POLICIES, EVALUATIONS AND INDICATORS THE ROLE OF INSTITUTIONAL DESIGN OF PUBLIC AGENCIES. THE CASE OF CONACYT AND THE NRS PROGRAM

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SUMMARY.

This paper aims to contribute to the thematic stream upon organizing work in the knowledge economy, and it is related to the question concerning both governmental strategies to foster creativity among workers and organizations, and the institutional design of the public agencies in charge of the development of science and technology. Our contribution explores the level of coherence among policy's aims, programmers' objectives, the methodologies to evaluate them and the indicators available focused in the institutional design of the regulatory agencies. It draws from the Mexican experience in the role of the regulatory agencies, the implementation of policies addressed to university research, as well as the designing of evaluations and the state of the art in the use of methodologies related to R&D and innovation activity. The exploration benefits from the discussion upon evidence-based public policy and STI indicator development (OECD, 2007a; Painter, 2007; Gough, 2007).

Key words: Governmental strategies, knowledge economy, public agencies, R&D and innovation activity.

RESUMEN.

Este trabajo tiene como objetivo contribuir a la corriente temática sobre organización del trabajo en la economía del conocimiento, y está

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relacionada a la pregunta sobre las dos estrategias gubernamentales para fomentar la creatividad entre los trabajadores y las organizaciones, y el diseño institucional de los organismos públicos encargados de la elaboración de la ciencia y la tecnología. Nuestra contribución se exploró el nivel de coherencia entre los objetivos de la política, los objetivos de programas, las metodologías para su evaluación y los indicadores disponibles se centraron en el diseño institucional de las agencias reguladoras. Se basa en la experiencia mexicana en el papel de las agencias reguladoras, la aplicación de políticas dirigidas a la investigación universitaria, así como el diseño de las evaluaciones y el estado de la técnica en el uso de metodologías relacionadas con la I + D e Innovación. La exploración se beneficia a partir de la discusión centrada en una política pública basada en la evidencia y el desarrollo de indicadores de STI (OCDE, 2007a; Pintor, 2007; Gough, 2007).

Palabras clave: Estrategias gubernamentales, economía del conocimiento, organismos públicos de I + D e Innovación.

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INTRODUCTION.

Earlier diagnoses on the main features of the Mexican system of innovation had identified an inadequate number of key institutional actors and a low level of articulation among the existing ones (Cimoli, 1999, 2000). As a response, policy makers began to reshape the institutional design in order to increase interactions among different actor in the S&T and economic arena. Collaboration between researchers and industry began to emerge as one of the principal aims of incumbent programmes and it has also inspired the lunching of new initiatives.

However, a decade later, the common perception is that the panorama has not change significantly. (Casalet and Gonzalez, 2003; Cabrero et al. 2006; FCCyT, 2006, Brunner et al. 2006) A convincing explanation of why this has been so is still pending to be offered. To this purpose, research evidence has to be gathered from different levels. In the meantime, we propose to start by analyzing how policies, programmes and measures revolve around the issue of collaboration, and studying the manner in which the creation of semi-autonomous public organizations may influence the implementation of policies.

In this sense, scholars and practitioners have warned about the limitations of R&D indicators to provide a comprehensive picture of the current innovation society. They point out that current indicators depict a partial illustration of a broader innovative effort, and then it is necessary to undertake research work that substantiates complementary indicators. (Hawkins, et al. 2007).

In the Mexican case, this concern increases to a higher level for the following reasons. Universities play a crucial role in the Mexican innovative system. It has been reckoned that crucial capabilities for the development of innovation and knowledge sources are highly concentrated in Higher Education Institutions (HEI) as a whole. They have been considered as an important knowledge repository too.

Universities are the most developed actor in the Mexican system of innovation, and then policy-makers should take advantage of that to leverage other actor's capabilities. However, current indicators and the role of regulatory agencies do not approach the issue of knowledge transfer in a comprehensive manner. There is still a great deal of work to do at international level in this area.(OECD, 2007b; Rip, 2003) In Mexico, the indicators available address the issue of technology transfer, mainly trough patent and licensing statistics, leaving out other outcomes and more subtle knowledge flows. (CONACYT, 2007)

Officials both from the ministry of education and the National Council for Science and Technology agree on the need to foster collaboration practices between university and the economic sector (SEP, 2007; Tuirán 2007; Rubio, 2006;); however there is a lack of evidence and analysis on the state of collaboration practices in México. (CONACYT, 2001, 2006). Regrettably, the willingness to implement programmes to promote links is hindered by the lack of a sound diagnosis; consequently, the success of intervention and the incentives can be jeopardized.

