

Contesting the Mainstream Narrative? A Conceptual Discussion on the Politics of Science, Technology, and Innovation from the Periphery

Carolina Bagattolli^{1,*}, Tiago Brandão²

¹Department of Economics, Federal University of Paraná (PPPP/UFPR – Curitiba, Brazil). Av. Prefeito Lothário Meissner - Jardim Botânico, Curitiba - PR, 82590-300, BRAZIL.

²Faculty of Social Sciences and Humanities (NOVA FCSH), Portugal. Av. de Berna 26 C, 1069-061 Lisbon, PORTUGAL.

ABSTRACT

Over the last decades, technological innovation became the new mantra in the Science, Technology, and Innovation (STI) policy arena of the most different countries, including the world peripheries. By adopting a historical and global perspective, we identify in this article a scope of isomorphic pressures in the core elements of the policy process, which became increasingly evident, aligned with neoliberalism and the ideals of rationalization and bureaucratization: discursive and argumentative rationalities, primary goals definition, policy mechanisms, and legislation – all elements central to policy formulation and very similar across countries, independently of some degree of variation within national contexts. Therefore, one can observe that the reforms held in the STI policy arena of different Latin America and Iberian countries, to create an ‘innovation culture’ of entrepreneurship, are based on very similar discourses and incentives. In this piece, we conduct a conceptual discussion on the politics of STI given the realities and historical backgrounds of some peripheral countries – mainly Latin American ones, highlighting the relations between interests and their respective agency within STI’s complex policy process.

Keywords: Science, Technology and Innovation (STI), Policy Analysis, Peripheral Countries, Isomorphism, Innovation Studies.

Correspondence

Carolina Bagattolli

Department of Economics, Federal University of Paraná (PPPP/UFPR – Curitiba, Brazil). Av. Prefeito Lothário Meissner - Jardim Botânico, Curitiba - PR, 82590-300, BRAZIL.

Email: carolina.bagattolli@ufpr.br

Received: 31-10-2020

Revised: 26-01-2021

Accepted: 06-03-2021

DOI: 10.5530/jscires.10.1s.18

INTRODUCTION

Several political events and the economic environment from the very 1970s onward created changes and cyclical pressures in favor of a common set of rationalities that began to influence the ‘discursive space’ of Science and Technology (S&T) policies.^[1,2] Encouraged by the Japanese case and the predominance of economic culture, the orientation of the S&T policy in many countries began to place “emphasis on industrial innovation and technological forecasting”.^[3] It has been a pervasive trend in most national science policy cases from the 1980s/1990s, increasingly assumed within the European integration and particularly during the transition to the 2000s.^[4,5] Since their European accession, it has become notorious in cases like Spain and Portugal, at least from the transition to the 1990s. In Latin America, with the usual lapse of time, the situation was quite similar.^[6] Despite some counter-hegemonic perspectives,^[7] technological innovation became the prior goal of different public policies.

The Brazilian ‘inovationism’^[8] regarding the S&T policy orientation is a prime example of this generalized trend in the geopolitical Southern. This interpretation was increasingly legitimized by OECD (Organisation for Economic Co-operation and Development) recommendations from the early 1990s, by acknowledging and favoring policy trends that intended to improve the innovation environment in the private sector – i.e., tax incentives, improving access to Research and Development (R&D) results, promoting technologies developed in university and public laboratories, with federal support, and the flexibilization of some antitrust laws to facilitate the establishment of R&D consortia among firms.^[9]

By adopting a global and historical perspective, it is worth noting that this new mantra of technological imperatives and innovation coincided with the changes, incredibly perceptive from the 1980s onwards, in the dominant view around the state’s role,^[10] which had been previously the model of rationality (e.g., Weber, Foucault). One key issue in the ‘new economic theory,’ as well as in some public policy theories, was a bruising criticism against the state’s role as the organizational agent of society. Neoliberalism emerged of this process based on a profound distrust against the state’s ability to steer the economy and society. From this moment,

Copyright

© The Author(s). 2021 This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

gained prominence a view that the state should seek to increase public activities' efficiency in terms of performance and satisfaction of the citizen-customer. The reforms resulting from this kind of thought had substantial repercussions in the Science, Technology, and Innovation (STI) policy arenas, including a significant impact on contemporary science's social contract.^[11] Amid neoliberal rationales, the state and its institutions needed to prove their worth and the 'utility' of public spending. Within the scientific and technological public system, agencies and research institutions are required, from this moment, to show the productivity of 'useful science'.^[12]

These changes in the dominant rationality of the state's role were not inconsistent with theoretical accounts that were gaining strength in S&T policies. We concur with the literature that pointed out how S&T policies were clearly in tune and supportive of those trends. Naturally, technological imperatives and innovation's economic bias was understandably attractive to scientists from some areas, especially those dedicated to generating new technologies and working collaboratively with private companies. It is a historical trend and permanence, from the second half of the 20th century, the 'co-evolution' of influential actors, binding academic science, industry interests and goals, and the political renewal of leaderships – all playing the same semantics on the purpose of promoting technological innovation.^[1]

Over the last decades, science policy specialists were engaged in performative discourses and theoretical frameworks pointing towards technological change and innovation. Being simultaneously experts and actors, they have suggested a new knowledge organization while participating in its realization.^[13] The majority of theoretical accounts have indicated innovation's virtues,^[14] adopting what recent literature has been recognizing as a pro-innovation bias.^[15] Several frameworks have been produced, most of them engaged in explaining (and extrapolating) trends of scientific systems allegedly in transformation, and mostly promoted by performative experts. Betting in change as a strategy (instead of tradition), specially 'technological change' is viewed as supposedly inexorable. Today, some of those frameworks came to be looked upon as authentic models. They came to be used by scholars, practitioners, and politicians to give a theoretical authority to political orientation.^[1]

1. One of those models that came to be widely used within STI policy circles was the 'national innovation system'.^[17] The 'systemic approach' was already present in the OECD policy culture from the 1960s, namely through Christopher Freeman (1921-2010) collaboration in this international organization. The concept of 'national innovation system' (NIS), on his hand, came to spread later, from Lundvall^[18] and Edquist^[19] works passing by Nelson^[20] – and not forgetting Nelson and Rosenberg.^[21] One must get that the NIS is just one of the many frameworks and models^[22] that influenced national science policies.^[14] It is remarkable the

Indeed, in the context of STI, one might argue that the purpose of models is then to influence political circles. As a set of generalizations and perceptions around a process, models serve purposes and have implications. From a historical perspective, a model is both a narrative about the origins and history of 'modern science policy' and a set of frameworks – erected as policy models – aligned with the technocratic concept of STI policy^[16] emergent after II world war and increasingly hegemonic up to our days. Within those S&T policy models, one can observe several concepts that, in interaction with each other, provide certain rationality – e.g., coordination, basic science, applied science, and many different categories that came to be instrumental for policy formulation in this area since a half-century ago. In the policy arena, a model is increasingly supported by *codified discourses*^[26,27] and *frameworks*,^[22] which by itself reinforces a process of homogenization (e.g., 'isomorphism,' among others).

Already underway, this isomorphism has been having a real impact in STI policy, by affecting the structures (institutions) and behaviors (actors), influencing and playing a central role in the construction and development of national science policies across several countries and regions – even if one acknowledges that the system's shape and its outcomes depend on national contexts and domestic idiosyncrasies. Like this, mimicking discourses and practices, following and supporting patterns, the practices considered successful elsewhere have been (and still are being) consistently spread through the entire organizational field, including STI institutional and policy practices.^[28]

Once briefly introduced this discussion, the objective of this article is to reflect on and problematize to what extent we can say there is an ongoing process of 'isomorphism' in the STI policy process in terms of 'strategic thought' and 'policy practices', within several Latin American and Iberian countries. Mainly following a historical and global perspective on the subject, to tackle this essentially conceptual discussion, the article looks at STI policies as a political process in the so-called geopolitical South. This account is based on a literature review that includes empirical evidence published in earlier works of the authors, accumulated over some years of thought, teaching, and scholarly production concerned with Brazil and Portugal cases, as well as additional data gathered from other

role that some concepts came to assume within the STI historical process. Frameworks and models like the 'production of knowledge' and the 'triple helix',^[23,24] both inspired by the "Mode 2" discourse,^[25] that coexisted or even combined with the 'systems of innovation' approach. Highly influential in peripheral countries, the NIS approach was developed within the evolutionary economics and became enormously influential in international bodies and the European Union. The implicit intent of many of those models was thus precisely to be influential among policy circles. All these models' explicit aim was to introduce a pro-innovation view, with emphasis in its economic potential.

