# Industrial and innovation policies

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Intro	What is IP?	Objectives	Changes	
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Plan				

# Plan of the lecture

- Introduction: contextualising why we talk about industrial policy
  - A short brainstorming
- A step back: What is IP
  - How is it defined?
  - Does it exist? Is it practised?
- Why do we need IP?
  - Objectives
  - Rationales
  - Changes in Objectives and Rationales
- How are IP implemented and are they effective?
  - Instruments
- Summary

Intro	What is IP?	Objectives	Changes	
00000000				
Main references				

## Main references

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Why do we need industrial & innovation policies?

"Any random collection of six economists is sure to produce at least a dozen different opinions on the subject [...]" (Geroski, 1989, p. 20)



Intro	What is IP?	Objectives	Changes	
000000000				
The lecture topi	с			

# Market failures



Source: Author modification based on GPT

More innovation (productivity)

Conditions to invest in innovation - including incentives

Returns to innovation expenditures are higher in countries more distant from the frontier: may gain even more from investing in R&D (Griffith et al., 2004) – spillovers

 $\Rightarrow$  The innovation 'paradox': We should expect to see more investment in innovation activities in lower income regions

Governing the direction of innovation

Government interest in the common good

"it is possible for government policy to improve social welfare by influencing the rate and direction of technological change" (Steinmueller, 2010, p. 1184)

 $\Rightarrow$  E.g. the AI act

Intro ○○○○○○●○○	What is IP? 000000000000000000000000000000000000	Why? 000000000	Objectives 0000	Rationales 000000000000000000000000000000000000	Changes 0000	How? 00000000	
The lecture topic							
Inequa	lities						

Making sure all parts of society benefit from innovation/productive activities

"To pursue economic development and wealth creation, particularly solving the problems of deprived segments of societies, while keeping resource consumption and pollution in accordance with Earth's biocapacity" (Altenburg and Assmann, 2017)

 $\Rightarrow$  Technical change has distributional impacts

 $\Rightarrow$  Most innovators come from a small part of society, and tend to innovate for them (Koning et al., 2021; Dossi, 2024)



## Future of humanities

"develop institutional and technological solutions that enable us to decouple economic development and human well-being from resource depletion and waste production" (Altenburg and Assmann, 2017)



Source: (IPCC, 2023)

# Navigating complexity

#### Synergies and trade-offs: who decides?



# Definitions: traditional

One step back. What is IP?

Differ based on objectives, areas of intervention and instruments used

Economic performance

- "structural" definitions: policies that aim to modify the industry composition of an economy (usually with vertical policies)
  - "narrow": selective measures that are aimed to have an impact on specific industries
  - "broad": any measure that is intended to improve economic performance by shaping the productive structure, (as a whole or part of it) of an economy
- "horizontal" definitions: policies that aim at improving efficiency across industries of the economy

Most analysts focus on the first definition and consider IP to be selective, i.e., targeted to specific industries (Chang et al., 2013)

 Intro
 What is IP?
 Why?
 Objectives
 Rationales
 Changes
 How?
 Summary

 00000000
 0000000000
 0000
 0000
 0000
 0000
 0000
 0000
 0000

 Theory: Definitions

# Definitions: extended

Definitions may differ with respect to the sector of intervention

- Interventions targeted at productive sectors of the economy
- Broader measures aimed at modifying the institutional and innovative conditions of an economy (Cimoli et al., 2009a)
  - ⇒ science, technology, and innovation policies (Cimoli et al., 2009b; Hughes, 2012)
- Social welfare and security objectives, including more general public goals (Juhász et al., 2023a), inclusion, sustainability, and resilience (Kastelli et al., 2023)

	What is IP?	Objectives	Changes	
	000000000000000000000000000000000000000			
Theory: Definiti	ons			

# Definitions

			Objectives	
Dimensions	(verti-	Economic p	performance	Social welfare
cal/horizonta	վ)			
		Industry focus	Innovation	
			system	
Structural Horizontal	Narrow Broad	Krugman and Obst- feld (1991); Hasanov and Cherif (2019) Chang (1994) Lee (2013) UNIDO Warwick (2013) Aiginger and Sieber (2005)	Lechevalier et al. (2019) EU	Kastelli et al. (2023)

