The Role of Commitments to Get There: A Pathway for Fostering Collaborative Technological Innovation

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Abstract

This study evaluates the outcomes of collaborative research projects for technological innovation supported by the Brazilian Company of Research and Industrial Innovation (Embrapii) model in Brazil, focusing on the results achieved for participating firms. Despite growing interest in university-industry collaboration (UIC), empirical evidence on the concrete impacts of structured incentive models remains limited, particularly in developing economies. To address this gap, this research investigated whether Embrapii's model for funding UIC effectively generates innovation, strengthens firms' technological capabilities, and leads to broader organisational and market outcomes. The analysis is based on a study conducted with 179 companies funded by Embrapii and constitutes the first comprehensive evaluation of the model. Methods include descriptive statistics, Qualitative Comparative Analysis (QCA), Cost-Benefit Analysis, and Input-Output Analysis. Results show that 68,2% of projects led to innovations, and 91% of firms reported positive impacts—ranging from increased product value and market access, to enhanced internal capabilities. These findings reveal significantly higher numbers when compared to the innovative performance of Brazilian industry in the national innovation survey, as well as figures higher than those found in other funding instruments addressing UIC. QCA suggests that intellectual property generation and competence building may contribute significantly to innovation within Embrapii's projects. Strong commitments from both sides of cooperation - research organisations and companies - appear to be at the core of these findings. The study provides valuable insights for Science, Technology and Innovation policy design in Brazil and other Latin American contexts.

Keywords: University-Industry Collaboration, Innovation, Funding Model, Evaluation, Embrapii

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1. Introduction

Beyond its historical role in economic growth, innovation now takes on new dimensions, becoming essential in addressing global challenges. For innovation policies to be more effective in achieving their goals, contributing to economic growth, social progress, and environmental performance, Research and Development (R&D) that strengthens collaboration between research organisations (ROs) and industry has gained increasing relevance in addressing these challenges (Galvao et al., 2019).

Furthermore, a transformative model of R&D and innovation must take into account the differences between countries in the Global South. As the world grapples with social and environmental issues, developing countries often need to deal with added hurdles that developed nations have already overcome (Mohamed et al., 2022).

Brazil faces a historical challenge in its attempt to foster innovation to gain international competitiveness. With high production costs and low technological capability, Brazil has remained relatively stagnant over the past 20 years in terms of investment in R&D and innovation performance, despite numerous government incentives, particularly fiscal and economic ones. This situation is not unique to Brazil but is shared by many other countries in Latin America and other Global South regions, such as India and South Africa (Bezerra Borges et al., 2021; de Negri, 2017; Figueiredo, 2023).

Tailored public policies are essential to address diverse innovation capabilities across sectors, as 'one-size-fits-all' approaches are often ineffective. Impactful programs should provide flexible frameworks meeting varied company needs and mitigate innovation uncertainties, especially in sectors with limited financial and managerial resources (Fischer et al., 2022b; Salles-Filho et al., 2023). Collaboration between research organisations and companies offers the potential for sharing risks and costs in the development of technological innovations (Salles-Filho et al., 2021). In addition, they can provide companies with significant gains in research skills and absorptive capacity, enabling them to better assimilate external knowledge and transform it into innovative solutions (Fischer et al., 2022b).

However, Brazil does not perform well in terms of university-industry collaboration (UIC): in 2024, the country ranked 75th out of 133 countries in UIC according to the Global Innovation Index (GII) from World Intellectual Property Organization. Some reasons have been highlighted: misaligned goals, bureaucratic challenges, and disputes over intellectual property (IP) often hinder these partnerships effectiveness (Brito Cruz, 2019; Fischer et al., 2022b; Salles-Filho et al., 2023).

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Even considering GII indicators altogether, Brazil has ranked the 50th economy in the world. Despite incentive policies, the innovation rate in the Brazilian industrial sector has remained stagnant or even declined over the past two decades (de Negri et al., 2020). Additionally, Brazil's limited economic openness discourages firms from pursuing innovation-based research, as competition is largely shaped by the internal protected market, with the country ranking among the world's most closed economies for four decades[1]. To overcome these challenges, innovation policies should go beyond financial incentives, for instance through fostering commitments and long-term collaboration between companies and ROs.

In 2013, the Ministries of Science, Technology, and Innovation, and of Education established the Brazilian Company of Research and Industrial Innovation (Embrapii) as a new model for fostering UIC towards innovation. This paper presents the first comprehensive evaluation of Embrapii, providing empirical evidence from 179 collaborative projects. It aims to assess the impacts of Embrapii's collaborative model on firms, particularly its effectiveness in fostering innovation from the R&D projects. To do so, we designed a multimethod evaluation approach, including a survey applied to companies engaged in co-funded R&D projects and with the support of Embrapii itself for the provision of secondary data.

Specifically, we aim to answer the following research questions: (1) To what extent do Embrapii-supported projects lead to innovation outputs within firms? (2) Which variables were most relevant for the projects to achieve innovation? And (3) which characteristics of Embrapii's model influenced project outcomes? By addressing these questions, we also consider the broader relevance of this model for other countries in the Global South that face similar challenges in promoting innovation through UIC.

2. Literature Review

2.1. University-Industry Collaboration: Conceptual Foundations and Emerging Perspectives

University–industry collaboration has been studied under various labels, for instance "Industry–Science Relationships" or "science–industry R&D collaboration". In this study, we adopt the term UIC due to its wide adoption, while acknowledging that collaborative arrangements frequently involve a broader range of ROs, including both public and private non-profit research and higher education institutes.

UICs are driven by a variety of incentives. From the perspective of firms, they provide opportunities to reduce R&D costs, gain access to cutting-edge scientific knowledge and research infrastructure, connect with highly qualified professionals, strengthen internal capabilities, and share the risks inherent to pre-competitive research and disruptive innovation. These benefits should be genuinely valuable for companies, rather than merely perceived as an opportunity cost (Salles-Filho et al., 2021). ROs, on the other hand, may benefit from engaging with real-world industrial challenges, increasing the likelihood of commercialising research outcomes, and fostering networks that can lead to future research and employment opportunities (Salles-Filho et al., 2021). At a systemic level, successful UICs may increase national R&D expenditure, foster cross-sector knowledge flows, and accelerate the development and adoption of technologies with positive socioeconomic outcomes (Abramo & D'Angelo, 2022).

Despite their potential, UICs face barriers such as differences in institutional priorities between academic and industrial partners, and bureaucratic and legal challenges, particularly around IP (Bruneel et al., 2010). These are especially pronounced in developing economies such as Brazil, where underdeveloped innovation systems and widely varying firm capabilities often leave individuals to bridge gaps and where further empirical work is needed to understand how such collaborations unfold and which mechanisms enable their success (Brito Cruz, 2019; Grasmik, 2016; Zawislak & Dalmarco, 2011).

The literature increasingly explores relational and cognitive foundations of UICs. The triple helix model conceptualises innovation as dynamic interactions among universities, industry, and government (Etzkowitz & Leydesdorff, 2000), drawing from earlier frameworks like national systems of innovation and Sábato's triangle. More recently, the concept of innovation ecosystems has gained traction as a way to understand complementarities, interdependencies, and systemic coordination among actors involved in innovation processes (Fischer et al., 2022a). The concept emphasises not only universities, firms, and government, but also the interactions with other stakeholders such as users, financiers, and society (Granstrand & Holgersson, 2020). Innovation ecosystems are characterised by shared institutional logics, co-specialised resources, and the co-evolution of capabilities, which create an environment conducive to knowledge generation and diffusion (Fischer et al., 2022a).

A key theoretical construct for understanding how firms benefit from UICs beyond the concrete outputs stemming from collaboration, is absorptive capacity, the ability of firms to identify, assimilate, and apply external knowledge (Cohen & Levinthal, 1990). Empirical studies demonstrate that firms with greater absorptive capacity are better positioned to internalise the outputs of scientific collaboration, particularly when the knowledge involved is tacit and complex. This capacity is shaped not only by R&D investment and prior knowledge but also by internal learning mechanisms, routines, and openness to collaboration (Fischer & Queiroz, 2016). In the Latin American context, Ribeiro et al. (2022) have shown that firms embedded in university-centred innovation networks often count on their proximity to academic institutions to supplement weaker internal capabilities.

