The market failure and the systemic failure rationales in technological innovation systems

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A B S T R A C T

In this paper we analyse the conceptual relationship between the market failure rationale and the systemic failure rationale as justifications for policy intervention within an innovation systems (IS) analytical framework. Current policy analyses in the IS literature are characterised by two contrasting theoretical positions regarding the way in which both rationales are conceptually interrelated. In one strand of the literature, the market failure rationale is considered as a valid although insufficient justification for policy intervention that therefore needs to be complemented by the arguments put forward by the systemic failure rationale. This perspective implicitly presents the systemic failure framework as a more general approach than the market failure perspective. On the other hand, a number of IS policy contributions explicitly reject the market failure approach and consider it a flawed argument for government intervention. In this theoretical view, the systemic failure approach is thus proposed as a more appropriate, alternative innovation policy rationale. Despite their relevance as the theoretical bases that currently underpin actual innovation policy design, an analysis of the robustness and conceptual coherence of these contrasting perspectives has not been provided so far. In this work, we set the analytical steps we deem required for this analysis, and investigate under which premises the relationship between the market failure and the systemic failure rationales proposed by these two policy perspectives is valid from a theoretical point of view.

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1. Introduction

A key general premise of innovation policy analyses within an Innovation Systems (IS) framework (Freeman, 1987; Lundvall, 1988; Nelson, 1993; Edquist, 1997) is that the standard market failure rationale for government intervention is not sufficient to promote the development and diffusion of new technologies. In the IS approach, innovation is understood as a complex evolutionary process distributed in a system of multiple socio-economic agents whose behaviour and interactions are governed not only by market forces but to a greater extent by non-market institutions (Kline and Rosenberg, 1986; von Hippel, 1988; Metcalfe and Ramlogan, 2005; Soete et al., 2010). The innovative performance of such a system depends crucially on its agents’ interactions and the institutions governing them, and as a result of the complex evolutionary character of innovation, the problems affecting performance that call for policy action are essentially brought about by difficulties in the coordination of these interactive behaviours. Therefore within the IS framework the rationale for government intervention goes beyond a market failure argument: it implies to embed policies in a broader institutional context, and a shift from top–down to network steering. Indeed, in an IS setting, governments have to deal not only with ‘market failures’, but most importantly with ‘system failures’ (OECD, 1998; Smith, 2000; Jacobsson and Johnson, 2000; Arnold, 2004; Woolthuis et al., 2005), i.e. with problems rooted in the interactive behaviour of the agents in the system and the institutions which drive them (Carlsson and Jacobsson, 1997; Edquist, 1997; Rotmans et al., 2001; Foster and Metcalfe, 2001; Metcalfe, 2005). The adoption of this perspective has involved a substantial shift in the design of innovation policy, and expanded the set of policy instruments aimed at supporting processes of innovation and technological change (EC, 2009; Hollander et al., 2008). In a systemic view, government action has acquired a broader supporting role not only to ensure the effective functioning of markets but

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1 Several authors consider that system ‘imperfections’ (Smith, 2000), ‘dysfunctions’ (Llerena and Matt, 2005), ‘weaknesses’ (Bergek et al., 2010) or systemic ‘problems’ (Chaminade and Edquist, 2010) are more suitable terms than system ‘failures’. The literature, however, tends to refer to them as failures, therefore we shall also use this term in this work.
also as a means of improving the institutional set up and opportunities for constructive non-market interactions that better encourage preferred innovation paths, and favouring actions that overcome path dependence and system ‘lock-ins’ (OECD, 1998).

Although the systemic failure rationale has recently acquired a predominant role over standard market failure arguments, both rationales are still used as theoretical justifications for government intervention in many innovation policy analyses that apply an IS framework (e.g. OECD, 1998; Bach and Matt, 2005; EC, 2009; Aghion et al., 2009). Other contributions within this framework, however, consider that the systemic failure rationale is actually the only valid argument to support innovation policy (e.g. Metcalfe, 1995, 2002, 2005; Edquist, 1997; Nelson, 2009; Chaminade and Edquist, 2010). It is indeed possible to distinguish two general theoretical positions in the literature. As indicated, many IS analyses start from the general premise that, while still a suitable argument, the market failure rationale is not sufficient to inform effective innovation policy as it does not take into account the key influence that non-market agents, interactions and institutions have in the innovation process. Within this theoretical position, the market failure rationale remains as a valid policy argument and the systemic failure rationale, is implicitly presented as a more general approach to justify government intervention. Other IS policy analyses explicitly reject the market failure rationale considering that it constitutes a flawed argument to support innovation policy. The basic idea in this theoretical perspective is that the neoclassical economic hypotheses that underpin market failure arguments are at odds with the complex evolutionary character of innovation, and this renders the market failure rationale unsuitable as a basis for innovation policy. In this view, therefore, the systemic failure approach, rooted in evolutionary economic premises, is proposed as a more appropriate, alternative innovation policy rationale.

