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EXPLORING THE LIMITS OF LOCAL ABSORPTION OF PUBLICLY FUNDED KNOWLEDGE

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Abstract

This paper examines the limited domestic utilization of publicly funded scientific knowledge in Argentina, focusing on patentable innovations generated by public researchers. The analysis investigates how, and by whom, these innovations are transferred. The study proceeds in three stages: (1) identifying patent applications filed by scientists with public funding and determining their ownership; (2) surveying those inventors about licensing and commercial use; and (3) conducting in-depth interviews with selected inventors to explore barriers to local transfer. The results indicate that very few public inventions are exploited domestically: only 12% of patents have been commercially used and 28% licensed—figures comparable to those reported in other countries. Moreover, more than half of the patents are not owned by Argentine institutions, and 22.9% are owned by foreign entities, most of which are filed abroad. This pattern points to a significant "cognitive appropriation" of knowledge by external actors. On the basis of these findings, a typology of constraints on technology transfer is proposed, and policy implications are discussed to ensure that publicly funded research more effectively supports national development.

Keywords: Cognitive Appropriation- Intellectual Property- Technology Transfer- Invention Patents- Economic Development.

Introduction

There is broad agreement that economic development depends on applying new knowledge. Scholars emphasize that capital accumulation and structural change are intrinsically linked to how effectively knowledge is used in production. Governments therefore fund science and innovation systems to generate knowledge, hoping it will foster growth. However, in many countries—and particularly in the global periphery—systematic data on how publicly funded research contributes to development are scarce and fragmented. In Argentina, the available evidence is mostly anecdotal and suggests that the productive use of publicly financed scientific knowledge is limited: patent licensing and commercial exploitation appear to be rare, and some of the most valuable outputs may even be appropriated by foreign actors rather than benefiting the society that funded them through the public

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system. Despite the importance of these issues, there is still a lack of solid, data-based evidence, which is essential for designing effective policies to ensure that public research supports national development.

The aim of this paper is to empirically examine the limitations to the local productive use of publicly funded scientific knowledge in Argentina. Specifically, we analyze (a) the extent to which this knowledge is absorbed by domestic firms, (b) the extent to which it is appropriated by international actors, and (c) the extent to which patentable knowledge remains altogether unused. To guide this inquiry, we address the following research questions: (1) to what degree are patentable innovations by publicly funded researchers transferred to and utilized within Argentina? (2) Who owns these patents, and what share is controlled by foreign institutions? (3) How frequently are these patents licensed and commercially exploited, and under what conditions? (4) What barriers do inventors themselves identify as obstacles to local technology transfer?

To answer these questions, we conducted a three-phase empirical study focusing on patentable knowledge. We first identified patent applications linked to state-funded researchers, then surveyed those inventors about licensing and commercialization, and finally interviewed select inventors to explore motivations and barriers. The remainder of the paper is organized as follows. We review theoretical concepts and prior literature, describe the research methodology, present the results from each phase, introduce a typology of constraints on local exploitation, and conclude with a summary of findings and highlight the contribution of this work.

Theoretical Framework and Literature Review

Economic theory traditionally assumes that innovation and development go hand in hand: countries advance by creating and absorbing knowledge. This view holds that strong intellectual property (IP) regimes are needed to incentivize innovation by granting inventors temporary monopolies (Arrow, 1962; Gould and Gruben, 1996;

