



A Study of Innovation Policies and Governance Structures in Emerging Economies Under the Path-Dependence Framework. The Case of Colombia

Mario A. Pinzón-Camargo[✉]
and *Gonzalo Ordóñez-Matamoros*[✉]

7.1 INTRODUCTION

The role assigned to Science, Technology and Innovation (STI) as sources of change (Godin, 2015) is on the top of the development policy discussions; mostly due to their proven effects on society, the economy and the environment. This discussion is a shared concern in emerging economies (Kuhlmann & Ordóñez-Matamoros, 2017a) and attracts the attention

M. A. Pinzón-Camargo (✉) · G. Ordóñez-Matamoros
Department of Science, Technology, and Policy Studies—STePS, University of
Twente, Enschede, the Netherlands
e-mail: mario.pinzon@uexternado.edu.co; m.a.pinzoncamargo@utwente.nl

G. Ordóñez-Matamoros
e-mail: gonzalo.ordonez@uexternado.edu.co

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about the relationship between innovation and development (Cozzens & Kaplinsky, 2009; Cozzens et al., 2007; Fagerberg & Srholec, 2009).

In this framework, Arocena and Sutz identify two roles which STI play on development (2017).¹ The first one is called ‘indirect approach to development’, whereby the centre of attention of STI is the firm, and the main goal is to increase productivity, efficiency and competitiveness. In this context, economic growth contributes to development by redistributing mechanisms like fiscal policies. The second one is named the ‘direct approach to development’, whereby STI policies aim to increase cooperation, participation, learning, among other capabilities in the communities (Bortagaray & Ordóñez-Matamoros, 2012). Based on these capabilities, communities will be able to attend their social needs and, and thus, increase their development.

Some authors argue that the role assigned to innovation in Latin American countries contributes to innovation policy locked-in under an indirect approach, that is, on a narrow focus on economic growth. Three arguments support this claim. First, most of the Latin American countries have adopted the notion of National Innovation Systems to exclusively organise relationships between different stakeholders in the productive sector (Dutrénit & Sutz, 2014). In such systems, STI policies are seen as elements in charge of increasing productivity in the private sector to improve competitiveness, income and therefore, economic growth (Pansera & Owen, 2018; Rennkamp, 2011).

Secondly, STI policies are oriented to the mainstream role of innovation for raising exports in these countries (Arocena & Sutz, 2017; Foster & Heeks, 2013; Smith et al., 2014) and in ‘catch-up’ models (Pansera & Owen, 2018; Smith et al., 2005), where this directionality, in some cases,

M. A. Pinzón-Camargo

Departamento de Derecho Económico, Universidad Externado de Colombia,
Bogotá, Colombia

G. Ordóñez-Matamoros

Centro de Investigaciones y Proyectos Especiales—CIPE, Universidad
Externado de Colombia, Bogotá, Colombia

¹ Others authors have made the same distinction using terms such as techno-nationalism vs. development and inclusion (Rennkamp, 2011) and market-centred vs social-centred (Pansera & Owen, 2018).

has been reinforced by international and free trade agreements (Smith et al., 2005), among other development policies.

Finally, there are private enterprises locked-in due to their reluctance to broaden their productive market towards non-traditional sectors. In this sense, Chataway et al. (2014), for example, conclude that companies in emerging economies do not want to address poor consumers' needs mostly because of the reputational costs associated with producing low-cost goods; the regulatory requirements that increase the value of goods; the country institutional arrangements and their objectives; and finally, the level of local development.

Despite the referred arguments, there are not enough analyses that provide systematic evidence whether exists or not a situation of lock-in of the role assigned to STI in emerging economies. In this vein, and to contribute to this discussion, this study assesses the extent to which the role assigned to STI policies in Colombia from 1990 to 2018 are in a lock-in situation. The reasons identified to choose this case will be pointed out in Sect. 7.3 below.

This study has seven sections. The next section discusses the conceptual framework to analyse the research question mentioned above. In this framework, we use concepts from path-dependence theory, governance and innovation policies studies. Particularly, we ensemble a heuristic to answer the question of this study using the three stages model by Sydow et al. (2009), and the ideas by Pierson (2000) about the role of specific self-reinforcing mechanisms leading to lock-in. In Sect. 7.3, we justify our case selection and describe the data sources, and the qualitative approach followed in this study. Sections 7.4–7.6 follow the phases described in the heuristic ensembled in Sect. 7.2. Thus, Sect. 7.4 describes the pre-formation phase in a path-dependence process. It discusses the actors, actions and events which triggered the junctural situation and therefore unfold the developing of a specific path in the role assigned to STI policies in Colombia. Section 7.5 focuses on the use of innovation policies and governance structures as self-reinforcing mechanisms, and how those mechanisms lead to a lock-in situation. In Sect. 7.6, we assess the fulfilling of the requirement to claim the existence of a lock-in situation. Finally, in Sect. 7.7, we discuss the results identified in the previous sections and point out some opportunities for further research based on the challenges of governance and innovation policies in emerging economies.

7.2 PATH DEPENDENCE, GOVERNANCE OF INNOVATION AND INNOVATION POLICY

The conceptual framework of this study relies upon three branches of development literature: the path-dependence theory, studies on governance of innovation and innovation policy research. Path-dependence theory will provide the frame to study the evolution of STI, hereafter innovation. The governance of innovation and the innovation policy literature contribute to explain the self-reinforcing mechanisms found in the process of path dependence and help to reflect on whether a lock-in situation has been established. In the following sections, we are going to discuss each of those branches, and we will explain the links between them to better position our research.

The notion of path dependence has been studied from different perspectives (Martin & Sunley, 2006). Two examples could be mentioned. First, in the philosophy of science literature, a path-dependence situation could be explained considering the role of normal science reinforcing an accepted paradigm (Kuhn, 2012). Second, in the economic history of technology, David (2007) mentioned the relevance of this notion to study the process of change. This notion has two interpretations (Pierson, 2000). The first underlines the incidence of past decisions in the current situation of a social variable. In short, this interpretation claims that the past shapes the future (Dawley et al., 2010, p. 655). The second interpretation is more precise, framing a situation where once one decision is taken, the cost of changing the decisions flow is too high and difficult to reverse (Levi, 1997). According to Henning et al. (2013), this notion has two uses. On the one side, it explains how a chain of decisions comes up with a suboptimal outcome in the economy, and, on the other, it describes the direction of the changes.

As for a path-dependence process, Sydow et al. (2009) identify three elements considered crucial. First, **the critical juncture**, defined as the time slot when one alternative is chosen among a large number of options. Second, **increasing returns** or **self-reinforcing mechanisms**: devices which increase substantially the cost of changing from one to other alternatives producing a **lock-ineffect**. This effect is the third crucial element and points out a situation reached by the work of the two first elements mentioned. According to Martin and Sunley (2006), it is possible to understand the lock-in effect in two phases. The first phase is a 'positive' period that induces the use of the self-reinforcing mechanisms, and

the second one shows a negative cycle where the process becomes more inflexible and rigid, producing negative results. Thus, the lock-in effect could be described as a situation where a series of non-reversible actions have been taking place (Salerno, 2007) making not available other courses of action, and hence shaping an inefficient scenario (Sydow et al., 2009) with high opportunity costs.

Critical junctures are best understood by looking at the role played by **Institutional Entrepreneurs (IEs)** (DiMaggio, 1988) who act as agents capable of intervening and altering the balances (Smith et al., 2005) in a situation by doing or not something (Garud et al., 2010) purposively. In this vein, a critical juncture could be understood as the result of actions developed by an actor, instead of a random event. According to DiMaggio (1988), **IEs** are organised actors with enough resources to promote and achieve a desired social result. Battilana et al. (2009) developed further this definition, suggesting that **IEs** promote divergent changes (those that break a current institutional setting) and take part in the process of institutional transformation. This definition can be used to explain how **IEs** use their skills and strategies (Fligstein, 1997) to build a **critical juncture** and foster a path-dependence process (Sydow et al., 2009). Besides, we suggest that **IEs** could contribute to explain the developing of the **self-reinforcing mechanisms**.