Methodology: To gain a deeper understanding on the level of coherence among policies, evaluations and indicators, this paper focuses mainly upon the issue of collaboration and knowledge transfer. Hence, the National Council for Science and Technology (CONACYT)'s programmes intended to promote S&T will be analyzed considering its institutional design. Particular attention will be placed on the analysis of a particular programme, the National Researches System (Sistema Nacional de Investigadores – SNI); because of the importance it has on university researchers.

In order to analyze mismatches between programme's objectives and ongoing evaluation practices, objectives and current practices are critically analyzed.

Preliminary findings point towards mismatch between policy's aims and monitoring practices and deviation between programme's aims and indicators.

It becomes evident the need to enhance feedback mechanisms between innovation policy research and Mexican policy making. In this sense, *brokerage agencies* may perform as key actor to link innovation policy research and policy making, in a similar manner to what Robert Boruch and Rebecca Herman suggested in the area of education research (Herman and Baruch, 2007).

I. SCIENCE AND TECHNOLOGY IN MEXICO. INSTITUTIONAL CONTEXT.

CONACYT's Institutional Design.

The antecedents of the CONACYT might be traced back to the end of the 1960s decade when the interest to establish a more formal policy had emerged among members of the scientific community and top governmental officials. The Council was born in 1971 as a public agency hierarchically subordinated to the Presidency and later moved to the Ministry of Programming and Budget. During its first years it appeared as a decentralized public body attached to the Ministry of Education; and throughout the first six years of existence, the Council was oriented to develop a close connection with the industrial sector and to establish several committees. In the following years, Mexico experienced the oil boom and an increasing of the public expenses, and perhaps because of that more public expenditures were granted to the development of Science and Technology; however, in spite of the policy programs, the Council failed to achieve an appropriate coordination with the academic and industrial sectors, even though by 1976 a network of the public centers were established. (Soberon and Urquido 1992).

Since the 1980s decade the Mexican context has been characterized by the presence of continuous economic crisis, and consequently the policy related to science and technology was affected, in such a way that the public expenditure granted to Conacyt was reduced and scholarships and funds were scarce. As a result of this situation the scientific community experienced the so-called brain drain and enormous difficulties to perform their job. In this regard, in 1984 was set up the National System of Researchers.

In the next decade, Conacyt and the whole federal public administration were subject to several transformations attached to the New Public Management trend, for example it was stated that Conacyt needed to meet the economic modernity in terms of delivering public services, external competitiveness and to change the regulatory framework in order to promote the economic activity and stimulates the innovations processes.

During the 1990's decade, the Mexican State was subject of diverse transformational processes not only in the regulatory framework, but also in the design and evolution of some kind of new hybrid public agencies, in which autonomy and independence seemed to play an important role. In this regard, the science and technology sector was transformed. The Ministry of Education acquired more faculties and competences related to the encouragement of science. These responsibilities were transferred to Conacyt and since then it began to be responsible for the so-called SEP-Conacyt System, which includes the establishment of the public research centers network. The main assumptions of those changes were firstly, to integrate research institutions in a sub-subsector and in consequence to promote the cooperation by means of new forms of partnership; and secondly to find an appropriate balance between the decentralization of the scientific and technology activities and enough coordination among the public and private entities.

The current institutional design of Conacyt is based on the amendments to the Science and Technology Law and the Organic Law of the National Council of Science in 2002, which grants more autonomy and independence to the Council, separated from the Ministry of Education as a decentralized public agency with technical and administrative autonomy. However, it is important to note that differently to other autonomous agencies there is a hierarchical relation with the executive power in so far the General Director is appointed and freely removed by the President.

To a certain extent Conacyt might be considered as a new form of public organization in which a reasonable degree of autonomy is necessary to perform its functions, and the establishment of a more heterogeneous mechanisms of governance and consultant becomes the key to foster science and technology. Conacyt's design attempts to set up the Council as a structurally disaggregated body removed from the Ministry that posses a high degree of specialization and the search for a considerable level of depolitization, even though there is a potential risk of a deficient coordination.

II. ANALYSIS OF POLICY PROGRAMS's AIMS

Policy Aims.

