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Coevolving Concepts in the History of Innovation Studies

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Contents

Innovation Barriers, Indicators and Policies

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ABSTRACT

This monograph discusses the coevolution of innovation barriers, indicators, and policies throughout the history of Innovation Studies. Our study starts with a thorough review of the theoretical and historical literature addressing the origins of these concepts to demonstrate that innovation barriers are intimately related to both the theoretical development of the innovation concept and its measurement as well as the policy-driven interest on innovation debates. The absence of a dominant epistemological paradigm in the field of Innovation Studies is arguably an important explanatory factor for the underuse of innovation indicators in policy decision-making which is in antithesis to the significant developments in the innovation measurement enterprise during

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the past few decades. We conclude that, although the context of changing paradigms benefits the creative freedom for research, it also hampers the stability and standardization necessary for the absorption of innovation indicators into the policy cycle. Efforts to change such a situation continue to this date.

Keywords: innovation barriers; innovation indicators; innovation policies; innovation studies; measurement models.

1

Introduction

The acknowledgment of the impact of Science, Technology, and Innovation (ST&I) on the economy after World War II ushered the advancement and progressive refinement of specific policies to address development issues (Fealing *et al.*, 2011; Freeman and Soete, 2008 [1997]). In parallel, the statistical production turned out to be crucial in the processes of designing, monitoring, and evaluating these policies (Gault, 2013; Velho, 2001). Nowadays one can easily verify the proliferation of ST&I statistics and indicators[1] from both national and international reputed organizations around the world such as the U.S. National Science Foundation (NSF, 2020), the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2016) and the Organization for Economic Cooperation and Development (OECD, 2018b), just to mention a few examples.

[1] We adopt herein the definition of indicators as combinations of statistics that may come from various sources (Gault, 2011). Figuratively, statistics would be like "atoms," while indicators would be like "molecules" (Sirilli, 2006).

The field of Innovation Studies[2] has witnessed remarkable development in recent years (Fagerberg *et al.*, 2013; Martin, 2012). Its activity has developed alongside lively debates among experts reflected in a broad and longstanding literature pointing out controversies and difficulties of incorporating ST&I indicators into the political and social spheres, challenging indicator legitimacy and consistency (Feller and Gamota, 2007; Godin, 2005; Jaramillo and Albornoz, 1997; Velho, 1992). Other studies have highlighted the coevolutionary processes underlying the development of our conceptual understanding of innovation during the past half century or so and of the policies (and policy waves) that have been devised to promote it (Godin, 2012; Meissner *et al.*, 2017). Yet others have pointed out systematic underutilization of innovation indicators in the policy cycle – extending to policy design, implementation, monitoring, and evaluation activities – across developed and developing countries (Arundel, 2007; Baptista *et al.*, 2010; Viotti, 2013).

It is within this very active milieu that the present monograph attempts to take stock. The monograph focuses specifically on exploring the historical coevolution of three core concepts in the field: barriers,[3] indicators, and policies. We argue that these concepts have coevolved and reinforced each other throughout the history of Innovation Studies. It is in this sense that a somewhat detailed historical review on the general conception of innovation is warranted in order to support a clear understanding of innovation barriers, indicators, and related policies as they have been shaped and co-evolved through time. Our understanding of innovation has consistently pointed out the presence of innovation opportunities and barriers. The presence of barriers to innovation called for policies. Policies demanded indicators to be evaluated. Refined and more diverse indicators opened up opportunities for considering

[2]There is a controversy in the use of the label "Innovation Studies" since it may suggest a monopoly as if it covered all that concerns innovation, although different perspectives on innovation exist (Godin, 2012). We are not addressing this issue here, as we assume the most common use of the label that has been developed in the literature in recent years (Fagerberg *et al.*, 2013).

[3]Barriers have also been referred to in the literature as obstacles, constraints, and inhibitors (Hadjimanolis, 2003). Although there may be subtle differences in the meaning of these terms, we use them interchangeably herein.

alternative barriers. We naturally pay attention to how an evidence-based innovation policy movement has gained momentum worldwide throughout this coevolutionary process.

Based on the thorough review of innovation barriers undertaken herein, we conjecture that financial and non-financial obstacles do not affect the innovation output directly. Instead, they impede the effect of the innovation determinants, whether these determinants are firm-specific, network-specific, or referring to the contextual environment (Antonioli *et al.*, 2017; Kanama and Nishikawa, 2017; Moraes Silva *et al.*, 2020). For instance, the financial obstacles could be thought to reference principally the difficulties of the company to fund R&D and other innovation activities internally or to obtain such funding externally. Similarly with other determinants such as knowledge access and absorption, external networking factors, demand factors, and organizational structure. Hence, the determinants and the obstacles to innovation coexist, the former representing the enabling conditions for innovation and the latter representing the inhibitors. One might perceive the obstacles to innovation as playing a moderation role, sitting between the determinants of innovation and the innovative performance, so that barriers are not simply the "lack of determinants (or capacity/efforts)", but actually real constraints that moderate how companies set up their innovation strategy to rely more or less on certain determinants depending on which barriers they are facing.

As we advance the discussion to innovation indicators and policies, we conceive that indicators are the products of theoretical models and cognitive interests of the actors engaged in their construction (Godin, 2005). At the same time, indicators potentially impact the perception of social reality and shape the diverse interests at play in the social and political spheres (Gault, 2011). In this sense, indicators can be seen both as "technologies" built upon perceived needs and as "interventions" designed for the purpose of changing behaviors (Gault, 2013). This reality highlights the need for increased responsibility by statisticians, as they are not only technocrats responding to demands, but also have the power to influence strategies and decisions (Sirilli, 2006). The capacity of statistics to influence policymaking and social decisions depends on several factors, including the stability provided

by an epistemological paradigm supporting the theoretical models of measurement. Our argument in this monograph is that the absence of a stable epistemological paradigm in the field of Innovation Studies explains a good part of the controversies and measurement difficulties hampering the incorporation of the innovation indicators into the policy cycle.

The rest of the monograph is organized in the following sections. Section 2 presents a thorough discussion on the historical evolution of the innovation concept and its connection to the concepts of barriers, indicators, and policies. Section 3 discusses the beginnings of the measurement of innovation barriers, as well as the linkage between the study of obstacles to innovation and a policy-driven approach towards scientific and technological progress. After presenting a brief illustration from Brazil, it also proposes the absence of an epistemological paradigm stabilizing the theoretical models within the Innovation Studies field as a powerful explanatory factor for the lack of legitimacy and the consequent underuse of innovation indicators in the policy cycle. Finally, Section 4 concludes with the main findings and avenues for future study.

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