

The effects of STI policies fostering Public-Private collaborations on a new generation of researchers in Argentina.

Cecilia Rikap (CEPED, IRD/Université Paris Descartes, IFRIS)
Hugo Harari-Kermadec (IDHES- ENS Saclay)

1. Context

- Public universities are the principal producer of knowledge and the main working place for researchers (including PhD and post PhD fellows) in developing countries.
- In 1918, the *Reforma Universitaria* in Córdoba, Argentina, highlighted university's autonomy and self-government as basic principle that later became more enrooted due to constant struggles against both dictatorial and democratic government throughout the XXth century
- Between 2003 and 2015: predominant place of STI policies in Argentina.
- Collaborations between public research organizations and industry became a central dimension of STI policies, in line with Latin America.

1. Objective and Hypothesis

- The study of the impact of STI policies on public-private engagements in non-central countries has been observed as an open field of research
- Research on individual motivations for collaborating with industry, or on the identification of different research cultures has not considered how the cohabitation of cultures affects the effectiveness of STI policies.
- **We aim to evaluate the impacts of recent STI policies** on a new generation of researchers.
- Hypothesis: **STI policies had an effect on actual collaborations between this new generation of researchers (and their labs) and Industry**, even if the traditional culture remains entrenched in part of the community. We will interpret our results on the basis of considering the cohabitation of 2 research cultures leading to a distinguished receptivity of STI policies that foster public-private collaborations.

2. STI policies in Argentina

Since the 2000s

- In 2007 the Secretary of Science, Technology and Productive Innovation was hierarchized into a Ministry (MinCyT).
- Links with industry and tightening IP rights were conditions established by international organizations to grant loans to the MinCyT .
- Also, public research-Industry collaboration was further encouraged because it was considered as a key contribution to national development.
- Definition of public government's strategic research areas.
- **Two strategic plans for STI: fostered public collaborations with industry.**

2. STI policies in Argentina

STI PLANS

- The **'Bicentenary'** STI Strategic Plan 2006-2010:
 - Overcome lack of coordination among actors
 - Concern about the small share of private investment in R&D.
- The **'Argentina Innovadora 2020'** STI Plan: fosters productive innovation contributing to increase productivity in Argentina:
 - Need to articulate the STI system, in particular public-private relations
 - Technology should be as important as basic science.
- The **'Argentina Innovadora 2020'** highlighted the role of the National Agency for the Promotion of S&T (ANPCyT) as the main provider of competitive grants for public research-industry collaborations.

2. STI policies in Argentina

Some national results

- From a total investment in R&D of 0.42% of GDP in 1997, to 0.64% in 2012.
- **FONARSEC** (regional fund created in 2010):
 - Regional Technological Innovation Fund (93% of FONARSEC projects in 2015): partly assigned to regions and universities not granted with other funds before.
 - 'Boosting Technology-Based Companies' program: 15 new companies in 2015.
- Training Program for Managers and Technology Brokers': +20 universities trained 1000 specialists in technology management.
- **FONCyT**: lines for the scientific community include the orientation of research towards innovation, and the development of links with enterprises.
 - Special line PICT-O Glaxo with GlaxoSmithKline.
 - 'R&D Projects' fund: to boost the links between researchers and productive and social sectors. Must be co-funded by a private enterprise or other organization (which holds priority rights for adopting results).

3. Research culture and determinants for collaborating with industry

- The literature studied the transformation of that traditional research culture or identity, into various cohabitating ones, focusing on:
 - individual motivations (Giuliani et al., 2010; Olmos-Peñuela et al., 2015; Perkmann et al., 2013)
 - local work environment (Bercovitz and Feldman, 2008)
 - how some research fields are more permeable, such as engineering (Boardman, 2008; Ponomariov, 2008) while others remain more distant (Taylor et al., 2013)
- All in all, the literature has given diverse proofs of the coexistence of different types of scientists, academic cultures or role identities, understood as ideal constructions that guide researchers' actions.
- However, as shown in Perkmann et al's (2013) comprehensive literature review, **the study of the impact of STI policies on actual public-private engagements in non-central countries has not been addressed**

4. Data.

Survey Strategy:

- According to the MinCyT, the total population of doctorate and post-doctorate fellows in Argentina was 13.661 in 2014.
- 1) CONICET post-doctoral scholarships, 2) CONICET doctoral scholarships, 3) national universities doctoral scholarships and 4) ANPCyT doctoral scholarships. CONICET fellows (1 and 2) were a vast majority (10 890, 80%).
- The complete list of fellows is not available, forbidding a census of this population or a simple random sampling within it.
- Online survey following a snowball strategy.
- 603 workable filled sheets have been gathered, representing a sampling of 4.4% of the original population.
- *Representativeness*: the repartition of CONICET's grants across scientific fields and provinces is publicly available. We use it to balance the survey.