Latin American countries. In order to address the discussion of this piece, the article will be structured as follows. The second section revolves around the implications of neoliberalism in terms of its deconstruction of previous thinking regarding the state's authority and managerial expertise. The third section examines the historical background of peripheral² countries, based on discursive analysis and literature review, providing several examples of ongoing isomorphic pressures, the general adoption of technocratic and economically biased narrative, and a pro-innovation pattern independently of political ideologies. Then, the fourth and final section summarizes the main considerations on the extension and implications of the historical and systemic pressures that seem to shape policies in the STI field.

NEOLIBERALISM, THE DECONSTRUCTION OF STATE, AND THE MANAGERIAL MANTRA

Neoliberalism as a 'collective thought'^[33] and ideological mantra had a tremendous impact on modern science's social contract, moulding the policy arena, refining the technocratic concept of science policy and its practices, based on economic planning techniques and biased towards a managerial perspective. Related to this, from the 1970s onward, a view arguing to increase the efficiency of public activities gained prominence. These changes regarding the state's role took shape including practices of business management.^[98] The neoliberal philosophy and the paradigms of global governance were behind the so-called 'New Public Management,' a new set of guidelines and principles, or a set of "doctrines of public accountability and organizational best practice".^[34] That is the emergence of 'best practices' as a management mantra^[35] and as 'the way' to rationalize public spending. As an emerging discourse, this was part of a process of deconstructing the Weberian state – the bureaucratic state, a manifestation of the rational spirit as a means to control the nation, the previous paradigm of rationality now openly challenged by private and corporate interests.

Disbelief in the state's role as an organizing agent of society, which is the core of the neoliberal ideology, and the reforms made as a result of that thinking, had substantial repercussions in the S&T area, significantly contributing to the development of a 'new innovation policy.' In the wake of neoliberalism, the state and its institutions needed to prove their worth and the 'usefulness' of their expenses. After that, within the scientific system, the public funding agencies and research institutions needed to show that they were producing 'useful science'^[12]

2. The framework 'center-periphery' appeared in Latin America in the 1940s based on recognition of the 'uneven and combined nature of development' (e.g., Trotsky) in Western capitalist evolution and how it impacted the development of Latin American economies. For further reading on this debate, see Prebisch,^[29] Furtado,^[30] among others. Concerning other uses of 'center-periphery' frameworks, see Singer^[31] and Shils.^[32]

– or socially relevant, depending on the political quadrant. Utility was more and more justified in terms of economic growth, and in our societies innovation came to be seen mainly as 'technological change'.

Innovation is immersed in different political quadrants, and in several countries, being perceived as socially and culturally desirable, an emblem of novelty and original creation. Even in the political milieus of peripheral countries, innovation has been contrasted to conservative forces' desiderata, almost as a 'myth for reformism' – for example, in economic corporatist regimes like Portugal and Spain before the 1970s. Though, a more practical view of innovation ('as technical change') emerged in Western societies, being quasi-hegemonic nowadays – at least from the last half of the twentieth century – inspired by historical experiences of technological success, like Japan or South Korea.

With Austrian economist Joseph Schumpeter considered as their founding father, many experts came to defend the role that innovation should occupy in economics, such as within the 'new growth theory,' an argument that convinced not just the neoliberals but also leftist and utopian milieus. For the neoliberals, innovation is often seen as being close to the ideals of free enterprise and entrepreneurship within the conception that innovation would be almost a natural consequence of a system of incentives and penalties established due to market liberalization. For social reformists and utopian quadrants, innovation is synonymous of freedom and original creation and a force against tradition and conservatism.^[36]

Later over the 2000s, even with the growing frustration regarding the results of neoliberal policies,^[37] innovation continued to maintain its positive connotation, making it a goal to be achieved through the adoption of active public policies. Even within the most radical economic liberalism, it was impossible to completely delegate the production of scientific knowledge to the private sector. So under the aegis of neoliberalism, the biggest supporter of research and development (R&D) remains the state, although the 'market' ought to determine its direction.

The role of new technologies to increase profits became a case for the idea of companies to engage in technological development, which came to be seen as the critical variable in evolutionist growth models. Accordingly, to those new theoretical accounts from economics, R&D's expenditure becomes to be seen as promising to generate increasing returns for companies instead of the constant returns expected by previous economic theories, which only considered capital and labor as factors of production.^[38,39] Following previous traditions of thought (e.g., M. Polanyi), additional theoretical accounts also brought forward the rhetoric of knowledge creation and the capacitation discourse, as new variables to

be considered within production factors and technological development.^[40,41] With this overall effort to present S&T as the main engine of economic growth, the rationality came to be that the government should spend as much as possible in infrastructure to continually ensure the generation of new ideas, namely those that could lead to new products and processes. All in all, this kind of expenditures become justified based on successively new and increasingly prevailing economic theories.^[42]

The fact is that, in the last decades, funding for STI have been integrated among the functions of a state that the neoliberals could not despise. Besides economic theories, the underlying reasoning is that innovation is presented itself as the ultimate output of science and technology activities, guaranteeing the appropriation of the technoscientific development undertaken within the public sector, in terms of economic outputs by companies. Even within the neoliberal logic, it is impossible to completely delegate to the private sector the production of scientific knowledge due to the market failures. So, under the aegis of neoliberalism, the biggest supporter of research activities remained the state, the ‘neoliberal state’,^[43] even if who ought to determine their direction should be the ‘market’.^[8]

This change in the ideology of public affairs meant a pressure for further rationalization of public expenditure towards managerial and market criteria, within a ‘globalized neoliberal world,’ forcing an increasing similarity in the political organization among different countries around the world. This implied significant pressure towards a good measure of homogenization. These pressures are perceptible when one looks to historical processes, wherefrom a global standpoint, it is clear many isomorphic pressures that took place through policy transfer strategies – processes by which “knowledge about how policies, administrative arrangements, institutions and ideas in one political setting... is used in the development of policies, administrative arrangements, institutions and ideas in another political setting”,^[44] involving not just policies *per se*, but also institutions, ideologies or justifications, attitudes and ideas.^[45]

In our view, the existence of neoliberalism should not be viewed as a mere conflict of ideology but rather as one of the most significant developments in the history of Western political ideas, private governance, state government, and public administration. Neoliberal ideas had, and still have, palpable implications, moulding our increasingly globalized international system, or the rationales behind national public policies, including shaping a new paradigm of governance. Based on the ideas of thinkers like Ludwig von Mises, Friedrich A. von Hayek, Milton Friedman, and James Buchanan emerging from the years immediately following World War II, neoliberalism influenced both political philosophy

and practice as a theoretical body of knowledge within the traditions of Western political thought. STI policy arena is neither more scientific than other public policy areas nor agnostic regarding our times’ *zeitgeist*.

FROM RATIONALIZATION TO HOMOGENIZATION – OR HOW STIP HAS BEEN HAPPENING IN THE WORLD PERIPHERY

Various policy analysts have always observed historical similarities between national S&T policies around the world. This process of policy homogenization has been characterized in different ways: extrapolation;^[46] transfer of institutional models;^[47] imitative institutional development;^[48] model emulation;^[49] ‘transduction’;^[50] policy transfer;^[44] mimetic translation^[51] and so on. One way to explain these phenomena is to appeal to international and more systemic trends, which are: (1) the bureaucratization and rationalization process^[27,52] within the public policy area, that was also underway and not exclusively to S&T field; and (2) the role of international organizations in shaping agendas and spreading policy concepts constructed as normative models to be replicated elsewhere.^[53]

Concerning the bureaucratization and rationalization process, it is a fact that the functioning of the state by itself demands a set of requirements – the budget cycle, procedures to organize the fiscal year, annual reports, financial reporting, and other requirements for contracts and funding. Thus, expansion of the state role supports, by itself, those trends to the standardization and homogenization of organizational models in the area. In this sense, the Science contract, from its beginnings, points to a rationalization process of both scientific practice and the state. Standardization and normalization were already within the organization of science purposes, as well as, later on, the evaluation for funding is going to shape the internal practices of scientific communities.

