System failures
Policy space	High room of manoeuvre and high political legitimacy of national development strategies	Reduction in the room of manoeuvre (WTO, TRIPS commitments, etc.) and low political legitimacy of national development strategies.	Moderate room of manoeuvre in traditional fields; regain of legitimacy of national development strategies	High room of manoeuvre in emerging fields

Industrial policy debate: rationales evolution



Sources of Industrial Policy Variety

- **Variety in national contexts: structures and 'forms of capitalism'**
  - Industrial structure and accumulated production capabilities
  - Variety of capitalism (Coordinated ME – intermediate varieties – Liberal ME)
  - Institutional complementarities & persistence/path dependence
- **Variety in industrial policy design and implementation framework**
  - Models
  - Packages
  - Transformation cycles
- **Variety in industrial policy implementation and policy regime**
  - Political economy and dominant ideology
  - Government capabilities and inter-agency coordination
  - Embedded autonomy
- **Variety of monitoring and evaluation frameworks for policy learning**

Varieties of Industrial Policy: Models, packages and transformation cycles

Country cases & scope

	MfG Value Added (MVA) per capita	MfG Export per capita	Med-High Tech MVA as % of total MVA	MVA as a % of GDP	Med-High Tech MfG Export as % of total MfG Export	MfG Export as % of total Export	MVA as % of World MVA	MfG Export as % of World MfG trade
Japan	7993.99	5521.02	53.70	20.39	79.75	91.62	14.13	6.53
United States	5522.09	2736.13	51.52	14.85	64.74	76.76	24.04	7.97
Germany	4666.91	13397.43	56.76	18.57	72.34	86.81	5.32	10.22
China	820.02	1123.62	40.70	34.16	60.52	96.25	15.33	14.06
Brazil	622.10	667.55	34.97	13.51	36.30	67.30	1.71	1.23
South Africa	567.27	991.15	21.24	14.93	45.66	68.32	0.39	0.45
Data Source: UNIDO INDSTAT & UNCOMTRADE, 2010 (Constant 2000 US$)								

Industrial Policy Models

The *industrial policy model* is defined according to the way in which countries frame their industrial policy strategy and the different actors involved in its design and implementation.

- Countries may rely on either articulated **plan-based strategies** or multiple **initiative-based measures**.
- The way in which plans or initiatives are designed and implemented may vary:
  - **Top-down / centralised**
  - **Bottom-up / decentralised**
  - **Mixed / multi-layered system**
- The choice of a certain policy model is partially determined by the inherited/state of national, regional and local institutions as well as distribution of government capabilities

Industrial Policy Packages

- Industrial policy as a “package of interactive measures” (Stiglitz, 1996)

- “…in East Asia, free trade, export promotion (which is, of course, not free trade), and infant industry protection were organically integrated, both in cross-section terms (so there always will be some industries subject to each category of policy, sometimes more than one at the same time) and over time (so, the same industry may be subject to more than one of the three over time).” (Chang, 2009)

Policy package matrix

(O'Sullivan, Andreoni, Lopez and Gregory, 2013)

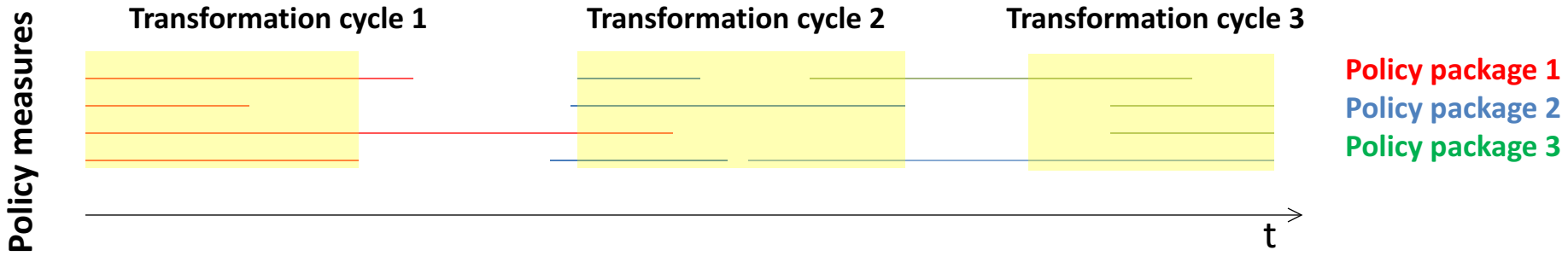
* Policy measure

INTERVENTION LEVELS	NATIONAL MANUFACTURING SYSTEM "FACTOR INPUTS"					
	Knowledge	Labour	Production capacity	Resources & infrastructure	Financial Capital	Global manufacturing systems & markets
Manufacturing firm						
Manufacturing sector	*		*	*		*
Cross-sectoral		*			*	
Macroeconomic framework						

key targets/policy type

Transformation cycles

- Policy measures (within policy packages) tend to operate with different time horizons according to the specific target/challenge they are addressing, but also to the extent to which they receive continuous policy support and are not impeded by exogenous factors.



- The concept of the 'transformation cycle' is introduced here to identify the time horizon/span within which a number of different measures are adopted as part of a comprehensive policy package.