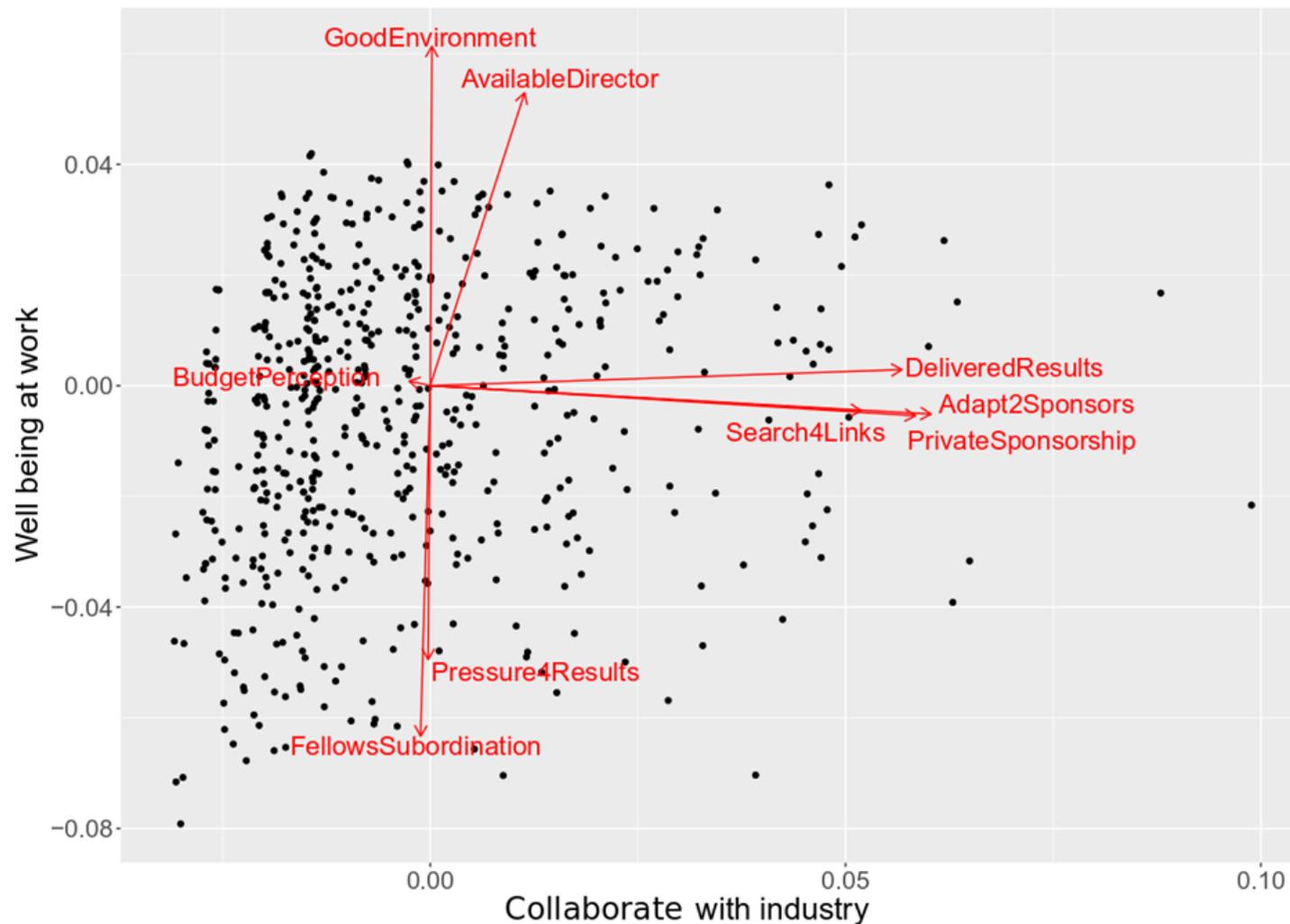
4. Data.

Survey description: The survey is composed of 6 parts and was completed in 10 to 15 minutes.

1. **Personal information:** gender, age, characteristic of PhD's and post-PhD's positions, etc.
2. **Working institution:** origins of the institution's funds, degree of interrelation with corporations, subjective evaluation of the impact of these collaborations on the institution's research agenda.
3. **Teamwork, relations with pairs and researchers' culture.** Questions refer to respondents' level of agreement with statements like the following ones: 'there is a good relation between all the institution members; everybody is receptive' and 'working environment is stressful; we are urge to deliver publishable results constantly'.
4. **Relation with their thesis' supervisor/director** (availability of the supervisor, importance of fund raising in supervisor's agenda, hierarchical distance between the scholarship fellow and his/her supervisor).
5. Subjective perceptions on **the global situation of Argentinian research**
6. **Destiny of achieved results:** communications, publications, patents, tech transfer, etc.

