

SCIENCE AND TECHNOLOGY PARKS: POLICY TOOL FOR CITIES' DEVELOPMENT?

The contribution of this paper consists of a model to assess how Science and Technology Parks (STPs) are impacting cities development. Brazilian policy makers claim them to be a strategic policy for development of cities. If so its formulation and implementation would be accordingly to the result development expected in those cities they are located and policy evaluation would capture previously planned benefits. However it seems to be not clear what kind of development STP is supposed to reach or how this policy can be adjusted institutionally if its needed. Maybe this reflects the lack of studies considering STP a policy. Still even if one presumes it according to the multicentric view of policies (SECCHI, 2010), those who examine policy cycles would neither cogitate STP as a possible policy to be studied.

Thus, the ambition of this paper is to address these gaps. Based on about 200 previous case studies developed by other authors, the following research question is answered: "how to observe STP's development effect on city's where they are located according to studies previously done?" Hypothetically by constructing a model to observe STP effect on cities indicators.

To do so by applying Systematic Literature Review (LEVY E ELLIS, 2006) combined with Coding Process (MILES AND HUBERMAN, 2014) with the support of Atlas Ti software and analyzing data from Development Theories in perspective, the following steps was taken:

- (i) Based on various development and public policy studies we learnt what kind of development authors think STPs are supposed to promote in cities and what indicators could measure them;
- (ii) Ascertain what incentives generated by the STP could connect with those types of development expected;

The result was:

- 1) Seven types of development STP can cause in cities;
- 2) Seven classes of indicators for each development;
- 3) Seven groups of STP internal incentives connected to those developments.
- 4) Possible data sources in Brazil.
- 5) Seven possible development theories to explain how such incentives and indicators can justify that type of development.

FINAL RESULT DEVELOPMENTS	DEVELOPMENT THEORIES	DEVELOPMENT INDICATORS	INCENTIVES INSIDE STP TO BE INVESTIGATED
INNOVATIVE	Development can be explained by the innovative process dominance. (LUNDVAL, 1992; CASSIOLATO e LASTRES, 2005)	University-companies interaction. Companies investment in R&D.	Fostering stakeholder's synergy.

ECONOMIC	Development can be explained by productive structure sophistication (CHENERY, 1986)	Increasing participation of technology intensive industry in total added value.	Fostering R&D of activities based on STI.
ENTREPRENEURSHIP CULTURE	Development can be explained by entrepreneurship promotion. (SCHUMPETER, 1991)	Number of start ups created and their survival.	Creating an environment conducive to start-ups creation and training.
ACADEMIC	Desenvolvimento explicado por melhores índices de educação (ETZKOWITZ, 2008).	Number of graduates, masters and PHDs in technological fields.	Attracting top academics and train more skilled workforce.
URBAN	Development of human capacity through improvements in the environment in which we live. (SEN, 2010)	Better urban infrastructure. Master plans and urban mobility.	Building an environment conducive to the creative class of the knowledge society so can it can live, work and play in one place.
INTERNATIONAL	Development explained by global competitiveness and cities' participation in a global production network (FRANSMAN, 1985, O'SULLIVAN et Al, 2013, GPN studies).	Increasing exports.	Fostering residents' internationalization . Attracting TNCs. Incentivizing cross research with international universities.
		Increasing international competitiveness.	
		Better position place in GPN.	
SOCIAL	Development of human capacity (SEN, 2010)	IDH, Health System.	Promote research aimed at mitigating specific social problems such as diseases, lack of food, environmental, and others.

Next steps would be:

- (i) Monitor this indicators over time beginning with the date STP was established;
- (ii) Observe the correlation between incentives generated inside STPs and indicators' evolution to measure the situation city accomplished after STP's creation. Whether this correlation is positive, evidences are that development is being fostered by STPs in cities.
- (iii) Control this analysis by previous conditions that a city must have in order to be able to construct a STP in first place. Any change on them would be capture by the final result development expected. Also controlled by any other policy directed to development.

For on side, an econometric model considering all the above factors would be perfect to observe the real impact of STP on cities, for the other side it seems to be an unrealistic task to be accomplished for many reasons, some of them being:

- 1) lack of data related to indicators to measure all the variables;
- 2) impossibility to control all variables that could be related to development of cities;
- 3) existence of externalities not observed that impact the result; and
- 4) experiences in a too short time length to be possible for impacting observation.