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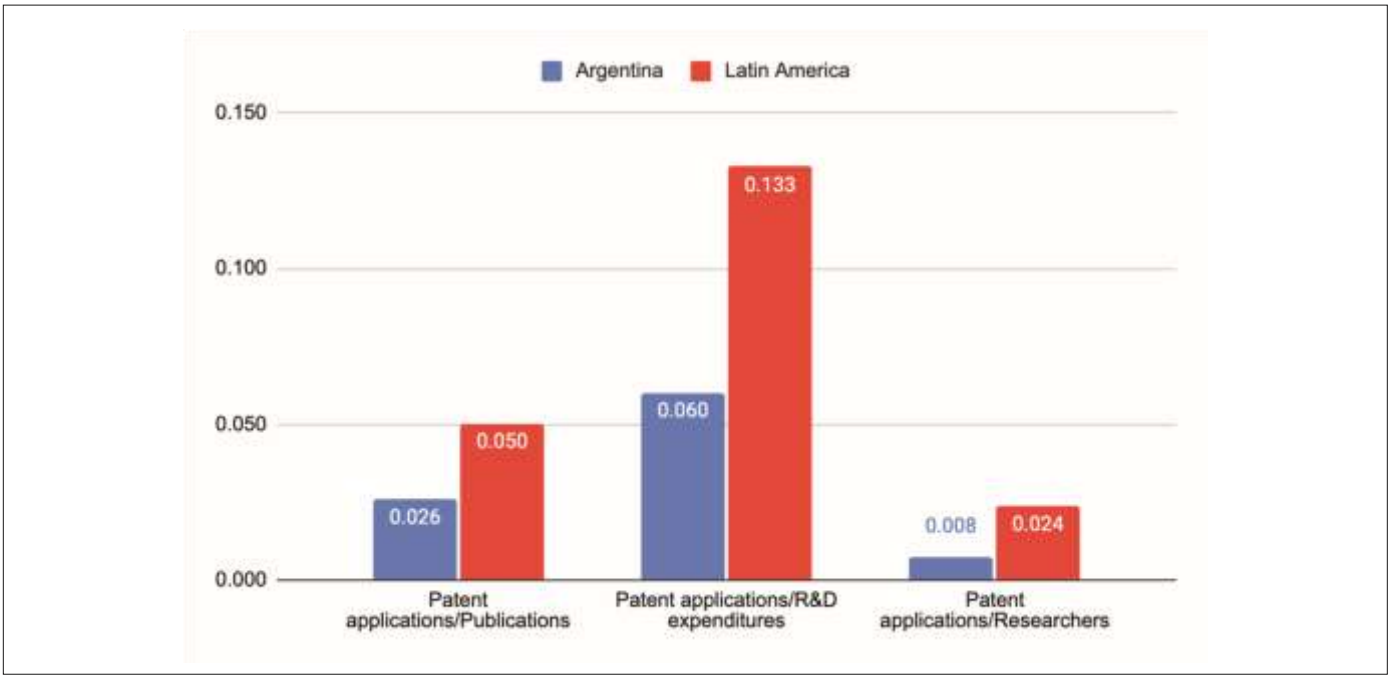
Posner, 2005; Romer, 1993). However, history and political economy challenge this simple view. Many successful economies grew under loose IP rules, effectively allowing unpaid transfer of foreign technologies before later tightening protection (Chang, 2001; Johns, 2010). In other words, leading states often "kicked away the ladder" after using others' knowledge to advance (Ben-Atar, 2004; Biagioli, 2006; Chang, 2001, 2013; Cimoli, Dosi, and Stiglitz, 2009; Drahos and Braithwaite, 2002; May and Sell, 2006; AUTHOR, 2020; Varian, 1998). This suggests that current strict IP standards, while intended to foster growth, may also exclude peripheral regions from utilizing publicly funded knowledge.

For clarity, we distinguish two broad types of publicly funded knowledge. Transferable knowledge is research

Figure 1. Patent Applications in Argentina and Latin America in the Context of the Science and Technology System



Source: Author elaboration based on RICYT, 2025.

intended (or capable) of moving directly into economic use; non-transferable knowledge is basic science or culture with more indirect or longer-term impacts. [1] A characteristic feature of Argentina's national science, technology, and innovation system is that the proportion of transferable, particularly patentable, knowledge is low relative to the number of researchers, publications, and funding levels, even in comparison with other Latin American countries (Figure 1).

However, our study focuses on the transferable category, specifically patentable knowledge. Patentable inventions are technical solutions that are novel, non-obvious, and industrially applicable. Patents are often

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viewed as tools for knowledge transfer; however, obtaining a patent does not guarantee its use or commercialization. Indeed, many countries (and industries) transfer technology through non-patented means (e.g. trade secrets, incremental know-how) when formal patenting is impractical or absent. We focus on patents partly for feasibility (patent databases allow empirical linkage to research funding) but also because they are explicit claims of commercial intent.