5. Methodology and results.

Figure 1. Argentina's PhD and Postdoctoral Scholars. Principal Plane of the PCA.



5. Methodology and results.

- The first plane contains 40% of the overall variance (22.4% for the first axis, 17.5% for the second).
- **The first group of variables can be interpreted as the degree of collaboration with industry** and the second one refers to perceptions with regards to well-being at work defined by working relations with the director and with other researchers of their research laboratory or institute.
- We concentrate on the variables concerning the degree of collaborations with private enterprises, therefore relevant for studying the impact of the STI policies that encourage those partnerships.
- We will refer to the previously mentioned first group of variables as a single direction of the plane that we have named '**CollaborateWithIndustry**'.

5. Methodology and results.

Table 1. Linear Model Specifications for 'CollaborateWithIndustry'.

Variable	Equation 1	Equation 2	Equation 3
Intercept	0.125	0.222**	0.675***
Adapt to MinCyT strategic lines	0.106***	0.101***	0.110***
Public Agency Funds	0.083	0.010	0.011
Adapt to budget scarcity	0.179***	0.122*	0.157**
QuantitativeEvaluation			-0.063
Adapt to Evaluation Criteria			0.065**
TeamWork			0.055**
Public University	-0.233***	-0.219***	-0.229***
Buenos Aires City	-0.322***	-0.183***	-0.205***
Field (ref.= Life and Health Sciences)			
Exact and Natural Sciences		-0.051	-0.059
Social Sciences and Humanities		-0.300***	-0.257***
Agricultural Sciences and Engineering		0.192	0.184
Technology		0.497*	0.580**
Age			-0.011
Female			-0.118**

p-value: *** stands for less than 0.1%, ** for less than 1% and * for less than 5%

5. Methodology and results.

- Our results show that **the role of Argentina's ANPCyT** (main provider of competitive funds for public research-industry relations) **did not have a significant impact on actual collaborations between industry**
- **Policies that indirectly fostered those collaborations do have a positive and significant impact:**
 - researchers that have further adapted their research towards **strategic research lines defined by the MinCyT** are, as well, those with greater collaborations with industry.
 - adapting research to the **evaluation criteria** defined mainly by the CONICET has a positive association with collaboration with industry .
 - Technology transfers were included in evaluation criteria in 2012
 - It makes sense to think that researchers less attached to traditional academic freedom culture -which rejects every external orientation of research- are also those that adapt to external evaluation criteria

5. Methodology and results.

- Control variables (considering literature results):
 - Collaboration with industry is very strongly and positively associated with the **adaptation of research according to budget scarcity**, possibly to enlarge their chances to find alternative funds from the private sector and augment their chances to win ANPCyT grants.
 - A strong and negative correlation between collaborating with industry and **working in a public university**. It could be that the traditional culture is stronger in public universities due to their history and identity, thus making researchers more reluctant to changes that may be perceived as limiting or constraining academic freedom.
 - Collaboration with industry is strongly and negatively correlated to working in **Buenos Aires city**, as opposed to the rest of Argentina. This result can actually be understood by the effect of the University of Buenos Aires.
 - **Expected outcomes in terms of fields**: weak though significant positive relation between collaboration with industry and 'Technology' and a strong negative association between the former and 'Social Sciences and Humanities'. And also in terms of gender, age and teamwork.

6. Final Remarks.

- The survey performed to a new generation of researchers showed that they can be distributed according to their degree of collaboration with industry.
- **STI policies that indirectly promoted collaboration with industry have been more successful than competitive grants given by the ANPCyT.**
- This partial failure of STI policies can be explained by an insufficient demand, but an additional explanation could be that **the traditional culture remains dominant in public universities, limiting collaboration with industry.**
- We may also consider that that **traditional culture is not hegemonic and cohabitates with an open culture**: more reactive to external constraints like budget shortfalls, more penetrated by STI policies and that develops collaborations with industry.

6. Final Remarks.

- Even if working in Public Universities is negatively associated with collaborating with industry, the traditional culture is not a wall dividing universities and the rest of the society. On the contrary, **community service** (called 'extension') has been one of public universities' missions in Argentina since the 1918 *Reforma*
- **'Extension' could be seen as a basis for designing STI policies that may have a greater effect on rejoining Argentina's STI system.**
- **Public universities and most vulnerable communities should have a role in STI policies' decision-making processes**, especially when defining research priorities.
- Limitations: i) not been able to compare with senior scholars, ii) results could benefit from in-depth interviews with a subsample, iii) comparative study could be conducted considering the experiences of other countries.

**Merci beaucoup.
Comments. Questions.**

Cecilia Rikap
Hugo Harari-Kermadec

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