# Working definition (Warwick, 2013)

- IP is *any type of government intervention* (horizontal, selective)
- that attempts to *improve the business environment* ("framework conditions")
- and modify the *structure of the economic activity* (production, consumption, innovation)
- towards *sectors, technologies and tasks* (beyond manufacturing, ICT, green tech, type of skills, e.g. identifying technology opportunities)
- that are expected to offer better prospects for *economic growth and societal welfare* (beyond productivity, including regional unbalances, full employment, green growth)
- than would occur in the absence of such intervention

 Intro
 What is IP?
 Why?
 Objectives
 Rationales
 Changes
 How?
 Summary

 000000000
 000000000
 000000000
 0000000000
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 000000000
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 Empirical evidence:
 The extent of industrial policies

## Industrial policies: beyond rhetoric

Widely used over the past decade, with an increase in its use over time – irrespective of how we measure IP

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## Industrial policies: instruments

Prevalence of subsidies and export-related measures, with the most prominent forms of industrial policy being trade financing, state loans, financial grants, financial assistance in foreign markets, local sourcing, loan guarantees and import tariffs (Juhász et al., 2022)



Source: (Evenett et al., 2024)

Industrial policies: not only a development strategy

A small number of developed countries account for the majority of industrial policies: wealthier liberal democracies (Juhász et al., 2022)

New Industrial Policy announcements



Industrial policies: building comparative advantages

Targeted at a select number of sectors, in which comparative advantage often exists, and often firm-specific (Juhász et al., 2022)

New Industrial Policies by sector



# Industrial policies: beyond rhetoric

How much is high spending in IP? – nine OECD countries (Criscuolo et al., 2023) + China (DiPippo et al., 2022)

- China's industrial policy spending totals at least 1.73 percent of GDP in 2019
- OECD countries: on average 1.4% of GDP on industrial policies through grants and tax expenditures and 1.8% of GDP through financial instruments
- Strong sectoral approach, with policies supporting the digital and green transition, as well as jobs and skills, remaining small
- High heterogeneity across OECD countries
- Green industrial policy instruments (e.g., green grants) have increased in importance in recent years

## Gross domestic spending on R&D



Source: OECD (2023), Gross domestic spending on R&D (indicator). doi: 10.1787/d8b068b4-en (Accessed on 28 November 2023)

What is IP? Empirical evidence: The extent of innovation policies

Government budgetary allocations for R&D



Source: OECD MSTI Database: http://oe.cd/msti. (Accessed on 28 November 2023)

## Formulating IP: a simple framework

#### From objectives to instruments



Source: Ciarli et al. (2024)

	What is IP?	Why?	Objectives	Changes	
		00000000			
The bright side	of innovation				

## Social returns to innovation

Social returns to innovation expenditures (R&D) are high (Hall et al., 2010; Bloom et al., 2013; Jones et al., 2020)

Study	Industry / Context	Social Rate of Return	Social Benefit- Cost Ratio
Alston et al. (2000)	Agriculture (review of 292 studies)	44% (median)	
Mansfield et al. (1977) and Tewksbury et al. (1980)	Industrial Innovations (37 case studies)	71% (median)	
Bloom et al. 2013	Publicly-traded firms, All industries	55%	14
Azoulay et al. 2019	Biomedical research from the NIH	1	> 3
Jones and Summers (2020)	Overall U.S. Baseline estimate Economy Conservative estimate	67% 20%	13.3 5

Source: Jones (2021)

#### Objective: innovation, economic performance, productivity

## Govt funds basic and risky research

Govt funds knowledge produced by basic and risky research (including education) (Mazzucato et al., 2015a)

Which is then used to develop several technologies (Mazzucato, 2013)



#### *Objective*: Innovation "missions" $\rightarrow$ competitiveness

## Innovation funding breeds innovation

Office of Scientific Research and Development (OSRD)

World War II public R&D kicked off the postwar growth of technology clusters in the US

Benefited from, but did not depend on, postwar federal R&D

Growth in local industrial employment and firm creation in related high-tech industries

Permanent effects on the direction of U.S. innovation – electronics and communications



Source: Gross and Sampat (2023)

#### The bright side of innovation

## Science is useful in the public domain



Source: (Yin et al., 2021)