Complementary to absorptive capacity is the notion of value co-creation, which repositions UIC not as a unidirectional transfer of knowledge, but as a mutually beneficial process of joint knowledge production, shared problem-solving, and reciprocal learning. This perspective aligns with broader innovation paradigms that emphasise interaction and iteration, such as user-driven and open innovation. Recent studies in the field of entrepreneurial ecosystems highlight the relevance of value co-creation in collaborative innovation settings

[1]https://www.theglobaleconomy.com/rankings/trade_openness/

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(Fischer et al., 2022a). However, its application to university–industry collaboration remains underexplored, particularly in terms of empirical analysis and frameworks for operationalisation (Polese et al., 2021).

2.2. UIC Policies: Global Models and the Latin American Landscape

Given the potential benefits of university-industry collaboration, several countries around the world have implemented targeted policies to stimulate such partnerships. To name a few, Germany's Fraunhofer Institutes act as intermediaries between academia and industry with strong government backing and a co-funding structure involving firms; in France, the Carnot Network facilitates technology transfer from public ROs to industry (Carnot Network, n.d.); and in the United Kingdom, the Catapult Centres operate as independent, not-for-profit hubs that link businesses with the research base to support mid-stage technological development. Despite differences in scale and design, these policies from the Global North often share an emphasis on sustained public support, robust institutional infrastructure, and close ties to industrial needs. They reflect an understanding that collaboration for innovation cannot be sustained solely through market forces (Brito Cruz, 2019).

In contrast, the landscape of UIC in Latin America presents significant differences. Although there have been considerable structural reforms since the 1980s, aimed at enhancing productivity and integration into global markets, the region has historically struggled to develop strong innovation systems (Fischer & Queiroz, 2016; Pietrobelli et al., 2023). Recent assessments indicate that despite increased investment in science, technology, and innovation, UIC in Latin America remains limited when compared to global standards, particularly due to structural, cultural, and institutional barriers (Fuentes-Solís et al., 2019). Issues such as limited private investment in R&D, insufficient infrastructure, and weak institutional support continue to hinder the full potential of university-industry collaboration (Dutrénit et al., 2010).

Specific initiatives across Latin America demonstrate varied levels of success. In Mexico, the Programme for Innovation Incentives was created to promote applied research jointly conducted by companies and ROs (Guerrero & Link, 2022), but scholars highlight persistent organisational barriers, bureaucracy, and low participation of researchers in collaborative innovation projects in the country, resulting in suboptimal technology transfer outcomes (Puerta-Sierra & Jasso, 2020). In Argentina, FONTAR (Argentine Technological Fund) aims to finance innovation projects in the productive sector, including initiatives that foster collaboration between firms and research institutions. However, evaluations underscore persistent challenges, such as weak institutional coordination and limited evidence of impact on innovation indicators (Hall & Maffioli, 2008).

Turning specifically to Brazil, the situation presents opportunities and challenges. On one hand, Brazilian universities display a robust and competitive research capacity. On the other, businesses have shown limited engagement in leveraging these capabilities, largely due to protectionist economic policies and insufficient internal R&D investments (Brito Cruz, 2019). Recent evidence indicates that 90% of Brazilian micro, small and medium enterprises remain at early stages of digital maturity, constraining their ability to absorb innovations (De Souza Regis et al., 2025). At the systemic level, the country also faces inadequate institutional infrastructure to support collaborative innovation, and difficulties in establishing effective legal and contractual frameworks to facilitate cooperation (Brito Cruz, 2019; Ribeiro et al., 2022).

Historically, Brazil has attempted to stimulate innovation primarily through financial incentives and tax exemption. Policies such as the Informatics Law and the Innovation Law have been the main instruments to encourage private R&D investment (Bezerra Borges et al., 2021). Public expenditure on these incentives has reached up to one billion dollars annually, or 0.14% of Gross Domestic Product (GDP) (De Negri, 2017). Nevertheless, studies suggest that these instruments have not been fully successful, and in some cases may have produced crowding-out effects—where public funding replaces rather than complements private investment (Zucoloto et al., 2017).

Examples of UIC policies beyond fiscal incentives are relatively rare in Brazil. Two noteworthy exceptions are PIPE (Innovative Research in Small Business) and PITE (Research Partnership for Technological Innovation) programmes by FAPESP (São Paulo Research Foundation), two state level policies that fund R&D projects (Romero, 2008; Salles-Filho et al., 2011; Salles-Filho et al., 2023); and the Embrapii model, which co-finances technological research through selected research units and private-sector partners nationwide (Gomes, 2020; Salles-Filho et al., 2021). The scarcity of such policies correlates with Brazil's poor performance in UIC as previously presented.

In summary, simply replicating innovation policies from developed economies has proven insufficient in Latin America. While models from the Global North could serve as inspiration, approaches must be adapted to the local institutional environment, as well as to the region's systemic, cultural, and economic challenges.

2.3. The Embrapii Model

While policies that specifically promote UIC in Brazil are rare, evaluative studies of such policies are even scarcer. Notable exceptions are the previously mentioned PIPE and PITE, both evaluated with positive results regarding R&D expenditure, employment, and revenue generation. In the case of PIPE, which does not require collaboration, a highlight of the evaluation was that 46% of projects involved partnerships with ROs (Salles-Filho et al., 2023). In turn, a highlight of PITE, where all projects necessarily involve collaboration, was an innovation rate of 40% (Romero, 2008).

In contrast, the Embrapii model institutionalises UIC by design, requiring technological innovation joint projects between accredited ROs and industrial partners nationwide, focusing on the commitment between them. We conducted a focused review and identified 20 publications that examined Embrapii's structure, implementation, or outcomes (Appendix 2). From this set, 6 studies adopted evaluative approaches to examine elements of the Embrapii framework. Nevertheless, they address specific aspects of the model and none provide a comprehensive impact assessment encompassing all involved stakeholders. For instance, Varrichio et al. (2020) concentrate on a single case; Schefer (2020) does not consider downstream effects on the firms involved and relies on partial internal evaluations; and while Salles-Filho et al. (2021) conduct an extensive assessment, their analysis is limited to Embrapii's pilot phase projects between 2012 and 2016.

To contextualise our study, it is important to further elaborate on the institutional framework and operational mechanisms of Embrapii. Drawing inspiration from the Fraunhofer model in Germany and the Carnot Network (Gomes, 2020), Embrapii[2] is a not-for-profit organisation created in 2013 to stimulate research projects for technological innovation in collaboration between ROs and the Brazilian industry. Guided by industry demands, both the company and the research organisation work together to develop technologies from the Technology Readiness Levels (TRLs) 3 to 6 (Fernandez, 2016), representing their pre-competitive phases. The responsibility of advancing the innovation into further TRLs belongs to the companies after the project's completion.

The project is granted tripartite funding: up to one-third is provided by the ROs (in terms of know-how, equipment, and specialised labour); from one-third to one-half is funded by the partnering company, primarily through financial resources; and Embrapii covers the remainder (Fernandez, 2016; Gomes, 2020). Only ROs that have been previously accredited as an Embrapii Unit (EU) through public calls are eligible to lead Embrapii projects with industry partners and receive Embrapii funding. This process ensures the selection of organisations that already meet key prerequisites for effectively conducting collaborative projects with industry.

The Embrapii funding model is based not only on cost and risk-sharing with companies. It also requires project and resource management practices that substantially increase the commitment of the parties involved to ensure the results are directly usable by the companies. There are three key instruments worth highlighting: a) project funds are only released after the negotiation between RO and company has clearly defined the desired outcomes and how they will be achieved; b) the projects are monitored by company technicians or researchers and must provide progress reports to both the company and Embrapii; c) there are two instances that certify the quality of the project and whether the results were achieved — the company itself and an external evaluator hired by Embrapii (Fernandez, 2016).

In this way, along with shared funding, Embrapii contributes to a more participative, controlled and effective model of research for innovation. In its first ten years of operation, Embrapii supported 2,206 research projects conducted by 67 EUs and 1,500 companies, amounting US$650 million applied. Given Embrapii's growing relevance, our study constitutes the first large-scale evaluation of the model, aimed at investigating its achieved outcomes.