Regarding the role of international organizations, it is abundant evidence of its policy influence. It is known that from the 1960s, by convening with national governments, OECD was conducting exams on members national science policies, being behind several attempts to stabilize the administrative structure of the organization of science, increasingly envisioned as an ‘innovation system,’ based on a package of recommended measures to *improve the climate for innovation* (essentially intended to stimulate R&D within the private sector). The OECD’s influence can be perceived in Latin America as well, mainly through his alliance with UNESCO and its systematic intervention altogether with the Organization of American States (OAS), materialized in the transfer of various policy mechanisms.^[54,55]

As mentioned before, this inclination towards homogenization in a public policy area is not exclusive of S&T, being an object of analysis by different disciplines. Within the literature, there are several concepts concerning that kind of phenomenon in public policies. One of the most used is *isomorphism*, defined by DiMaggio and Powell^[52] as a process of constraint that forces an entity or institution of a population to resemble other organizations facing the same set of conditions. According to the authors, this process results from the acceptance of the ideals of rationalization and bureaucratization originated from the ‘competitive market environment’ and transposed to neoliberalism’s public policy arena. Within the very basis of modernity as an idea of civilization, the ideal of rationality is always the best model to follow, pressuring organizations to ‘adopt it.’

Isomorphic pressures – institutional and policy compliance

The literature related usually points to three interconnected isomorphic pressures by which change follows an isomorphic path: (i) *coercive*, stemming from political influence or addressing legitimacy problems; (ii) *mimetic*, which leads to the adoption of a standard approach in situations of uncertainty; and (iii) *normative*, related to the interests of the dominant players in the space of the public policy in question.^[56]

As McNeely^[57] stresses, despite the varying conditions and characteristics –economic, social, historical, political and so on– ‘... countries have tended to develop similar institutional arrangements and activities in which institutionalized rules and normative prescriptions dictate how states act (or should) to achieve goals of progress and development within the international system’. As the basis of these mimesis forces, it is broadly accepted that international organizations have contributed to developing ‘*increasingly codified conceptions of science*’.^[27] Increasingly “modernized” and integrated, the global system generates institutional forms and practices that spread throughout it to the extent that virtually all nation-states enact the wider system’s structures in their pursuit of progress’.^[57]

One example is the worldwide funding of Ministries of Science and Technology,^[58] another one is the creation of national agencies of science, which comprehended at least two generations: a first one devoted to the promotion of science and the second one, from the 1960s onwards, based on the myth of coordination.^[35] In the Iberian countries, as in Latin American ones, with a very clear strategy of political coordination of the national production, some initiatives had been set in motion. For example, in Portugal, the setting up of JNICT – *Junta Nacional de Investigação Científica e Tecnológica* (the National Board for Scientific and Technological Research) in 1967, occurred as part of a long-term policy to prepare the

Portuguese economy for open competition. It is discernible the same kind of coordination agencies (sometimes the reform of previous bodies) in Spain and across several Latin American countries.

Despite some lag in Latin America, the post IIWW brought the first science agencies in the region, as the CNPq (1951) in Brazil and the CNICyT (1951) in Argentina, both oriented towards granting fellowships and subsidies to scientists. However, over the years, reforms tended to shape those agencies to become coordination bodies and adopt the so-called system perspective, very characteristic of the technocratic elite, which aimed at a systemic articulation between scientific and technical institutions, including the coordination with other interests for the national development project.

As early as 1964, CNPq was assigned the role of defining Brazilian national STIP, promoting planning exercises, and encouraging collaboration with the industrial sector.^[59] In Argentina, the creation of CONICET in 1958 (dissolving CNICyT) maintained the previous profile for scientific community corporate representation, but additional reforms would also try to assign this agency a coordination function. Further, this assignment would be transferred to CONACyT, created in 1966.^[60] Also common to several national cases, those agencies created or reconfigured to coordinate the respective national ‘system of science and technology’ would be derogated when national ministries of S&T were created.

This copying of organizational structures was in part due to international organizations influence next to national practitioners. For example, the OECD has engaged in constructing organized science narratives and the so-demanded statistics that would serve as the leading indicators for the S&T policy area.^[61] Additionally, experiments of technology forecasting and funding schemes for research by contract programs were also part of an international policy implementation trend. On his hand, the United Nations Education, Scientific, and Cultural Organization (UNESCO) strongly influenced many countries, particularly peripheral underdeveloped nations including Latin America ones, recommending countries to build a ‘proper’ scientific infrastructure, contributing to the institutionalization process of STI policy, generating rationales within the logic of ‘how-to’ handbooks and so on. Other international organizations^[62] have played an important role in harmonizing these national science policies, including the Inter-American Bank of Development (IBD), with its loans to Latin American countries, which were implemented with ‘strings attached,’ as some authors have been studying it.^[63,64]

Modalities of those isomorphic pressures may vary, including in their intensity. One way of homogenization is from *coercive isomorphism* pressures, which can be both *informal* or *formal*. It

can also be felt by force or persuasion, being subtler and less explicit. It usually is the case of some relations between national authorities and international entities, like the European Union, whose normative framework became increasingly binding to its members. It is also a ‘mechanism’ applied to the central state’s relation with subordinate departments and institutions. *The direct imposition* of standard operating procedures and rules also happens from the governmental arena.^[28]

One example is the ‘strings attached’ to the so-called Washington Consensus, a set of economic measures formulated in 1989 by a group of financial institutions such as the located in Washington (hence its name), like the International Monetary Fund (IMF), the World Bank and the US Department of Treasury. Making these economic measures the official policy of the IMF in the 1990s, these financial institutions became involved in promoting macroeconomic adjustments in Latin America, contributing to shape institutional frameworks and policy formulation possibilities in several areas, including STI. The ‘prescription’ was composed of ten core rules, including (i) promote fiscal discipline, (ii) reduction of public spending, (iii) carrying out tax reform, (iv) regulate market interest and (v) foreign exchange, (vi) trade liberalization, (vii) promoting foreign direct investment, with the elimination of any barriers, (viii) privatization of state enterprises, (ix) economic and labour market deregulation and (x) creating a legal framework to guarantee respect for intellectual property.

To obtain international loans, Latin American countries were indeed forced to adopt, with immediate effect, the ‘international standard’ of intellectual property through internal judicial reforms.^[65] Examples of adopting this ‘recommendation’ are the changes to the legal framework on intellectual property in the region’s countries since then, beginning with Chile (1992). For example: (a) Chile, law 19.166 (1992), changing the previous legislation of intellectual property; (b) Argentina, the law of the author’s rights n. 24.249 (1993); (c) México: creating an interministerial commission for the protection, surveillance, and safeguarding of intellectual property rights (1993); (d). Brazil, the law of intellectual property n. 9.279 (1996).

Other examples of *coercive isomorphism* relate to European Union (EU) accession of sovereign states, particularly to small countries when dealing with the norms associated with the community funds. Allocated through a myriad of funding programmes, access to EU structural funds is set by well-delimited procedural norms, such as the selection criteria and the implementation/ assessment of research contracts and projects. For some actors, the EU with its legal framework presents as a case of coercive isomorphism. Although if coercion can be debatable, normativism is running through the veins of EU framework funding programmes. *Normative*

isomorphism is associated with professionalisation^[28] – from which we may evoke Peter Haas’s^[66] concept of ‘epistemic communities.’ In the case of Powell and Di Maggio,^[28] one should understand “professionalization as a collective struggle of members of an occupation to define the conditions and methods of their work, to control ‘the production of producers’ ... and to establish a cognitive base and legitimation for their occupational autonomy.” That is why historical studies stress the role of actors who participate in isomorphic practices to legitimize their social function.

As for the policy mechanisms, despite the nuances in place, isomorphic pressures can lead to two kinds of conformity: (i) in terms of compliance (direction of movement – degree of change in the direction appointed by isomorphic pressures) and (ii) of convergence (resemblance – the extent to which the organisations in a field resemble each other) – being the first more frequent.^[67] An overview of those instruments in the Latin American and Iberian countries is very enlightening concerning compliance (Table 1).