*Objective*: Knowledge  $\rightarrow$  Economic growth & and other challenges

Why? 000000000

# Building industries (structural change)

The bright side of innovation





#### Objective: Economic growth, productivity, employment

# Real Annual Average Growth Rates of Manufacturing Output (O) and Manufacturing Output Per Employee (O/e) (O/e)

	1960-	70 (%)	1970-	80 (%)	1980-	99 (%)	1990-	95 (%)	1960-	95 (%)
Country	0	O/E	0	O/E	0	O/E	0	O/E	0	0/E
Argentina	5.4	na	0.5	4.6	-1.4	-3.1	11.6	13.8	2.1	3.4
Brazil	8.0	na	9.0	2.2	0.1	1.5	25.2	24.3	8.5	6.4
Chile	9.4	na	1.8	3,4	2.9	-1.1	10.4	7.2	5.5	2.4
China	na	na	8.4	3.7	9.6	8.9	13,5	13.2	9.9	7.7
India	3.1	ne	4.0	-0.1	7.4	7.0	2.3	-0.6	4.5	2.6
Indonesia	6.4	na.	14.2	9.9	7.4	-1.7	15.1	4.5	10.1	4.2
Korea	17.7	na	16.0	8.4	12.0	5.8	10.9	10.7	14.6	7.B
Malaysia	10.9	na	11.8	4.3	9.5	5.0	19.8	9.5	12,0	5,6
Nexico	9.7	154	7.2	3.9	2.2	3.1	8.4	11.5	5.5	5.0
Taiwan	15.0	03	12.6	3.7	7.2	4.9	4,8	5.6	10.6	4.5
Thailand	9.1	na	10.1	-2.1	9.6	1.3	13.2	9.1	10.1	3.5
Turkiy	8.1	nə	5.1	1.5	7.1	4.9	4.7	5.8	6.5	3.7
Average for "the rest"	9.7	na	9.1	3.5	6.4	3.6	11.7	9.1	9.0	4,7
Canada	4.7	na	3.6	2.3	2.2	2.0	0.0	2.1	3.0	2.1
France	6.9	rsa	3.8	4.8	1.0	2.4	1.7	4.3	3.6	3,8
Germany	7.7	na	2.1	3.9	1.1	1.5	3.7	5.0	3.7	3.2
Italy	8.2	na	42	4.0	2.8	4.0	2,3	1.5	4.7	3.9
U.K.	2.9	08	0.0	2.0	1,2	4.2	0.1	3.2	1.2	3.1
U.S	4.2	na	5.0	2.3	3.6	4.8	2.9	3.2	41	3.5
Average for the N. Atlantic	5.8	na	3.1	3.2	2.0	3.3	1.8	3.2	3.4	3.3
Japan	15.2	na	5.3	6.0	5.8	5.3	6,3	1.6	8.4	6.1

The Asiatic model: state and 'institutions' (Amsden, 2001)

- Pick sectors and firms
- Reciprocity: firm performance (output, export, R&D)
- Wage and labour discipline, accompanied by subsidies and capital investment
  - Cost advantage & productivity
- $\Rightarrow$  The right "wrong" prices

The Asiatic model: national ownership (Amsden, 2001)

All countries continued to "buy" large quantities of foreign technology, and every country had to invest in some adaptive engineering in order to make foreign technology work

China, India, Korea, and Taiwan began to invest heavily in their own proprietary national skills

Migration (returnees)

MNC supply chains: Original Equipment Manufacturing

Intro What is IP? Why? Objectives Rationales Changes How? Summary

The dark side of innovation

# Public R&D also defines the direction of future technological developments



Source: (Moretti et al., 2019)

#### Objective: innovation, security

# Objectives

#### So, what are the main objectives of industrial and innovation policies?

Consider also the definitions of industrial policy

# Categorisation of objectives

**Economic** objectives: competitiveness; innovation; economic growth; and employment.

**Societal challenge**: inequality and inclusiveness; climate change and environmental sustainability; digitalisation, artificial intelligence, and other emerging technologies; demographic transition, youth bulge, and ageing population; intergenerational challenges (e.g., demography, climate, wealth inequality, inclusiveness).