3. Methodology

Our evaluation featured a design aiming to identify whether and how Embrapii projects are contributing to the outcomes and to medium and long-term impacts on firms. Given the absence of prior comprehensive assessments, as previously noted, this study provides the first broad evaluation of the model, here focusing on the participating companies. Based on Embrapii's Theory of Change (ToC), it combined secondary data provided by the organisation with primary data collected through questionnaires, descriptive analysis, a Qualitative Comparative Analysis (QCA), a Cost-Benefit Analysis (CBA), and an Input-Output Analysis (IOA). Previous studies demonstrate that developing integrated approaches based on criteria and indicators for evaluating innovation outcomes can better support public policies and strategic decisions (de Jesus-Hitzschky, 2007).

The ToC that underpinned our evaluation design is an approach in which stakeholders articulate their long-term goals and identify the necessary conditions and assumptions to achieve them (Taplin and Clark, 2012). In the case of Embrapii, it was structured to be guided by the actions and impacts on the two actors encompassed by the model (Figure 1): the industry (focus of this study) on the left, and the research organisations on the right. It was divided into three layers: at the base, the identified needs that justify the policy; in the middle, the policy instruments; and at the top, the outcomes and medium and long-term impacts. Thus, starting from a basic need linked to each actor and taking into account the specificities of the Embrapii model, the ToC reaches six main long-term impacts, all falling under the umbrella of "socio-economic return".

[2] https://embrapii.org.br/en/

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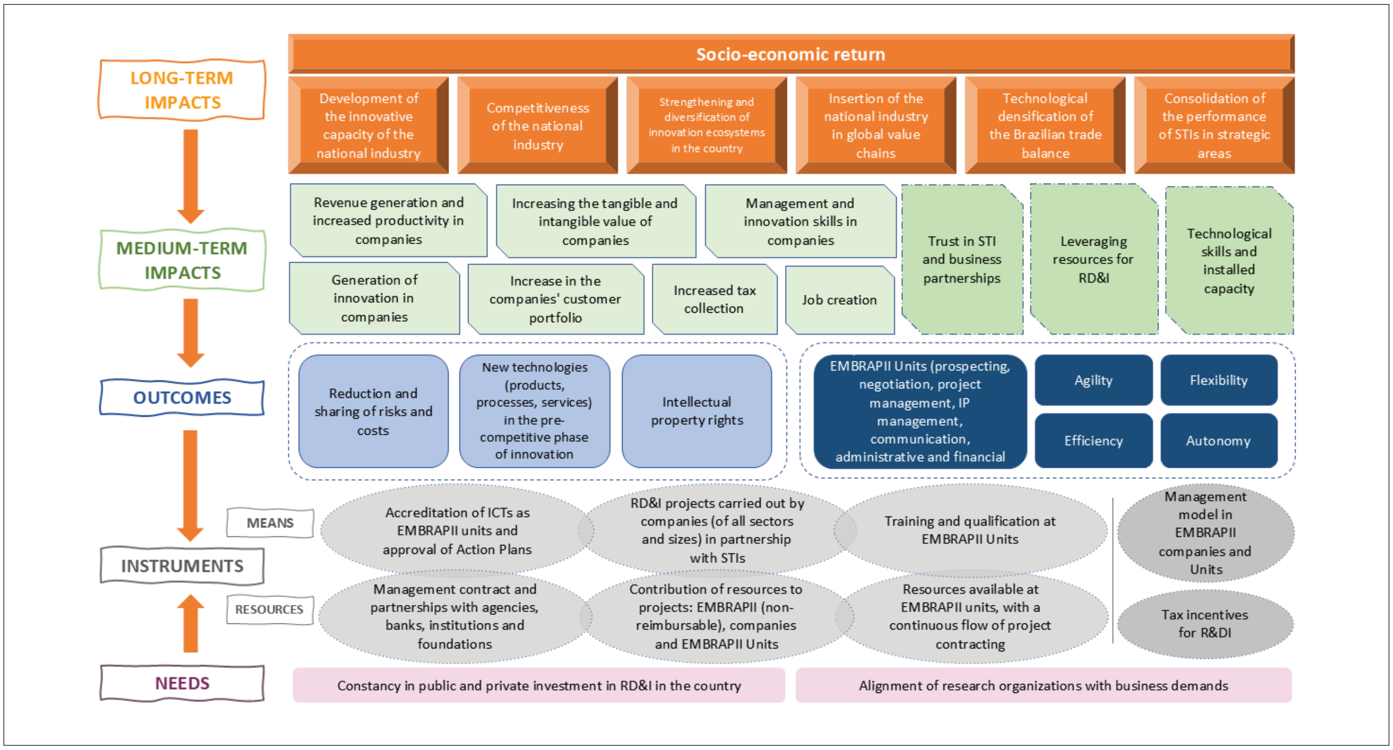
Figure 1. Embrapii's Theory of Change



Source: Authors' elaboration

The evaluation took place between mid-2022 and the end of 2023. Given our objective, it was necessary to establish a study sample that allowed sufficient maturation time post-project completion. Therefore, our sample included all Embrapii projects finalised between 2015 and 2021. Projects prior to 2015 were pilot projects, which were subject to an earlier evaluation (Salles-Filho et al., 2021), while those concluded after 2021 had not yet accumulated enough data to demonstrate concrete impacts. Thus, our sample comprised 840 research projects for technological innovation carried out by 47 ROs in partnership with 565 companies.

Regarding the data provided by Embrapii for this study, there are two main sources: an internal data system called SRInfo, which tracks operational data such as project prospecting, financing amounts, project details and timelines; and a monitoring and evaluation system utilising questionnaires sent to companies, EUs, and external technical consultants who assess the projects.

Despite the substantial dataset available, most information had been collected for short-term monitoring and did not include companies' financial figures. To address this gap, we developed an electronic questionnaire for the firms, designed with input from Embrapii representatives and validated through interviews with company managers. It included 60 questions across 7 themes: i) innovation generation, characterisation and application; ii) environmental impact; iii) cashflow including gross operating revenue, capital expenditure (CAPEX), and operational expenditure (OPEX); iii) IP and technology transfer; iv) generation of technological competencies and influence on R&D expenditures; v) value generation and personnel employed; vi) contribution to innovation ecosystems; and vii) adoption of Environmental, Social and Governance practices. After two and a half months of data collection, we obtained 179 responses (31.7% of the sample of 565 companies).

The analysis of the collected primary and secondary data drew on descriptive statistics and three complementary approaches. First, the Qualitative Comparative Analysis, a configurational method used to identify necessary and/or sufficient conditions for a given outcome. It was employed to examine the conditions underlying innovation generation in companies and Embrapii's contribution to it.

Second, the Cost-Benefit Analysis, based on the obtained questionnaires' responses, estimated the return on investment. It quantified the companies financial gains from innovations for each unit of currency invested in the joint projects.

Third, we estimated the effects of Embrapii projects on Brazilian GDP, gross production value, job creation, and indirect taxes using Input-Output Analysis (Cunha and Scaramucci, 2006; Miller and Blair, 2009). The analysis was based on project expenditure data available from SRinfo.

The absence of a control group, since there is no information on projects negotiated with EUs but ultimately not implemented through partnerships with companies, required the use of alternative methodological strategies for assessing the contribution of Embrapii projects. Specifically, we employed the self-reported redundant factor (as previously applied in evaluation studies such as Salles-Filho et al., 2011) and a what-if approach (Mueller et al., 2014), both based on specific questions from the questionnaire. These were combined with the complementary approaches previously described: QCA, which explores configurational associations in studies with a moderate number of cases; and CBA, which estimates benefits reported as resulting from innovations in Embrapii-supported projects, thereby providing indicative evidence of the programme's contribution.

4. Results

4.1. Sample Characterisation

As mentioned above, our sample consisted of 840 projects completed between 2015 and 2021, conducted by 47 EUs in partnership with 565 companies. The characteristics of the companies in the completed questionnaires closely matched those of the total sample, resulting in a high level of representativeness for the profiles in the completed questionnaires.