Regarding these policy instruments, summarily, the emphasis is on the financial mechanisms oriented to promote technological innovation – as concessional credits, reimbursable funds with subsidized interest rates, direct subvention, and concession non-refundable resources and tax incentives. These types of financial mechanisms emerged earlier in public policy history, along with the creation of various scientific and technological institutions, and even since World War I. For example, concerning concessional credit, along with OECD countries as France (since 1974 through Sofinnova Ventures³) and Japan (implemented by Japan Small and Medium Enterprise Corporation – Jasmec,⁴ established in 1980), several Latin American countries use similar mechanisms. Brazil, by the *Financiadora de Estudos e Projetos* – Finep,⁵ Brazilian Innovation Agency, established in 1967, acting more actively from the 1980s). As well as Argentina (*Fondo Tecnológico Argentino* – FONTAR,⁶ the Argentine Technological Agency, created in 1996), Chile (*Corporación de Fomento de la Producción* – CORFO,⁷ an agency oriented to promote a business sector, established in 1939 and reoriented to development and innovation since the 1990s) and Venezuela (*Fondo Nacional de Ciencia, Tecnología e Innovación* – FONACIT, created in 1967, abolished in 1984 and recreated in 1985 – responsible for the management and control of the financing of plans, programs, projects and activities in the field⁸). To mention just some examples of agencies that offer different options of concessional credit to technological modernization.

This modality of funding, oriented towards projects considered of low risk, is the most ancient and basic one, emerging in Latin America and other peripheral regions since the post-war alongside the creation of various scientific and technological institutions, following the guidance and support

Table 1: Comparative analysis of policy instruments.

Country	Funds promoting innovation and business competitiveness	Venture capital, seed capital, and other financial instruments to support R&D and innovation	Support programs incorporating researchers and scholars in business	Clusters promotion mechanisms, technology centers and business incubators
Argentina	√	√	√	√
Bolivia	√	√		
Brazil	√	√	√	√
Chile	√	√	√	
Colombia	√	√	√	
Costa Rica	√	√		
Cuba	√	√		
Ecuador	√	√		
El Salvador				√
Spain	√	√	√	√
Guatemala	√	√		
Honduras				
Jamaica	√	√		
México	√	√	√	
Nicaragua	√	√		
Panamá	√	√	√	
Paraguay	√	√		
Peru	√	√	√	√
Portugal	√	√	√	√
Dominican Republic	√	√		
Trinidad y Tobago	√	√		
Uruguay	√	√	√	√
Venezuela	√	√		

Source: Prepared by the authors based on data collected on the Report of Policy Instruments, by the RICYT – Ibero-American and Inter-American Network of Science and Technology Indicators, MEyC^[68] and the Portuguese National Innovation Agency (ANI).¹ Obs.: It is worth mentioning that among RICYT’s objectives are the systematization of national STI metrics and the design of specific indicators for STI measurement in Ibero American countries.²

of multilateral organizations such as UNESCO, OECD and the Organization of American States (OAS). The similarity of orientation and strategy in the quest to mobilize financing sources to promote technological innovation becomes evident when one compares the countries’ innovation policy instruments, as unveiled by Table 1. Except for El Salvador and Honduras, all the other countries included in the study have some instruments for promoting innovation and competitiveness in enterprises. Altogether, there are dozens of instruments, with the Southern Cone countries with more variety of these devices. It is worth noting that Argentine, Brazil, Spain, Peru, Portugal and Uruguay have the same set of financial instruments, with at least one mechanism in each of the categories analyzed.

Concerning the institutional systems (convergence), all 23 Iberoamerican countries analyzed tend to follow a consistent pattern. All of them count with a sound legal framework build on ‘national innovation system’ narratives, which consistently

adopted a pro-innovation discourse. Even historically, most of the countries followed trajectories that reveal more convergence than divergence. For example, almost all national cases created funding agencies since earlier (e.g., Spain, Argentina, Portugal) or after the Second World War (e.g., Brazil and others). After a while, a second generation of funding agencies for STI was created, aiming to coordinate S&T institutions and provide political and scientific advice to governments. The emergence and dissemination of ‘Ministries of Science’ meant to strengthen the political tutelage over STI, arguing for more generous funding. This political umbrella for STI came to empty those previous Coordination and Advisory bodies from their initial mission concerning Policy-setting and guidelines, which came to be performed by Ministries or States Secretariats.

There are, of course, some nuances here and even competing models regarding the organization of science establishments.^[53,69,70] Since early, though, most relevant

players in the region created funding agencies, and some of them are already historical institutions (e.g., JAE | CSIC-Spain, CONICET-Argentina, CNPq-Brazil, Capes-Brazil, JEN-Portugal, JNICT | FCT-Portugal, among others). There is also a pattern of solutions to deal with funding demands, most of them trying different organizational solutions and funding schemes, but following a shared repertoire of policy arrangements, from the traditional science state agency to national funds, including the detachment from or newly

created agencies designed explicitly for applied research, technology, and innovative activities (as Finep-Brazil and ANI-Portugal, for example).

If there is a wide variety of institutional arrangements, from ministries to national councils, and a certain degree of variation according to the different cultures and groups participating in the national S&T effort, there is no doubt a consistent trajectory of isomorphic practices regarding the institutional

Table 2: Comparative analysis of institutional systems.

Country	Legal framework ⁽ⁱ⁾	Policy-setting body and political tutelage over STI ⁽ⁱⁱ⁾	Coordination and advisory bodies ⁽ⁱⁱⁱ⁾	Funding agencies for STI activities ^(iv)	R&D executing bodies ^(v)
Argentina	√	√	√	√	√
Bolivia	√	√	√	√	
Brazil	√	√	√	√	√
Chile	√		√	√	√
Colombia	√	√	√	√	√
Costa Rica	√	√	√		√
Cuba	√	√	√		
Ecuador	√	√	√		
El Salvador	√	√	√		√
Spain	√	√	√	√	√
Guatemala	√	√	√	√	√
Honduras	√	√	√		√
Jamaica	√	√	√		√
México	√	√	√	√	√
Nicaragua	√	√	√		√
Panamá	√	√	√	√	√
Paraguay	√	√	√		√
Peru	√	√	√		
Portugal ^(vi)	√	√	√	√	√
Dominican Republic	√	√	√	√	
Trinidad y Tobago	√	√	√		√
Uruguay	√	√	√	√	√
Venezuela	√	√	√		√

Source: Prepared by the authors based on data collected on the Institutional Systems Report by the RICYT – Ibero-American and Inter-American Network of Science and Technology Indicators. Available at: http://bd.politicasci.net/report_SI.php/politicasci/all/all/all/es.

Notes:

(i) This includes legislation establishing the National System of Innovation, consecrating at a national level both the system perspective for the ST&I activities and the adoption of the pro-innovation bias.

(ii) Encompasses Ministries, Vice-Ministries, National Secretariats, Administrative Departments, and even Advisory Councils.

(iii) Includes not just Coordination Bodies, but also Assessment Councils.

(iv) Funding bodies cover different historical generations of agencies supporting S&T activities, including agencies designed to apply technologies and innovative activities.

(v) This includes a variety of public institutes and state laboratories doing S&T activities.

(vi) Portugal was filled based on Brandão,^[35,71] Rollo *et al.* 2018,^[70] Henriques 2006,^[72] and Heitor and Horta 2004,^[73] including resources from the Portuguese Foundation for Science and Technology (FCT) and the Portuguese National Innovation Agency (ANI).

system (Table 2). Not just every country have a similar legal framework towards innovation; as over past decades, most of them have created a political body for policy-setting and guidelines. They all have a political coordination (and advisory) body in STI, including Chile that historically had a decentralized institutional configuration. Besides CONICYT created in 1968, other instances had huge autonomy, like the Program Chile-IIDB, CORFO-Ministry of Economy or the *Consejo Nacional de Innovación para la Competitividad*, created in 2007. In 2018, Chile finally created a Ministry of Science, Technology, Knowledge and Innovation (MICITEC⁹) and, in 2020, set up a National Agency for Research and Development (ANID¹⁰) integrating the 52 years old CONICYT, which never assumed the role of coordinating the Chilean S&T system.

Another strong trend in STI policy formulation is that from the very beginning, the definition of a national science policy passed through the identification of strategic areas, in particular when coordination agencies and new funding arrangements emerged during the 1960s, assuming the task of reorganizing the national scientific and technological research establishments. Since then, scientific and technological clusters were being successively replicated around areas like Agriculture, Public Works, Nuclear Energy, Outer Space, Oceanography, Environment, Biotechnology, Nanotechnology, etcetera. At last, most (18 of 23 countries) presents scientific and technical institutions, some of them based on local research traditions, promoting and doing R&D activities. However, R&D executing bodies are mostly public institutes and state laboratories on technical and technoscience fields but also following fashionable labels of their respective time – labels that were being promoted over more than a half-century, even when it was not possible to find a critical mass or research schools within the respective scientific communities.