**Strategic** objectives: resilience; strategic autonomy; long term planning (foresight).

## Evolving objectives

Economic  $\mapsto$  challenges  $\mapsto$  strategic

ttro What is IP? Why? **Objectives** Rationales Changes How? Summary

Objectives: A view from international organisations

# International organisations: examples

Objectives	Economic	Social challenges	Strategic
OECD (Criscuolo et al., 2023, 2022)	Innovation; productivity; economic growth; competitiveness	smoothing transition costs; fostering economic activity and employment in disadvantaged areas; SDGs; inclusion of firms and workers	Strategic autonomy; Resilience
World Bank (Hallegatte et al., 2013)	Competitiveness; green jobs	Green industrial restructuring	0
IMF (Cherif et al., 2022)	Diversification; new industrial capabilities		
UNIDO <sup>1</sup>	Guiding business expectations about future growth areas, and catalysing activity	Climate change; energy transition	

Source: (Ciarli et al., 2024)

## STI policies becoming sustainable

Environmental sustainability is a shared goal across STI strategies, but its meaning differs between countries. The specific priority targets for the green transition and the proposed technologies to build green transitions differ

Most countries' national STI strategies identify digitalization as an important tool for achieving other socio-economic goals.

Inclusivity explicitly reflects country-specific circumstances and social priorities



Source: McGuire and Paunov (2022)
Objectives: A view from country reports

## Countries IP: examples

Objectives	Economic	Social challenges	Strategic
USA	Infrastructures; Competitiveness; Manufacturing; Employment;	Environmental sustainability (energy innovation); health care; equity; regional disparities	Strategic autonomy; national security (defence); emerging/critical technologies
EU	Competitiveness; (green) Jobs;         Climate change;           Infrastructures; Structural         environmental           transformation (digital);         degradation; region           Economic growth         disparities		Strategic autonomy; security; technology autonomy; Framework conditions
China	Manufacturing (advanced); Innovation capabilities; Efficiency; Competitiveness; Structural transformation	Environmental impacts; health impacts	Technology autonomy
Republic of Korea	Employment; Innovation, Investment; Structural transformation (digital)	Energy transition; social security	
Thailand	Digital technologies	Clean technologies	
UAE	Economic growth; Competitiveness; Productivity	Clean energy	Strategic autonomy (skills)

Objectives: A view from academic researchers

## Objectives discussed in academic publications



Source: (Ciarli et al., 2024)



# Rationales

Ok, but why do we need the public intervention to achieve these objectives?



Source: Bloom et al. (2019)

#### US Research and Development as a Share of GDP, by Source of Funds: 1953–2015

## What is a rationale for IP?

#### What is a rational for IP?

Arguments that justify the use of government policy / intervention over a laissez-faire market-based alternative to achieve objectives related to the performance of the productive sector, including in ways that can contribute to achieving, rather than worsening, social challenges and strategic objectives, and which invests in science, technology and innovation as a means to achieve desired objectives (Ciarli et al., 2024)

# What is not a rationale for IP?

Most country reports mix objectives with rationales

And GPT: "How can we best distinguish between objectives and rationales of industrial policy?"

- Rationales are the underlying reasons or justifications for why specific policy measures are adopted.  $\surd$
- They explain the necessity or desirability of pursuing certain objectives.  $\sqrt{\,X}$
- Rationales provide the theoretical or practical basis for the chosen objectives X
- and the methods employed to achieve them.  $\sqrt{}$
- Market Failures; Strategic Trade Theory; Learning Curves; Equity Considerations  $\sqrt{}$
- National Security; Economic Resilience; Innovation Systems; Global Positioning X

 Intro
 What is IP?
 Why?
 Objectives
 Rationales
 Changes
 How?
 Summary

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 0000000000
 0000
 0000
 0000
 0000
 00000000
 0000
 00000000

 Rationales: back to theory

# What is a rationale for IP?

Define rationales based on theory

- IP literature from market (Pack and Saggi, 2006; Juhász et al., 2023a) to system failures (Cimoli et al., 2009a)
- Properties of technical change (Metcalfe, 2014; Arthur, 2009)
- National Innovation Systems (Freeman, 1987; Lundvall, 1992)
- Sectoral systems and industry properties (Malerba and Orsenigo, 1997)
- Missions and technological programmes (Ergas, 1986; Mazzucato, 2018; Gross and Sampat, 2023)
- Structural change (Prebish, 1950; Cimoli and Porcile, 2009)

	What is IP?	Objectives	Rationales	Changes	
			000000000000000000000000000000000000000		
Rationales: back	to theory				

# Market failures

Externalities (Bartelme et al., 2019)

- Production of knowledge e.g. basic and with high failure
- Imperfect markets for know-how and learning (Arrow, 1962)
- Markets, demand condition (e.g. new economic activities (Hausmann and Rodrik, 2003))
- Pollution reduction including generational equity failure
- Reducing dependence on foreign sources of supply
- Defense
- Creating jobs
- Agglomeration (Crafts and Hughes, 2014)