Since its creation in the early 1970s CONACYT had established the importance of not only increasing the public and private investment in science and technology, the number of scientists and engineers, and strengthening the scientific infrastructure in the country, but it also established the goal of collaboration as one of the most important for the development of scientific and technological capabilities.

During its first decade of existence, the issue of collaboration did not appear as a priority in the official discourse, as an objective it began to emerge more clearly in the next decade (1980's), when collaboration between Higher Education Institutions (HEI), Public Research Centers (PRC) and industry began to emerge more boldly.

During the early 1990s, according to the National Program for Scientific and Technological Modernization 1990-1994 (Programa Nacional de Ciencia y Modernización Tecnológica), CONACYT decides to invest a small part of its budget in risk capital, technological parks and incubators, as well as in the linking of universities and industries. At least in the discourse of the official programs, the science and technology policy goals began to be related to the need of meeting economic and social demands, as well as implementing different mechanisms to link researchers in the public sector with companies.

The National Plan for Development (1995-2000) (Plan Nacional de Desesarrollo) set the goal of fostering a quality culture among companies that enable them to increase their exporting capabilities; promotion of industrial clusters and parks; and once more, to foster collaboration among the economic and scientific actors.

Specifically, in terms of scientific and technological policy, the Plan established that:

"In the context of globalization, it is of foremost important that the country achieve a greater capacity to participate in the worldwide scientific progress and to transform that knowledge in useful applied developments, especially in terms of technological innovation. This means that the country has to endow a solid infrastructure of basic and applied research and, particularly, highly trained scientists in every discipline. **Additionally, it is necessary to enhance the ability of the productive sector to innovate, adapting and diffusing technological development in order to increase productivity**". (Emphasis added by authors).

The National Program for Science and Technology (1995-2000) highlights the need of decentralizing scientific and technological activity, the use of public resources under the basis of rationality, and the importance of **promoting coordination among sectors and institutions**.

The program acknowledges that it is very important to strengthen the culture of innovation in the productive sector: "in the technological field, it is of great importance to generate in productive companies a greater interest and ability to create and absorb new technological knowledge". Among the programs objectives we find some of them that are related to bridging science and technology with technological needs:

- Research ought to respond to economic and social needs.
- Increase links between the academic and business community.
- The SEP- Conacyt Public Research Center System has to facilitate decentralizations and the connection between research and country needs.

In this period it is acknowledged that former programs get short at achieving their socioeconomic goals because they did not incorporated technological knowledge as a core element in an innovation strategy. They admitted as well, that they failed when inadequately promoted more coordination among crucial actors such as companies and universities.

Programa Especial de Ciencia y Tecnología (2008-2012).

The National Program for Science and Technology (PECiTI) 2008-2012 (Diario Oficial de la Federación, martes 16 de diciembre de 2008) states "the National Plan for Development's guide the objectives of the Special Program for Science and Technology. The PECiTy conceive them as a launching platform to detonate the growth of science, technology and innovation in the country. It also states that it will be crucial the **collaborating and interaction** among all the agents in the sector, along with more funding for research and the increasing participation of the productive sector in that investment. (p.4)

III. THE NATIONAL RESEARCHERS SYSTEM.

The National Researchers System (NRS) programme (known in Mexico as SNI, the acronym in Spanish for *Sistema Nacional de Investigadores*), has

become one of the most important and stable programmes managed by CONACYT.

This programme was launched in 1984, incorporating only 1,396 researchers as beneficiaries, and since then it has been operating as one of the most permanent and important for the Mexican research community. It can be observed in graph 1 that researcher's membership to the system has been growing since middle 1990s. In 1995, the total number of researchers belonging to the NRS was 5,868 and it grew to 13,485 researchers in 2006 (Parada 2004a).

Graph 1-

Source: Parada, Jaime (2004a) Informe 2001-2003 y perspectivas para el 2004, CONACYT, Mexico.

The total number of researchers in Mexico in 2002 was estimated by CONACYT (CONACYT, 2004) as 27,626, which means that approximately 36% of the total population of researchers belongs to the NRS.

This programme covers a wide range of disciplines both in the natural and social sciences areas. It benefits researchers from humanities and social sciences to engineering, including basic and natural sciences.

Apparently, the membership composition has been mirroring some characteristics of the Mexican R&D system, inasmuch it shows geographical, institutional and gender concentration. Even though Council efforts to decentralize R&D activity, researchers supported by this programme are still concentrated in important higher education institutions located in central Mexico, it has gradually incorporated researchers from other states and institutions.