In turn, **self-reinforcing mechanisms** describe actions or processes which have a positive feedback, as defined above.² It means that the positive results reached from their use make them more appeal to be used again (Sydow et al., 2009). Those mechanisms can be used to study political (Pierson, 2000) and policy processes (Salerno, 2007). Pierson (2000) identifies four categories of self-reinforcing mechanisms in politics. **Table 7.1** summarises those mechanisms.

To sum up, path dependence, along with the concept of **IEs** and the four categories of self-reinforcing mechanisms, provides a promising framework to study the role assigned to innovation by innovation policies implemented in Colombia. However, it is necessary to introduce some concepts from governance and policy studies to strengthen this framework and thus, unfold the analysis of the role assigned to innovation by innovation policy and the governance of innovation between 1990 and 2018

² Examples of those mechanisms are scale and scope economies, network externalities, complementary effects, coordination effects (Sydow et al., 2009), formal institutions, collective action mechanisms, political authority (Pierson, 2000) among others.

Table 7.1 Four self-reinforcing mechanisms

<i>Mechanism</i>	<i>Description</i>
The collective nature of politics	Public goods produce negative incentives, like free-riding (Pinzón-Camargo, 2015). These negative incentives justify State intervention to provide such goods to society. However, these actors face problems of collective action. Facilitating the conditions to boost collective action is a costly endeavour. Thus, the production of such conditions produces interdependences and organisational process with a high cost of change
The institutional density of politics	It explains the complex interdependences between actors and institutional arrangements designed to address social concerns. These interdependences produce learning, coordinate effects and adaptive expectations that increase the cost of change from one specific institutional arrangement to another (Pierson, 2000). Thus, once an institutional arrangement is lunched, and the actors learn how it works, they would prefer to continue using and improving it, instead of creating a new one if such arrangement is not working correctly
The political authority and power asymmetries	It represents the interplays between actors and their relative power position in a governance structure. Actors with a better allocation of political authority set the rules over time to increase and keep their political relevance (Pierson, 2000). Setting these rules increases the cost and makes complex to develop or use alternative rules to address a social concern, and in turn, it increases the power allocation of the actors which produce them

(continued)

in Colombia. In this vein, Sects. 7.2.1 and 7.2.2 examine how governance and innovation policies literature can contribute to understanding the strengthening a particular path.

Table 7.1 (continued)

<i>Mechanism</i>	<i>Description</i>
The complexity and opacity of politics	Politicians and policymakers face two challenges in their daily life, among others. They have to understand environments with high levels of complexity, and they have a short time to understand and make decisions about such environments. They overcome these challenges using models to simplify and understand their reality. These models are filters to process information based on their mental biases. The development of these biases demands highly starting-up cost and learning effects, which across time make them evolve in mental-maps (Pierson, 2000). Thus, it is difficult to modify a mental-map settled

Source Authors' own elaboration based on Pierson (2000)

7.2.1 *Governance of Innovation and the Self-Reinforcing Mechanisms*

Understanding the governance of innovation contributes to understanding three of the self-reinforcing mechanisms listed in Table 7.1. First, it helps to explain **the *institutional density of politics***. In this vein, the governance of innovation is a heuristic (Kuhlmann, 2007) which unfolds interactions (Borrás, 2009; Bovaird, 2005), processes (Kuhlmann, 2001; Laranja, 2012), debates and negotiations (Kuhlmann, 2007), taking place in an arena composed by the State, private entities (Laranja, 2012; Palmberg & Lemola, 2012; Smith et al., 2005) and the society (Borrás, 2009). Among several dimensions (Palmberg & Lemola, 2012, p. 469), different authors underline the governance capacity to provide conditions for coordination (Borrás, 2009; Bovaird, 2005; Jessop, 2007; Palmberg & Lemola, 2012). These conditions emerge as a consequence of several processes studied by Kuhlmann (2001) and Laranja (2012). Achieving and developing those features of the governance of innovation require investments and interdependences between actors to steer social concerns around innovation. The settling process of the governance of innovation and its work after its institutionalisation produces the effects explained by the institutional density of politics.

Second, the governance of innovation depends on *the political authority and power asymmetries*. In this mechanism, actors in leading positions inside the governance of innovation can define the directionality of the role assigned to innovation through innovation policies.

The dance metaphor is useful to understand this self-reinforcing role of the governance of innovation. This metaphor has been used by several scholars (Rip, 1992; Kuhlmann et al., 2010; Kuhlmann & Ordóñez-Matamoros, 2017b) to study the interplays between actors (dancers). This dance evolves in three stages (Rip, 1992). The first is the beginning of the dance, which emerges according to ‘(...) particular historical circumstances and made possible by particular “cognitive infrastructures”’ (1992, p. 232). The second is the dance-engagement, where the actors, based on the expected value of the dance, identify incentives to continue or not their performance. Finally, there is the stage where the dancers decide if they want to change, transform and we add, finish the dance. The dynamics of those interplays is captured by Kuhlmann et al. (2010) when they explain the existence of an *Innovation Policy Dance*. The dance described by these authors helps to unfold the interplays between ‘(...) innovation practice (I), innovation related to public intervention strategies (P) and innovation research and theory (T)’ (2010, p. 7).

Third, the governance of innovation could help to depict *the complexity and opacity of politics*. In this case, two aspects should be considered. On the one hand, the notion of governance provides three tools to address complex situations (Jessop, 1999). The first is the ‘noise reduction’ when governance brings channels to find mutual understandings between actors. The second is the ‘negative coordination’ in the sense of introducing the need for the actors to consider possible adverse outcomes based on their decisions. The third is the ‘positive coordination’ as the result of consensus around visions allowing to carry on actions to pursue particular objectives.

On the other hand, the learning process is crucial in the governance of innovation (Kuhlmann, 2007). This process is classified as a first or second order. Whereas first-order learning focusses on improving particular path without considering any change, in a second-order process, new understandings, objectives, actors and interplays could appear (Kuhlmann et al., 2010; Rip, 1992). The tools to address complex situations set the institutional logic (Leca & Naccache, 2006) or the mental-maps that give the directionality of the interplays between the actors under a first-order learning process.

7.2.2 *Innovation Policies and the Self-Reinforcing Mechanisms*

Innovation policies could represent two roles according to the self-reinforcing mechanisms. The first one is according to *the collective nature of politics*. Three aspects help to understand the link between this self-reinforcing mechanism and innovation policies. First, the definition of policies³ as actions implemented under a governmental framework to address a social concern (Ordóñez-Matamoros, et al., 2013). Second, their capability to canalise tensions, agreements and relationships among actors and institutions (Dawley et al., 2015; Martin & Sunley, 2006; Mazzucato, 2013). Third, the aim of innovation policies to ‘(...) strengthen the competitiveness of an economy or selected sectors, in order to increase societal welfare through economic success’ (Kuhlmann, 2001, p. 945). These elements allow understanding innovation policies as drivers to foster the production of knowledge to increase competitiveness, according to the governance of innovation’s decisions. This understanding of the innovation policies set them under an indirect approach to development.