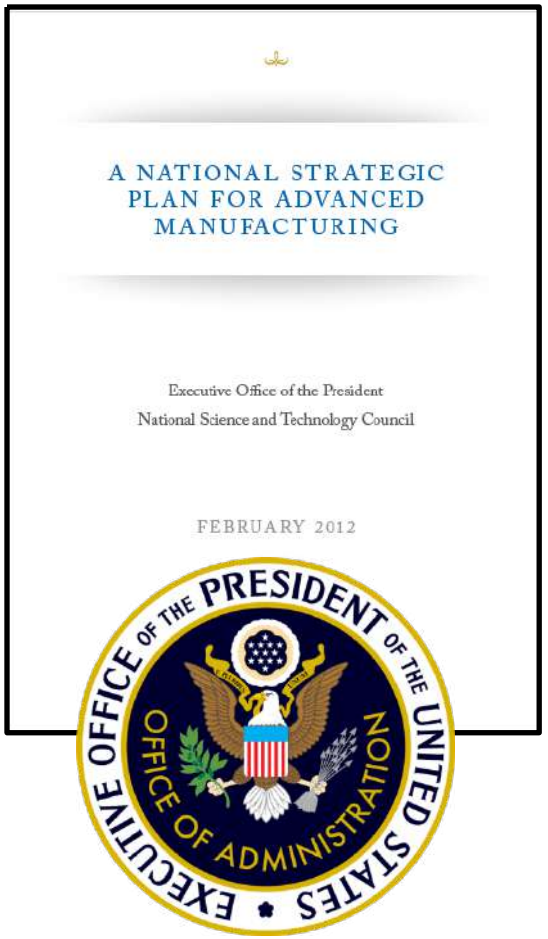
- Countries' difficulties in aligning policies over time within each transformation cycle as well as transitioning from one transformation cycle to another (thus from one policy package to another), help explain discontinuities in their industrialisation paths.

Varieties of Industrial Policy: Country cases

United States

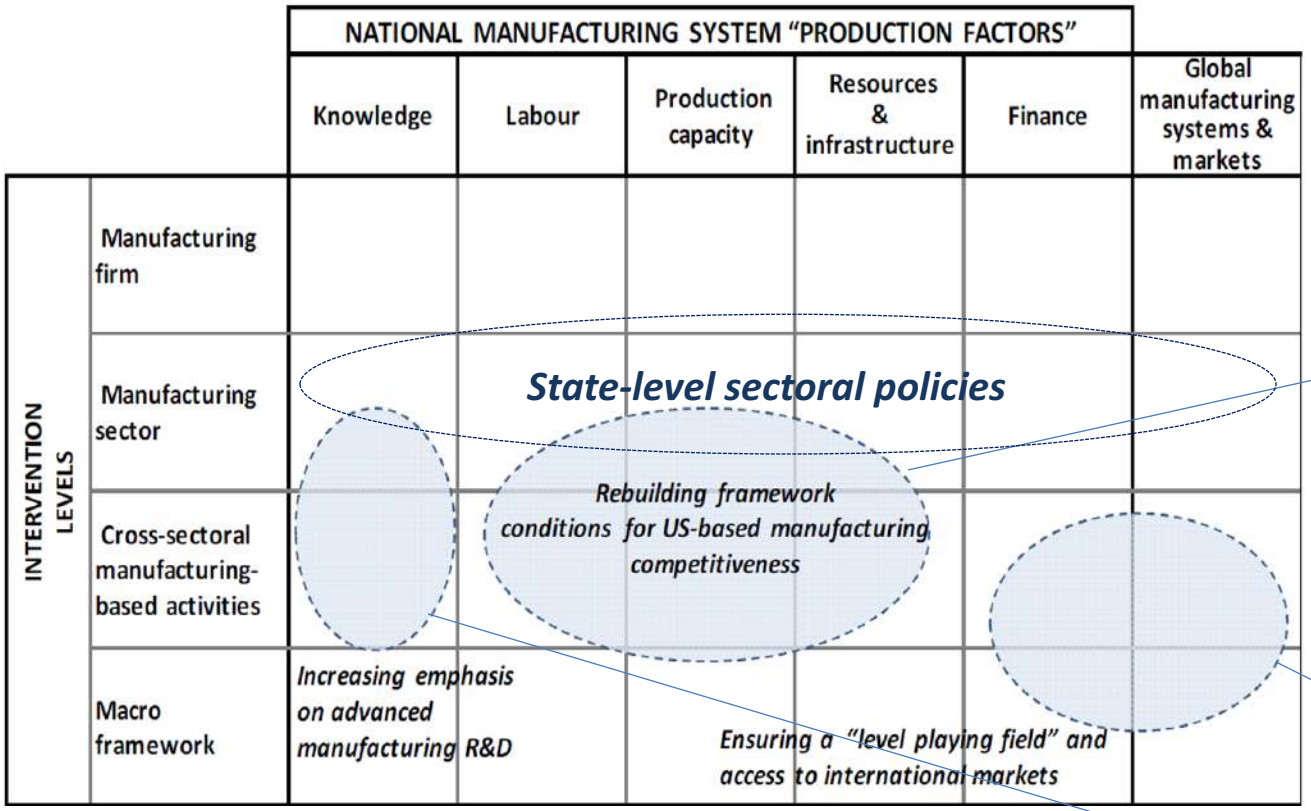
Multi-layered model – initiative based

- US Federal Administration's industrial policy focus on:
  - ✓ **Rebuilding *framework conditions*** for US-based manufacturing competitiveness by providing access to skills and finance for SMEs, and by reducing costs faced by companies, such as those related to healthcare, taxes and energy
  - ✓ **Creating a *'level playing field'*** and ensuring access to international markets through bilateral agreements and enforcement of WTO regulations
  - ✓ **Boosting *advanced manufacturing R&D*** by allocating resources for science and technological innovation and supporting special agencies or programmes
- US State-level - Multi-layered system
  - ✓ Sectoral policies across all the spectrum of factor inputs (e.g. education, energy, etc.)