Of the 565 companies, 33% were large (189 companies), 16% medium-sized (93), 15% small (84), and 24% were micro-enterprises (133 companies). Regarding the main activity of the companies involved, nearly half (275) belong to the Manufacturing Industries section; 87 companies are in Information and Communication (15%); 54 fall under Professional, Scientific, and Technical activities (10%); and the remaining 149 are in "Administrative and Support Service", "Extractive Industries" or other categories. The 840 projects in the sample have different durations, with varying start and end years. Table 1 below shows the distribution of projects from the study sample according to their start year concomitant with their completion year.

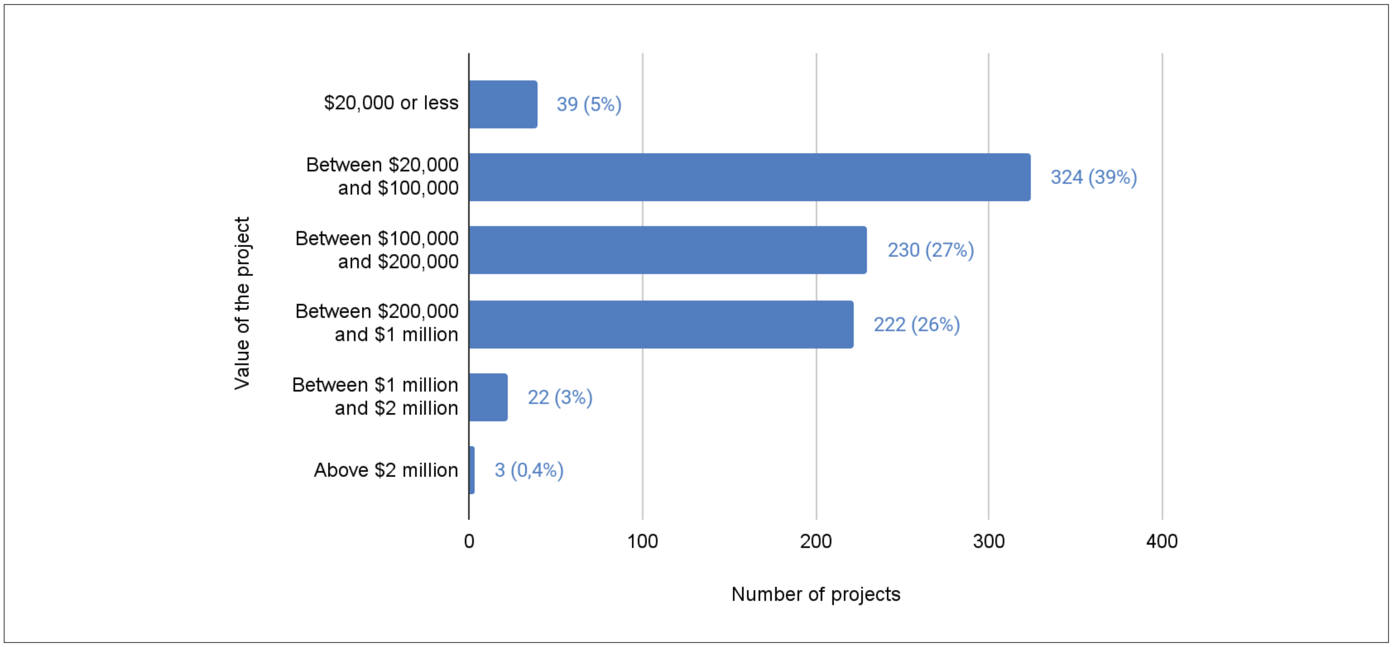
Table 1. Distribution of the sample projects according to their start and completion year

		Year of completion									
		2014	2015	2016	2017	2018	2019	2020	2021		
Year of start	2014	0	0	4	2	1	0	0	0	**7**	**Total projects by year of start**
	2015		1	17	21	14	4	3	0	**60**	
	2016			9	37	24	10	4	3	**87**	
	2017				24	80	64	16	6	**190**	
	2018					16	85	68	38	**207**	
	2019						21	57	68	**146**	
	2020							18	105	**123**	
	2021								20	**20**	
		0	**1**	**30**	**84**	**135**	**184**	**166**	**240**	**TOTAL: 840**	
		Total projects by year of completion									

Source: Authors' elaboration

The projects belong to 5 technology areas: Information and Communication (456 projects, 54%); Mechanics and Manufacturing (154 projects, 18%); Chemistry and Materials (114 projects, 14%); Applied Technologies (84 projects, 10%); and Biotechnology (32 projects, 4%). The total value of the projects reaches 163 million dollars, with 47% coming from companies, 34% from Embrapii, and 19% from ROs. Figure 2 shows the total value ranges of the 840 projects in the sample, with the vast majority falling between 20,000 and 200,000 dollars (554 projects, 66%).

Figure 2. Value of projects



Source: Authors' elaboration

4.2. Survey Insights: Innovation Outcomes and Embrapii's Impact
Out of the 179 responses collected through our survey (Table 2 summarises the main results), 122 (68.2%) reported that their projects had already generated at least one innovation, 37 (20.7%) indicated that innovations are expected to be achieved shortly, while 20 (11.2%) reported neither having achieved nor expecting to achieve any innovation. When disaggregated by company size, the results show a stronger effect among smaller firms: 85% of small companies reported having achieved innovation, compared with 77% of medium-sized firms and 62% of large firms.

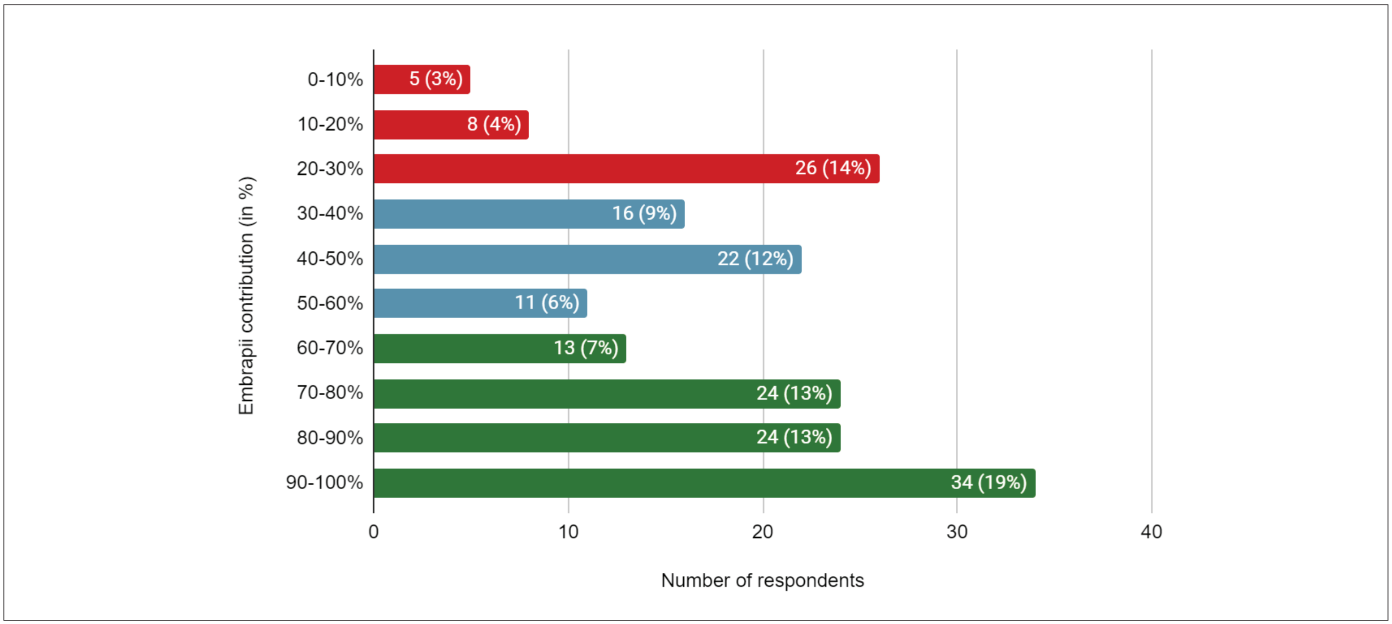
The innovations were classified by type following the terminology of OECD, and PINTEC — the national innovation survey carried out by the National Institute for Geography and Statistics (IBGE). Companies indicated that the most frequent was "product or business process development innovation" (46%), while the least common was "logistics process" (2%). Regarding application, 54% were introduced to the market, 19% applied internally, and 26% in other contexts such as technology transfer. Appendix 3.1 illustrates an innovation in the sample that was introduced to the market, albeit with elements related to internal applications within the participating company.