The second role is developed under *the complexity and opacity of politics*. In this case, the ‘successive limited comparisons’ model by Lindblom (1959), among a variety of methods (Cf. Ordóñez-Matamoros et al., (2013)), allows understanding the policymaking process as the consequence of the appropriation of mental-maps by policymakers. In detail, this method explains the changes promoted by the State as the result of a series of small decisions done by policymakers. Those actors make their choices regarding their previous elections, experiences and the likelihood to predict possible outcomes derived by those decisions. Besides, the decision-making process is the outcome of the interplays and negotiations of those actors with other stakeholders (dancers). In this point, it could be added that those interactions happen under the governance of innovation with an institutional logic that supports the innovation policies.

³ We consider this definition as comprehensive of the notion of policies. However, we are aware of the diversity of meanings that this concept has (Cf. (Salazar Vargas, 1995; Roth Deubel, 2010).

7.2.3 A Heuristic of a Path Dependence in the Role Assigned to Innovation

The elements discussed in Sects. 7.2.1 and 7.2.2 are used in Fig. 7.1 to describe a process of three phases following the model developed by Sydow et al. (2009). This model was designed to explain the formation of an organisational path. However, we consider this model as suitable to unfold the path-dependence process in the role assigned to innovation. We include IEs as agents who trigger and push the evolution of the process as further development in this model. This inclusion also tries to provide an alternative to overcome some of the path dependence’s critics (Martin & Sunley, 2006; Martin, 2010; Dawley et al., 2010; Cooke, 2012).

In Fig. 7.1, the first phase in a path-dependence process is the **pre-formation phase**. It describes the existence of a large number of

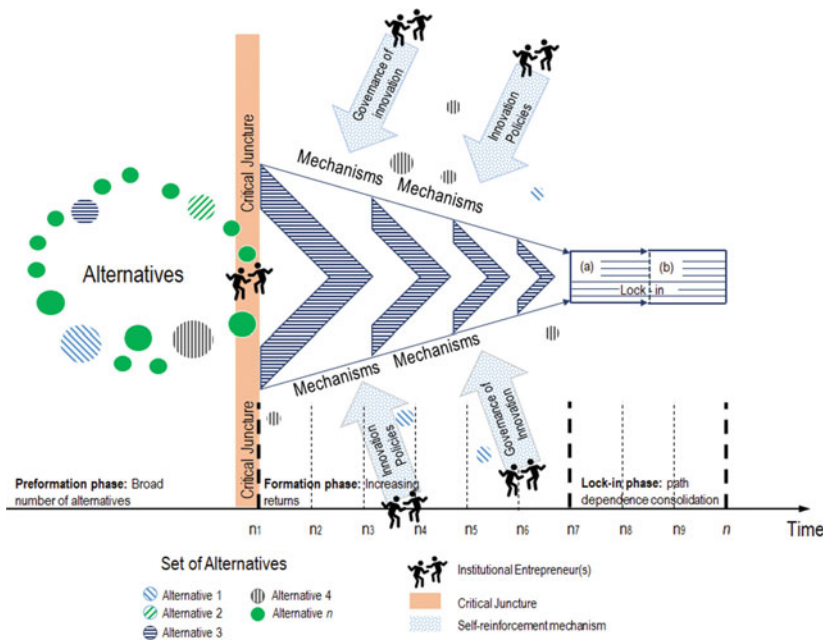


Fig. 7.1 Phases in a path-dependence process (Source Based on Sydow et al. (2009))

alternatives available⁴ to attend a social phenomenon. In this phase, **IEs** begin to imagine new paths to overcome a social concern. They use their skills, strategies and current events to build empathy and legitimacy among other actors (Fligstein, 1997). Therefore, they reframe or create new institutions to support their objectives (Tracey et al., 2011). These actions will trigger the **critical juncture** initiating a path-dependence process. The second phase is the **formation phase**. In this, a small number of alternatives remain, and one of them becomes more appeal. It is because the IEs' strategies begin to generate increasing returns towards the desired one. In Fig. 7.1, governance and innovation policies are illustrating their use as '**self-reinforcing mechanisms**' by the **IEs**. The third phase shapes the emergence and consolidation of a **lock-in** situation, which is a consequence of the use of self-reinforcing mechanisms by IEs. According to Sect. 7.2, two sub-phases shape this phase. Thus, whereas the letter '(a)' depicts a 'positive' period of using the self-reinforcing mechanisms, the letter '(b)' illustrates the negative cycle of the lock-in situation. Regarding the aim of this study, the following section will describe the data sources consulted, and the approach followed, and the Sections 7.4–7.6 will present the results of the data analysis.

7.3 RESEARCH APPROACH: WHY COLOMBIA?

To answer the question posed in this research, Colombia was selected as a case of study. The current high levels of poverty and inequality (The World Bank, 2018), low levels of economic productivity (Matalana, 2017) and its challenges in terms of peace make this country an interesting example to analyse the role assigned to innovation under the path-dependence framework. Indeed, Colombia has been portrayed as a country where innovation policies and governance are facing major challenges in terms of their contribution and legitimacy in the framework of the peace agreement signed with one of the oldest guerrillas' groups in the world (Ordóñez-Matamoros et al., 2018). In this respect, Colombia can be classified as an emerging economy where rapid advances in Science, Technology and Innovation system are taking place, while political and social struggles happen at the same time. For these reasons, the reflection as to whether a new generation of innovation policies

⁴ These authors acknowledge that these broad number of alternatives are somehow influenced by the past (Cf. Sydow et al. (2011, p. 4).

are viable and/or desirable; which makes these reflections relevant to the current Colombian situation. We aim at contributing to Innovation Policy and Governance Studies involving developing countries where rapid socio-economic and political changes take place. We claim that by better understanding of the Colombian case, some lessons can be learnt not only concerning the situations in emerging economies but also for to the changing situations in the so-called stable economies. We think that ‘stability’ is an exceptional situation nowadays in the world.

We did a full reading of 53 white papers⁵ published in the period 1990–2018 by the National Government in the fields of innovation and competitiveness. Twelve of them were excluded because their objectives and policy strategies did not have a direct relationship with the objective of this study. Policies in the field of competitiveness were included because, in Colombia, they are commonly used to present innovation policies’ strategies. Chapters and sections of the eight National Development Plans and the most relevant legal documents (Laws, Decrees and Resolutions) in the same fields were consulted. Besides, secondary information like newspapers and analysis of these policies was considered for contextual and analytical purposes. The analysis span was defined considering the methodology followed by Sydow et al. (2011), and the relevance attention of path dependence on the time dimension of the processes (Salerno, 2007) as a medium to understand ‘how socio-economic systems change’ (Martin, 2010, p. 2). However, it does not mean a detailed recapitulation of all the single events in this period of time.⁶ Instead of that, it means to point out the relevant features according to the heuristic ensembled in the last section.

Based on a qualitative approach, the revision of the documents mentioned above followed two steps. First, the documents were classified in a spreadsheet according to their alignment with the direct and indirect approaches to development. To this end, their objectives, strategies and policy actions were studied following the definitions of those approaches to development. Second, the results of the previous step were

⁵ In Colombia, the white papers are called CONPES documents. In those documents, the National Government defines long-term policies for different areas. Their main feature is their commitment to improve the level of coordination between national, and in some cases, regional entities around common strategies.

⁶ An insightful recapitulation of the Institutional Changes of the Colombian STT’s system could be found in Salazar (2013).

classified again, but considering their contribution to the self-reinforcing mechanisms discussed in Sects. 7.2.1 and 7.2.2. The contribution of each document was examined also considering the definition of path dependence given by Levy (1997), and the path-dependence stages described by Sydow et al. (2009). The documents pointed out in the last paragraph were used to gain a better understanding of the events that took place in each of the path-dependence stages.

Following the methodologies used by Rossiter and Smith (2017) and Edquist (2018), the analysis presented in this article will consider the personal experience of the authors as practitioners in different entities in the National Government of Colombia as a source of reflection and reinterpretation of the context, which also will be supported by the conceptual framework in Sect. 7.2. Thus, in this paper, we are not claiming particular objectivity (Rossiter & Smith, 2017).