Intro 000000000	What is IP? 000000000000	Why? 000000000	Objectives 0000	Rationales 000000000000000000000000000000000000	Changes 0000	How? 00000000	
Rationales: back	s to theory						
Marke	t failures						

Coordination (or agglomeration) failures

- Complementary assets/inputs/outputs (Rosenstein-Rodan, 1943) (e.g. imperfect capital markets (Hasanov and Cherif, 2019))
- Network externalities
- (Dynamic) economies of scale (Bartelme et al., 2019)
- Marshallian externalities (Crafts and Hughes, 2014)
- $\Rightarrow$  Multiple equilibria

Intro 000000000	What is IP? 000000000000	Why? 000000000	Objectives 0000	Rationales 000000000000000000000000000000000000	Changes 0000	How? 00000000	
Rationales: back	to theory						
Marke	t failures						

#### Activity-specific public inputs (Soete, 2007)

- Law and regulation
- Education
- Infrastructures

Intro	What is IP?	Why?	Objectives	Rationales	Changes	How?	
Rationales: back	to theory						
Market	t failures						

Missions (projects of national strategic relevance)

- Knightian uncertainty (Mazzucato et al., 2015b)
- Defense (Ergas, 1986)
- Health, nutrition, sanitation, climate emergence including inequality failure (Foray et al., 2012)

Intro	What is IP?	Why?	Objectives	Rationales	Changes	How?	
Rationales: back	to theory	000000000	0000		0000	00000000	
Govern	nment fail	ures					

# Imperfect information – Govt has no better info to make decisions

Political capture

# Market failures: Crucial and incomplete

"albeit quite common, the 'market failure' language tends to be quite misleading in that, in order to evaluate the necessity and efficacy of any policy, it takes as a yardstick those conditions under which standard normative ('welfare') theorems hold. The problem with such a framework is not that 'market failures' are not relevant. Quite the contrary: *the problem is that hardly any empirical set-up bears a significant resemblance with the 'yardstick' –* in terms of e.g. market completeness, perfectness of competition, knowledge possessed by economic agents, stationarity of technologies and preferences, 'rationality' in decision-making, etc. (the list is indeed very long!). In a profound sense, when judged with standard canons, the whole world can be seen as a huge market failure!

Non-market institutions (ranging from public agencies to professional associations, from trade unions to community structures) are at the core of the very constitution of the whole socioeconomic fabric

they offer the main governance structure in many activities where market exchanges are socially inappropriate or simply ineffective" (Cimoli et al., 2009a)

# Structural failures (structuralist approach)

Knowledge does not diffuse freely and is not accessible to all (Rosenberg, 1976)

• The existing productive specialisation and technological trajectory of an economy determines its future productive and technological developments (Cimoli and Porcile, 2009; David, 2000)

Several institutional conditions are required to use knowledge and technology to develop (Gerschenkron, 1962)

• Introducing new technologies requires a costly change of existing technologies, capabilities, practices, and institutions that have developed around given technological paradigms

Terms of trade (Prebish, 1950; Singer, 1950)

• Exploit of defy comparative advantages? (Lin and Chang, 2009)

 $\Rightarrow$  Acquisition of knowledge and capabilities that may not be present in the economy

 Intro
 What is IP?
 Why?
 Objectives
 Rationales
 Changes
 How?
 Summary

 000000000
 0000000000
 0000000000
 0000
 00000000000
 0000
 0000000000
 0000000000
 0000000000

 Rationales: back to theory

# National Innovation Systems

Fosters dynamic competitiveness (Aiginger and Sieber, 2005)

Institutional incentives and coordination between institutions – linking actors (Freeman, 1987)

Designing institutions or framework conditions that can guarantee the sustainability of the system

Technological foresight to scope opportunities and threats (Irvine and Martin, 1984)

Creative destruction: low cumulativeness, low appropriability, and lower risk –  $(\mathbf{SM}\ \mathbf{I})$ 

Creative accumulation: high cumulativeness, high appropriability, and higher risk –  $(\mathbf{SM}\ \mathbf{II})$ 

 Intro
 What is IP?
 Why?
 Objectives
 Rationales
 Changes
 How?
 Summary

 000000000
 0000000000
 0000
 0000000000
 0000
 00000000
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 Rationales:
 back to theory