Regarding spillover effects within companies resulting from the innovation, 91% of respondents observed at least one. The most frequent effects were "increase in the added value of goods and services" (23%) and "access to new markets" (17%). The least observed was "reduced imports" (3%). As for value chain impacts, 73% of the respondents observed transformations: 19.2% reported "inclusion of new suppliers", and 20% indicated "increase in purchases by already established suppliers"; 28% reported "inclusion of new buyers or clients", and 33% indicated "increase in sales to already established buyers or clients".

We also investigated whether innovations reduced environmental impacts. Of the 105 companies that answered this question, 35% stated that they did: 26% cited "reduced contamination (soil, water, air, or noise)"; 23% declared "substitution of raw materials with less polluting or dangerous alternatives"; and 17% the "replacement of fossil fuels with renewable energy". Among these, 76% stated that the environmental improvements also enhanced their market competitiveness. Appendix 3.2 illustrates the reduction of environmental impacts through innovations of a project in the sample.

To assess Embrapii's role in achieving innovation, we asked companies to indicate the model's level of contribution (Figure 3). 52% reported that Embrapii contributed 60% or more, while 21% indicated a contribution of 30% or less.

Figure 3. Embrapii contribution to innovation



Source: Authors' Elaboration

In a similar line, 145 companies indicated what they would have done without Embrapii funding: 32% said "the project would not have taken place", 10% "would have sought other external sources", 18% "would have combined their own resources with external ones", and 30% "would have relied solely on internal funding". When disaggregated by company size, the percentages change: 48% of medium-sized firms and 39% of large firms would have used their own resources to carry out the project anyway; compared with only 25% of small firms and 27% of micro-enterprises. This indicates that Embrapii funding is comparatively more crucial for smaller firms.

On the other hand, it is interesting to note that Embrapii funds usually represent a small share of firms' total R&D resources: 50% reported that they accounted for only 0–10%, and 36% for 11–40%. At the other extreme, just 6% said Embrapii covered 81–100% of their R&D spending. When disaggregated by company size, these values shift slightly, as the share of small and micro-enterprises in the 81–100% range doubles to 12%, while their share in the 0–10% range falls by more than half to 22%. Nevertheless, overall, this suggests that most companies seeking EUs generally already have established R&D routines, with Embrapii funding acting as a complement. The higher the share of Embrapii funds in a firm's R&D budget, the more likely the respondent is to indicate that the project would not happen without them.

Beyond the innovations, 78% of respondents indicated that the projects and interactions with EUs expanded (62%) or developed new (38%) technological competencies. They also indicated contributions to increasing both tangible (60%) and intangible (69%) company value.

Table 2. Main questions and answers from the survey instrument

Question topic	Number of respondents for each question	Answers
Innovation generation	179	202 innovations generated
Innovation type	181[3]	• Product or business process development innovation (84 cases, 46.4%); • Information and communication system process innovation (30 cases, 16.6%); • Product innovation (24 cases, 13.3%); • Production process innovation (19 cases, 10.5%); • Service innovation (14 cases, 7.7%); • Management process innovation (6 cases, 3.3%); • Distribution/logistics process innovation (4 cases, 2.2%)
Application context	182	• Introduced to the market (99 cases, 54%); • Used in the companies' internal processes (35 cases, 19%); • Different application contexts (48 cases, 26 %)
Spillover effects from innovation	461 observed effects *(by 170 respondents; other 16 respondents did not observe any effects)*	• Increase in the added value of the company's goods and services (107 cases, 23%); • Access to new markets (77 cases, 17%); • Expansion of the range of goods and services offered by the company (75 cases, 16%); • Increase in the company's market share (72 cases, 16%); • Increase in the company's production capacity or service delivery (64 cases, 14%); • Effects on the control of health and safety aspects (27 cases, 6%); • Effects on compliance with regulations and standard norms by the company (27 cases, 6%); • Reduction in the company's imports (12 cases, 3%).
Transforming the company's value chain structure	271 observed effects *(by 138 respondents; other 39 respondents did not observe any transformation)*	• Inclusion of new suppliers in the chain (52 cases, 19.2%); • Increase in the volume of inputs acquired by already established suppliers (54 cases, 19.9%); • Inclusion of new buyers or clients in the chain (76 cases; 28%); • Increase in the volume of products and services acquired by already established buyers or clients (89 cases, 32.8%)
Reduction of environmental impacts	123 observed effects *(by 37 respondents; other 49 did not observe reduction and 19 respondents did not know how to respond)*	• Reduction of soil, water, air, or noise contamination (32 cases, 26%); • Substitution (total or partial) of raw materials with less polluting or dangerous alternatives (28 cases, 23%); • Recycling of waste, wastewater, or materials for sale and/or reuse (23 cases, 19%); • Substitution (total or partial) of fossil fuel energy with renewable energy sources (21 cases, 17%); • Reduction of the company's CO_2 footprint (total CO_2 production) (19 cases, 15%)
Embrapii contribution to innovation achievement	183	• 0-10% (5, 3%); • 10-20% (8, 4%); • 20-30% (26, 14%), • 30-40% (16, 9%), • 40-50% (22, 12%), • 50-60% (11, 6%), • 60-70% (13, 7%), • 70-80% (24, 13%), • 80-90% (24, 13%), • 90-100% (34, 19%)
What would the company do if did not receive Embrapii funding	145	• The project would never have taken place without Embrapii funding (46 cases, 32%); • Would have sought other external sources (15 cases, 10%); • Would have used a mix of their own resources with other external sources (26 cases, 18%); • Would have used only their own resources to carry out the project (43 cases, 30%); • Did not know how to respond (15 cases, 10%)

[3] The number of responses to some topics may be higher than 179 because companies were allowed to register more than one innovation per questionnaire.

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Representation of Embrapii funds over the total volume of R&D	145	• 0-10% (73, 50%); • 11-20% (32, 22%); • 21-30% (9, 6%), • 31-40% (12, 8%), • 41-50% (4, 3%), • 51-60% (5, 3%), • 61-70% (1, 1%), • 71-80% (1, 1%), • 81-90% (4, 3%), • 91-100% (4, 3%)
Changes in the company's technological competencies	125 observed effects *(by 117 respondents; other 33 did not observe effects)*	• Expansion and/or improvement of existing technological competencies (77 cases, 62%); • Development of new technological competencies that did not previously exist in the company (48 cases, 38%)
Increase in the tangible and intangible values of the company	136	Tangible • Projects contributed to the increase (79 cases, 60%); • Projects did not contribute to the increase (36 cases, 27%); • Unable to answer (17 cases, 13%). Intangible • Projects contributed to the increase (90 cases, 69%); • Projects did not contribute to the increase (19 cases, 15%); • Unable to answer (20 cases, 16%).

Source: Authors' elaboration

4.3. Qualitative Comparative Analysis and complementary approaches

We conducted two QCA studies. In the first one (Table 3), the output (or outcome) variable was 'innovation generation,' and in the second study (Table 4), the output variable was 'Embrapii's contribution to innovation generation.' For each analysis, we defined a series of input variables, as detailed below.