Albeit, we argue that even if it's not likely for a perfect impact model to be formulated, getting to know final results STPs are supposed to produce in cities, represents already an important step to guide STPs performance. That would be a clue on how investigates whether a STP is really pointing incentives to the right target.

Moreover, based on a systematization of what authors claim to be forms to observe STP's success, a structural model to observe final result was able to be formulated and this could also orient future STP study cases.

Authors consider the following ways to analyze STP's success:

- 1) Previous Conditions (PC) – what city counts before hand explains STP's success;
- 2) Internal Structure (I) – the internal administration, governance and legal model are responsible for the success a specific STP;
- 3) Direct Impact on Stakeholders (DI) – the way residents benefit directly;
- 4) Externalities (E) – the spill over that benefit cities.

Nonetheless, besides DI and E the other two first possible evaluation paths wouldn't represent the result of STPs. Only Direct Impact (DI) meaning how STP is benefiting its residents (private return) and Externalities (E) meaning how this DI is spilling over and benefiting the whole city (social return) can represent those final results (DEVELOPMENTS) pursued by STPs.

We consider that:

- 1) Previous Conditions (PC) aren't the result but necessary conditions (not sufficient) for a STP's creation. It answers not success, but what advantages city must count on so a STP's project can become concrete. We consider there are at least two PCs according to authors explanation and based on literature about STP:

1.1. Triple helix elements:

- 1.1.1. Entrepreneurial universities
- 1.1.2. Big companies with academic perspective that invests on laboratories and R&D centers
- 1.1.3. Government programs that aim at approximating those first two actors.

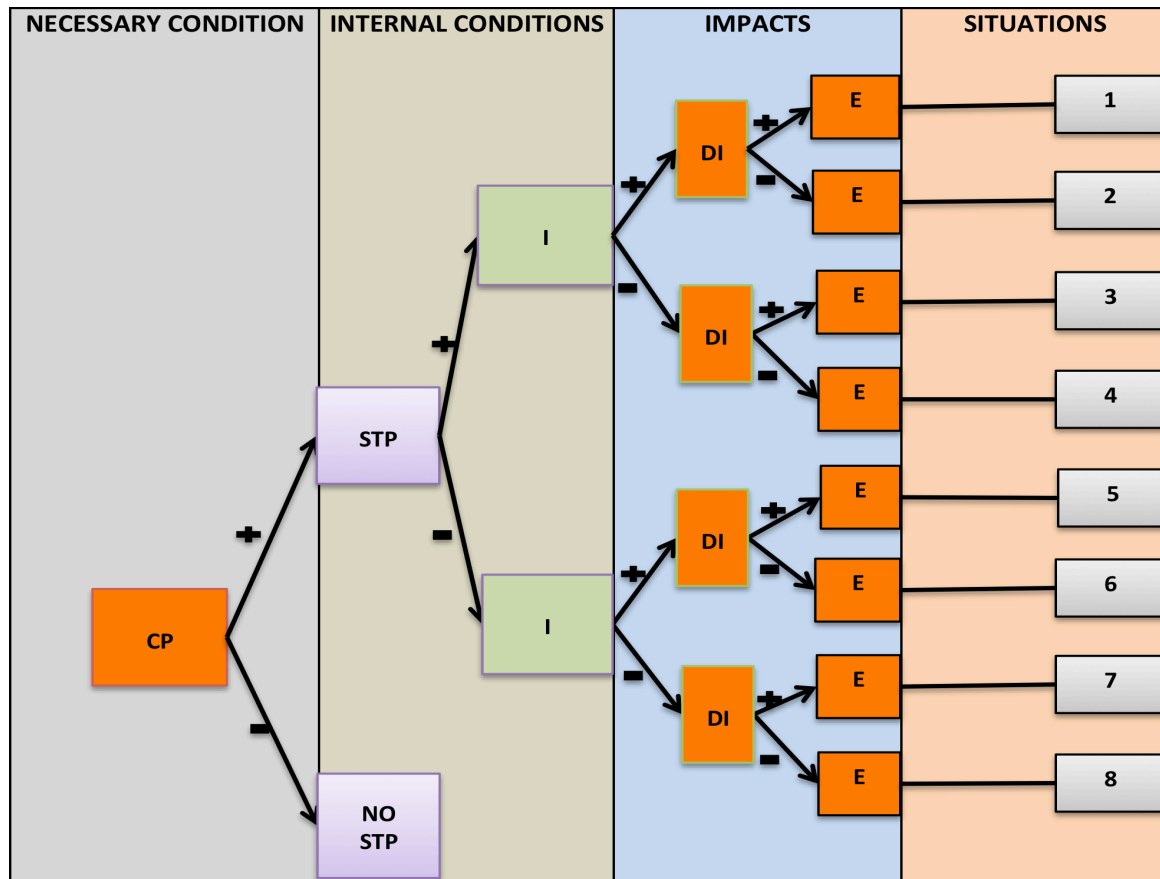
1.2. City being part of a Global Production Chain in a sector considered strategic for country's development.