United States

"Reversing manufacturing decline and re-shoring productive capacity"



US Policy package (main)
• Clean Energy Initiative (ARRA) • Manufacturing Extension Partnerships • Advanced Energy Manufacturing R&D Tax Credit • Insourcing income tax credit • STEM Initiative (Innovate American Act)
• National Export Initiative • Export-Import Bank • Interagency Trade Enforcement Centre
• **National Network of Manufacturing Innovation** • Materials Genome Initiative • Robotics Initiative • **Small Business Innovation Research (SBIR)**

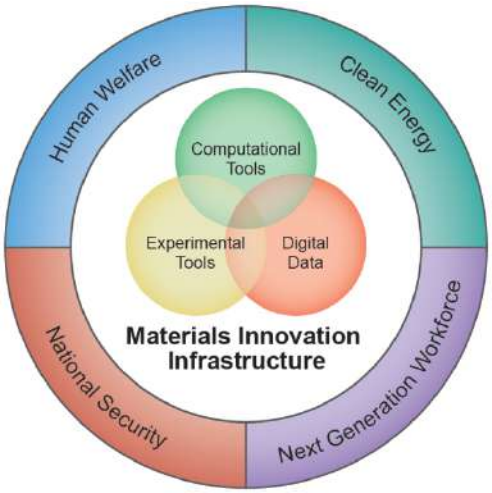
- Improvements in coordinating R&D funding for cross-cutting technologies (initiative-based)
- Advanced Manufacturing Investment Portfolio
- Technology infrastructure (re-)development

United States

Technology infrastructure (re-)development

- **NNMI - National Network for Manufacturing Innovation**

Network of regional 'Innovative Manufacturing Institutes' designed to accelerate the development and adoption of advanced manufacturing technologies, new models for workforce development and access to state-of-the-art equipment and infra-technologies



- **MEP - Manufacturing Extension Partnership**

Originally launched by Bush Administration, received 100% increase in funding

- **SBIR - Small Business Innovation Research Program**

R&D grants and public contracts/hybrid public procurement to SMEs (2.5US$ billion annually)

Japan

Recent national government policy agenda has involved a range of measures focused on:

- ✓ **Japan as manufacturing hub:** Improving Japan's overall attractiveness as a manufacturing hub

- ✓ **Accessing world markets:** Supporting the deployment of Japan's technologies, products, engineering services to world market (in particular SMEs)

- ✓ **Addressing energy supply** shortages

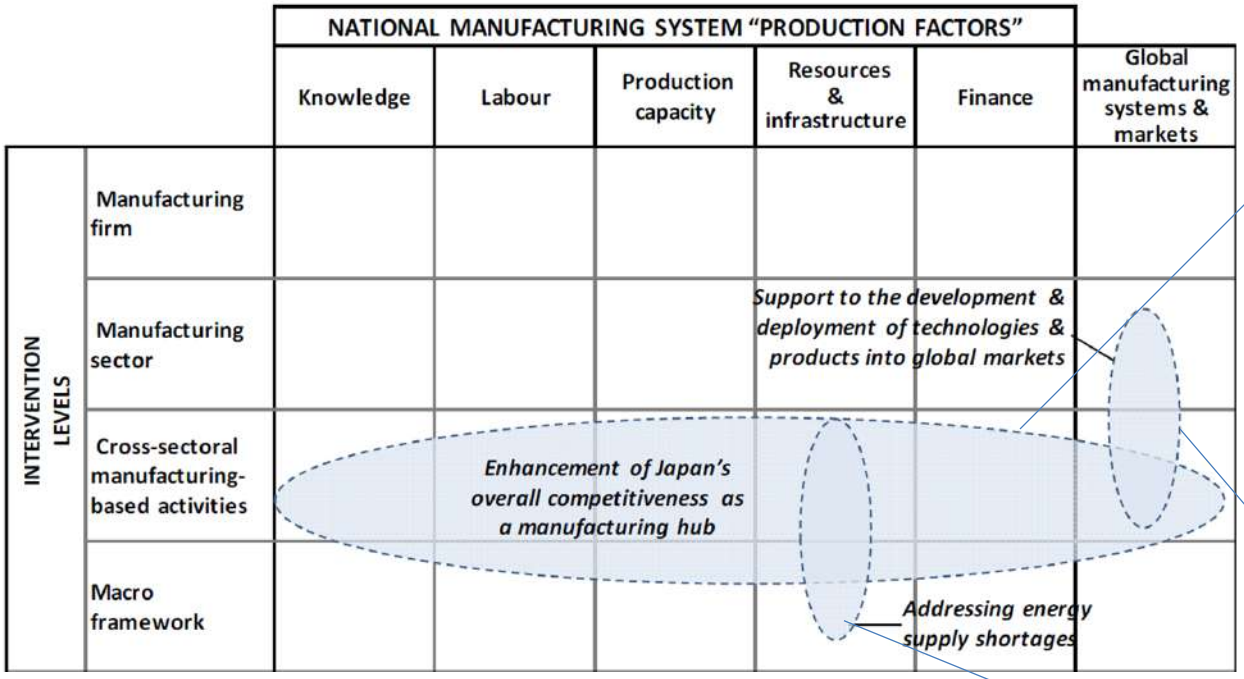
経済産業省
Ministry of Economy, Trade and Industry

THE INDUSTRIAL STRUCTURE VISION 2010

JAPAN'S NEW GROWTH STRATEGY

Japan

"Re-organisation of the domestic industrial structure and increased participation in global markets"



- **Increasing industrial resilience: from a mono-pole (automotive-electronics) to a multi-poles industrial structure (5 new 'strategic industrial fields')**
- **Encouraging organisational change and SMEs direct global expansion/value capture**

Japan Policy Package (main)

- Corporate tax reform
- New incentives to attract key corporate functions
- Increased investment in logistics infrastructure
- New long-term funds for business restructuring
- New incentives to attract human resources from abroad

- Technology demonstration projects in developing countries
- International standardisation strategy
- Creation of a SMEs' overseas expansion support programme

- Expansion of collaborative frameworks with resource-rich nations
- Reorganisation of the Japan Bank for International Cooperation (JBIC)
- Rare metals recycling programme

Japan

Encouraging organisational change and SMEs direct global expansion/value capture

Concerns about traditional **industrial organisation (*keiretsu)***:

- "Pyramid structure": SMEs nurtured / protected by larger manufacturers of assembled products (build-to-order manufacturing model)
- SMEs hindered from capturing opportunities in growth markets despite "dominance" in range of technologies/capabilities
- Movement from the sale of individual products with advanced functions to the provision of integral system solutions combining manufacturing and service components

Policy measures:

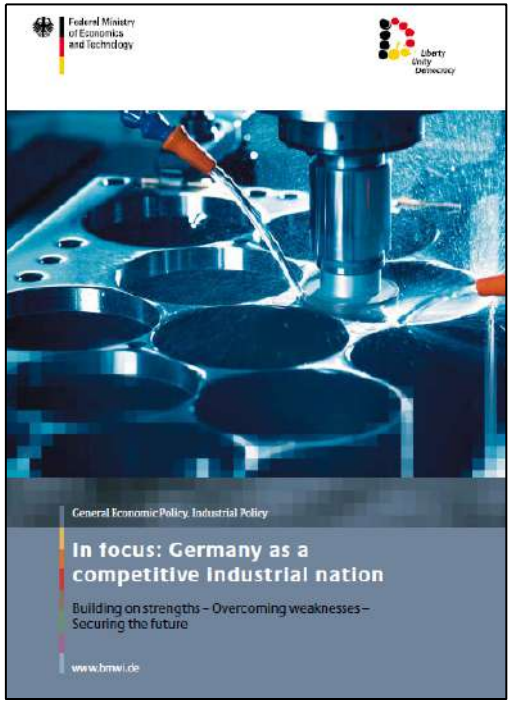
- Creation of a SMEs' overseas expansion support programme, extended guaranty insurances on overseas expansion, technical advisory services, and the establishment of overseas business expansion support centres
- Demonstration projects in developing countries, promotion of investment agreements and exports (JICA)

Germany

- Recent changes in **Federal Government's industrial policy** agenda are mainly shifts in effort/emphasis (limited evidence of a new transformation cycle – continuity/adaptation):

  - ✓ Boosting governmental ***education and R&D*** expenditure
  - ✓ Stronger coordination of policies around **"central missions":** climate/energy, health/nutrition, mobility, security, communication
  - ✓ ***Development of foreign markets:*** increased emphasis on market opportunities abroad, esp. associated with emerging global challenges

Federal Ministry of Economics and Technology

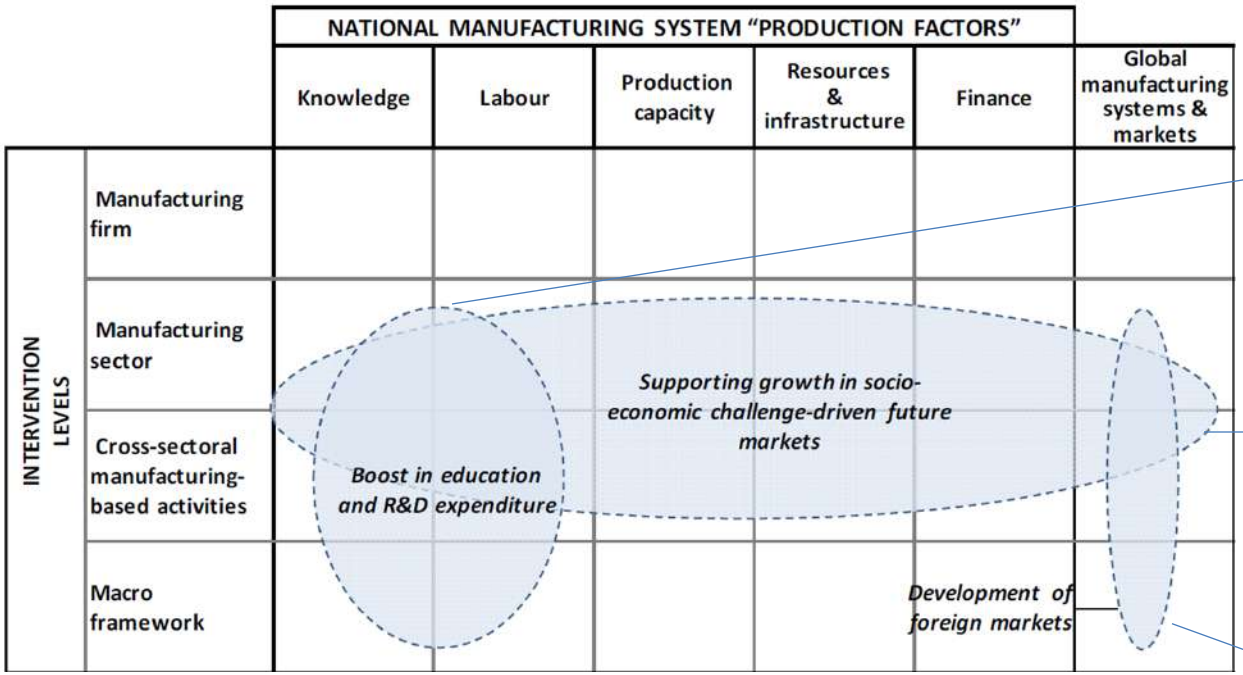


- **German *Lander*-level** - Multi-layered system
  - ✓ Sectoral policies
  - ✓ Institutional infrastructure nurturing / bottom-up model
- **EU supra-national level**

(German federal-level: 'invisible hand' rhetoric)

Germany

"focus on growth industries associated to emerging global socio-economic challenges"



Germany Policy Package (main)
• "Pact for Research and Innovation" • "Excellence Initiative" • "High-Tech Strategy"
• "ICT Strategy 2020" • "CO2-Neutral, Energy Efficient and Climate Adapted Cities" • "A million electric vehicles in Germany"
• "Programme to develop foreign markets" • Additional funds for the network of bilateral chambers of commerce • Large-scale bilateral projects • Additional support to Germany's participation in world expositions

- **Supporting SMEs through R&D collaboration networks grants/loans (ZIM), SMEs programmes (AiF), patient capital (KfM), chambers of commerce (AHKs)**
- **Sector-focused institutional infrastructure (including unions, regional banks, universities, R&D Centres) each of them performing multiple functions**

Germany

Sector-focused Institutional Infrastructure

Manufacturing firms traditionally supported by decentralised institutional infrastructure

- Often funded directly or indirectly by the government
- Many have deep historical roots
- Functions have been continuously upgraded
- Ensured a relatively stable policy context and continuity across different transformation cycles

Institutional infrastructure enables:

- State-support for industry-specific 'bottom up' coordination/coherence
- (which in turn) translates into skills, financial and technological assistance to individual manufacturers