Table 3. Indicators employed in the QCA I study

Indicator	**Indicator Description**	**Orientation**
Performance (output)		
INOV	Innovation generation	0 = no innovation generation 1 = there was a generation of innovation
Conditions (input)		
TRL	technology readiness level	0 = TRL 3 and 4 1 = TRL 5 and 6
SKL	change in the company's technological skills	0 = no change in skills 1 = with change of skills
CAUS	what the company would have done in the absence of Embrapii resources	0 = company would not carry out the project 1 = company would carry out the project
RDI	volume of resources allocated by the company to Research, Development and Innovation (RDI) activities as a percentage of revenues	0 = below 5% 1 = above 5%
RDIE	percentage share of Embrapii projects in the volume of resources applied to RDI activities by the company	0 = below 20% 1 = above 20%
SZE	company size	0 = micro and small companies 1 = medium and large companies
IPR	generation of intellectual property rights	0 = no IPR generation 1 = IPR was generated

Source: Authors' elaboration

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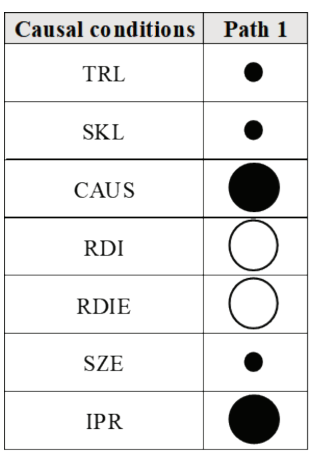
Table 4. Indicators employed in the QCA II study

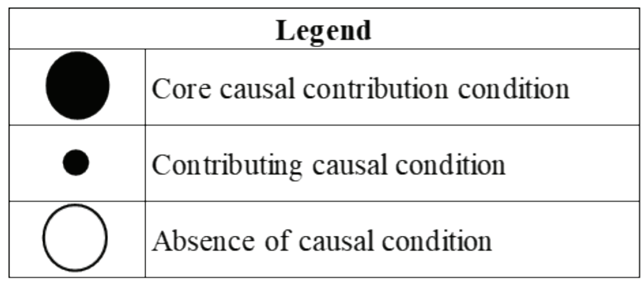
Indicator	Indicator Description	Orientation
Performance (output)		
INOV	Embrapii's contribution to innovation generation	0 = contribution below 70% 1 = contribution above 70%
Conditions (input)		
SKL	change in the company's technological skills	0 = no change in skills 1 = with change of skills
CAUS	what the company would have done in the absence of Embrapii resources	0 = company would not carry out the project 1 = company would carry out the project
RDI	volume of resources allocated by the company to Research, Development and Innovation (RDI) activities as a percentage of revenues	0 = below 5% 1 = above 5%
RDIE	percentage share of Embrapii projects in the volume of resources applied to RDI activities by the company	0 = below 20% 1 = above 20%
IPR	generation of intellectual property rights	0 = no IPR generation 1 = IPR was generated

Source: Authors' elaboration

For 'innovation generation' (study I), the output variable was binary (0 for no innovation, 1 for innovation). Seven input variables, also binary, were analysed across 148 cases (from 179 questionnaire responses). The analysis showed a 91,7% consistency rate[4], revealing that the likelihood of innovation (output = 1) is strongly correlated with two variables (Figure 4): 'what the company would do in the absence of Embrapii funding' and 'intellectual property generation from the project.' Additional variables, such as TRL reached by the Embrapii project', 'generation of technological competencies in the company from the projects'; and 'company size' also contributed to innovation generation but were less central. Conversely, the 'volume of resources allocated by the company to R&D activities as a percentage of its revenue', and 'percentage participation of Embrapii projects in the total volume of resources allocated to R&D activities by the company' were not found to influence innovation generation.

Figure 4. QCA I study solution





Source: Authors' elaboration

In other words, companies that are less dependent on Embrapii funding and generated IP tended to innovate more, particularly when projects had reached higher TRL, the companies were larger, there were pre-existing R&D structures and competencies were acquired from the project.

On the other hand, specifically regarding achieving innovation, there does not appear to be a direct relationship based on whether the volume of resources applied to R&D is higher, or on the representativeness of Embrapii funding over these resources. This suggests innovation outcomes are influenced by established R&D structures, enabling companies to carry out projects independently of Embrapii funding.

For 'Embrapii's contribution to innovation generation' (study II), the output variable can be 'contribution less than 70%' (value 0) or 'contribution greater than 70%' (value 1). We analysed five input variables across 88 cases (Figure 5). In this case, two pathways[5] were identified as combinations of conditions leading to the expected outcome, understood as a greater contribution of Embrapii to the innovations generated. The first pathway shows a consistency score of 77.8% and

[4] The parsimonious solution yielded the following values: inclS = 0.917; PRI = 0.917; covS = 0.237. Intermediate and conservative solutions were also computed to inform the identification of core, contributing, or absent conditions.
[5] The parsimonious solution for Path 1 yielded the following values: inclS = 0.778; PRI = 0.778; covS = 0.163; and for Path 2, the following values: inclS = 0.667; PRI = 0.667; covS = 0.140. Intermediate and conservative solutions were also computed for both paths to inform the identification of core, contributing, or absent conditions.

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indicates that the central condition for this contribution is the 'percentage participation of Embrapii projects in the total resources allocated to R&D activities by the company', with complementary conditions being 'change in the company's technological skills' and the 'generation of intellectual property rights'. The second pathway, with a consistency of 66.7%, also highlights the 'percentage participation of Embrapii projects in the total resources allocated to R&D activities by the company' as a central condition, combined with the 'generation of intellectual property rights', and with 'change in the company's technological skills' as a complementary condition. In both paths, the variables 'what the company would have done in the absence of Embrapii resources' and 'volume of resources allocated by the company to RDI activities as a percentage of revenues' do not have a direct relationship.

Figure 5. QCA II study solution

Causal conditions	Path 1	Path 2
SKL	●	●
CAUS	○	○
RDI	○	○
RDIE	⬤	⬤
IPR	●	⬤

Legend	
⬤	Core causal contribution condition
●	Contributing causal condition
○	Absence of causal condition

Source: Authors' elaboration

These findings underscore that Embrapii's impact is most significant when its funding represents a large proportion of the company's resources and when the project generates IP rights. This scenario is reinforced when the company acquires technological competencies from the projects.

Additionally, the Cost-Benefit Analysis revealed the return on investment based on the responses to the questionnaire regarding cash flow. We obtained only 30 responses (17% of total respondents), although nearly half of these presented implausible figures and were therefore excluded. As such, we worked with 16 valid responses, calculating an average benefit/cost of 2.7—meaning that for every dollar the companies invested in Embrapii projects, they received $ 2.7 in return.

While this is a positive result, it is based on a limited number of observations, which undermines its robustness and generalizability, intended solely to illustrate the performance of a limited set of selected innovations. The limited number of responses points to a lack of internal accounting by companies regarding the innovations generated, which compromises both Embrapii's understanding and the companies' own knowledge of the gains and savings achieved.

Finally, using data from the Resource and Use Tables of the IBGE available for 2019, the Input-Output Analysis measured direct, indirect and induced effects of Embrapii projects on Brazilian GPD. The findings indicated: 3.7 times for gross production value; 2.3 times for GDP; and 33 jobs created per million invested[6]. The generation of indirect taxes in the input-output matrix accounted for one-third of the total investment in the projects under evaluation, meaning the government has recovered approximately the same amount it initially invested - remembering that Embrapii's part (public funding) must be up to one-third of the total amount invested in the projects.

5. Discussion

The results provide evidence of the Embrapii funding model's success in fostering commitments between research organisations and companies across various fields, leading to outcomes on multiple levels. The conversion rate of research into innovations (68,2%) is relatively high compared to Brazilian standards: the most recent Innovation Survey, referring to the year 2023, indicates an innovation rate of 64.6% among Brazilian companies. If we consider that 20.7% of the companies in our sample stated that they have not yet achieved innovation but are likely to do so soon, our result may be up to 24.3% higher than PINTEC. It is worth noting, on the other hand, that only 19.9% of the companies surveyed by PINTEC reported having collaborated with science and technology institutions. In this regard, it is relevant to compare our findings with those of the Research Partnership for Technological Innovation programme. The most recent evaluation study of PITE dates back to 2008 and found an innovation rate of 40% among the funded projects (Romero, 2008). Still, it is worth noting that responses to the survey question on Embrapii's importance for achieving innovation were distributed across all ranges: while most companies attributed more than 60% of the success to the model, a considerable share pointed to the influence of other factors in explaining the conversion of projects into innovations.

[6] This number reduces to 12 if the induced effect is not considered, only direct and indirect effects.