# Properties of technical change

Uncertainty - technological developments and their consequences

Inequalities - space and individuals

Directionality

Inclusion

Promoting diffusion of new technologies

Reducing the conditions for lock-in in incumbent technologies

 Intro
 What is IP?
 Why?
 Objectives
 Rationales
 Changes
 How?
 Summary

 000000000
 0000000000
 0000
 0000
 000000000
 0000
 00000000
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 Five categories of rationales

# 1. Structural Transformation

Individual actors (e.g., firms), even when working in concert, may not have the knowledge, resources or influence to engender broad-based structural transformation (e.g. path dependency, multiple equilibria, or market failures)

Central authority to provide resources, coordination, and direction for such transformation

Structural transformation: new sectors, activities, and occupations, (static and dynamic sense through encouraging and investing in innovation) – e.g. shifts towards the green economy and to sectors insulated from the negative effects of technological change could be considered under this rationale

Intro What is IP? Why? Objectives accords occords of rationales Objectives occords occ

Providing infrastructure to meet firm needs, creating and enhancing factors of production (e.g., education), production activities (e.g., the provision of public goods), and either directly or indirectly creating demand for firms.

Including innovation - uncertain, costly, and not always appropriable

# 3. Directing technological change

Pushing out the *technological frontier* and in influencing the *direction* of technological change.

- Providing and encouraging basic science, engaging in technology foresight and related activities, and in the generation of general-purpose technologies.
- Path dependency and the risk that technical change lock in suboptimal trajectory
- Make sure that technological trajectories are not driven by few private corporation, which may not reflect the priorities of different components of the society (e.g. in health research)

Encourage technology upgrading and alter the dynamic allocation of resources through changing the incentives for innovation and technological change which is uncertain, costly, not always appropriable

# 4. Creation of framework conditions

Institutions and rules to regulate different markets, e.g., to facilitate the transfer of technology and knowledge, and to solve information asymmetries, correct positive and negative externalities

# 5. Coordination and managing complexity

Navigating the complexity of technical change

- Correcting coordination failures, generating interdependencies between different actors, linking the private and the public sector, linking firms within the private sector
- Understanding how these and other interdependencies influence the impact of firm activities on social objectives, including in engaging in technology foresight and related activities

Rationales: A view from international organisations

# International organisations: examples

	Structural Transformation	Conditions for production	Directing technical change	Framework conditions	Coordination & managing complexity
OECD (Criscuolo et al., 2023, 2022)		Access to inputs (e.g., skills, knowledge, infrastructure); demand to increase scale; knowledge externalities (appropriability)	Missions to address challenges	Competition; Well- functioning capital markets; Governance of new GPTs such as AI; Firm concentration (digital); Machine learning for industrial policies	Complementarities between policy instruments; complexity of chellenges
World Bank (Hallegatte et al., 2013)	Discover latent comparative advantages	Complementary inputa			Complementary activities; negative externalities; knowledge spillovers; coordination failures; capital market imperfections
IMF (Cherif et al., 2022)		Intermediate goods; skills; infrastructure			Learning externalities; coordination failures
UNIDO			Support public purpose technologies	Markets and institutions are co- created by public, private and third sectors	

Source: (Ciarli et al., 2024)

Rationales: A view from country reports

## Countries IP: examples

		Country Strategy							
Rationales	USA	EU	China	Republic of Korea	Thailand	UAE			
Structural Transformation	(Selective) reindustrialisation; Shift to clean energy technologies	New areas of production and work linked to green and digital transition	Upgrade and encourage higher quality production ("structural optimisation")	Develop new industries	Develop new industries				
Conditions for production	Accelerate introduction of productivity- enhancing manufacturing technologies	Complementary inputs (e.g., infrastructure and capacity in energy networks)	New production methods, industry forms, and business models; Generate indigenous innovation	Creation of new markets; Development of infrastructure	Infrastructure development; Investment in skills	Adoption of advanced technologies			
Directing technical change	Address emerging challenges; Develop new technological areas	Innovation to meet emerging challenges (specifically environment related); Disruptive and breakthrough innovation							
Framework conditions		EU as a regulator and enabler: Provide political and policy direction to create certainty for private sector; Ensure a level playing field	Legislation and standards to improve institutional environment	Developing framework conditions for the twin transition; Institutions to accelerate private sector investment in innovation	Access to markets, information, and finance	Generate attractive business environment			
Coordination & managing complexity	Build supply chain resilience	Co-design and co-create solutions;	Coordinating role linking government, firms, academia, and research institutes						