In short, despite some degree of variance or specificity was already predicted by some authors that wrote on isomorphic pressures, this debate on the global isomorphic process is indeed enlightening to understand that we should adopt a macro view on the national STIP, not just a microanalysis from case studies and policy programs and mechanisms.

The political discourses – convergence with a pro-innovation pattern

As we have pointed, almost all Latin America countries, from the relatively industrialized to the less developed, seem to embrace a set of organizational structures and policy mechanisms to foster technological innovation and target R&D funding.^[74] However, more than policy instruments and mechanisms is at stake. This process of rationalization and homogenization carries broad implications, not just in terms of ‘policy practices’ but also of a ‘strategic thought’ supported

by the international diffusion of conceptual policy tools and thought models (i.e., frameworks). This process entails a *modus operandi* based on a mimetic thought process that has conditioned STIP evolution in peripheral regions.

One of the most important Latin American thinkers in S&T matters, the Argentine Jorge A. Sabato, argued since the 1960s that these countries could be just as capable as others of doing science and developing technology, embracing innovation’s values as a tool to bridge the gap with the North.^[75] It was a counter-hegemonic view in its context, but the condition then was that S&T was seen as the right path to breakthrough economic (and political) dependence, overcome underdevelopment. Since then, national governments in the geopolitical South began to see the potential of science to fulfil a dual role: on the one hand, to solve the most urgent practical problems arising from the underdeveloped condition; on the other hand, to publicly promote S&T to bridge the gap with the North and give governments the appearance of modernizing.^[76]

Simultaneously, though, the challenge from these historical S&T thinkers was also sensitive to the degree of this imitation and further implications that could arise concerning the right way to adopt those external technoscientific cultures. As perceived by Spanish Nobel Prize laureate from our history, Miguel de Cervantes, “It was ignored that only the ideas are fruitful. And looking for recipes and formulas of action is the cause of atrophy in the wings of the spirit, incapacitating men for great inventions”. Another Argentine, Oscar Varsavsky,^[78] stress that the high degree of cultural dependence in the peripheral countries is remarkable, arguing though that these countries should import (or “feel” the constraint to copy) not just the goods produced but also the methods, without which they would continue underdeveloped.^[78] Indeed, the political stance of following ‘exemplary’ countries has historical roots in Latin America, but the strategic dimension of STIP was fully understood. Furthermore, a perspective on the implications of a globalized development model was framed by a historical perception regarding peripheral countries’ political economy. Receiving great awareness in the past by historians, sociologists, and economists over the years, this political economy entanglements were even the focus of a United Nations agency, the Economic Commission for Latin America (ECLA), in 1948. ECLA was an international organization where a ‘post-colonial’ awareness was raised concerning several economies’ dependent position on those in the geopolitical North. A strategy of economic development ‘catch up’ was the focus of several Latin American economists (e.g., Raúl Prebisch, Celso Furtado, and others), whose accounts provided the theoretical basis for an industrial strategy followed throughout the 1950s and 1960s, before

the model of global imperatives came to shape the political economy of present times in many of these countries.

Nonetheless, if one looks at more recent STI political discourses, it seems that these concerns had disappeared. Although pressures to adopt hegemonic and mainstream's perspectives can be seen everywhere in national plans and legislation. Today, those official documents became essential mechanisms of regulation and shaping behaviour. For example, among several national plans across Latin America, the Brazilian *National Strategy on Science, Technology, and Innovation*, for the period 2012 to 2015, while specifying differences in emphasis and focus, recognizes the similarities in national policies' guidelines across countries, acknowledging that...

'...the national plans and strategies for science, technology and innovation in developed countries... as well as in key emerging countries, are generally similar. Strengthening business innovation in order to increase industrial competitiveness remains a common goal, especially in terms of raising productivity, employment growth and improve quality of life...'^[79]

Equally symptomatic, the elaboration process of the Argentine ST&I national plan started with a "review of national and international antecedents," including "analysis of the recent experiences of planning in the selected countries," mainly in the "national science and technology plans".^[79] Furthermore, as another example, the Mexican Plan has, as among one of its specific goals, "strengthen bilateral and multilateral cooperation with international organizations to exchange knowledge, methodologies and best practices".^[80]

In Latin American countries, the aforementioned international institutions' strategy to influence the STI policy was based on two major components. On the one hand, a political one through periodic meetings of the National Councils leaders for Science and Technology Policy of the countries of the region. On the other, a technical or project execution one, involving more specific transfer activities as advisory services, training of local personnel, financing of studies on specific STIP topics and organization of technical meetings to share the progress made.^{[64,53]11}

Indeed, understanding the paths of the Latin American and Iberian countries STI policy requires an understanding of the emergence of particular discourses, with the related concepts and argumentation – i.e., the technocratic concepts, conveyed by a group of economists and engineers.^[81] The building of professional and epistemic communities in the STI area is visible in national cases since the 1960s, shaping the language, the concepts and the views that characterize the political process of defining and implementing STI on the eve of European accession, by following certain technocratic discourses and concepts disseminated by the OECD international jargon, a

new generation of S&T managers, the so-called technocrats, were responsible for rehabilitating previous science agencies. By reforming them in modern techno-bureaucracies, that came to centralize the management of research funding, competing with and even absorbing previous science policy agencies from the first half of the XXth century.^[82]

For instance, when looking at Portugal's second historical OECD exercise (1981–1986), already in the Democratic period, we can say that those international organisations were instrumental at least since the 1960s. In getting the attention of political circles, this kind of international activity was explicitly intended *to the enrichment of existing knowledge on the content of science policy*. So, to understand how this evolves, in the Iberian countries, one could look at the emergence of certain discourses from a group of economists and engineers who have been the predominant elite in the political process of defining and implementing STI policies.^[81] Following these discourses, emerging between the 1960s and 1980s, is observable the increasing predominance of a techno-bureaucratic culture to manage S&T resources and STI policy.

If one looks to the European Union accession of Portugal and Spain, and still nowadays, we are learning in the last decades that that process has meant not only quantitative but also qualitative implications for 'national science policy'.^[53] The 'Europeanization' of STI policy had theoretical and practical substance, consisting of following a particular STI policy vision. The launch of many EU funding programmes supporting R&D imposed a growing specialisation among its stakeholders in the public administration and scientific institutions. It strengthened the bureaucratic culture, which had been growing since the 1960s but was supported by the influence of community funds from the 1980s and 1990s.

On his side, the content of STI political discourses in Latin American countries can be observed in the national plans and legislation, as important mechanisms of regulation and behaviour shaping searching for emulated 'best practices.' Examples we find in the reforms held in the STI policy framework of different Latin American countries, to create an 'innovation culture' in the entrepreneurial ranks, based on very similar discourses and incentives from one country to another. In that discursive arena, STI national plans allege that "There is a consensus in the Academy, in the Government and society that... the generation of wealth, employment, income and opportunities, with the product diversification and the increase of the added value in the production of goods and services, depends directly on the strengthening of country's research and innovation capacities";^[83] "...scientific research, technological development and innovation are [considered] essential precursors of competitiveness and economic growth; therefore, they require a strong boost, promoting collaborative

links between scientists, technologists, academics and industrialists”.^[84]

In being so, national governments are engaged in “...deepen this action in the coming years and create the conditions for science, technology and innovation to be the driving force behind a qualitative leap in terms of social and economic development and social inclusion ...to respond to the challenges of the present and make real the opportunities that knowledge offers towards the construction of a more just and thriving country”.^[85] In this sense, one should consider innovation as “...a means and a process. It is a means to expand productivity, possibilities and solutions to achieve a different and better development than we have today. Moreover, it is a process since its continuous application is required to generate results. Companies and institutions need to develop a muscle, routines, and innovation culture for it to really happen. They must make innovation part of the companies’ business, which is an iterative process of trial and error, of permanent testing”.^[86] Narratives like these can be found even in Latin American countries with different political perspectives, like Venezuela, where it is defended the need of national government “To promote the effective contribution of science, technology, innovation and their applications to the development and strengthening of production with a high level of Venezuelan added value that strengthens our national sovereignty”.^[87] “Current industrial development involves an aggressive policy of induction of technical change at the company scale, a process that must be accompanied by support and induction policies from the State through the instrumentation of mechanisms such as R&D, creation of incentives for innovation, the flexibility of transfer processes, among others, so that the company-state relationship must be very close”.^[88] Analogous in Cuba’ documents, innovation is approached altogether with productive strategies to “Achieve higher levels of productivity and efficiency in all sectors of the economy by increasing the impact of science, technology and innovation on economic and social development, as well as the adoption of new patterns of use of productive factors, management models and organisation of production”.^[89]

Nevertheless, despite discursive and rhetorical promises, technological sovereignty and productive transformation are still a mirage for these countries. For Venezuela, for instance, despite the unprecedented amount of resources allocated to STI in recent years (e.g., reached 2,0–2,5% GERD in 2003–2008), economic diversification, dependence on the oil industry, reliance on foreign technology, etcetera, did not change (when it did not get worse).^[90,91] Not just S&T ‘endogenisation’ is still a dream; there are serious signs that scientific standards were not sufficiently grounded, and infrastructure is already deteriorated by neglecting policies, including the ones designed in the name of innovation.