The findings identified following the approach described here will be presented according to the three phases of a path-dependence process illustrated in Fig. 7.1. Thus, the critical juncture in the pre-formation phase is the focus in Sect. 7.4, and part five will examine the formation phase and the role played by the governance of innovation and innovation policies as self-reinforcing mechanisms. Finally, Sect. 7.6 will be focused on the lock-in situation. Part seven will open a discussion regarding the results of the previous ones.

7.4 BUILDING THE JUNCTURE PHENOMENA: THE ROLE OF THE INSTITUTIONAL ENTREPRENEURS IN THE POLITICAL CONSTITUTION OF 1991 AND THE ECONOMIC LIBERALISATION PROCESS

In Colombia, the juncture events which lead to assign a particular role to innovation were built by a sum of actions launched by collective and individual IEs. IEs sought to change the institutional framework to overcome an extensive period of intense violence and engaged the country in the process of modernisation (Carrillo Flórez, 2016). Two relevant IEs were identified.

The first IE was the student movement. This movement implemented symbolic actions and public performances as strategies to gain empathy, legitimacy and support by the Colombian society. Among other actions, the ‘march of the silence’ (Castro Caicedo, 1989; El Tiempo, 1990)

and ‘the seventh ballot’ produced enough support among the Colombian population to enact and sustain the vision of change developed by these IEs. This support was evident in the 1.35 million people (Lemaitre Ripoll, 2016) who vote in favour of the idea of a constitutional change promoted by the IEs. These votes became in a symbol for calling a Constitutional Assembly (García, 2008). Based on these results, the outgoing President ordered the inclusion of a ballot in the presidential elections of May of 1990, asking if people wanted or not a Constitutional Assembly. As a result, circa 5.3 million people voted favourable and less than the 5% voted against (Alarcón, 2015). The results of the strategies implemented by the student movement fostered a constitutional reform which introduced a new set of rules for Colombian society.

The second IE was the President in the period 1990–1994. He supported his actions in the constitutional reform achieved in 1991. As the main feature of the new constitution settlement, the country became a social rule of law without defining a particular economic model as a norm (Correa Henao, 2008). This feature set a situation where the State was called to develop institutional arrangements and policy strategies to address the challenges of an open market, without disregarding the population’s welfare. In this frame, the President began to find social support, particularly from entrepreneurs, around his intention to speed up processes of modernisation and economic growth as a path to increase development. Among other strategies, the President settled down public–private arenas of debate about the strategies, decisions and challenges to implementing the liberalisation process, where industrial, academia and labour sectors were called to participate. To frame his discourse, he fostered diagnoses about the challenges and benefits regarding industrial competitiveness. To this end, he used technical documents, like the CONPES 2652 of 1993, and hired studies by international consultants, such as the firm Monitor Group. Based on those diagnoses, he presented the economic liberalisation’s process as a source of multiple advantages for Colombia and as a way to improve the country’s reputation. An example of this process of framing the advantages of the economic liberalisation, it will find the following in the CONPES 2494 of 1990:

Since the beginning of this administration, the National Government has proposed a vigorous program of economic modernisation in the frame of the Social Economic Plan. It has the purpose of overcoming the structural barriers to economic growth and create the conditions required to improve

the employment and income circumstances and raise the welfare levels of the population.⁷

To summarise, both IEs shared the vision to overcome the violence period in the country and began a process of modernisation. Thus, whereas the student movement fostered a constitutional reform of the country, the President introduced a new economic directionality based on such reform. Both of those visions are divergent changes, and also the actors were part of the implementation of such changes. The before elements allow to claim them as IEs regarding the definition of IEs discussed in Sect. 7.2. The actions performed by these IEs built the critical juncture to introduce depth transformations in the Colombian society. This critical juncture worked as a window of opportunity for STI's actors. Those actors were working since the 1980s to set STI as a national priority, and among others of their advances, they enacted the first law of Science and Technology (ST) of Colombia (Law 29/1990) (Lucio-Arias et al., 2013). These elements settled the conditions and alternatives for the role assigned to innovation in the period 1990–2018. The following section will study those conditions and alternatives considering the role of governance and innovation policies as self-reinforcing mechanisms.

7.5 THE FORMATION PHASE: INNOVATION AND COMPETITIVENESS POLICIES AND THEIR GOVERNANCE STRUCTURES AS SELF-REINFORCING MECHANISMS

In the Colombian's case, innovation and competitiveness policies along with their governance structures contribute to understanding the role assigned to innovation. In this section, more than an in-depth study of one of the four self-reinforcing mechanisms described in **Table 7.1**, it will study how these policies and governance structures in the period of the analysis showed features according to this table. The following sections

⁷ Free translation: 'Desde comienzos de la presente administración, el Gobierno Nacional planteó en el Plan de Economía Social un vigoroso programa de modernización de la economía, con el fin de superar los obstáculos estructurales al crecimiento económico y crear las condiciones requeridas para mejorar las condiciones de empleo e ingreso y elevar los niveles de bienestar de la población' (DNP, 1990).

will discuss those features and their contribution to the role assigned to innovation in Colombia.

7.5.1 The Collective Nature of the Politics: Knowledge as Input for Productivity in Policies

The economic liberalisation process led by the President from 1990 to 1994 prompted to consider innovation as fundamental to increase the level of productivity and competitiveness in the country. It was evident, for example, in the policy of Science and Technology of 1991 (CONPES 2540):

The common thread of the new policy in this area must lead to an improvement in productivity, quality, management and competitiveness in all economic activities. It will operate on two fundamental fronts: the generalized support for the processes of technological modernisation and creative innovation in all sectors of the economy, and the strengthening of the country's scientific capacity, particularly in strategic areas that allow development in the medium and long term of new technologies.⁸

Thus, innovation policies were understood as drivers for knowledge and technological development production according to the needs from productive sectors. Besides, they were considered as an asset to advance in the modernisation process and harness the benefits from free trade and access to international markets (DNP, 1991c). This conception of innovation policies did not show significant changes through the period of analysis, and they followed an incremental pattern in terms of the policy-design. The main discussions and changes were about the role assigned to innovation as transversal or sectoral policies which could be identified in the National Development Plans of each period.⁹

⁸ Free translation: 'El hilo conductor de la nueva política en esta área ha de llevar al mejoramiento en la productividad, la calidad, la gestión y la competitividad en todas las actividades económicas. Operará en dos frentes fundamentales: el apoyo generalizado a los procesos de modernización tecnológica e innovación creativa en todos los sectores de la economía, y el fortalecimiento de la capacidad científica del país, particularmente en áreas estratégicas que permitan en el mediano y largo plazo el desarrollo de nuevas tecnologías' (DNP, 1991b).

⁹ Transversal policies could be defined as those policies seeking to implement instruments to benefit a broad group of agents. Sectorial policies are those policies trying to

This understanding of innovation policies guided the development of policy tools to incentive knowledge production. In this vein, circa 73% of the 41 white papers consulted included strategies towards encouraging the production of knowledge according to the productive sectors' priorities. These tools can classify into four groups. The first one is set by actions to improve intellectual property rules as a medium to correct market failure (i.e. CONPES 2540 (DNP, 1991b); 3484 (DNP, 2007a); 3866 (DNP, 2016)). The second is actions to foster the knowledge production through financial instruments such as credit lines or taxes benefits to support the technological upgrading of the productive sector (i.e. CONPES 2510 (DNP, 1991a); 2762 (DNP, 1995a); 3080 (DNP, 2000); 3280 (DNP, 2004); (DNP, 2015a)). The third set is shaped by non-financial instruments such as public calls like those defined in the CONPES 3484 (DNP, 2007a) or 3527 (DNP, 2008a). Finally, there are actions to align processes of human capital training, both at technical as higher education according to the priorities of the productive sectors (i.e. CONPES 2762 (DNP, 1995a); 3439 (DNP, 2006); 3582 (DNP, 2009)).