Within this framework, cognitive appropriation refers to the process through which knowledge produced with public funds comes under the control of external actors, generating benefits abroad rather than domestically and contradicting national regulations (AUTHOR, 2022). In our context, this refers to Argentine public inventions that are patented but ultimately owned or exploited by foreign firms or institutions. This notion builds on Latin American thought in economics, science, technology, and development, which emphasises how peripheral countries risk losing strategic knowledge (Arocena and Sutz, 2010; Cimoli, Dosi and Stiglitz, 2009; Chudnovsky, 1999; Erbes and Suarez, 2016; Herrera, 1971; Sábato and Botana, 1968; Vessuri, 1994).

Specifically, the field of social studies of science and technology (STS) has highlighted the local challenges of utilising knowledge generated by publicly funded researchers (Kreimer and Thomas, 2006; Kreimer and Zukerfeld, 2014; Goldstein, 1989). While these studies provide valuable insights, they share a common limitation: they are either purely theoretical, rely on anecdotal empirical evidence, or are restricted to specific cases (Álvarez et al., 2010; Aggio et al., 2017; Arza, 2013; Fernández-Arias et al., 2016). For this reason, studies analysing large 1Naturally, this distinction by no means implies that the “non-transferable” are less important for society and its development, nor that their public funding should be considered any less of a priority.

2 The chart shows the results of patent applications by Argentine residents in relation to public and private R&D expenditures and the number of researchers in full-time equivalents.

sets of patents in relation to their ownership (Rikap and Lundvall, 2020), as well as the citation analyses by Codner, Becerra, and Díaz (2012) and Codner and Perrotta (2018), are particularly significant. The former focuses on a comparison between science–technology collaborations and patent co-ownership, suggesting knowledge predation by Big Tech over other organizations. The latter examines citations of Argentine scientific articles in foreign patents. Unlike earlier studies, these works frame the issue within a systemic perspective, emphasising centre–periphery dynamics. However, unlike our research, they are based on proxy indicators (collaborations, citations), whereas cognitive appropriation directly addresses how ownership of publicly funded knowledge is transferred to other actors without compensation. By examining patterns of patent ownership and use, we can assess whether such appropriation is occurring alongside more routine transfer failures.

Methodology

We employed a mixed-methods design in three stages.

Stage I – Patent Analysis: We first identified a universe of potentially transferable inventions by public researchers. We began with 8,791 “Responsible Researchers” (RRs) who applied for grants from

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Argentina's primary science funding program (PICT) during 2003– 2014. We then queried the World Intellectual Property Organization's PatentScope database (covering 2003–2019) to find all international patent applications listing at least one of these RRs as an inventor or applicant. Through this matching, we identified 932 patent applications that met the criteria. The inventors in these applications (which we call RRIAs: Responsible Researchers who are Inventors/Applicants) numbered 784 individuals. This step allowed us to measure who held legal title to inventions stemming from publicly funded research.

Stage II – Survey: Next, we surveyed the 784 RRIAs about technology transfer outcomes. A self-administered questionnaire (30 questions) asked whether the inventor had licensed each invention and whether it had been commercially exploited. We piloted and then emailed the final survey between September and November 2022. A total of 145 researchers responded (about an 18.5% response rate). This rate is comparable to similar surveys in other countries (e.g. Nagaoka y Walsh, 2009; Torrisi et al., 2016). and the respondents represented the broader group in terms of fields and institutions. The survey data allow us to quantify how many patents moved forward through licensing or commercialization.

Stage III – Interviews: Finally, we conducted in-depth interviews with nine of the survey respondents, selected to capture diverse cases (funded vs. unfunded projects, different disciplines, and especially those with untransformed innovations). These semi-structured interviews (guided by the survey themes) explored inventors' understanding of IP rules, their institutions' handling of patents, collaboration experiences, and perceived reasons for successful or failed transfer. This qualitative phase provided context and explanations behind the survey patterns.

Throughout these stages, we incorporated relevant literature and institutional contexts (e.g., national IP laws, university policies) to interpret the data, employing basic statistical analysis techniques. In reporting the results, we reference existing studies (such as surveys of TTOs and prior national analyses) to compare our findings with global and regional benchmarks.