As pointed out earlier, evidence of this shaping of ‘strategic thought’ in policy discourses is a central feature in the current STI political process, most remarkable across different political forces: the policy of recourse to (or reliance on) models, to produce innovative outcomes.^[92] The *mimetic thought process involves searching for models*,^[28] which follows a pro-innovation bias in the case of STIP. With considerable overlap in these modelling recommendations for S&T governance, multiple frameworks gained ground over the 1980s and 1990s. The ‘systemic’ approach, in general, became enormously influential within the OECD umbrella from the 1960s onward and in the EU and Latin American countries gained significant momentum over the 1990s and 2000s. For example, the ‘national innovation system,’ cyclically benefiting from influential inputs promoted by Anglo-Saxon^[25] and Scandinavian gurus^[18] or the ‘triple helix’,^[23] being the most widely diffused of the conceptualizations crafted for policy modelling. All the Latin America countries organizing national S&T adopted this systemic approach and the technocratic language that goes with it.

As early as 1972, the ‘National System of Science and Technology’ was legally instituted in Brazil. Even in Venezuela over *Chavismo* years, most of the STI jargon used by the ‘Ministry for Popular Power in Science, Technology and Innovation’ is pretty much aligned with technocratic narratives, replacing ‘economic appropriation of S&T’ with the ‘social appropriation’ of S&T and Innovation.^[90] This socialist model adopted a discourse of *participated* and ‘useful Science’ but just replacing ‘the market’ with a ‘for the People’ clause.^[91] It is even remarkable how even with leftists’ governments in the region (including the case of Cuba, if one looks at the description of Sáenz Sánchez 2000,^[93] the understanding of innovation as ‘technological change’ follows the same technocratic and pro-innovation pattern.^[94] When there is mention of social and inclusive innovation, it is just residual – e.g., Brazilian policy programs from *Lulismo* years on Social Technology got very mild support.

Regarding this technobureaucratic and economically biased culture, we can say that, from the 1970s and 1980s, which were transitional years in many regards, it is even possible to see the gradual emergence of a consensus among new scientific leaders, seeking to take advantage of international funding opportunities. During the first stage of EU integration, for example, there was indeed visible effort to reconceptualize problems concerning STI policy by the stakeholders involved, from the more academic to official discourses suggesting reconfiguration of the ‘scientific system’ into an ‘innovation system.’ It was the case in the Iberian nations’ transition to democracy during the 1980s. There were similar trends within other peripheral contexts. The STI policy began to merge and reshape into a policy for applied imperatives. Under the aegis

of innovation as a panacea or picturing innovation as a *hope discourse*.^[71]

The ‘key apparatuses’ of the ‘pro-innovation’ rationale in S&T policies have been based on endless reports, indexes, scoreboards, databases, development outlooks, cluster plans, training courses, a ‘best practices’ rhetoric that guide science policy formulation and implementation at our present time. Performative and usually anonymous documentation that ultimately have the purpose of making stakeholders aware of the interests in favour of opening the administration (including the scientific infrastructure) to the pressures of economic forces.

This overview on Latin American STIP reveals not just a ‘pro-innovation’ bias but also a change in its paradigm, from promoting techno-scientific development (based on infrastructure) to a “pro-innovation” one based on the market and techno-innovative enterprises,^[95] accompanied by a substantial increase (but not catching with the developed countries) regarding the financial resources for the science, technology and innovation area. All the STI area interests took advantage of this relative growth of resources when the innovation rhetoric got the political and public spheres’ attention. However, the amount of resources involved and the proportion of R&D funded by the government in these countries still varies significantly; results regarding a structural change in these countries’ political economy are very mild. In 2018, for example, five countries were responsible for 87% of the Iberoamerican Gross Expenditure on R&D (GERD) (RICYT): Brazil, Spain, Mexico, Argentina and Portugal.

FINAL CONSIDERATIONS

Following Latin American countries (and having in mind the Iberian countries in the European periphery), it is easy to observe a similarity in the political and technocratic discourses and with the adopted institutional and policy settings. When one accepts a global perspective, it is indisputable that there is a good measure of similarity in discourses and policies.

In none of these countries, this ‘pro-innovation orientation’ was just a symbolic and discursive turn. There is on-going materiality in this process due to historical background and trajectories, shaping institutions, programmatic documents, policy mechanisms, funding options, etc., moulding a strategic thought and an innovation discourse pervasive to all areas, supported and legitimized by international organizations’ recommendations. International authority, then, aims to promote the desired effect in policy milieu, being instrumental in persuading courses of action.^[53] This approach to policy formulation and implementation based on the appeal of *models*, supported by *discourses*^[26] and *frameworks*,^[22] engenders a process of ‘isomorphism’^[27,28] on

the *structures* (institutions and policies) and *behaviours* (actors and discourses) regarding national STIP.

At the same time – although it is not the focus of this article –, we could unveil some nuances in the STIP process of those peripheral national cases. When looking at the *conformity* of STIP in Iberoamerica, the impact of isomorphic pressures tends to be more assertive on organizational strategies and culture than on structures and instruments. As the literature acknowledges, this means the impact regarding the adoption of the mainstream best practices in the national STIPs are more evident in terms of *compliance* (organizations movement in the direction consistent with isomorphic pressures) than in terms of *convergence* (the extent to which all organizations in a field resemble each other more closely over time) – which can happen with or without compliance, according to Ashworth, Boyne and Delbridge.^[67] However, *convergence* is manifest in the discourses and main goals of different Latin American national plans and even policy mechanisms/instruments, quite similar, while formal structures may vary more from country to country,^[58,96] though also following a continuous *movement in terms of a direction consistent with the isomorphic pressures* (i.e., *compliance*).

This subtlety is important because it shows what is happening in peripheral cases. Furthermore, to a significant degree, what is happening is a high level of *conformity* and, to a lesser extent, *convergence*.^[67] Apparently, in Latin America, for example, more than a policy learning – that ‘occurs when policy-makers adjust their cognitive understanding and modify policy in the light of knowledge gained from past policy experience’^[45] – what is happening is a *policy transfer*. An extensive diffusion of policy ideas, programmes and, more recently, what seems to be an acritical adoption of so-called ‘best practices.’

This concurs with what we have found throughout history: i.e., the development of imitative policies has been a typical feature of these regions. Moreover, following this *modus operandi*, one might view the advancement of innovation policies in the last two decades as *the only possible model*, which also seems to be the assumption of a ‘single thought’^[6] in the S&T area. That came to mean the predominance of instrumental reason dominating the realm of economic policy, which includes the subsuming of several historical dimensions on the *scope* of STI policy motivations (e.g., university, knowledge creation, culture) and – in what appears to be happening in the face of the hegemonic of Neochumpertian readings –, alienating endogenous traditions of thought.

As expected, when one raises the isomorphism debate, despite the existing literature and the empirical examples we have discussed, many STIP actors naturally reject the idea of merely replicating discourses or theories from abroad. Others (including scholars) prefer to stress national characteristics.

However, the two perspectives are not incompatible. There is room for different approaches, depending on following a micro or macro level of analysis. Thus, if one adopts a global view, both from a historical and contemporary perspective, the similarities and convergences are quite apparent, pretty remarkable when one analyses documental sources, stakeholders' discourses, as well as quantitative data.