ALLIANZ INDUSTRIE FORSCHUNG

Fraunhofer

AHK German Chambers of Commerce Worldwide Network

KFW Bank aus Verantwortung

Germany

Institutions with multiple functions

- **Access to R&D funding**
  Via networks coordinated by research organisations, e.g. **Fraunhofer, Helmholtz**; as well as SME-specific programmes, e.g. those of Federation of **Industrial Research Association**

- **Vocational training**
  Supported by Germany's dual education system, and coordinated by **industry associations** and **trade unions**. Student loans offered by government-owned **KfW bank**

- **Access to manufacturing advisory/support programs**
  and practices for improving organisational and technical capabilities, through **Fraunhofer Institutes/Steinbeis Centres**

- **Stable access to finance**
  Particularly to SMEs, through government-owned **KfW**; range of savings / cooperative banks

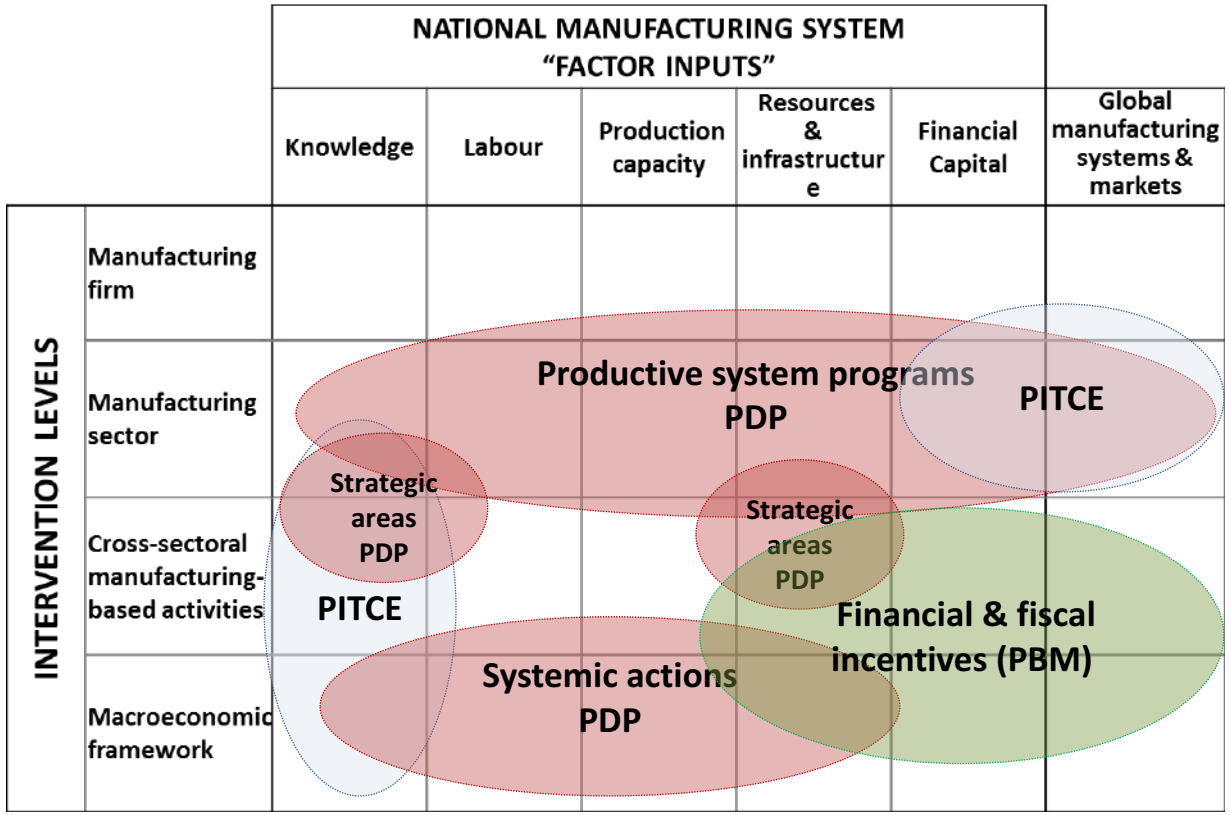
- **Foreign trade and investment advice**
  Offered by **Germany Trade & Invest** (GTAI), foreign trade & inward investment agency, and **German Chambers of Commerce** (AHKs)

Brazil

The return of industrial policy – 3 steps

- ***2004-7 Industrial, Technology and Trade Policy* (PITCE)**
  - Increasing industrial competitiveness in four key sectors
  - Developing the scientific and technological systems
- ***2008-11 Productive Development Policy (PDP)***
  - **Systemic actions**
  - **Programs for productive systems**
    - Mobilization programs in strategic areas (mainly fiscal measures and six strategic technological programs)
    - Programs to strengthen competitiveness (12 sectors/areas)
    - Programs to consolidate and expand market leadership (7 leading sectors)
  - **Strategic areas**
- ***2011-14 Plano Brasil Maior (PBM)***
  - **4 strategic objectives**: sustainable development, expand markets, enhance value chains and strengthen critical competences
  - **40 measures** including mainly financial and fiscal incentives (tax reliefs, trade remedies, financing and loan guarantees for exporters)

Brazil



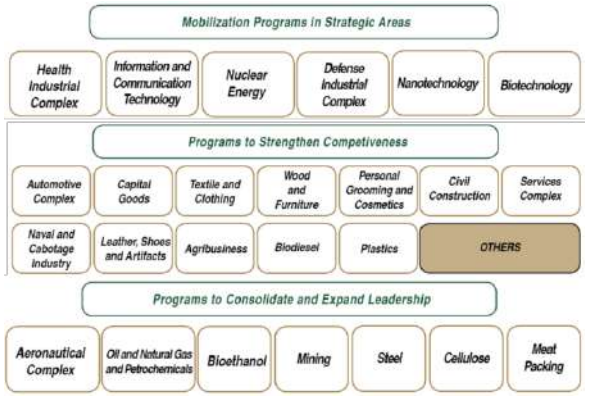
- **The most advanced, ambitious and better articulated/coordinated industrial policy in the region**
- **Changing from a sectoral competitiveness imperative to a competence/industrial ecosystem approach**
- **Intermediate institutions for scaling up and exploiting innovative/technological solutions across sectors: Embrapa**