Results

Next, the findings are presented in four sections. The first three address: (i) patent ownership and cognitive appropriation, (ii) licensing and exploitation of inventions, and (iii) knowledge of regulations and reasons for non-transfer. The final section introduces a typology of limitations to the local use of publicly funded patentable knowledge. The interpretation of findings in the context of the research questions is contained in each section.

Patent Ownership and Cognitive Appropriation

We first examined the legal ownership of the identified patent applications. The 932 cases were classified into three groups based on the first patent-holding institution: (1) national public research or higher education organizations (e.g., universities, S&T institutes); (2) individual inventors or local private companies; and (3) foreign companies or foreign research organizations. According to Argentine law, category 1 institutions should normally retain ownership of patents arising from their employees' research, as they are entitled to results

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produced with public resources. Category 2 reflects instances where individuals or domestic firms claimed ownership, often in contravention of regulations. Category 3 (foreign holders) represents a clear case of appropriation, where inventions funded with Argentine public money are owned abroad.

Table 1 summarizes the breakdown. It is worth noting that only 46% of patents are owned by Argentine public institutions. The remainder is divided between domestic private holders (about 31%) and foreign entities. Specifically, patents owned by foreign organizations (category 3) account for 22.9% of the total. As explained in the source, this third category represents the core of cognitive appropriation: such patents do not contribute to local development, as they are owned and exploited abroad. In effect, nearly one-quarter of Argentina's publicly funded inventions are legally controlled overseas, reflecting a substantial transfer of research benefits abroad.

Table 1. Patent applications by type of institution of the first holder of the application and RRIAs

	Type of institution of the first holder		**Type of RRIAs institution**	
National research and/or higher education institutions	431	46.2%	931	99.9 %
Individuals and local companies	288	30.9%	1	0.1 %
Foreign companies, research and higher education organisations	213	22.9%	0	0.0 %
Total	932	100.0%	932	100.0 %

Source: Adaptation from AUTHOR (2022, p. 266).

The intended market for each patent was assessed by examining its filing location. Overall, 50.4% of the 932 applications were filed with the Argentine patent office, 26.4% under the international Patent Cooperation Treaty (PCT) system, and 8.4% with the U.S. office. By owner type, a consistent pattern is observed: patents held by foreign entities are predominantly filed in foreign jurisdictions. Over 90% of category-3 (foreign-held) patents were filed abroad. This indicates that foreign owners did not seek to exploit these inventions domestically; rather, their filings were directed toward international markets. By contrast, domestic public institutions and companies primarily filed in Argentina, although public institutions also maintained a modest share of filings through the PCT.

These ownership and filing patterns suggest that many Argentine inventions are being channeled outside the local innovation system. Public organizations formally own only half of the patents, and nearly all foreign-held patents are intended for use in foreign jurisdictions. We conclude that a substantial portion of publicly funded patentable knowledge is cognitively appropriated by nonlocal actors at the cognitive level, with negligible benefits accruing to Argentina's economy.

Licensing and Exploitation of Inventions

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The following section reports on the actual use of these patents, as revealed by the inventor survey. Of the 145 respondents, 40 (28%) indicated that they had licensed at least one of their patented inventions, and 17 (12%) reported that an invention was commercially exploited (manufactured or sold). Notably, 17% of respondents were uncertain about their license status, underscoring that many researchers are not fully informed about the fate of their patents. Thus, only a minority of inventions progressed to any form of technology transfer, as summarized in Table 2.

Table 2. Commercial exploitation and licensing of an invention by researcher

	Commercial exploitation of an invention		**Licensing an i**	**nvention**
	Freq.	**%**	**Freq.**	**%**
Yes	17	12%	40	28 %
No	105	72%	71	49 %
Do not know	13	9%	24	17 %
No answer	10	7%	10	7 %
Total	**145**	**100%**	**145**	**100 %**

Source: Adaptation from AUTHOR (2024, p. 11).