Nonetheless, we do not intend to summarize the STI political and policy processes as involving only a single dynamic. As Niosi^[97] states, these transfers of knowledge and practices are challenging to evaluate because their result is *complex and difficult to observe*, imitation being an unfinished and still incomplete process which, in the long run, may uncover *cultural traits and local conditions*, following a hybrid path: i.e., 'While these trends are crucial, some of them may reinforce, rather than reduce, national differences.'^[97]

However, we claim here with this article that understanding these dynamics is important, taking us to a sort of issues that mainstream and more conservative approaches tend to disregard. The type of questions raised here matter for further debate, helping to clarify the future of STIP and how they happen in peripheral regions:

- In terms of actors, who is talking about innovation? What is the degree of variation in the policy discourses?
- Who are the hegemonic actors in the STI policy arena within those peripheral countries?
- What is the relation between policy actors and theorists of innovation (and its performative propositions)?

Those questions, in themselves contextual in nature, provide essential answers to understand, formulate and evaluate current STIPs, and most importantly, in peripheral countries, where, above all, mimetic discourses and practices play an instrumental role for agency purposes within the policy arena. Let us remember that STIP is one of the longest historical processes of argumentation, revealing how that despite the diversity of national cases, there is a global meaning to this institutional and policy settings. A historical perspective that shows us a wide degree of conformity, but paradoxically without the desired outcome, as it is evident when looking at those ST&I Latin American global indicators. This could mean many things, but certainly means that innovation, in its past and present political praxis, is a concept full of ambivalence and tensions, and already a political mantra for a significant time. Then, a bigger picture should be welcoming, allowing us to question our current frameworks and the hegemonic culture of nowadays STIP.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

ANI: Agência Nacional de Inovação [PT - National Innovation Agency]; **ANID:** Agencia Nacional de Investigación y Desarrollo [ES - National Agency for Research and Development]; **Capes:** Coordenação de Aperfeiçoamento do Ensino Superior [PT - Coordination for the Improvement of Higher Education]; **CNICyT:** Consejo Nacional de Investigaciones Científicas y Técnicas [ES - National Council for Scientific and Technical Research]; **CNPq:** Conselho Nacional de Pesquisas [PT - National Council for Researches]; **CONACyT:** Consejo Nacional de Ciencia y Tecnología [ES - National Council for Science and Technology]; **CONICET:** Consejo Nacional de Investigaciones Científicas y Técnicas [ES - National Council for Scientific and Technical Research]; **CONICYT:** Comisión Nacional de Investigación Científica y Tecnológica [ES - National Commission for Scientific and Technological Research]; **CORFO:** Corporación de Fomento de la Producción [ES - Production Promotion Corporation]; **CSIC:** Consejo Superior de Investigaciones Científicas [ES - Superior Council of Scientific Researches]; **ECLA:** Economic Commission for Latin America; **EU:** European Union; **FCT:** Fundação para a Ciência e a Tecnologia [Foundation for Science and Technology]; **Finep:** Financiadora de Estudos e Projetos [PT - Financier of Studies and Projects]; **FONACIT:** Fondo Nacional de Ciencia, Tecnología e Innovación [ES - National Fund for Science, Technology and Innovation]; **FONTAR:** Fondo Tecnológico Argentino [ES - Argentine Technological Fund]; **GERD:** Gross Expenditure on R&D; **IBD:** Inter-American Bank of Development; **JAE:** Junta para Ampliación de Estudios e Investigaciones Científica [ES - Board for Expansion of Studies and Scientific Researches]; **JEN:** Junta de Educação Nacional [PT - National Education Board]; **JNICT:** Junta Nacional de Investigación Científica e Tecnológica [PT - National Board of Scientific and Technological Research]; **MICITEC:** Ministerio de Ciencia, Tecnología, Conocimiento e Innovación [ES - Ministry of Science, Technology, Knowledge and Innovation]; **NIS:** National Innovation System; **OAS:** Organization of American States; **OECD:** Organisation for Economic Co-operation and Development; **R&D:** Research and Development; **RICYT:** Ibero-American and Inter-American Network of Science and Technology; **S&T:** Science and Technology; **STI / ST&I:** Science, Technology and Innovation; **STIP:** Science, Technology and Innovation Policy; **UN:** United Nations; **UNESCO:** United Nations Education, Scientific, and Cultural Organisation.

REFERENCES

1. Braun D. The mix of policy rationales in science and technology policy. *Melbourne Journal of Politics*. 2006;31:8-35.
2. Lundvall BA, Borrás S. Science, technology and innovation policy. Jan Fagerberg J, Mowery DC, Nelson RR, editors. *The Oxford Handbook of Innovation*. Oxford University Press; 2004;599-631.