Rationales: A view from academic researchers

#### Rationales: discussed in academic publications



Objectives and rationales

## Formulating IP: a simple framework

#### Objectives and rationales

				1	Rationales		
			Structural transformation	Conditions for/means of production	Directing technological change	Framework conditions	Coordinating and managing complexity
	Economic objectives	Examples - Productivity - Innovation - Employment 					
Objectives	Social Challenges	Examples - Inequality - Climate change - Digitisation 					
	Strategic objectives	Examples - Resilience - Strategic autonomy - Planning 					

Source: (Ciarli et al., 2024)

## Evolving objectives and rationales

#### $Economic \mapsto Challenges \mapsto Strategic objectives$

# Market failure $\mapsto$ Govt failure $\mapsto$ System failures/learning $\mapsto$ Critical protection/Independence

	What is IP?	Objectives	Changes	
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ID Evolution				

# Industrial policy waves

#### Continuation of a long history of policy thinking

Main features	First wave 40s to mid-70s	Second wave Mid-70s to 90s	Third wave 2005	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 modemisation (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", Horizonial policies Exposure to competition FDI attraction	Targoted 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 Competencies/capshilities
Policy model	Top-down Centralised system National agencies/councils Developmental institutions	Minimal state (Weakering and/or dismantling of national institutions)	Multi-layered (Top-down/tiottom-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 Infami industry protection Hard infrastructure development Public funded research Compensation posicies for legging areas.	Innovation policies ICT diffusion Competitiveness programmes Human capital SMEs support (regional level)	Credits and grants for production development and innovation Public procurrement Promotion of entrepreneurship (venture capital, angel investors and support to business capabilities) Hard and soft infrastructure Technical competences and skills	Technology infrastructure & intermediate RSD&M institutions Manufacturing research Scaling up Strategic public procurement General purpose technologies Rey enabling bechnologies 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, atc.) 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 Selds



# Industrial policy waves and turning points

From the "old" structuralism approach by the founders of development economics supporting the "Big Push" and the focus on high-linkages sectors (Rosenstein-Rodan, Hirschman, Prebish and Singer) (1950s-1960)

• Picking winners, strategic sectors, development state

To the debt crisis in LACs and the establishment of the Washington Consensus (1980s) – rejection of structuralism and triumph of the market liberalisation, privatisation and stabilisation policies

- Govt failures: no IP
- Kicking away the ladder: high income countries use IP (Chang, 2002)

To the "neo-structuralism" put forward by Lin and Stiglitz and Rodrik, Hausmann more recently through the identification of "binding constraints" and self-discovery (Hausmann, Rodrik and Velasco (2000s).

- East Asian Miracle Report (World Bank, 1993)
- 'Normalisation' towards the modern debate

Instruments

# A long list of instruments

Domain	Horizontal Policies	Selective Policies
Product markets	Competition and anti-trust	National Champions
	Indirect tax	Nationalisation/privatisation
	Product market regulation	Output subsidies/state alds
	Exchange rate policy	Export promotion
		Price regulation (e.g. pharma)
		Public procurement
		trade policy
		Car scrappage
Labour and skills	Skills and education policies	Targeted skills policies
	Training subsidies	Apprenticeship policies
	Wage subsidies	
	income and employment tax	
	Management advisory services	Sector-specific advisory services
	Labour market regulation	
Capital markets	Loan guarantees	Strategic Investment Fund
	Corporate tax/capital	Emergency Loans
	allowances	State Investment Bank
	Macro/financial stability	Inward investment promotion
	Financial market regulation	TO THE REPORT OF A DECK
Land	Planning regulation	Enterprise zones
	Land use planning	Place-based clusters policy
		Infrastructure
Technology	R&D tax credit	Green technology
(centrology)	Science Budget	Load Markets
	IPR regime	Public programment for innovation
		Patent Box
		Selective technology funding
		Centres of expertise
		centres of experiese
Systems/Institutions	Entrepreneurship policy	indicative planning
	Scenario planning	Foresight initiatives
	Distribution of information	identifying strategic sectors
	Overall competitiveness	Sectoral competitiveness strategy
	strategy	Clusters policy