Altogether, the 145 inventors accounted for 457 patents, although full details were available for 364. Of these only 36 patents (10%) were both licensed and exploited, meaning that just one-tenth of the inventions reached the market. Meanwhile, 166 (46%) of the applications were granted (and remain in force), but appear to be unused; 91 (25%) were pending; 29 (8%) were rejected or withdrawn; and 42 (12%) had expired. Overall, 88% of patented inventions remained commercially unexploited.

Certain factors influenced these outcomes. First, patent status is important: patents that were granted and maintained in force were substantially more likely to be transferred. Table 3 shows that among the granted patents, 34% had been licensed and 15% exploited. In contrast, none of the rejected or withdrawn applications resulted in any transfer, and only a few expired patents were licensed (29%) or exploited (7%). Second, the filing location also correlates with outcomes. Of the specific patents selected by respondents (145 applications), 103 were filed in Argentina and 42 abroad. Domestic filings experienced very low uptake: only 8% were exploited and 22% were licensed. Foreign filings performed better: 21% were exploited and 41% were licensed. These findings suggest that patents processed through international systems, presumably by better-resourced actors who filed abroad, had higher chances of commercialization.

Table 3. Status of applications according to exploitation and licensing

Application status	**Licensed**		**Exploited**		**Total**	
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**
It was granted and is in force	32	34%	14	15%	94	100 %
It is in the pipeline	4	15%	2	7%	27	100 %

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The application was withdrawn	0	0%	0	0%	5	100 %
It was granted, but has already expired	4	29%	1	7%	14	100 %
The application was rejected	0	0%	0	0%	5	100 %
Total	**40**	**28%**	**17**	**12%**	**145**	**100 %**

Source: AUTHOR (2024, p. 12).

In summary, the survey reveals that only 12% of surveyed inventions have been commercialized, and 28% have been licensed. These rates are low, yet not uncommon in the global context. For example, an international review indicates that roughly 12% of academic patents worldwide are ultimately commercialized (Lee, 2012, cited in Hernández, 2020, p. 38). Other studies report comparable figures: Caviggioli et al. (2020) found that 37% of U.S. university patents were monetized and 30% were licensed, while Indian universities report approximately 15% commercialization (Bhardwaj and Sandhu, 2021). In Brazil, Dias and Silveira Porto (2018) analyze data from two leading universities for the period 2007–2016, reporting licensing rates of 5% for USP and 16% for UNICAMP with respect to their patent applications. Hernández (2020) notes the absence of aggregate data for Colombia; however, a survey of inventors of 87 patents filed between 2008 and 2017 across 21 Colombian universities revealed that 78% of these patents had not been commercialized. Thus, Argentina's performance appears to fall within the range observed internationally.

Knowledge of Regulations and Reasons for Non-Transfer

The survey and interviews also shed light on inventors' awareness of intellectual property (IP) rules and their perceptions of obstacles. When asked, only 40% of respondents reported being familiar with their institution's patent regulations, and only 22% reported knowing the national Patent Law. In contrast, the remainder indicated only partial or no knowledge; notably, 63% had received no formal

Table 4. Causes for non-exploitation of patentable inventions training in IP or technology transfer. By way of comparison, Baldini et al. (2007) found that 68% of Italian academic inventors were aware of their university's patent rules and 61% were aware of national law—figures substantially higher than those observed in Argentina. Interviews illustrated this gap: as one inventor explained, "I acquired the limited knowledge I possessed through personal experience and trial and error, as there was an absence of formal training." Another interviewee observed that past lab members had simply "known" the rules by tradition, rather than through formal instruction (AUTHOR, 2023, p. 48).

Respondents were also asked why their inventions had not been commercialized. Table 4 summarises their reported reasons; respondents could select up to three. The most frequently cited reason (57%) was that "no interested companies or organisations have been found," indicating that inventors were unable to identify local partners willing to license or develop the technology. The second most common reason (16%) concerned administrative or bureaucratic difficulties within the inventor's institution. These included paperwork and inter-

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institutional disagreements. Other reasons included inventions still "in negotiation" (12%), legal or economic disagreements with a potential partner (6%), and internal valuation disputes (4%). Overall, these responses suggest that the principal barrier lies in the lack of external demand, while institutional and legal issues appear secondary.