Brazil Policy Packages (main)

Industrial, Technology and Trade, PITCE

- Innovation Act, NIIP, Legal framework
- Profarma and Prosoft programs

Productive Development, PDP



Systemic actions:

- infrastructure, energy, logistics
- ICT infrastructure
- Human resources training and development

Plano Brasil Maior, PBM

- Incentive for investment & innovation
- Foreign trade promotion/support
- Industry & domestic market defence

Brazil

Embrapa: Empresa Brasilera de Pesquisa Agropecuaria

- Founded in 1972, in 2005/6 massive effort for tech infrastructures improvement (R$ 90m): E.g. ***National Agribusiness Nanotechnology Lab*** (biosensors, smart packaging)
- Today the largest intermediate institutions for research at the interface between agriculture, biotechnologies and advanced manufacturing.
- Main functions:
  - Bridging and transferring knowledge across different sectors and, thus, facilitating various forms of **inter-sectoral learning** (e.g. satellite monitoring service for acquisition of remote sensor images and field data, 1989)
  - Providing **"translation research":** translate new findings and discoveries from fundamental research into engines of innovation and, thus, new products, processes and services and their scale up/manufacturability.

  E.g. The ***'Cerrado miracle'***: first feasibility study (PADAP), then scaled up by JICA (PRODECER) and extended to other areas
  - Providing **infratechnologies and related infrastructure services** including measurement and test methods (metrology), process and quality control techniques (standards), evaluated scientific and engineering data and technical dimensions of product interfaces
- Recently inspired the idea of **Embrapi:** Empresa Brasilera de Pesquisa Industrial

China

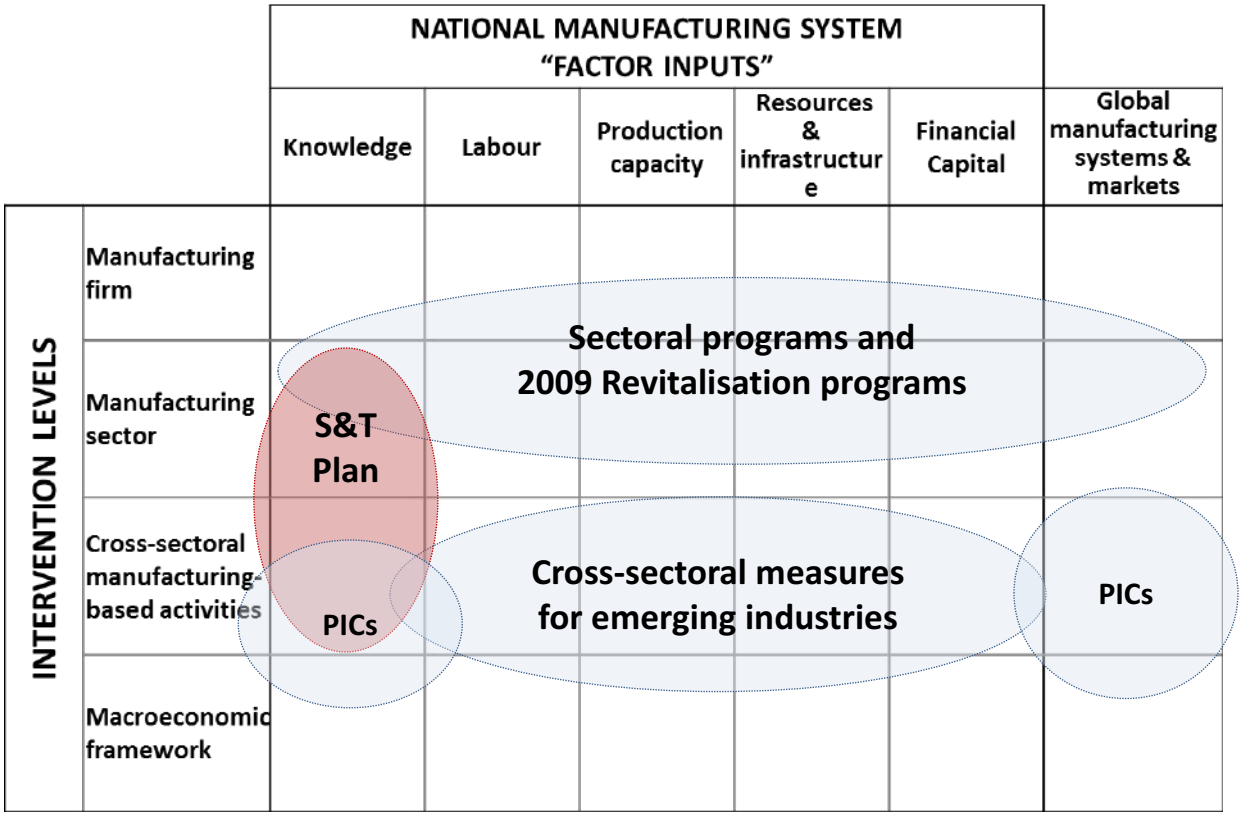
The new manufacturing frontier

China's industrial policies embodied within its Five-Year Plans:

- **Seventh Five-Year Plan (1986-90):**
  - 1987 Establishment of the Industrial Policy Department under the State Planning Commission
  - 1989 Announcement of selected industries (strategic 'pillar' industries)
- **1989 and 1994 First two rounds of industrial policy programs:**
  - **Sectoral policies – SOEs targeted**: Tariffs and non tariffs barriers, import quotas, local content requirements, subsidised loans from state-owned policy banks (Exim, CDB, ADBC)
  - **Clusters development** (in different towns and cities with unique pillar industries)
  - **Industrial restructuring and consolidation** (through mergers and acquisitions)
  - **FDI 'encouraged', 'permitted', restricted' and 'prohibited'**: SEZs, tax exemptions, subsidised land, but also local content requirement and joint ventures rules, R&D incentives
- 1998-2003 SETC was reorganised and dismantled / 2001 Access to WTO
- **2004-2012: The new transformation cycle**