The allocation of resources to make possible the use of the policy tools to foster knowledge production was a concern along the period of analysis. It was evident in the CONPES 2540 (DNP, 1991b), 2739 (DNP, 1994a), 3080 (DNP, 2000) and 3582 (DNP, 2009), among others. Hence, and despite the low level of investment in STI activities as a proportion of the country's Gross Domestic Product (GDP), the governments have tried to increase the number of innovation's resources. Figure 7.2 depicts the evolution of this variable from 2000 to 2018. It shows positive changes in the pattern of investments in innovation activities. This situation was reinforced by the transformation of the institutional framework to manage the Colombian's royalties schema¹⁰ in 2011. In 2011, a constitutional amendment assigned 10% of the national

identify beneficiaries. The former category is better known in the industrial policies as 'picking winners'. The innovation policies in the periods 1990–1994, 1998–2002, 2002–2006 and 2014–2018 could be classified as transversal policies, and those of the periods 1994–1998, 2006–2010 and 2010–2014 as sectorial policies.

¹⁰ For more information about this royalties' schema, we recommend checking the official web page of the Colombian National System of Royalties: <https://www.sgr.gov.co/Qui%C3%A9nesSomos/SobreelSGR.aspx>.

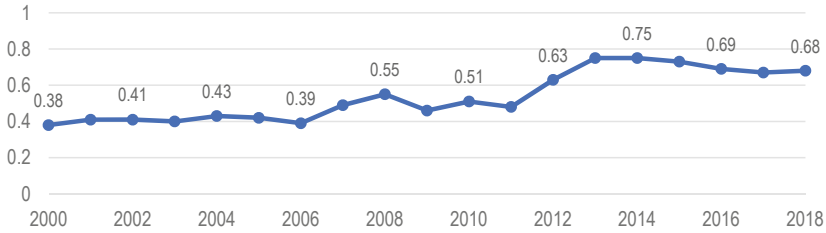


Fig. 7.2 Investment in STI's activities as a percentage of Colombia's GDP (Source OCyT (2017))

royalties¹¹ to set down mechanism to incentive knowledge production under the conception mentioned in this section. Royalties' contribution to the STI's activities represented 5% of the National Investment in the period 2012–2018 (DNP, 2018c).

7.5.2 *The Institutional Density of Politics: STI and the Increasing Scope of the Competitiveness' Governance*

The four categories of policy tools mentioned in the last section required governance structures to bridge relationships and improve coordination between public and private actors. The Circa 43% of the studied white papers entailed actions towards set institutional arrangements (i.e. CONPES 2540 (DNP, 1991b), 2739 (DNP, 1994a), 2762 (DNP, 1995a), 3280 (DNP, 2004), 3527 (DNP, 2008a), 3934 (DNP, 2018b)). Laws, Decrees and Legal resolutions complemented these actions, which were channels to develop those arrangements. Governance structures were opened in two areas. The first one focused on innovation and the second one on competitiveness.

The first governance structure was settled under the name of the National System of Science and Technology (NSST). It was established in 1990 by the Law 29 and the Decree 1767, and the Decree 585 of 1991. This system was designed to increase collaboration between

¹¹ According to official sources, the financial resources assigned to STI by this fund contribute to foster 360 projects in the period 2012–2018, with a sum equals to COP \$2,780 billion (DNP, 2018a, p. 327).

government, academics and industrial sectors. However, those regulations did not define the objective of this collaboration. This lack of clarity was convenient for the government and enterprises representatives. They determined the directionality of innovation policies towards incentive productivity and competitiveness.

The NSST remained in a first-order learning process in the period of analysis. Actors were focused on improving the rules of the dance defined in the competences of NSST's council board and learning the rhythm of the dance (innovation to increase productivity). The directionality introduced by those actors in the NSST was enacted by the Law 1286 of 2009. This Law changed the name of the NSST and signalled explicitly that the first objective of the National System of Science Technology and Innovation (NSSTI)¹² was to increase the use and production of STI knowledge to achieve higher levels of economic growth. Thus, it could be possible to improve the quality level of the population lives.

The development of the second governance structure began in 1991 with the Committee of liberalisation. The institutionalisation of this Committee was in 1994 under the figure of the National Council of Competitiveness. It has the aim to connect and coordinate relationships between the government, the industry, the academics and the labour sectors. This institutional arrangement had a clear objective from its beginning. It was to advise the President to improve quality, productivity and competitiveness in the country and their regions. The improvement of these elements was considered as the path to speed up economic development and therefore achieve a better quality of life for all the population (Decree 2010 of 1994). The focus on increasing competitiveness and productivity has been stable in this institutional arrangement in the period of analysis, despite some changes in its configuration, functions

¹² Innovation as a component was included by the Law 1286 of 2009.

and names¹³ before 2015. As the governance of innovation, the governance of competitiveness shows an incremental evolution according to Lindblom's model (1959) under a first-order learning process.

The governance of competitiveness defined the role assigned to innovation because of the absence of clear objectives for the governance of innovation. It was done through a process of increasing the scope of the competencies and responsibilities assigned to the former governance structure. The article 1 in the Law of Competitiveness (Law 1253 of 2008) and the Decree 1500 of 2012 are examples of the expansion of the governance of competitiveness into the governance of innovation. In the second example, innovation was included as a field to be managed directly by the governance of competitiveness through the National Administrative System of Competitiveness and Innovation (NASCI).

The scope expansion of the governance of competitiveness produced overlapping and tensions between the actors. These situations, besides the incidence of the governance of competitiveness in the role assigned to innovation, affected the coordination capabilities in both governance structures. Along the period of analysis, these problems were acknowledged in white papers (i.e. CONPES 2739 (1994a), 3439 (2006), 3638 (2010); 3866 (2016)). As an alternative to solve these difficulties, the National Government ordered to merge both governance structures in 2015. The National Development Plan's Law (Law 1753 of 2015) from the period 2014–2018 did this action and settled the National System of Competitiveness, Science, Technology and Innovation (NSCSTI). The NSCSTI has been developing according to the structure defined by the Decree 1500 of 2012. It has meant the reinforcement of the role assigned to innovation as a source to increase competitiveness. This exercise did not finish due to the organisational tensions between the actors that belong to each structure. In 2018, the High Presidential Counsellor for

¹³ In this vein, along with quality, productivity and competitiveness, in 1998, the need to increase the exports development of the country was included in this governance structure. The National Council of Competitiveness was merged with the Superior Commission of Foreign Trade settling the Mixed Commission of Foreign Trade (Decree 2222 of 1998). In 2006, the range of action was reduced only to the competitiveness and the National System of Competitiveness (Decree 2828 of 2006) was settled down. Finally, in 2012, the system was increased again covering also innovation and productivity, the name given to that system was National Administrative System of Competitiveness and Innovation (Decree 1595 of 2012).

the Private Sector and Competitiveness,¹⁴ with the support of the public and private entities,¹⁵ tried to start up the new system in a de facto governance of competitiveness, Science, Technology and Innovation.

Currently, the National Development Plan for the Period 2018–2022 (DNP, 2018d) fostered an articulation process between different systems. In this line, the Decree 1651 of 2019 was enacted to guide such process of articulation. Despite that some experts point out the absence of an explicit order to merge the systems, it is possible to realise how the process of articulation of them was oriented towards improving the competitiveness conditions of the country. Thus, this Decree reinforced the role assigned to innovation by the subordination of the NSST to the National System of Competitiveness and Innovation (NSCI) created by the Law 1955 of 2019.