Source: AUTHOR (2024, p. 17).

Such patterns are echoed in other peripheral contexts. Surveys of academics worldwide often find that the biggest hurdle to patent commercialization is primarily a lack of market demand or potential partner interest. The prominence of the 'no partner found' outcome (57%) reflects the "weak knowledge demand in the South" described by Arocena and Sutz (2010). For instance, Bhardwaj and Sandhu (2021) report that many Indian university patents are limited to announcements in journals or searches for potential customers, with "no customers found" reported as a frequent outcome. Conversely, in Italy and Colombia, administrative challenges

Causes	Freq.	%
No interested companies or organisations have been found yet	83	57 %
Administrative or bureaucratic difficulties at my employing institution	23	16 %
It is in the process of negotiation with an interested company or organisation.	18	12 %
Difficulties and/or differences of criteria with the company or body concerned (administrative, legal, economic, etc.)	9	6 %
Differences in criteria with my employing institution (economic value of the invention, interpretation of the rules, etc.).	6	4 %
Other	6	4 %
Total	145	100 %

are more pronounced, aligning with the second most frequently cited obstacle in Argentina (Baldini et al., 2007; Hernández, 2020). Meanwhile, in Brazil, Dias and Silveira Porto (2018) identify both issues internal to academic institutions as well as those related to the business environment. In summary, the obstacles identified by

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Argentinean researchers are broadly comparable to those in other peripheral countries, with particular emphasis on the lack of local market interest.

Typology of Constraints

These results suggest that publicly funded patentable inventions in Argentina face two types of hurdles. First, the absorptive side is weak, characterized by few firms able or willing to utilize the knowledge, limited IP awareness among inventors, and bureaucratic procedures. Second, the appropriation side remains significant, as knowledge is frequently owned or pursued by foreign entities. Previous studies have identified these issues in Latin America (Baldini et al., 2017; Dias and Silveira Porto, 2018; Dutrénit and Arza, 2010; Hernández, 2020, among others); however, they have not yet been examined empirically in a systematic manner.

By integrating the survey and interview findings with prior studies, Table 5 presents a typology of these constraints, systematized for future research. Overall, these constraints are evident in the two processes examined in this paper: cognitive appropriation and patent licensing and exploitation. They have been organized into six main categories, each encompassing closely related factors and addressing either external or internal elements. Moreover, each category is linked to a specific actor within the science system: individual researchers, research institutes or universities, companies, technology transfer offices, funding agencies, and national science, technology, and innovation system institutions.

i. **Training and Knowledge Gaps:** Many inventors lack formal education or guidance regarding intellectual property, patenting processes, and technology transfer. Limited training in commercialization may result in missed or poorly managed opportunities.

ii. **Individual Motivations:** Researchers often prioritize academic publication or personal incentives over commercialization. Some pursue patents primarily for academic prestige or personal gain, potentially undervaluing the invention's relevance for the domestic context.

iii. **Organizational Culture:** University and research institute norms may not reward technology transfer. Bureaucratic inertia, unclear IP management, or a culture of open science may hinder active commercialization efforts. For instance, unclear rules on authorship and ownership can result in disputes or delays.

Table 5. Limitations to local use of publicly funded patentable knowledge

Limitations	Description	Major Player
Training and Knowledge Gaps	Lack of knowledge of intellectual property legislation	Universities or Research Institutes
	Limited training in technology transfer	

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	Characteristics of research stays and projects conducted abroad	
Individual Motivations	Pursuit of individual profit	Individual Researchers
	Motivation to transfer innovations regardless of regulations	
	Low concern for the productive impact of knowledge	
Organisational Culture	Learned practices and routines	Universities or Research Institutes
	Ambiguous boundaries between work and autoside work	
Business Environment	Supply-demand mismatches	Companies
	Local business dynamics	
	Informal linkages	
	Requirements imposed by business accelerators	
	Management challenges in international offices	
Technology Transfer Capacities	Deadlines	Technology Transfer Offices (TTOs)
	Administrative inefficiencies	
	Limited institutional capacities	
	Institutional or regulatory loopholes	
	Rigidity of agencies in relinquishing rights	
	Prevalence of informal negotiation channels	
	Lack of agreement on the market value of inventions	
	Excessive burden on inventors	
Policy and Institutional Factors	Policy and institutional instability	Funding Agencies and National Science, Technology, and Innovation Institutions
	Absence of comprehensive policies and regulatory updates	
	Disincentives linked to science and technology evaluation policies	
	Problems in inter-institutional coordination	

iv. **Business Environment:** Weak links between science and industry greatly hinder technology transfer. Many inventions lack a ready market; local firms may be small, undercapitalized, or focused on low-tech niches,