Instruments: A view from country reports

#### Countries IP: examples

Objectives		USA	EU	China	South Korea	Thailand	UAE
	Examples					1	
Economic Objectives	Competitiveness Innovation Economic growth Employment	Investment in R&D, menuflacturing and workforce development	EU competition policy to level playing field; New standards and technicat regulations; EU funding programmes	State-owned banks: subsidies, low-interest loans, and bonds, Targets for RAD and labour productivity; Quality control and management mischanisma	Investment in training	Infrastructure: Eastern Economic Corridor: tax, land, visa incomtives to investing firms One-stop service centres to simplify regulatory processes; Tax holidays	Trade agreements; Energy subsidies for industry; Flexible financing for priority sectors; Simplifying procedures
-	Inequality Inclusiveness				Universal unemployment insurance		
Social Challenges	Climate change / Environmental sustainability	Infrastructure investments: Tax incentives, grants, and loans for Climate- related technologies. Consumer tax credits for green products	Large scale innovation projects; Public-private partnetships		Infrastructure investments		
	Digitalisation Artificial Intelligence New technologies	Tax credits; Loan guarantee programs; Workforca development; R&D translational research Grants to construct, expand, and modernize domestic facilities and equipment	Development of quantum communication infrastructure and enabling technologies		Investment in digital Infrastructure		
Strategic	Strategic autonomy	Direct support of semi- conductors production;	Regulations on screening of foreign direct investment; Increased recycling				

# Recent trends in IP: countries

- Move away from a reliance on tariffs and taxes.
- Stronger focus on engaging in (and crowd-in) large-scale investments: infrastructure (including digital and green infrastructures) or innovation activities.
  - Larger investments in higher income countries

Differentiation of policies and instruments by income level.

- diffusion and adaptation of technology –value chains and trade agreements
- push out the technological frontier

European Union exception

- Significant funding to encourage and facilitate twin transition
- Stronger emphasis son framework conditions, and specifically issues related to regulation, standards, and certifications

Instruments: A view from country reports

# Taxonomy of instruments



Source: Criscuolo et al. (2022a)

# Recent trends in IP: strategies

When dealing with the complexity of the challenges and of economic systems, important to focus on sets of instruments rather than on single instruments and policies

• Systemic 'industrial strategies'

#### OECD

- traditional sectoral strategies to build capabilities in competitive sectors that trigger economic growth in the rest of the economy;
- mission-oriented strategies to achieve specific and well framed missions, which could range from technological achievements to addressing societal challenges;
- technology-focused strategies to spur the production and/or diffusion of innovations;
- place-based strategies, to redistribute productive opportunities across regions, as well creating regional poles of attraction

# **OECD** Industrial Strategies



Source: Criscuolo et al. (2022a)

Intro 000000000	What is IP? 000000000000	Why? 000000000	Objectives 0000	Rationales 000000000000000000000000000000000000	Changes 0000	How? ○○○○○○●○	
Evaluation							
Is IP ef	fective?						

Largely yes (Criscuolo et al., 2022b; Juhász et al., 2023a), and effects are long lasting  $\Rightarrow$  IP is needed

But

- Depends on the instruments
- Depends on how it is implemented

	What is IP?	Objectives	Changes	How?	
				00000000	
Evaluation					

# Example of different innovation policies

Policy	Quality of evidence (1)	Conclusiveness of evidence (2)	Net benefit (3)	Time frame (4)	Effect on inequality (5)
Direct R&D grants	Medium	Medium	10: 10:	Medium run	Ť
R&D tax credits	High	High	0.0.0	Short run	1
Patent box	Medium	Medium	Negative	NA	Ť
Skilled immigration	High	High	3Q6 3Q6 3Q6	Short to medium run	i.
Universities: incentives	Medium	Low	10 <sup>1</sup>	Medium run	Ť
Universities: STEM supply	Medium	Medium	\$Q€ \$Q€	Long run	1
Trade and competition	High	Medium	N: N: N:	Medium run	Ť
Intellectual property reform	Medium	Low	Unknown	Medium run	Unknown
Mission-oriented policies	Low	Low	ŝΩŧ	Medium run	Unknown

Source: Bloom et al. (2019)
# Three main shifts in IP thinking and practice

Extension of industrial policy objectives to embrace broader social challenges and strategic objectives – especially in high income countries

• 'Privilege' of high income countries -- although recently also LIC connect to social objectives

Technological race - driven by strategic motives

Synergies and trade offs: from policies to strategies

#### Two main limitations in current IP practice

Too little attention to rationales - and academic literature

Too little long term planing in strategies: synergies and trade offs

Too little evaluation

	What is IP?		Objectives		Changes		Summary
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#### A revised framework



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