7.5.3 Political Authority and Power Asymmetries: Unbalanced Arenas and the Arising of the Industrial Sector

This self-reinforcing mechanism could be studied regarding the two main spaces of governance coordination both in innovation and in competitiveness structures. The first space is the advisory boards. The composition analysis of these boards contributes to identifying the level of actors' representativeness in each governance structure. Thus, whereas the government, academic and industrial sectors were part of both structures, only the governance of competitiveness considered the labour sector. Similarly, representatives from the local realms were considered since the 1990s by the governance of innovation, while they only were included in the governance of competitiveness since 2006. Both governance structures showed a clear bias towards government participation. In the

¹⁴ This administrative figure was created in the early 2000s. The name of this Counsellor evolved along the time from the High Presidential Counselling for Public and Private Management in 2010 (Decree 3445), to Minister Counsellor for the Government and the Private Sector in 2014 (Decree 1649), and to High Presidential Counselling for the Private Sector and Competitiveness in 2017 (Decree 672 of 2017).

¹⁵ The public entities that have supported this process are the Ministry of Trade, Industry and Tourism, The National Planning Department. Regarding the private sector, the support has come from those that belong to the executive committee and the National Business Association of Colombia (ANDI, by its acronym in Spanish).

governance of innovation, the academia shared relevant representativeness than the industrial sector, and in the governance of competitiveness, it is on the other way around.

The second space of analysis is the directive councils. In the case of the governance of innovation, these councils are the core of the NSSTI (Salazar, 2013), and they currently cover ten thematic areas.¹⁶ However, some experts disagree with the previous affirmation and consider that these councils are only advisory bodies at the sectoral level. Along the period of study, they lost their role as policy authority and decision-maker.¹⁷ However, they recovered their importance to steer policy decisions again in 2015.¹⁸ In terms of actors' composition, these councils are primarily biased towards academia. According to the Legal Resolutions, 068 and 81 of 2015 published by COLCIENCIAS, circa 55% of their representatives belong to academia, 24.8% to the government and 20.2% to the industry.

In the case of the governance of competitiveness, the Executive Committee of the NASCI represented the directive council. This Committee was introduced in 2007 by the Decree 61 of 2007 under the name of Mixed Technical Secretariat. This Committee received the centrality when it was in charge of coordinating and steering the NASCI in 2012 by the Decree 1500. This Committee showed high participation of representatives from the industrial sector, whereas the Labour, Academia and Regions did not have enough representativeness. An attempt to solve this bias, it was included the Director of COLCIENCIAS and the Executive President of the Colombian Federation of the Chambers of Commerce. Besides the last actors, this council is comprised nowadays by the National Planning Department, the Ministry of Trade, Industry and Tourism, the High Councillor for the Public and

¹⁶ According to Decrees 585 of 1991 and 2926 of 1991, in the early 1990s the councils were: The Basic Sciences Program, The Social and Human Sciences Program, The Industrial Technological Development and Quality Program, The Agricultural Science and Technology Program, The Environment and Habitat Sciences Program, The Program of Scientific Studies of Education, The Health Science and Technology Program, Electronics, Telecommunications and Computers, Science and Technology of the Sea, Research in Energy and Mining, Biotechnology.

¹⁷ The changes in the Councils were introduced by the Decrees 585 of 1991, 2934 of 1994, 2610 of 2010 and the Resolution 68 of 2015.

¹⁸ According to the Resolution 61, the main functions of these councils were the definition of the policy guidelines for the program development; designing and developing

Private Management, and the President of Private Council of Competitiveness.¹⁹ Recently, Decree 1651 of 2019 included the ministries of Labour, Education, Agriculture and Rural Development, Information and Communication Technologies and representatives from the regional competitiveness and innovation commissions.

The actor's representativeness in both directive councils unveils the same bias than the advisory boards. These biases could explain the lack of interest from the private sector to participate in the governance of innovation (COLCIENCIAS, 2008) and the increasing participation of this sector in the governance of competitiveness. The last phenomenon could be understood as a strategy of the private sector to strengthen their vision of the role of innovation. This strategy has been consequent with the intention of the National Government to put the private sector as the centre of the economic liberalisation process that began in the early 1990s. Actions such as the launching of the National Commission of Competitiveness in 2006, the enactment of the National Development Plans in the periods between 2010 and 2018 (DNP, 2011; DNP, 2015b) and the CONPES 3866 (DNP, 2016) have reinforced this governmental intention. In the same line, some international organisations even have suggested that in the innovation's system, the enterprise must be the centre of the actions (OCDE, 2013).

The analysis of the actors involved in the governances of innovation and competitiveness, along with the evolution of their main spaces of coordination, depicts the industrial sector's power allocation. This situation has been the result of an incremental process of rules modification in the governance structures, which also has allowed to define the role assigned to innovation according to the industrial sector's interests. Some facts, like the followings, have reinforced this power allocation. First, the inclusion of *innovation* as a topic to be coordinated by the NASCI in the Decree 1500 of 2012. Second, the merging of the governance structures of innovation and competitiveness by the Law of the National Development Plan from 2014 to 2018. Third, the failure in the approbation

strategies and projects according to the guidelines defined; defining criteria for financial distribution among programs and projects; encouraging the coordination among the actors that belong to the program and promoting the institutional development of the STI.

¹⁹ It is a non-profit organisation sponsored by private companies and universities. This council works as a think-tank focusing on competitiveness and is in charge of articulating dialogues between the public, private, academic and other sectors.

of an Innovation CONPES in 2016 (Wasserman, 2017) and the incorporation of some of its strategies and actions in the CONPES 3866 of productive development (Prieto et al., 2018). Fourth, the assignation of the role of formulation, orientation, coordination and implementation of the innovation policy to the Ministry of Trade, Industry and Tourism in the CONPES 3866 (2016). Finally, the subordination of the NSSTI to the NSCI by the Decree 1651 of 2019.

7.5.4 *The Complexity and Opacity of Politics: Innovation for Economic Productivity*

The start-up cost of the process of economic liberalisation in Colombia linked policy tools, public investments and the governance structures of innovation with an indirect approach to development. In this vein, the role assigned to innovation was associated with two objectives in the period of study. The first objective was to support the industrial modernisation in the economic liberalisation process in the 1990s. The second one was to bring access to benefits from the free trade agreements to the country by the sophistication of the export basket and to increase the industrial productivity in the 2000s (DNP, 2007b). In the latter, the main trigger of this purpose was the free trade agreement with the United States (DNP, 2004). This understanding of the role assigned to innovation was found in circa 88% of the CONPES consulted (i.e. CONPES 2510 (DNP, 1991a), 2652 (DNP, 1993), 2724 (DNP, 1994b), 2848 (DNP, 1996), 3179 (DNP, 2002), 3360 (DNP, 2005), 3533 (DNP, 2008b), (DNP, 2016)). This interpretation has been reinforced in all the National Development Plans from 1990 to 2018, including the current development plan.