China

The new transformation cycle 2004-12



- **Profound shift from sectoral to cross-sectoral policy coordination and alignment with S&T policies**
- **Development of technological capabilities for endogenous innovation *('zizhu chuangxin')* and value chain upgrading**

China Policy Package/s (main)

Sectoral programs
- 04 Automobile (>2011 regional)
- 06 Machine building
- 09 Information technology
- 09 Logistics
- 09 'Revitalization Programs' for Nine Traditional Sectors
- 12th Five-Year Plan 2011-15

Cross-sectoral programs
- 05 Industrial Structures Adjustment
- 07 Service sector dev. Accelleration
- 10 Strategic Emerging industries
- 12th Five-Year Plan 2011-15

Priority Investment Catalogues
- 04 Priority High Tech Industries
- 05 Priority for Foreign investors
- 07 Priority Import Technology and products

Science & Technology ML Term Plan
(alignment with industrial policy)
- 16 Special projects for developing Key Technologies
- 8 R&D programs in 'cutting-edge technological areas'
- Technology procurement

China

"Japanese [good enough] quality at Chinese prices"

- **Is China developing technological capabilities for endogenous innovation?**
  - Input/output innovation indicators no evidence (time lag?)
  - MIT studies (96-97; 99-05) no significant evidence of innovative capabilities
- MIT PIE Report (2010-13) documented the emergence of a rich industrial ecosystem of specialist contractors and components suppliers:
  - **Scale up capabilities**: companies in high tech sectors (wind , solar, medical devices and batteries) increasingly master the scale up of complex system products and process, translate between advanced product design and advanced manufacturing, reduce the time to the market
  - **Redesign for manufacturability, reverse-engineering and re-engineering capabilities:** re-assembling foreign components, changing functions , materials and characterisation to reach 'good enough' quality
  - **Indigenous product innovation based on manufacturing competences**

South Africa

Manufacturing development with or without employment?

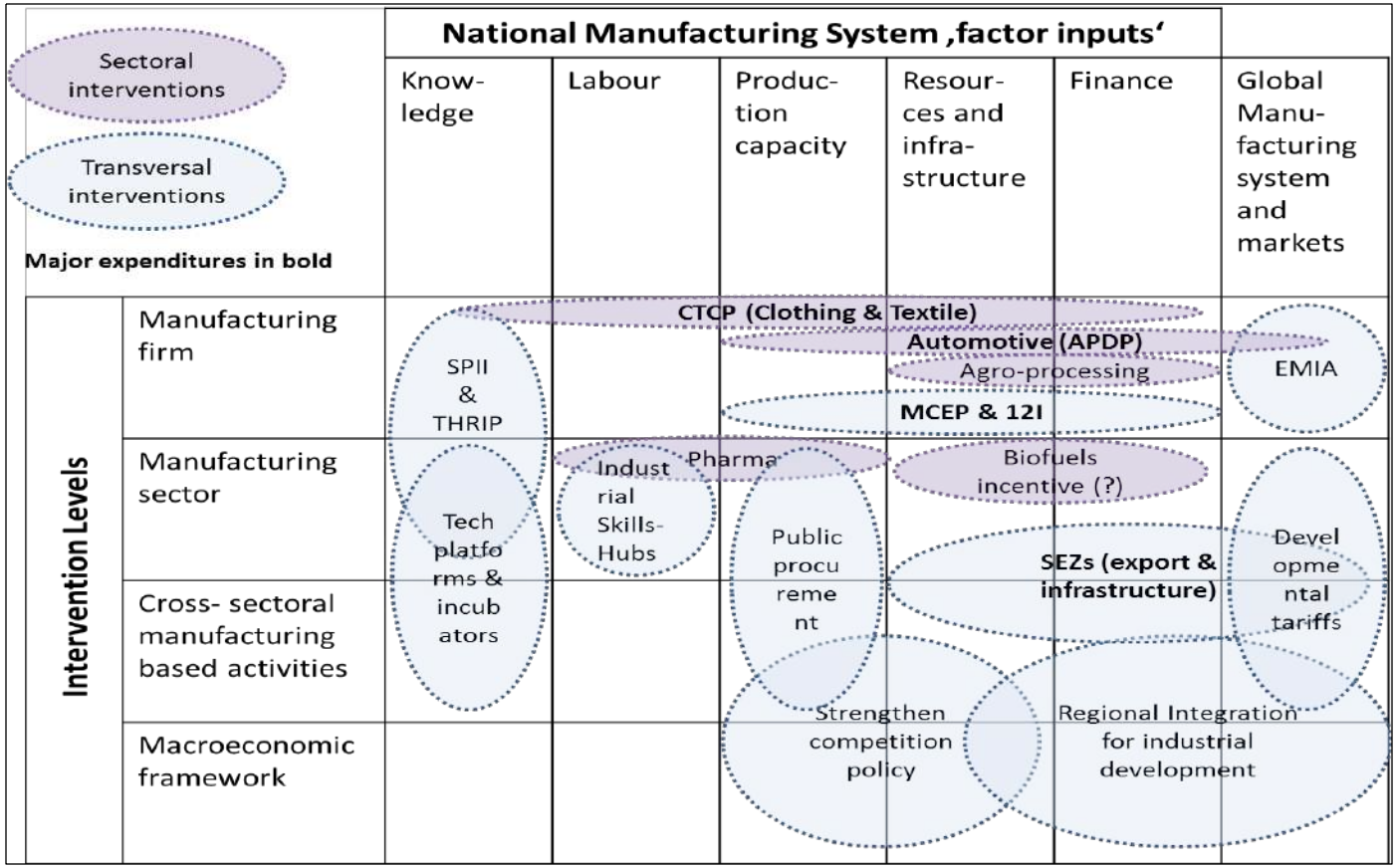
- The **Industrial Policy Action Plans** (IPAP 1 in 2007 & IPAP 2 in 2010) marked the beginning of a new transformation cycle in South Africa (recognised in the *National Development Plan 2030* – although still not fully aligned)
- The Industrial Development budget increased significantly over the last 3 years from R 5.8 billion in 2010 to R 9.4 billion in 2013.