3. Elzinga A, Jamison A. Changing policy agendas in science and technology. In: Jasanoff S, Markle GE, Petersen JC, Pinch T, editors. *Handbook of Science and Technology Studies*. London: Sage; 1995;572-97.
4. Guzzetti L. A Brief History of Innovation. European Union Research Policy. Brussels: European Commission; Office for Official Publications of the European Communities; 1995.
5. Oudheusden MV. Where are the politics in responsible innovation? European governance, technology assessments and beyond. *Journal of Responsible Innovation*. 2014;1(1):67-86.
6. Albornoz M. La política científica y tecnológica en América Latina frente al desafío del pensamiento único [ES - Scientific and technological policy in Latin America facing the challenge of single thought]. *REDES*. 1997;4(10):95-115.
7. Medina E, Marques IC, Holmes C, editors. *Beyond Imported Magic. Essays on Science, Technology, and Society in Latin America*. Cambridge, Massachusetts, London: MIT Press; 2014.
8. Oliveira MB. O inovacionismo em questão [PT - The innovationism at issue]. *Scientiae Studia*. 2011;9(3):669-75.
9. OECD. *Science and Technology Policy: Review and Outlook*. Paris: Organisation for Economic Co-operation and Development; 1991.
10. Mazzucato M. *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*. London: Anthem Press; 2013.
11. Guston DH, Keniston K. *The Fragile Contract: University Science and the Federal Government*. Cambridge, London: MIT Press; 1994.
12. Douglas H. *Science, Policy and the Value-Free Ideal*. Pittsburgh: University of Pittsburgh Press; 2009.
13. Godin B. Writing performative history: The new new Atlantis?, *Social Studies of Science*. 1998;28(3):465-83.
14. Hessels L, Lente HV. Re-thinking new knowledge production: A literature review and a research agenda. *Research Policy*. 2008;37(4):740-60.
15. Godin B, Vinck D, editors. *Critical Studies of Innovation: Alternative Approaches to the Pro-Innovation Bias*. Edward Elgar; 2017.
16. Velho LMS. Conceitos de Ciência e a Política Científica, Tecnológica e de Inovação [Science Concepts and Scientific, Technological and Innovation Policy]. *Sociológicas*. 2011;13(26):128-53.
17. Miettinen R. *National Innovation System: Scientific concept or political rhetoric?* Helsinki: Edita; 2002.
18. Lundvall BA, editor. *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Anthem Press; 1992.
19. Edquist C, editor. *Systems of Innovation: Technologies, Institutions and Organisations*. New York, London: Pinter; 1997.
20. Nelson RR, editor. *National Innovation System: A Comparative Analysis*. Oxford: Oxford University Press; 1993.
21. Rosenberg N, Nelson RR. *Technical innovation and National Systems*. In: Nelson RR, editor. *National Innovation System: A Comparative Analysis*. Oxford: Oxford University Press. 1993.
22. Godin B. *The Making of Science, Technology and Innovation Policy: Conceptual Frameworks as Narratives, 1945–2005*. Montreal: INRS; 2009.
23. Etzkowitz H, Leydesdorff L. The endless transition: A triple helix of university-industry-government relations. *Minerva*. 1998;36:203-18.
24. Leydesdorff L. The triple helix: An evolutionary model of innovations. *Research Policy*. 2000;29(2):243-55.
25. Gibbons M, Limoges C, Nowotny H, Schwartzman S, Scott P, Trow M. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage; 1994.
26. Majone G. *Evidence, Argument and Persuasion in the Policy Process*. New Haven (CT): Yale University Press; 1989.
27. Drori G, Meyer J, Ramirez F, Schofer E, editors. *Science in the Modern World Polity. Institutionalization and Globalization*. Stanford (CA): Stanford University Press; 2003.
28. DiMaggio PJ, Powell WW. *The New Institutionalism in Organizational Analysis*. Chicago: University of Chicago Press; 1991.
29. Prebisch R. Panorama general de los problemas de regulación monetaria y crediticia en el continente americano [ES - General overview of the problems of monetary and credit regulation in the American continent]. In: *Memoria de la Primera Reunion de Tecnicos sobre Problemas de Banca Central del Continente Americano*. Ciudad de Mexico: Banco de Mexico; 1946;25-33.
30. Furtado C. *Desenvolvimento e subdesenvolvimento* [PT - Development and underdevelopment]. Rio de Janeiro: Fundo de Cultura; 1961.
31. Singer H. Gains and Losses from Trade and Investment in Under-Developed Countries. *American Economic Review: Papers and Proceedings*. 1950;40(2):473-85.
32. Shils E. Centre and periphery. In: *The Logic of Personal Knowledge: Essays Presented to Michael Polanyi on his seventieth birthday, 11th March 1961*. London: Routledge and Kegan Paul; 1961;117-30.
33. Mirowski P, Plehwe D. *The Road from Mont Pelerin: The Making of the Neoliberal Thought Collective*. Cambridge (MA): Harvard University Press; 2009.
34. Hood C. The "New Public Management" in the 1980s: Variations on a theme. *Accounting Organisations and Society*. 1995;20(2-3):93-109.
35. Brandão T. A emergência da Junta Nacional de Investigação Científica e Tecnológica (1967-1974): Receção de um modelo e racionalidades tecnocratas [PT - The emergence of the National Board of Scientific and Technological Research (1967-1974): Reception of a model and technocratic rationalities]. *Análise Social*. 2017;223(LI12):234-79.
36. Godin B. *Social Innovation: Utopias of Innovation from c. 1830 to the Present*. Working Paper No. 11, Project on the Intellectual History of Innovation. Montréal: INRS; 2012;11:1-5.
37. Bagattolli C. *Política Científica e Tecnológica no Brasil: Mitos e Modelos num País Periférico* [dissertation] [PT - Science and Technology Policy in Brazil: Myths and Models in a Peripheral Country]. Campinas: Unicamp; 2013.
38. Boskin MJ, Lau LJ. *Contributions of R&D to Economic Growth*. In: Smith BLR, Barfield CE, editors. *Technology, R&D and the Economy*. Washington (DC): The Brookings Institution and American Enterprise Institute; 1996;75-113.
39. Mansfield E. *Contributions of New Technology to the Economy*. In: Smith BLR, Barfield CE, editors. *Technology, R&D and the Economy*. Washington: The Brookings Institution and American Enterprise Institute; 1996;114-39.
40. Machlup F. *The Production and Distribution of Knowledge in the United States*. Princeton: Princeton University Press; 1962.
41. Foray D. *L'économie de la connaissance* [The knowledge economy]. Paris: Editions La Découverte; 2000.
42. Kallerud E. Goal conflicts and goal alignment in science, technology and innovation policy discourse. *EASST 2010 Conference: Practicing Science and Technology, Performing the Social*. 2000;1:1-22.
43. Harvey D. *Breve historia del neoliberalismo* [ES - A Brief History Of Neoliberalism]. Madrid: AKAL; 2007.
44. Dolowitz DP, Marsh D. Learning from abroad: The role of policy transfer in contemporary policy-making. *Governance: An International Journal of Policy and Administration*. 2000;13(1):5-24.
45. Stone D. Transfer agents and global networks in the "transnationalization" of policy. *Journal of European Public Policy*. 2004;11(3):545-66.
46. Amadeo E. Los consejos nacionales de ciencia y tecnología en América Latina. Éxitos y fracasos del Primer Decenio [ES - The national councils of science and technology in Latin America. Successes and Failures of the First Decade]. *Comercio Exterior*. 1978;28(12):1439-47.
47. Oteiza E. *La Política de Investigación Científica y Tecnológica Argentina: Historia y Perspectivas* [ES - The Argentine Scientific and Technological Research Policy: History and Perspectives]. Buenos Aires: Sociedad y Cultura; 1992.
48. Bell M. *The Great Experiment: Harnessing Science and Technology to Third World Development. A Review of Policy and Policy Analysis since the 1950s*. Brighton: SPRU; University of Sussex; 1985.
49. Bastos MI, Cooper C. *Politics of Technology in Latin America*. London: Routledge; UNU Press; 1995.
50. Dagnino, R. and H. Thomas. *La política científica y tecnológica en América Latina: nuevos escenarios y el papel de la comunidad de investigación* [ES - The science and technology policy in Latin America: new scenarios and the role of the research community]. *REDES*. 1999; 6 (13): 49–74.
51. Albornoz M. *Innovación, equidad y desarrollo latino-americano* [ES - Innovation, equity and Latin American development]. ISEGORIA. *Revista de Filosofía Moral y Política*. 2013;30(48):111-25.
52. DiMaggio PJ, Powell WW. The iron cage revisited: institutional isomorphism and collective rationality in organization fields. In: Powell WW, DiMaggio PJ, editors. *The New Institutionalism in Organizational Analysis*. Chicago: University of Chicago Press; 1983;63-82.
53. Bagattolli C, Brandão T, Davyt A, Nupia CM, Salazar M, Versino M. *Relaciones entre científicos, organismos internacionales y gobiernos en la definición de las Políticas de Ciencia, Tecnología e Innovación en Iberoamérica* [ES - Relations between scientists, international organizations and governments in the definition of Science, Technology and Innovation Policies in Ibero-America]. In: Casas R., Mercado A. *Mirada Iberoamericana a las Políticas de Ciencia, Tecnología e Innovación. Perspectivas Comparadas*. Madrid: CYTED; CLACSO; 2016;187-219.
54. UNESCO. *The role of national research council in the formulation of a national policy for and the financing of scientific research*. Meeting of directors of national research centres. Milan: United Nations Educational, Scientific and Cultural Organization; Retrieved from UNESCO/NS/IAC/31; 1955.
55. Motoyama S. *Prelúdio para uma história: ciência e tecnologia no Brasil* [PT - Prelude to a story: Science and technology in Brazil]. São Paulo: Editora da USP; 2004.
56. Shenhav YA, Kamens DH. The "costs" of institutional isomorphism: Science in non-Western countries. *Social Studies of Science*. 1991;21(3):527-45.
57. McNeely C. *Constructing the Nation-state. International Organization and Prescriptive Action*. Westport, CT: Greenwood Press; 1995.
58. Jang YS. *The Worldwide Founding of Ministries of Science and Technology, 1950-1990. Sociological Perspectives*. 2000;43(2):247-70.
59. Muniz NAC. *O CNPq e sua trajetória de planejamento e gestão em C&T: Histórias para não dormir, contadas pelos seus técnicos (1975-1995)* [dissertation] [PT - O CNPq e sua trajetória de planejamento e gestão em C&T: Histórias para não dormir, contadas pelos seus técnicos (1975-1995)]. Brasília: Universidade

(ENDNOTES)

1. < <https://www.ani.pt/en/> >
2. The Ibero-American and Inter-American Network for Science and Technology Indicators (RICYT) was created following a proposal outlined in the First Ibero-American Workshop for Science and Technology Indicators, held in Argentina in 1994. All the American countries, as well as Spain and Portugal, participate in RICYT. Today, its primary support is the Ibero-American States Organization (OEI), through the Observatory for Science, Technology and Society. RICYT takes part as observer in the NESTI Group of the Organization for Economic Cooperation and Development (OECD). Besides, RICYT works jointly with the UNESCO Institute for Statistics, the Interamerican Development Bank (IADB), the Economic Commission for Latin-America and the Caribbean (ECLAC), among other institutions.
3. < <http://www.sofinnova.com/> >.
4. < <http://www.meti.go.jp/english/apec/apec-isti/ISTI/abridge/jpz/jpzsm03.htm> >.
5. < <http://www.finep.gov.br/> >.
6. < <http://www.agencia.mincyt.gob.ar/frontend/agencia/fondo/fontar> >.
7. < <http://www.corfo.cl/inicio> >
8. < <http://fonacit.gob.ve/> >
9. < <https://www.minciencia.gob.cl/> >.
10. < <https://www.anid.cl/historia/> >.
11. Bagattolli et al. (2016) present a more detailed account of the impact of international organizations on the STIP of Iberoamerican.