This study found some attempts (see Table 7.2) to give different roles to innovation under a direct approach to development. However, those attempts have not gone further from a discursive statement. For example, it was the case of the CONPES of social innovation. This CONPES was cancelled despite a long and participative work of various social actors from different regions (Villa López & Melo Velásco, 2017). As a consequence, the strategy of social innovation was put out of the governances of innovation and competitiveness' agendas. Three arguments support the claim that alternative roles assigned to innovation have remained on a discursive level. First, in comparison with the strategies and policy actions designed to use innovation as a trigger of industrial productivity,

Table 7.2 Different attempts of giving different roles to STI in the National Development Plans

<i>Role given to innovation</i>	<i>Presidential period(s)</i>	<i>Description</i>
Public innovation	1994–1998 2014–2018 2018–2022	The STI's purpose is to improve the delivery of social services (DNP, 1995b), looking through new alternatives to produce public value for all the citizens (DNP, 2018d)
Social innovation	1998–2002 2010–2014 2014–2018 2018–2022	The STI's contribution to the society is based on its capability of support '(...) designing and implementing ideas and projects to solve social, cultural, economic or environmental problems' (DNP, 2011, p. 226)
Social transformation	2002–2006	The role assigned to STI is to foster knowledge production to promote social development and upgrading of social and political institutions and the enterprise system, in fields such as critical social problems like poverty (DNP, 2007b, p. 244)

Source Authors' own based on the National Development Plans of the periods pointed out

these attempts did not show precise mechanisms to operationalise such roles. Second, the resources assigned to these attempts are marginal. For instance, in the period 2010–2018, whereas COLCIENCIAS allocated in average 9.87% of its budget to foster the role of innovation as a trigger of industrial productivity, less than 2% was appointed to alternative roles of innovation (COLCIENCIAS, 2019). Finally, as a consequence of the lack of mechanisms and resources to operationalise the alternative roles for innovation, they have produced incipient impacts (Salazar et al., 2013).

The before elements show a predominant mental-map to understand the role that innovation has performed in Colombia. The name of this mental-map could be *innovation for economic productivity*, and it is featured by its aligning with an indirect approach to development. This mental-map has been identified both in the governance of innovation

and in the competitiveness one, also in the policies, national development plans and relevant regulations (i.e. Law 1253 of 2008, Law 1286 of 2009, Decree 1500 of 2012).

To sum up this section, the study carried out of the governance and innovation policies as self-reinforcing mechanisms contributes to understanding the actions that took place in the formation phase of a path-dependence process. The role of these self-reinforcing mechanisms is described in **Table 7.3**. Based on those actions and the results of the use of these mechanisms by IEs, it will be possible going to assess if the role assigned to innovation is in a lock-in situation. It will be the purpose of the following section.

7.6 THE LOCK-IN SITUATION: A CONSOLIDATED PHASE

Three conditions should be met to confirm if a situation is locked-in (see Sect. 7.2). In the first place, if a series of non-reversible actions were implemented and secondly, if a consequence of the non-reversible actions, feasible alternatives were dismissed. Finally, if a suboptimal outcome was achieved because of the two previous conditions.

The assessment of the first condition shows several non-reversible actions implemented in the period of study. Section 7.5 studied these actions. Common features of these actions were their alignment with the indirect approach to development, according to the traditional innovation policies' definition, an evolution under first-order learning following the Lindblom's model. From the viewpoint of the self-reinforcing mechanism studied, all of them were salient in their objective to reinforce the role assigned to innovation as a driver to foster productivity, competitiveness and economic growth. The second condition to claim a lock-in situation was also fulfilled in this case. Across the period of analysis, the documents studied showed a clear process of enforcement in both policies and governance of innovation structures to pursue the process of modernisation and access to global markets. Despite the attempt to emerge alternative roles to innovation, they have been left aside (see Sect. 7.5.4).

Finally, a general overview of two objectives pursued by the role assigned to innovation leads to consider the emergence of a suboptimal outcome. The first objective was to increase the productivity of the industrial sector. In this case, Colombia showed 50% of the times between 1990

Table 7.3 Four self-reinforcing mechanisms in the role assigned to innovation in Colombia

<i>Mechanism</i>	<i>Description</i>
The collective nature of politics	Knowledge is considered as a public good. Solving the problem of collective action to produce it was solved through white papers and public investments. In those documents, knowledge was linked with fostering innovation to increase the productivity and competitiveness of the country. This solution to foster knowledge production was reinforced in the analysed period of time. Thus, most of the white papers consulted (73% of them) have strategies to encourage knowledge production according to productive sectors
The institutional density of politics	Colombia tried to develop two governances, the governance of innovation (NSST) and the governance of competitiveness (NASCI). However, the last one increased their importance, capturing the governance of innovation by the Decree 1500 of 2012. This expansion produced overlaps and tensions between the systems. Those were solved giving more importance to the NASCI, instead of improving the coordination between the institutional arrangements. Thus, it was decided to merge them under the umbrella of the governance of competitiveness by the Decree 1651 of 2019
The political authority and power asymmetries	The governances of innovation and competitiveness showed two bias. The first one was towards government participation; both of them shared it. The second bias was according to academic sector participation in the first governance, and the industrial sector in the second one. The industrial sector faced a lack of participation in the governance of innovation which fostered their involvement in the governance of competitiveness. It allowed strengthening their vision of the role of innovation. The merging of the institutional arrangements described in the previous mechanism could be understood as evidence of the power allocation by the industrial sector

(continued)

Table 7.3 (continued)

<i>Mechanism</i>	<i>Description</i>
The complexity and opacity of politics	Circa 88% of the white papers consulted in the period of the analysis showed the role of innovation as a source to increase industrial productivity. This understanding was also identified in the National Development Plans from 1990 to 2018 and also in the relevant regulations for the NSST and the NÁSCI, such as the Law 1253 of 2008 and 1286 of 2009. This understanding of the role of innovation depicts a mental-map named by us as <i>Innovation for economic productivity</i>

Source Author's own elaboration

and 2015 a negative or null productivity growth (Matallana, 2017).²⁰ On average, its productivity was around 0.3%, which was lower than similar countries like Peru, Ecuador or South Africa (DNP, 2016). Considering the role of innovation a driver for increasing exports, own calculations based on the World Development Indicators (2018) showed between 1991 and 2016 high-technology exports shared circa 6.5% of the total manufactured exports of the country, whereas the share for the total exports was less than 2%. The second objective was to increase indirectly the population's quality of life as a consequence of achieving the first one. In this vein, and considering the results showed by the first objective, the 14.13% of the national population is still living with Unsatisfied Basic Needs (DANE, 2020a), and more than 19% of the population is living in multidimensional poverty (DANE, 2020b). Thus, we argue that the role assigned to innovation in the period of study has not contributed to improve the quality of life as was expected.

The analysis of the three elements to claim the existence of a lock-in situation of the role assigned to innovation showed clear results. Thus, the role assigned to innovation in Colombia is in a lock-in situation shaped by aligning with an indirect approach to development. This result leads

²⁰ According to the author, productivity was measured considered the Total Factor Productivity (TFP), which along with the labour productivity is commonly using to assess the productivity performance, for more detail see Hulten (2001).

to consider the challenges that the self-reinforcing mechanisms have to address to avoid the adverse effects linked to this situation. In this vein, the purpose of the next section will be to discuss those challenges and summarise the results of this study.

7.7 DISCUSSION

This paper aims to demonstrate if the role assigned to innovation in Colombia was in a lock-in situation featured by its understanding only as a medium to increase industrial productivity. The data studied showed such lock-in situation in the role assigned to innovation. This lock-in of the role assigned to innovation was the result of the three path-dependence phases described in the model discussed in Sect. 7.2. Sections 7.4–7.6 discussed the evolution of this path-dependence process. Figure 7.3 helps to summarise the evolution of the role assigned to innovation in Colombia according to the three phases of a path-dependence process.