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limiting their capacity to exploit advanced academic inventions. Informal or poorly aligned collaborations, often due to lack of demand, are included in this category.

v. **Technology Transfer Capacities:** Few Argentine institutions possess fully developed technology transfer offices (TTOs) or dedicated support personnel. Limited expertise in marketing, licensing negotiation, or patent management means that even willing inventors receive minimal assistance in identifying licensees. Under-resourced TTOs may delay or hinder transfer processes.

vi. **Policy and Institutional Factors:** Broader structural issues also play a role. Argentina's science and innovation policies have been unstable, and enforcement of IP and funding regulations, such as ensuring that institutions assert ownership of publicly funded inventions, may be weak. Fragmentation in national policies may create uncertainty and impede full enforcement of regulations.

vii. Source: own elaboration.

viii. This typology, synthesizing 25 specific constraints identified in our mutually reinforcing, contributing to the simultaneous presence of study, illustrates the factors limiting the local use of publicly fun- unexploited patents and foreign-controlled patents within Argentina's ded patentable knowledge. The categories are interrelated and often innovation system.

Discussion

Argentina produces relatively little transferable and patentable knowledge in proportion to its research output and funding. Specifically, regarding patentable knowledge, Argentina's academic patent transfer rates (12% exploited, 28% licensed) are in line with global patterns, as many countries struggle to commercialize more than a minority of university patents. Idle patents are therefore not unique to Argentina. However, the particular form of underutilization observed here is noteworthy: a significant share of inventions is effectively transferred abroad, with over one-fifth of patents foreign-owned and primarily pursued in international markets. In practice, this means that Argentina's public investment in these discoveries yields limited domestic return.

From a theoretical perspective, these findings illustrate the center– periphery dynamic: domestic firms fail to fully absorb new knowledge, leaving a gap that foreign actors exploit. Survey data indicate that many domestic challenges are primarily demand-related; 57% of respondents reported that no local partner could be found. This weak local demand likely stems from structural factors: Argentina's peripheral industries are often less technologically advanced, and local businesses may lack the capacity or scale to develop novel inventions. Moreover, much of the patentable knowledge produced by the science and technology system may be of limited relevance to local industry, while some may be highly valuable to foreign companies.

Institutional factors exacerbate these outcomes. The low levels of IP awareness and institutional support mean that many inventors do not push their patents into local channels. For example, our interviews revealed that some researchers either forwent assigning patents to their universities (violating rules) or engaged with international patent offices without notifying their institutions. If a university or agency is not even aware of a technology's

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existence, it cannot mobilize it for local benefit. Similarly, procedural delays or bureaucratic disputes (cited by 16% of respondents) can stall transfers. In sum, the domestic system does not strongly enforce the link between public funding and public benefit.

In peripheral country contexts, such as Argentina, the gap in technology transfer becomes evident. In environments with robust technology transfer offices and clear policies, inventor incentives are aligned with commercialization; however, in many peripheral settings, these structures are weak or absent. Researchers often report lacking dedicated support staff or formal incentives to license their patents. As one researcher noted, they tended to rely on personal experience and informal laboratory norms. In the absence of stronger institutional support, inventors may prioritize publishing or pursuing opportunities outside the local context.

It should also be noted that low utilization extends to other forms of innovation beyond patents. This study focused solely on patentable inventions; in practice, many research outputs, including software, materials, and know-how, remain unpatented. Given the already low transfer rates for patents, those for these non-patented outputs may be even lower, potentially understating Argentina's overall technology transfer performance. Future research could extend this analysis to non-patented outcomes and examine comparisons with countries in similar peripheral contexts.