Regarding the geographical distribution of NRS members, approximately 49.5% work outside Mexico City, but only 10% of these belong to the highest levels NRS 2 and NRS 3. CONACYT (2001:48)

In 2001 the institutional distribution of NRS researchers was as follows: UNAM (29%); SEP-CONACYT Centers (12%); IPN and CINVESTAV (6%); UAM (6%); different state universities (21%). CONACYT (2002:66)

According to figures from 2003 and 2004, approximately 70% of the researchers are men and 30% women. CONACYT (2004c), CONACYT (2005).

This programme is also relevant considering that the financial support for its beneficiaries represents around 20% of the CONACYT budget. (See Table 1).

Table -1 CONACYT'S budget in main areas of investment in 2003. (Millions of Mexican Pesos)

Area of investment	Budget	Percentage
National Researchers System (NRS)	1,017.7	20.0
Scholarships for Postgraduate studies	1,619.2	31.9
Scientific and Technological Projects	1,958.8	38.6
Administration and Diffusion	481.0	9.5
Total	**5,076.7**	**100**

Source: CONACYT (2004b) Informe General del Estado de la Ciencia y la Tecnología 2004. CONACYT, Mexico.

At the moment in which the NRS was created, the Mexican S&T policymakers faced macroeconomic challenges. The economic crisis in early 1980s harmed the real purchasing power of national researchers; it was necessary to boost research capabilities in the context of increasing economic competence; and it was necessary to face both challenges by assuring a more rational S&T policy by using criteria to get the most from the scarce public money invested. (Valenti et al., 2000:156; OCDE, 1994:93) The previous factors led CONACYT to design the National Researchers System.

The NRS creation decree of 1984 established the following main objectives (Article 1):

1. Foster the country's scientific and technological development by strengthening research in any discipline and specialisation, by supporting researchers from higher education institutions and public research centers.
2. Increase the number of national researchers and upgrade their professional level.

3. Promote efficiency and quality in research.
4. Promote public sector research according to the priorities stated in the National Development Plan, "*Plan Nacional de Desarrollo"*.

The programme was originally addressed to researchers in higher education institutions and research institutions from the public sector; however, in 1986 an amendment in its constitution decree allowed to incorporate researchers from the private sector. (D.O.F. 6th of February 1986)

Even though the programme appeared as an instrument focused on public sector research and academia, aimed to enhance the quality and quantity of research and to promote human resources formation; over time it gradually began to incorporate other non academic responsibilities related with its contribution to the development of national competitiveness in a global economy and to compensate national and regional inequalities. The next extracts from its regulations exemplify this evolution:

Just four years after its foundation, in 1988 the NRS's regulations included the next statement to justify the importance of the programme. "the creation of the NRS […] has probed that the promotion of scientific research **increases** not only the enthusiasm to participate in this activity, but also what is of overall importance, **the productivity of areas and sectors which development represents an important factor for achieving the national economic and social advance**" (CONACYT, 1988a). Even though there was not an evaluation demonstrating such level of impacts, the statement illustrates the implicit model operating in CONACYT's policy-makers who designed and updated this programme. It shows that there is a straightforward connection between the promotion of science and technology and socio-economic development. (Emphasis added)

More recently, in 2003, the NRS's regulations included the next statement in its justification. "The National Researchers System (NRS) will continue promoting scientific and technological development, but it will have to increasingly emphasize the formation of new **researchers committed with the elimination of the recently deepened gap between science, technology and social development"** (CONACYT, 2003, Reglamento del SNI 2003, Artículo 1, Capítulo I,). (Emphasis added by the authors)

In the same year, the NRS's regulations made clear that the main objective of the NRS is to contribute to solve national problems. "The objective of the NRS is to reward national research work by a science and technology competition, contributing to both enhance international

competitiveness in these areas and **to solve national problems**. As a reward, distinctions and financial incentives are granted; these certify quality, productivity, relevance an impact of the work done by selected researchers" (CONACYT, 2003, Reglamento del SNI 2003, Artículo 1, Capítulo I,). (Emphasis added by the authors)

One of the provisions of the NRS's regulations for 2003 states that the general criteria to incorporate new members are: "contributions to scientific, technological and cultural knowledge, by the means of research, science diffusion, and **activities to connect public, social and private sectors, as well as to develop infrastructure**. (CONACYT, 2003, Reglamento del SNI 2003, Capítulo VIII: de las distinciones, Artículo 19) (Emphasis added by authors).