First, in the **pre-formation phase**, the institutional entrepreneurs (IEs), both collective and individually, sought to change the rules of the game as a strategy to overcome the period of violence in the country. This commitment led IEs to build the juncture phenomenon, which allowed to introduce economic liberalisation process as divergent change. Second, in **the formation phase**, two elements frame the implementation of the four self-reinforcing mechanisms discussed in Sect. 7.5. The first element was the economic liberalisation process in the early 1990s, and second one was the aim to access to international markets by the national industry and the utilisation of international trade agreements signed by the country in the 2000s. Those mechanisms followed Lindblom's model and remained under a first-order learning process. In this first-order learning process, the role assigned to innovation was in an indirect approach to development. Finally, regarding the lock-in phase, this stage began (Letter '(a)' in Fig. 7.3) in 2012 with the inclusion of innovation as a topic to be managed by the NASCI. The Law of the National Plan for the period 2014–2018 (Law 1753 of 2015) marked the beginning of the second sub-phase of the lock-in process (Letter '(b)' in Fig. 7.3). This Law ordered to merge the governance structure of competitiveness and innovation. In 2019, the Law for the National Development Plan for the period 2018–2022 reinforced this process (Law 1955 of 2019).

The conceptual framework discussed in Sect. 7.2 provided useful entrances to discuss and reflect the two aims of this study. In this vein,

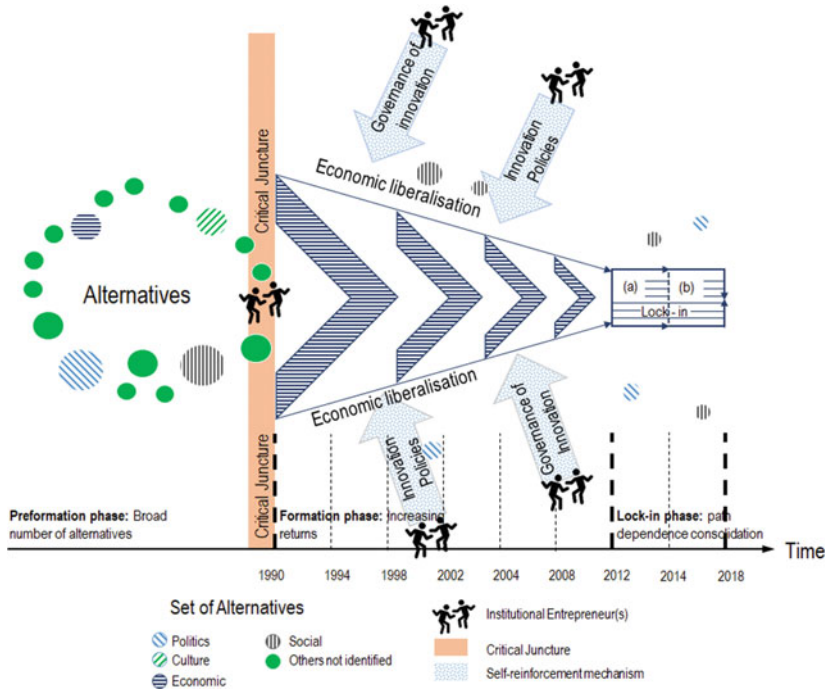


Fig. 7.3 Role assigned to innovation in Colombia in the period 1990–2018 (2009 Source Based on Sydow et al. ())

the path-dependence definition given by Levi (1997) was useful to study the role performed by innovation in the period 1990–2018 in Colombia. Also, in our analysis, the Institutional Entrepreneurship was not only crucial to understand the process of lock-in, but also to disentangle the process that takes place between pre-formation phase and formation phases. Finally, the path dependence’s stages depicted by Sydow, et al. (2009), along with the four self-reinforcing mechanisms explained by Pierson (2000), were central to claim if one situation is in a lock-in. Besides, those mechanisms were useful to explain with more detail an incremental policy process, regarding Lindblom’s model, which makes them a powerful tool in the policy analysis field.

Considering that a lock-in situation cannot go on forever, it is necessary for further research to discuss the alternative and necessary roles that

could be assigned to innovation in emerging economies. We believe that such roles should bring opportunities for those living under conditions of poverty and marginality. In this vein, path-creation literature (Garud et al., 2010) would provide the framework to explore this concern. Also, it will be fruitful to study the challenges that governance and innovation policies have to address to contribute, as self-reinforcing mechanisms, in the process of path-creation. Table 7.4 describes those challenges.

The challenges pointed out in Table 7.4 need to be addressed in the Colombian case to overcome the adverse effects of the lock-in situation of the role assigned to innovation. To this end, it should be necessary to consider, among others, the following questions: how to reconfigure the governance and policies of innovation? How to change or complement the directionality of the role assigned to innovation in Colombia? How to increase the inclusion capacity of the current governance structures to develop an inclusive-governance of innovation? Also, how to introduce a new generation of innovation policies as a permanent field in the policy-making process in Colombia? These questions will be part of an incoming article.

Table 7.4 Challenges of governance and innovation policies for future roles assigned to innovation in emerging economies

<i>Area</i>	<i>Challenge</i>	<i>Description</i>
Governance of innovation	Actors' representativeness	The number of heterogeneous actors, along with their interests and values, has been increasing (Kuhlmann, 2007). This situation requires that the governance of innovation guarantees the representativeness of actors from different realms (Palmberg & Lemola, 2012), mainly when the inclusion capability of governance structures is currently under debate ²¹
	Actors' alignment	Regarding the adverse outcomes that innovation policies are producing in terms of poverty (Borrás, 2009) and welfare (Soete, 2013), the governance of innovation needs to consider the alignment of their actors with social and economic concerns (Arnold, et al., 2003; OCDE, 2003) to fulfil in a more satisfactory and legitim way their expectations

²¹ For instance, the traditional vision based on the notion of 'triple helix' (Leydesdorff, 2012) or the Sabato triangle (academia, government and firms) (Salazar, 2013) that describes the main actors of the National Innovation Systems is challenged by the notion of 'quadruple helix' (Carayannis & Campbell, 2009). In this frame, it could be settled the idea of transformative policies developed by Schot & Steinmueller (2018). These authors consider as crucial to include civil society as a fundamental dancer in the frame number 3 that they develop to explain the new directions of the innovation policies.

<i>Area</i>	<i>Challenge</i>	<i>Description</i>
	Governance's effectiveness	The coordination ability of the governance of innovation is defied. In this vein, effective governance is crucial (Borrás, 2009) to identify collaboration strategies between different actors which make possible to tackle market failures, improve coordination between governmental entities and among public, private, academia and the civil society, discuss and negotiate budgets (Arnold, et al., 2003), and set the public agenda's priorities

(continued)

Table 7.4 (continued)

<i>Area</i>	<i>Challenge</i>	<i>Description</i>
Innovation policies	Innovation's social dimension	This dimension has become more salient and robust (Kuhlmann & Ordóñez-Matamoros, 2017b), and it leads to consider the emergence of a new generation of policies (Kuhlmann & Rip, 2018). This new generation is aligned to the direct approach to development and demands the governance of innovation, which fits with a learning of second order. Ideas like social innovation (Howaldt et al., 2018), inclusive innovation (Foster & Heeks, 2013) and transformative policies (Schot & Steinmueller, 2018), among others, represent these new generation of policies. These policies have the aim to promote social inclusion (Karmani, 2007; Papaloannou, 2014; Fressoli et al., 2014; Mazzucato, 2015) and attend social concerns directly (Harsh et al., 2017)
	Increasing complexity level	Innovation policies are facing an increasing level of complexity (Laranja, 2012) to reach social objectives. In this challenge, the State has to increase the variety of perspectives in the policymaking process (Lindblom, 1959). The variety of perspectives should also come from non-State actors, like those who are living in marginal conditions

<i>Area</i>	<i>Challenge</i>	<i>Description</i>
	State's role	<p>The State has to play an active role. It means to consider the State as a source for creating and transforming markets (Mazzucato, 2015) and enabling economic development (Rossiter & Smith, 2017). Aligned with the new generation of innovation policies, some scholars demand that the State guarantees innovation policies which address social concerns (Altenburg, 2009), involve designers and users and align their interests (Heiskanen et al., 2010)</p>

Source Authors' own

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