- 2) STP internal structure is what we call internal conditions translated into

INCENTIVES (I) that can impact cities' results.

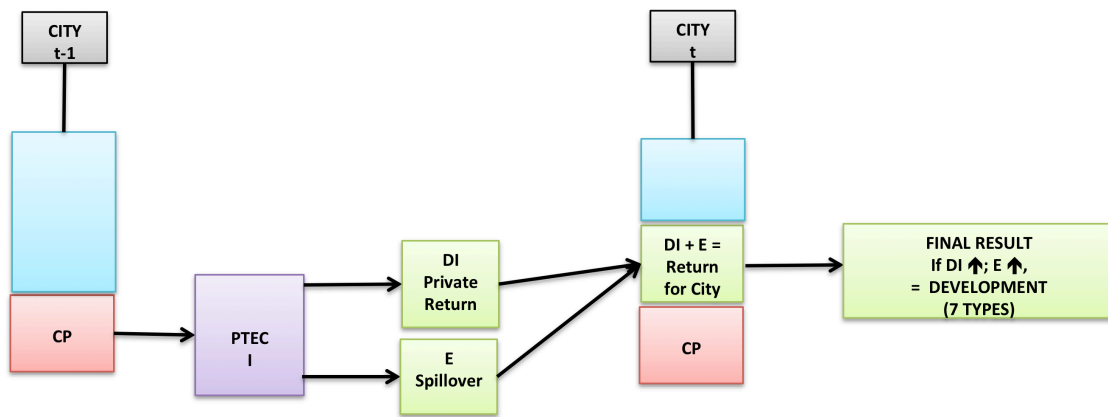
So while CP conditions STP existence, I conditions STP impacts.

Whether a city has PC a STP may be implanted and whether is has good inside conditions (I) it can present good results for the city.



SITUATIONS	I	DI	E	POSSIBLE ANALYSIS
1	+	+	+	H1: SPT promotes development.
2	+	+	-	Private return only.
3	+	-	+	Institutional design must be reviewed.
4	+	-	-	Institutional design must be reviewed or too soon for evaluation.
5	-	+	+	Development generated by other channel.
6	-	+	-	Possible industrial district.
7	-	-	+	E generated by other channel.
8	-	-	-	H0: SPT doesn't promote development.

H1 would happen with we observe the following pattern:



So the city in t-1 would have conditions to receive a STP and this generates the right incentives to a specific development, which will result in private return and spill overs to society. These two together would represent the final result meaning the specific development that STP pursues.

Thus, in order to analyze STP's results one has to look inside STP and develop interviews and/or apply questionnaires in order to check DI and E for each type of development. All data gathered shall be organize in a way it is possible to see the pattern above.

Therefore the objective of this study lies on finding out what should STP promote in cities and how to observe. In general it represents an attempt to shed light on what should be expected by and required to STPs in its daily administration, more than to construct a perfect impact model risking to loose all immeasurable externalities produced by STPs. Getting to understand what goals this policy has to persecute and how to observe them is a first step for the STP targeting the results to be experienced by the respective city.

Case studies developed considering this pattern could reveal reach details that can help the understanding of this innovative environment, the administration of them enriching just the same this model.