Despite their relevance as the theoretical bases that currently underpin actual innovation policy design, an analysis of the robustness and coherence of these two contrasting perspectives has not been provided so far. Within the first view, market failure arguments remain valid, however they are not conceptually linked or integrated within the more general framework allegedly provided by the systemic failure view. This leaves some fundamental questions unanswered: how is the market failure rationale exactly placed within the theoretical framework of the systemic failure approach? Does it provide market related arguments that are complementary to systemic failure justifications? Are the neoclassical economic premises underlying the market failure rationale compatible with the evolutionary assumptions that underpin the systemic failure approach? Unsurprisingly the way in which both rationales are conceptually integrated within the IS framework is not discussed within this theoretical perspective as: the two rationales are rooted in very different economic theories, the establishment of a conceptual link between them is extremely challenging and thus normally left outside the analysis.

Innovation policy analyses that reject market failure arguments, i.e. those within the second theoretical perspective, clearly do not address the conceptual integration of both rationales in a systemic context as they consider them incompatible. Nevertheless, as a result of their emphasis on the exclusive validity of the systemic failure as a policy rationale, contributions within this perspective tend to overlook the key role of markets in the innovation process. It could be argued that, although often not explicitly stated, analyses adopting this position do not really invalidate the argument that markets for technologies should function properly for the formation and the adequate development of an innovation system. In reality, this view rejects the way in which markets and their ‘failings’ are defined and analytically represented in the neoclassical approach. However, this point is precisely the origin of this perspective’s conceptual underdevelopment: policy contributions that reject the market failure rationale do not usually provide an alternative definition of market ‘failures’, or a detailed analysis of the way in which these are originated and affect innovation in a system.

In our view, the origin of the conceptual limitations of these two perspectives, and the absence of an analysis of the theoretical interrelation between the systemic and market failure policy rationales is the lack of a definition within the IS framework of the concept of market failures and their effects on innovation underpinned by evolutionary premises. This has resulted in IS policy analyses that overlook the key role of the dynamics of the market in the innovation process. And those IS based policy contributions that use neoclassic market failure arguments to fill this conceptual void are supported by two potentially conflicting, certainly not conceptually integrated, theoretical rationales.

The aim of this paper is to advance in this direction. In particular, in this work we provide the analytical steps that we deem necessary for the analysis of these contrasting policy perspectives within the IS framework, and investigate under which premises their arguments regarding the relationship between the market failure and the system failure rationales are valid from a theoretical point of view. As suggested, this requires an IS analytical framework that explicitly accounts for both the evolutionary sources and consequences of market failures in an innovation system. The analysis thus requires two analytical steps. First, in order to pinpoint the effect that markets malfunctioning has for innovation performance, it is necessary to use an IS approach that explicitly incorporates the key role of the market in an innovation system. Second, the approach must incorporate a definition of market ‘failures’ or malfunctions and an explanation of their sources in an evolutionary context. The first step involves using an IS analytical framework that takes into account the influence of the dynamics of markets in innovation. The second step requires that this analytical framework accounts for the complex evolutionary dynamics of markets.

The literature on innovation systems is extremely rich and heterogeneous (see e.g. Soete et al., 2010 for a review) and has provided a number of innovation systems concepts all of them relevant as theoretical constructs for the study of processes

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2 This is also the case at a practical policy level. For instance, in some countries such as Australia, while systems thinking infuses the policy debate, actual policy formulation is primarily shaped by market failure justifications (Dodgson et al., 2011).

3 Robust and conceptually coherent theoretical analyses are of paramount importance for effective policy design as they help shape actual policy making decisions by providing the justifications for government intervention, and motivating the implementation of specific instruments or policy mix choices (Laranja et al., 2008; Nelson, 2009; Bergek et al., 2010).

4 See however the work by Aghion et al. (2009) in which the authors integrate the market failure rationale within a complex systemic perspective, and Weber and Rohracher’s (2012) framework for market failures, structural system failures and transformational system failures.

5 Metcalfe (1998, 2005), Nelson (2009), Metcalfe et al. (2006) constitute exceptions within this theoretical view.

6 The sources and the effect of market failures for innovation are clearly defined in the neoclassical approach: the effect of the existence of market failures is an underinvestment in R&D for the production of new knowledge, and their sources are explained by the public nature of knowledge understood as an economic good—which leads to inappropriability problems, indivisibility in production, and imperfect and asymmetric information. As Dodgson et al. (2011) have indicated the clarity characteristic of market failure justifications contrasts with the rather nebulous innovation systems approaches (ibid, p. 2).
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