Additionally, CONACYT (2003) claims that in the NRS, "the State has a source of experts in diverse disciplines, able to produce responsible, realistic and well supported opinions upon **how to overcome national problems, and the measures that need to be taken to optimally implement such solutions**" (CONACYT, 2003, Reglamento del SNI 2003:3, Exposición de Motivos) (Emphasis added by authors)

It is possible to observe how this programme that appeared mainly aiming at scientific and academic related goals, gradually and explicitly began to incorporate broader socio-economical objectives. However, it has been maintaining basically the same structure, selection mechanisms, operation and traditional peer review system.

Structure and regulations.

Levels.

The NRS establishes two main categories to classify researchers: 1) National Researchers and 2) Candidate to National Researcher. The first one is subdivided into three consecutive levels: NRS 1, NRS 2 and NRS 3. Each level has an associated pecuniary fellowship. The second category is for young researchers who are at the beginning of their research career.

Evaluation Committees.

There are 7 Evaluation Committees (*Comisiones Dictaminadoras*) in the National Researchers System, one per each of the 7 disciplinary areas. These are peer review committees integrated by 12 distinguished scientists who belong to the NRS 3rd level. Members of the Evaluation committees

act as evaluators for a 3 years period and then they are renewed. Every year four of its members are substituted.

These committees are very important because they review the applications for incorporation into the System as well as they review and judge the annual reports that every researcher is obliged to submit for monitoring his/her activity and the performance of research project supported by CONACYT. They decide in principle who is accepted and who is not longer meeting the acceptance criteria and therefore should not been supported and lose the NRS status. Recently, a mechanism to review the Committee's decisions has been made explicit.

Evaluation practices at CONACYT

External evaluation of programs in CONACYT is still an incipient practice that needs more systematization. Regrettably, the methodologies and results of external evaluations for some projects are not disclosed to the public yet. However, regarding internal evaluation the panorama is less mysterious. We could observe from interviews that it has an administrative character and it is intended to monitor administrative indicators to assist programme managers in the achieving of administrative goals.

The ex-ante and on-going evaluation of individuals and supported projects, is conducted by a strong peer system. Some of these peers are NRS beneficiaries that become evaluators when the Council nominates them as such.

The study of the evaluation practices within the NRS was useful for a double reason. Firstly, it explained how evaluation procedures are implemented to select beneficiary members within this programme, and secondly, because top NRS researchers become evaluators of projects supported by the Council.

According to CONACYT's statistics, the NRS programme supports a third of the national researchers and consumes a fifth of the Council's budget. Nevertheless, the real significance of this programme goes beyond its coverage of beneficiaries and financial resources.

Some studies (Jaso, 2007) has began to look at the way the NRS has been able to change the research dynamics within a scientific and technological community. In other words, its significance has to be found in the way it has been affecting the nature of research projects and collaborative behavior. Therefore, its relevance can be identified by the way its incentives are being able to modify researchers and technologists routines in the search for funding.

These Committees are very important because they review applications for the incorporation of new members into the system. They also evaluate compulsory annual reports from current members and supported projects (as part of on-going evaluation mechanisms). These committees decide in principle that is admitted, upgraded, downgraded or expelled from the system (losing the NRS status).

According to the official regulations, peers within Committees have to consider general criteria, such as production of scientific and technological research (measured through publications); contribution to specialised human resources; participation in diffusion of science; contribution to the promotion of collaboration between the productive and social sectors; and development of infrastructure.

However, specific criteria are in practice redefined by each disciplinary Committee. Interviews with NRS programme managers, members of evaluation committees and beneficiaries, made clear that the main criterion is the number of publications in journals indexed in the ISI database. The journal's impact factor, as well as citations to the articles is considered as proxy indicators of quality and impact of research.

I. DISCUSSION.

Recent changes in Conacyt might be explained as a consequence of two main pressures, firstly as a product of some international trends processes aimed at transforming the public sector and the kind of interactions between citizens and government; secondly, as the result of internal pressures by the academic sector that has advocated for a greater involvement in the design and formulation of policies related with science and technology. New forms of governance have contributed to develop innovative public single-purpose organizations characterized by a high degree of vertical and horizontal specialization, as well as, the establishment of ad-hoc units and programs to cope with the demands of the context.

