UNIVERSITY OF CAMBRIDGE

Cambridge Industrial Innovation Policy

CSTI

Industrial Innovation Policy: Rationale, Definitions and Challenges.

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Summary

- Industrial Innovation Policy (IIP) is a useful concept for **designing and implementing policies** that foster competitiveness across innovation and industrial systems.

- Most advanced technologies today are characterised by strong **technical and economic interdependences**; policy requires addressing the gaps across these 'techno-economic' systems to ensure that **value creation and value capture opportunities** align over time.

- IIP is a **concept** that can be adapted to different institutions and stages of development.

1. Introduction

Industrial policy is experiencing a resurgence in policymakers' interests across the globe. Despite being excluded from policy and academic circles and discussions for a few decades between the 1980s and the 2000s, industrial policy has always existed under different names. Industrial strategy, science and technology policy, innovation policy are just some examples of names that were more acceptable in a time when government intervention was not a hot topic, at least in debates surrounding policy and academic discourses. Called by different names, sometimes creating confusion in an already grey area, science, technology, innovation, and industrial policies are part of national (or regional) governments' tools to 'select' some sectors over others for the development of capabilities and the upgrade of the overall economic structure.

In this policy brief, we propose the use of Industrial Innovation Policy (IIP) as a concept that better serves the technological and productive complexity of our time and as a useful term to capture the dynamics between the research and innovation base and the industrial/productive base. IIP is an emerging multidisciplinary approach to addressing important technology and manufacturing-related policy questions, which emphasises the structures, linkages and interdependencies between technology innovation systems and industrial value chains.

In the US, the term IIP has begun to be used to indicate governmental intervention in one or more post-research stages, from development to prototyping to production to further technology innovation to capture the value created during research-intensive activities[1]. Yet, IIP is, at the same time, a flexible concept that can be targeted to the policy, the productive and institutional context of different countries; the main aim is to align research and innovation strengths with industrial opportunities, to combine research outputs (knowledge and human resources) with national (or regional) capabilities to build (or upgrade) a competitive productive structure.

2. Definition

The term innovation within IIP speaks to innovation that supports the wider industrial system, paying attention to the innovation needs of the broader value chain (industrial) actors that support sector-level competitiveness (e.g., system engineering innovation, manufacturing tool/tech innovation, process innovation). A key premise underpinning the concept of innovation systems (and related innovation policies) is the notion that a key determinant of the competitiveness of a knowledge economy is the quality of connections and configuration of the different system elements (and that national/regional competitive advantage can be gained from innovation policies, which proactively foster an infrastructure of linkages between actors). While modern

[1] Bonvillian, W. B. (2022). Industrial innovation policy in the United States. *Annals of Science and Technology Policy*, *6*(4), 315-411.

innovation policy acknowledges the importance of linking industry, universities and government in post-research innovation stages, IIP goes further than this. Specifically, the concept is used to argue that the configurations of capabilities and quality of linkages within the combined innovation and industrial systems matter for industrial competitive advantage.

IIP field is likely to explore how technological and operational innovations get translated and absorbed into industrial value chains. It is a policy-led field where the implications for government policies, programmes and strategies are at the core of it. One of the key aspects of IIP research is the distinction between different types of technologies, innovation institutions, and sectors while also proposing a set of tools to better frame and understand the challenges of innovation development, diffusion and adoption. The analysis of competitive advantage and windows of opportunity for industrial value capture requires an understanding of the combined systems. The effective design of "industrial innovation policy" related priorities and programmes requires a contextual understanding of the innovation needs/opportunities of the extended value chain.

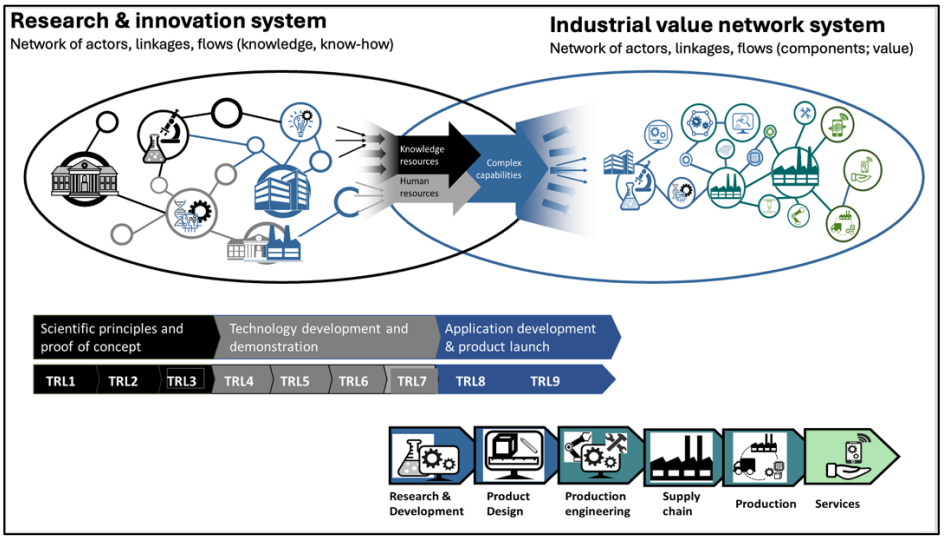

Figure 1. Innovation and production systems: a conceptual framework.