The CBA, despite being based on limited financial data, suggests an average return of 2.7. Also, the IOA showed relevant multipliers for GDP, aggregated value and job creation. The strong performance in value creation, intellectual property generation, and market access indicate that commitments can be a key differentiator in funding policies. These results resonate with recent literature emphasising the role of engagement mechanisms and relational governance in overcoming barriers to effective university-industry collaboration (Bruneel et al., 2010; Salles-Filho et al., 2021; Ribeiro et al., 2022).

Of course, there are heterogeneities. The relative importance of Embrapii funding varies by company size and the proportion of funding in the company's R&D budget. Small and medium-sized enterprises (SMEs) where Embrapii funds constitute over 20% of R&D spending place greater value on the program. Notably, within the model, SMEs displayed higher innovation rates. Innovation was achieved by 85% of small firms and 77% of medium-sized firms, in contrast to Brazil's usual pattern, where smaller companies tend to be less innovative. According to the 2023 Innovation Survey, only 59.3% of small enterprises and 70.8% of medium-sized companies reported having innovated.

Our findings suggest that Embrapii's importance in generating innovations is inversely proportional to a company's prior innovation effort. The creation of IP and the enhancement of technological competencies are relevant factors for innovation, as observed in the QCA, in alignment with the concept of absorptive capacity (Cohen and Levinthal, 1990). Companies with greater prior innovation efforts are likely to have developed routines, skills, and organisational structures that enable them to better leverage the collaborative environment fostered by the Embrapii model. The multi-sided effects of these innovations are robust: 91% of respondents reported positive impacts, including increased product value and market access; 78% noted improvements in the value chain, and 35% highlighted environmental benefits and competitive advantages.

Last but not least, the model requires engagement from companies and research institutions, not only based on scientific or technological merit of projects, but on concrete implementation goals. It demands formalised commitments for funding release, joint monitoring, and output validation by firms and external experts to verify if objectives were successfully achieved.

Although not all projects lead to innovation, our evaluation suggests that funding for innovation-oriented research achieves better results when coupled with mechanisms that ensure commitment from actors. While seemingly intuitive, this approach had not been adopted in Brazil, where research policies historically assumed that financial constraints were the primary barrier to innovation - in truth, a common scenario in Latin America. The main assumption of innovation policies in Brazil has been based on reducing the cost of money, as it was sufficient to foster true cooperation for innovation. Yet, decades of subsidised financial resources from bodies like the Funding Agency for Studies and Projects (FINEP), the National Council for Scientific and Technological Development (CNPq), and various ministries have shown limited impact when other critical factors remain unaddressed (Figueiredo, 2023; de Negri, 2017).

The replication of the Embrapii model in other contexts is feasible where certain institutional prerequisites are present. In fact, the model's original design was inspired, in part, by the experience of other organisations, particularly the Carnot Institutes in France and, to a lesser extent, the Fraunhofer Society in Germany.

Since its creation, the model has incorporated features to strengthen commitment between EUs and companies. Three appear to be critical: a) fostering professional capabilities within EUs in technology and innovation management, including project prospecting with companies, contract negotiation, and project management; b) establishing joint project governance where both UEs and companies are closely involved in the project inception, development and conclusion; and c) requiring tripartite financial commitment from UEs, companies and Embrapii itself. In addition, Embrapii has a continuous monitoring process of all projects. All these characteristics contribute to the differentiation of the model and are core conditions for successful adoption elsewhere.

Despite the evidence gathered in this research, future studies are needed to expand the dataset, particularly by including companies involved in more recent projects concluded after 2021 and verifying whether those that reported being close to achieving innovation have indeed done so. The main limitation of our evaluation was the low response rate regarding financial data on cash flow and added value generated by the innovations, indicating that our findings remain preliminary. As this type of data is not easily obtained from companies, Embrapii could include it in its regular monitoring process to enable a more accurate CBA.

Further investigation should also explore the extent to which some of the involved companies would have moved forward without Embrapii funding; assess firms' absorptive capacity through their level of engagement in co-authored publications; and understand the role of the professionalisation of EUs in supporting technology-based innovation, especially in areas such as project management, technology foresight, IP, and other practices required by the model. Lastly, the influence of innovation ecosystems should be considered, including whether outcomes differ when companies and Embrapii Units are embedded in more developed environments.

6. Conclusion

This paper presented the first large-scale evaluation of the Embrapii model from the perspective of participating firms. Results indicate that the model successfully fosters technological innovation through shared commitments and structured collaboration. The innovation conversion rate reached 68,2%, with additional evidence of value creation, job generation, and environmental impacts. A CBA suggested an average return of 2.7 for every unit invested, while the IOA demonstrated significant economic multipliers. The QCA identified configurations in which IP generation and competence enhancement often co-occur with innovation outcomes, especially when Embrapii funding represents a large share of firms' R&D budgets.

This study contributes to the literature by evidencing how institutional design elements—such as milestone-based funding, joint validation mechanisms, and the requirement for clearly defined project outcomes negotiated between stakeholders—can shape more effective UIC outcomes. As recommendations for improving the model, our study points to a greater emphasis on SMEs, where the impact on innovation generation was found to be higher and the likelihood of crowding out lower; furthermore, we recommend that companies be required, from the outset of each project, to systematically collect and share data — particularly financial data — related to the resulting innovations, both to enhance their own strategic learning and to support Embrapii's evaluation. From a policy perspective, it highlights Embrapii as a promising model for other Latin American countries seeking to overcome the longstanding challenges of fragmented innovation systems and weak firm engagement in R&D. Finally, it offers methodological advances by integrating a Theory of Change-based evaluation with Qualitative Comparative Analysis, Input-Output Analysis, and Cost-Benefit Analysis into a single impact assessment framework.

References

Abramo, G., & D'Angelo, C. A. (2022). Drivers of academic engagement in public–private research collaboration: An empirical study. *The Journal of Technology Transfer*, *47*(6), 1861–1884. https://doi.org/10.1007/s10961-021-09884-z

Bezerra Borges, D., Meyer Soares, P., & Santana Silva, M. (2021). Programs and Instruments for Promoting Innovation with Technology-Based Companies in Brazil. *Journal of Technology Management & Innovation*, *16*(2), 28–40. https://doi.org/10.4067/S0718-27242021000200028

Brito Cruz, C.H. de B. (2019), Benchmarking university/ industry research collaboration in Brazil, in Reynolds, E.B., Schneider, B.R. and Zylberberg, E. (Eds.), Innovation in Brazil: Advancing Development in the 21st Century, 1st ed., Routledge, pp. 120–143, doi: 10.4324/9780429053092.

Bruneel, J., D'Este, P., & Salter, A. (2010). Investigating the factors that diminish the barriers to university–industry collaboration. *Research Policy*, *39*(7), 858–868. https://doi.org/10.1016/j.respol.2010.03.006

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 128–152. https://doi.org/10.2307/2393553

Cunha, M.P. and Scaramucci, J.A. (2006). The Construction Of An Updated Economic Database For Energy Studies: An Application To The Brazilian Sugarcane Agroindustry.

de Jesus-Hitzchky, K. R. E. (2007). Impact Assessment System for Technological Innovation: INOVA-tec System. *Journal of Technology Management and Innovation | Innovation for Social and Sustainable Progress*, 2(2), 67–81. Retrieved from https://www.jotmi.org/index.php/GT/article/view/art46

de Negri, F. (2017). Por Uma Nova Geração de Políticas de Inovação no Brasil, Políticas de Apoio à Inovação Tecnológica no Brasil: avanços recentes, limitações e propostas de ações, pp. 25–46.

de Negri, F., Zucoloto, G., Miranda, P., Koeller, P., Rauen, A. and Szigethy, L. (2020), Redução Drástica na Inovação e no Investimento em P&D no Brasil: o que dizem os Indicadores da Pesquisa de Inovação 2017, No. 60, Instituto de Pesquisa Econômica Aplicada (IPEA), p. 14.