This study has some practical implications for public policy. In general, three widely shared perspectives can be identified regarding the relationship between scientific and technological knowledge and the productive sector, which can be presented as ideal types. The first promotes the commodification of all knowledge production, valuing only what is recognized by the market, while advocating for a State that disengages from the production and distribution of scientific knowledge. This view is often associated with approaches that devalue endogenous knowledge production. The second, at the opposite extreme, assigns a central role to the State in promoting scientific activity but neglects further use of knowledge, exercising no control over who utilizes publicly funded knowledge or for what purposes. While the second orientation may be inefficient and unjust, the first is potentially disastrous. A viable development path, by contrast, is only compatible with a third orientation, in which the State provides significant—but not exclusive—funding for research in science, technology, and innovation, and establishes rules to ensure that knowledge is used productively by the funding society, whether through the market or other allocation mechanisms.

From this perspective, several policy recommendations can be drawn from this research to optimize the local use of knowledge: strengthening intellectual property and technology transfer training for researchers, agencies, and technology transfer offices; enhancing inter-institutional coordination; strengthening links between supply and demand, as well as regulatory considerations, in research and innovation policies; simplifying intellectual property registration procedures; developing indicators to monitor intangible assets funded by the national science, technology, and innovation system; establishing rules to ensure knowledge transfer for development, avoiding both lack of transfer and cognitive appropriation; and building capacity in technology transfer offices

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through specialized staff, potentially consolidating dispersed capacities within regional agencies across different institutions.

This study has some limitations. First, international comparisons are inherently challenging due to differences in methodologies across contexts and the scarcity of cross-national data. Second, more refined statistical techniques could be applied. Third, the breadth of results presented in this article allowed only for a general discussion with previous literature, which could be explored in greater depth with respect to specific aspects.

Future research can address these limitations by focusing on more specific topics. This would enable the application of advanced statistical methods where appropriate, allow for relevant comparisons with other contexts, and facilitate more detailed engagement with existing literature. In addition, we look forward to empirically testing the typology presented in Table 5 and deepening the discussion of the relationship between patentable and non-patentable knowledge in peripheral contexts.

Conclusion

This study has documented that a substantial proportion of Argentina's publicly funded patentable innovations does not contribute to local development. Only approximately 12% of surveyed inventions were commercially exploited, and 28% were licensed. Moreover, over half of the patents were owned by external actors (domestic firms or foreign entities), with 22.9% fully foreign-controlled. The primary reason cited by researchers was the lack of interest from local companies, reflecting limited domestic demand for new technologies. At the same time, inventors frequently lacked IP training (63% had received none) and faced bureaucratic inertia, further impeding technology transfer. These factors align with global observations: low utilization of academic patents is common internationally; however, Argentina is characterized by a low proportion of transferable, particularly patentable, knowledge relative to the number of researchers, publications, and funding levels—even in comparison with other Latin American countries— and by the widespread appropriation of publicly funded innovations by foreign actors, although this latter feature may also occur in other peripheral contexts.

Through a three-stage research design—mapping patents, surveying inventors, and conducting interviews— our study provides rare systematic evidence on technology transfer in a semi-peripheral country. The key contribution lies in developing a typology of 25 constraints that limit the local use of patentable inventions, ranging from individual and institutional factors to structural issues in policy and business contexts. Moreover, by introducing and operationalizing the concept of cognitive appropriation, the study highlights how foreign and private actors can capture the benefits of public research, while local societies remain excluded. This work not only fills an empirical gap in Latin American innovation studies but also offers a diagnostic tool and policy framework for addressing systemic failures in linking science to development.

Ultimately, advancing from knowledge to development in Argentina requires both nurturing local demand and safeguarding publicly funded knowledge for public benefit. By highlighting these issues with data, we aim to inform an evidence-based dialogue (rather than anecdote) about reforming technology transfer policy. Data-

driven changes along these lines – consolidating training, improving coordination between actors, and ensuring public research serves national goals – could help ensure that Argentina's investment in science more reliably contributes to its economic and social development.

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