Therefore, the functioning of innovation systems and productive/value chain systems requires to be analysed, organised and strategized with a comprehensive understanding of their connections and complementarities. Innovation systems are organised by a flow of information between knowledge development, diffusion and adoption; the industrial cycle, represented by the value chain of activities, is organised around the division of labour to deliver a specific product; the systems/cycles are then organised through different principles, yet their interaction is mediated through capabilities.

3. Rationale

The challenges brought by the fast-evolving nature of the manufacturing sector require a comprehensive approach. Most advanced technologies today are characterised by sectoral complementarities and interdependences in such a way that policy programs should be focused on promoting innovation while aligning value creation (at the innovation/technology level) and making sure that value is also captured across the productive structure. Innovation policy alone, especially when exclusively focused on promoting research/science and innovation capabilities, does not sufficiently consider how critical it is to conceptualise, count and strategise for 'industries' in ways that reflect how firms organise themselves into value chain networks, and the very specific challenges that occur at the industrial/manufacturing level. On the other hand, as the experience of some emerging economies that got stacked in the middle-income trap shows, industrial policy alone could underestimate the importance of targeting the development of innovation capabilities in critical innovation technology domains that are key to continue increasing productivity and competitiveness.

4. Why defining government policies as innovation industrial policy is useful/important?

IIP helps address value creation and value capture opportunities, addressing the numerous market and system failures[2] that characterise modern manufacturing systems. This approach also enables policymakers to work across the (often too siloed) departments, bringing a truly interdepartmental approach to policy design and implementation. Governments such as the UK and the US face critical challenges in terms of scaling up technologies and implementing them in production processes while innovating in production technologies and processes.

Figure 2 is a representation of IIP as a field at the intersection between different policy domains; the boundaries are not always clear-cut, and there is a risk of neglecting the overlapping spaces between the different domains. The three spheres might take different names and have different stakeholders involved across different countries; however, IIP involves by definition the interaction of different disciplines and ministerial/department competences and processes. This latter element increases transaction costs and presents organisational challenges that require to be addressed at the institutional, policy and political levels.

[2] Arnold et al., 2014. The case for public support of innovation. UK Department for Business Innovation and Skills. https://assets.publishing.service.gov.uk/media/5a7dcf11e5274a5eaea6675f/BIS_14_852_The_Case_for_Public_Support_of_Innovation.pdf

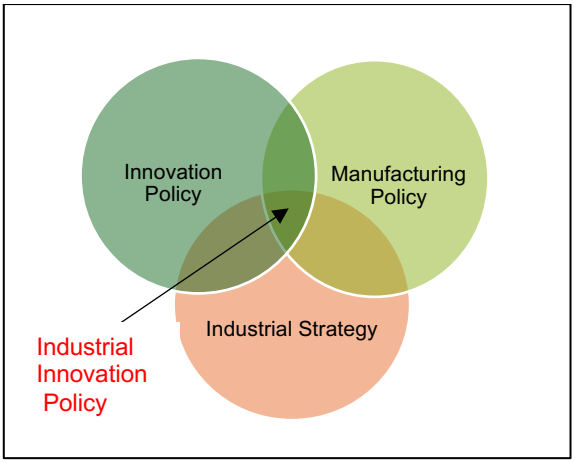

Figure 2. The fuzzy boundaries of IIP.

What industrial innovation policy is not about?

Industrial innovation policy covers the building up of capabilities across the innovation and production domains. IIP is not about other types of policies that could complement an effective IIP but are not part of it. For example, trade policy or competition policy use different, yet sometimes complementary, tools and respond to different incentives.

5. Challenges

IIP as a concept may be more (or less) useful depending on different countries and different phases of development. While the concept at first glance might seem to target mainly advanced economies that are at the technological frontier and/or that are de-industrialised and are now required to rebuild manufacturing capabilities, IIP is also key for emerging economies. For the latter, a focus on standard industrial policy, which would target specific sectors that are likely to create opportunities for learning and productivity increases, remains key. Yet, there are some common elements in the policy-making process of advanced and emerging economies. It is a key role for the government to consider the strengthening of links between value creation (innovation policy) and value capture (industrial policy) to avoid lock-in mechanisms. Considering both innovation and industrial challenges (and thus policies) at the same time is complex. It requires a profound understanding of both science, innovation and industrial dynamics. For this reason, IIP poses a series of questions on the capabilities that policymakers are required to have to see the overall spectrum of innovation and industrial systems, to map them and to see where gaps lie and where and which type of intervention is needed to address the gaps. A grounded understanding of how innovation works and what is required to promote competitiveness and value-capture opportunities is key to designing policies that target capabilities underpinning industrial innovation systems.

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Cambridge Industrial Innovation Policy is based at the Institute for Manufacturing (IfM), a division of the University of Cambridge's Department of Engineering. CIIP brings together the Centre for Science, Technology & Innovation Policy at the Institute for Manufacturing, the Policy Links Unit from IfM Engage, and the Babbage Policy Forum.

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