The above could lead to establish central dilemmas related to question of finding an appropriate balance between the necessity of having enough autonomy to perform its functions and to interact with diverse sectors such as universities, research centers and industry, and on the other hand, enough control to avoid the risk of atomization and lack of coordination in the science and technology policy. Different to other governmental sector, the governance structure of the policy of S&T has established an institutional space to discuss and to formulate the policy;

and to make a considerable effort to gather the most important actors in both public and private sector. In this regard, coordination is based through continuous interactions between Conacyt, the General Council of Research Investigation and Technological Development, the Scientific and Technology Advisory Board, the Research Public Centers, and the National Network of Groups and Research Centers. Nevertheless, differences between federal and local norms do not allow a greater coordination.

Now if we look at the relationship between programme's objectives and its own internal evaluation criteria we can observe some inconsistencies.

The Table 2 below shows the insufficiency of CONACYT's evaluation tools for the assessment of expanding NRS's objectives. On the one hand, the NRS's objectives have been expanding to incorporate broader socio-economic goals, such as linking public, social and private actors, and solution of national needs[4], but on the other, requisites and criteria in regulations and practices continue supporting the traditional academic profiles. We have to admit that patents and technology transfer have certainly been incorporated in printed guidelines, but patent activity in Mexico is not significant and its value for the evaluation of individuals is dubious. The ability of scientists to value technology transfer has also been questioned.

Another contrast can be observed between the requisites to apply and be upgraded within the NRS and the criteria and set of indicators that peers are supposed to use in the evaluation of researchers. While there is a more plural list of indicators (publications, conferences, patents, etc.) the requisites to be upgraded are concentrated in those aspects that depict the consolidation of a remarkable academic career. To illustrate this point, we shall present the following requirements that depict the consolidation of an academic profile: for joining NRS level 1 a researcher has to demonstrate original and high quality research; for being upgraded to the next level, the research has to show in addition continuity, consistency and public recognition. For joining the next level, the expectations go higher and demand a superior scientific or technological contribution, leadership, national and international recognition and a reputable trajectory in human resources formation and training.

This mismatch may be explained either because of the Council expects that the same evaluation methods employed for the evaluation of traditional academic objectives can be employed in the evaluation of socio-economic objectives or it has not been expeditious in the customization of evaluation methods for the assessment of its new objectives.

Table 2
Evaluation tools for the assessment of expanding NRS's objectives.

	Traditional Academic Objectives	Broader Socio-economic Objectives (Gradually incorporated)
Explicit Objectives	• Foster the country's scientific and technological development by strengthening research, by supporting research from HEI and PRC. (Creation decree, 1984)	• Elimination of science, technology and social development gap. • Enhance competitiveness in science and technology and solve national problems. • Connect public, social and private sectors. (CONACYT, 2003, Reglamento SNI)
Requisites for applying to NRS	• NRS Level 1: Original and high quality research. • NRS Level 2: Previous plus continuity and consistency of research along with public recognition. • NRS Level 3: Previous plus transcendental science or technological contribution, leadership, national and international recognition and reputable human resources trajectory.	Nil
Criteria and Indicators	• Publication in indexed journals, journal impact factor, citations. • Participation in academic events. • Human resources formation.	• Criterion: Contribution to the promotion of collaboration between productive and social sectors. • No suitable indicators have been developed. • Regulatio ns mention: Patents and technology transfer agreements.
Evaluation methods	• Traditional peer review supported by basic bibliometric indicators.	• Traditional peer review supported by basic bibliometric indicators.

Source: Made by the authors.

In this paper we have made an attempt to combine two research projects namely Science and Technology Policy, and Regulation and Regulatory Agencies. By drawing on the analysis the institutional design of the Council, two general models of regulation stand out; one the one hand, the idea of a regulatory intervention through authorities, and on the other hand, by means of legislative acts and policy programs. However, there is not enough attention to the potential tensions in terms of transparency and accountability of the organizations related to the S&T.

The discussions of these themes open the door for future research concerning not only the development of S&T in Mexico, but also to study the specific conditions under which innovative systems may take place. For example, when the State decide the establishment of public-private partnerships, the creation of regulatory mechanisms that allow a better performance in the implementation of policy programs, and the role and coordination of other regulatory agencies to promote economic advancement and development of S&T.

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