Explicit focus on:

- 8 Areas of **'Transversal interventions'** (financing, innovation/technology, skills, public procurement, competition policy, trade policy, regional integration and SEZs)

- **Sectoral interventions:** Textile, Automotive, Agro-processing, metal fabrication and capital equipment, pharma (new ones in the IPAP 2013/14-15/16)

South Africa



- **Broad sectoral policies scheme** (IPAP priority sectors account for 74% of current manufacturing employment – see also IPAP 2013/14-15/16)
- **Boosting special economic zones development** (since 2000, SEZs Bill, 2013)
- **Production capacity expansion through combined supply-side (MCEP) and demand-side (Public procurement) policies**

South Africa

MCEP programme & Public procurement

- MCEP is a matching grant scheme to invest in competitiveness enhancement by upgrading production facilities, processes, products and people
- MCEP seeks to maximise employment and value-added potential in strategic sectors (IPAP 2012-15).
- Preferential Procurement Policy Framework Act (PPPFA) – revision/strategic selection

Core components of MCEP: Matching grants for industrial upgrading

Capital Investment Grant (equipment upgrading or expansions)
* 192 of 197 projects in 2012/13

- **Objective:** to support capital investment in equipment upgrading and expansions that will lead to the creation of new jobs and retention of existing jobs.
- **Grant** ranging from 30%-50% (depending on firm size)
- **Qualifying Assets and Investment Costs:** Machinery and equipment at cost, as well as setting up, installing and upgrading laboratory equipment. Building improvements and extensions, forklifts and tools, jigs and dies.

Green Technology and Resource Efficiency Upgrade Grant
* So far 2 projects in 2012/13

- **Objective:** To support projects with green technology upgrades and business development activities that will lead to cleaner production and resource efficiency as well as engineering and conformity assessment services that support the green economy through the manufacturing sector.
- **Grant** ranging from 30%-50% (depending on firm size)
- **Qualifying Assets and Investment Costs** in areas of cleaner production, waste management, energy efficiency, renewable energy, water use efficiency and conformity assessments.

Enterprise Level Competitiveness Improvement Grant (BDS)
* So far 3 projects in 2012/13

- **Objective:** To enhance the competitiveness of enterprises through the enhancement of conformity assessments and improving processes, products and related skills development through the use of business development services.
- **Grant** Ranging from 50%- 70% (depending on firm size)
- **Qualifying Activities/ Costs** include process improvement/optimization, product improvements, conformity assessment certification, logistics improvements, information technology systems, skills development, procurement process improvement and bidding costs.

Other MCEP components that have not yet provided grants as of 2012/13 and IDC's MCEP component

Feasibility Studies Grant
- 50% or 70% of the cost of the feasibility study that is likely to lead to bankable investment proposal

Cluster Competitiveness Grant
- Grant for 80% of collaborative production and marketing efforts of clusters of enerprises (e.g. BDS)

Industrial Financing Loan Facility (IDC component)
- **Pre- and post-dispatch working capital facility:** Loans at preferential interest rate (4%) for working capital (pre and post dispatch, e.g. production, raw material, and packaging and transportation costs, performance bonds and performance guarantees)
- **Industrial policy niche projects fund:** Grant to projects in new areas with potential for job creation (limited take-up in 2012/13)

Industry/sector/sub-sector	Minimum threshold for local content
Buses (bus body)	80%
Textile, clothing, leather and footwear	100%
Power pylons	100%
Canned / processed vegetables	80%
Rolling stock	65%
Pharmaceutical products (oral solid dosage tender)	(73% of the tender volume)
Set-top boxes for TV digital migration	30%
Furniture • Office Furniture • School Furniture • Base and Mattress	 85% 100% 90%
Power and telecom cables	90%
Solar Water Heaters (collectors and storage tanks/geysers)	70%

The future of industrial policies: emerging trends and practices for value creation and capture

Emerging trends and practices (I)

- "***Most modern technologies are systems***, which means interdependencies exist among a set of industries that contribute advanced materials, various components, subsystems, manufacturing systems and eventually service systems based on sets of manufactured hardware and software" (p. 6). ***The modern global economy is therefore constructed around supply chains, whose tiers (industries) interact in complex ways***".

(Tassey, NIST 2010)

Emerging trends and practices (II)
Packages

- Reliance on **sectoral policies** (even among advanced developed economies), increasingly **substituted by/combined with cross-sectoral policies aimed at picking cross-cutting technologies** (also in catching up economies): major focus on general purpose technologies, enabling technologies and platforms development.

- Increasing emphasis on **'selective learning' and technological infrastructure provision** for reducing the risk involved in technological change, scaling up production and addressing manufacturability challenges: focus on infra-technologies and quasi-public good facilities for specialist contract R&D, rapid prototyping, quality/standards development…

- Increasing awareness that existing and developing **industrial commons** (closely complementary and geographically clustered manufacturing competences) offers competitive advantage and resilience to the national manufacturing system – emphasis on **industrial ecosystem development**

Emerging trends and practices (III)
Policy model

- **Multi-layered industrial policy model** combining top-down and bottom-up approaches (like the one adopted in the US and Germany) offers **more flexibility** in the composition of the policy package and adoption of complementary (as well as only apparently contrasting) measures.
- However, 'multi-layered' policy regime runs the **risk of incoherence** and different levels undermining each other.

Emerging trends and practices (IV)

Alignment and coherence along transformation cycles

- **National industrial, institutional and cultural features confer certain 'qualities' on national manufacturing systems** (coordination, long term orientation, industrial intelligence, coherence in transitioning from one transformation cycle to another).
- However countries are adopting **new institutional solutions to exploit complementarities within policy packages and give them coherence over time**

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BACK UP SLIDES

Selective learning and technology infrastructure (Tech portfolio composition – quasi public goods)