De Souza Regis, A. M., Castro Gomes, S., & Georges, M. R. R. (2025). Impact of Digitalization and Technological Human Capital on The Performance of The Brazilian PYME: An Empirical Study. *Journal of Technology Management & Innovation*, *20*(1), 74–85. https://doi.org/10.4067/S0718-27242025000100074

Delduque, M.C., Alves, S.M.C., Montagner, M.I. and Montagner, M.Â. (2022). Are the measures to make COVID-19 vaccine mandatory in Brazil reasonable and proportionate?, Saúde Em Debate, Vol. 46 No. 134, pp. 870–876, doi: 10.1590/0103-1104202213420i.

Dutrénit, G. (Ed.). (2010). *El sistema nacional de innovación mexicano: Instituciones, políticas, desempeño y desafíos* (1a ed). Universidad Autónoma Metropolitana , Unidad Xochimilco [u.a.].

Fernandez, G. D. R. (2016). *Diretrizes Para Construção De Uma Metodologia De Gerenciamento De Projetos De Pesquisa, Desenvolvimento E Inovação Tecnológica – Caso Do Escritório De Gerenciamento De Projetos Do Int Na Embrapii*. UNIVERSIDADE FEDERAL FLUMINENSE.

Figueiredo, P.N. (2023), "National innovation strategy: A brief contribution to its effectiveness from the perspective of technological capability accumulation", Revista de Administração Pública, Vol. 57 No. 5, pp. e2022-0418, doi: 10.1590/0034-761220220418x.

Fischer, B. B., & Queiroz, S. (2016). On the mediating role of systemic absorptive capacity: An assessment of FDI effects in developing countries' innovation systems. *Revista Brasileira de Inovação*, *15*(2), 193. https://doi.org/10.20396/rbi.v15i2.8649128

Fischer, B., Meissner, D., Vonortas, N., & Guerrero, M. (2022a). Spatial features of entrepreneurial ecosystems. *Journal of Business Research*, *147*, 27–36. https://doi.org/10.1016/j.jbusres.2022.04.018

Fischer, B., Salles-Filho, S., Zeitoum, C., & Colugnati, F. (2022b). Performance drivers in knowledge-intensive entrepreneurial firms: A multidimensional perspective. *Journal of Knowledge Management*, *26*(5), 1342–1367. https://doi.org/10.1108/JKM-03-2021-0264

Fuentes-Solís, R., Soto-Caro, A., & Paredes, D. (2019). The Impact of Cooperation on Business Innovation in Developing Countries: Evidence from Chile in Latin America. *Journal of Technology Management & Innovation*, *14*(4), 31–40. https://doi.org/10.4067/S0718-27242019000400031

Galvao, A., Mascarenhas, C., Marques, C., Ferreira, J., & Ratten, V. (2019). Triple helix and its evolution: A systematic literature review. Journal of Science and Technology Policy Management, 10(3), 812–833. https://doi.org/10.1108/JSTPM-10-2018-0103

Gomes, R. D. S. (2020). *Arranjos Institucionais E Governança Para O Fomento À Inovação No Brasil: Análise Dos Principais Resultados Da Embrapii 2013-2019*.

Granstrand, O., & Holgersson, M. (2020). Innovation ecosystems: A conceptual review and a new definition. *Technovation*, *90–91*, 102098. https://doi.org/10.1016/j.technovation.2019.102098

Grasmik, K. (2016). Academic Spin-off as Triple Helix Element: Case-Study of Russian Regions. *Journal of Technology Management & Innovation*, *11*(3), 127–136. https://doi.org/10.4067/S0718-27242016000300015

Guerrero, M., & Link, A. N. (2022). Public support of innovative activity in small and large firms in Mexico. *Small Business Economics*, *59*(1), 413–422. https://doi.org/10.1007/s11187-021-00517-1

Hall, B. H., & Maffioli, A. (2008). *Evaluating the Impact of Technology Development Funds in Emerging Economies: Evidence from Latin America*.

Miller, R.E. and Blair, P.D. (2009) Input-Output Analysis Foundations and Extensions. 2nd Edition, Cambridge University Press, Cambridge.

Mohamed, M. M. A., Liu, P., & Nie, G. (2022). Causality between Technological Innovation and Economic Growth: Evidence from the Economies of Developing Countries. Sustainability, 14(6), 3586.

Mueller, C. E., Gaus, H., & Rech, J. (2014). The Counterfactual Self-Estimation of Program Participants: Impact Assessment Without Control Groups or Pretests. *American Journal of Evaluation*, *35*(1), 8–25. https://doi.org/10.1177/1098214013503182

Pietrobelli, C., Anlló, G., Barletta, F., Bianchi, C., Dutrénit, G., Menéndez, M., Puchet, M., Rocha, F., Ruiz, K., Segura Bonilla, O., & Szapiro, M. (2023). *Navigating challenges: STI policies for sustainable and inclusive development in Latin America* (MERIT Working Papers 2023–040). United Nations University - Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT). https://ideas.repec.org/p/unm/unumer/2023040.html

Polese, F., Ciasullo, M. V., & Montera, R. (2021). Value co-creation in University-Industry collaboration. An exploratory analysis in digital research projects. *Sinergie Italian Journal of Management*, *39*(2), 117–134. https://doi.org/10.7433/s115.2021.07

Puerta-Sierra, L., & Jasso, J. (2020). University-Industry Collaboration. An Exploration of An Entrepreneurial University in Mexico. *Journal of Technology Management & Innovation*, *15*(3), 33–39. https://doi.org/10.4067/S0718-27242020000300033

Ribeiro, F. W., Lazaro, J. C., Machado, D. D. Q., & Façanha Câmara, S. (2022). Collaborative network of SMEs innovation projects: Influence of scientific and technological institutions. *Journal of Technology Management & Innovation*, *17*(2), 11–20. https://doi.org/10.4067/S0718-27242022000200011

Romero, T. (2008). Excelência mensurada. *Agência FAPESP*. https://agencia.fapesp.br/excelencia-mensurada/8719

Salles-Filho, S., Bin, A., Bonilla, K., & Colugnati, F. A. B. (2021). Effectiveness by Design: Overcoming Orientation and Transaction Related Barriers in Research-Industry Linkages. *Revista de Administração Contemporânea*, *25*(5).

Salles-Filho, S., Bonacelli, M. B., Carneiro, A. M., De Castro, P. F. D., & Santos, F. O. (2011). Evaluation of ST&I programs: A methodological approach to the Brazilian Small Business Program and some comparisons with the SBIR program. *Research Evaluation*, *20*(2), 157–169. https://doi.org/10.3152/095820211X12941371876184

Salles-Filho, S., Fischer, B., Juk, Y., Feitosa, P., & Colugnati, F. A. B. (2023). Acknowledging diversity in knowledge-intensive entrepreneurship: Assessing the Brazilian small business innovation research. *The Journal of Technology Transfer*, *48*(4), 1446–1465. https://doi.org/10.1007/s10961-022-09976-4

Schefer, C. F. (2020). *Embrapii E Sua Relevância Como Instrumento De Política De Ciência, Tecnologia E Inovação*. UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL.

Varrichio, P. de C. (2020). *Novos Modelos De Financiamento À Inovação Tecnológica No Brasil: Um Estudo Sobre A Embrapii Nos Projetos-Pilotos Do Ipt*. https://doi.org/10.36942/reni.v4i2.208

Taplin, D.H. and Clark, H. (2012), "Theory of Change Basics: A Primer on Theory of Change", ActKnowledge, March.

Zawislak, P. A., & Dalmarco, G. (2011). The Silent Run: New Issues and Outcomes for University-Industry Relations in Brazil. *Journal of Technology Management & Innovation*, *6*(2), 66–82. https://doi.org/10.4067/S0718-27242011000200005

Zucoloto, G. F., Bruna Goussain Santana, Leandro Justino Pereira Veloso, & Sérgio Kannebley Jr. (2017). Lei do Bem e Produtividade das Firmas Industriais Brasileiras. In *Políticas de Apoio à Inovação Tecnológica no Brasil: Avanços recentes, limitações e propostas de ações* (pp. 295–332).

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Data Availability

Data used in this study were mainly obtained from Embrapii under a confidentiality agreement. Aggregated main results are presented throughout the article in a manner that prevents the identification of any individual company or sensitive information. Due to the confidentiality terms, disaggregated data cannot be shared publicly. Further details may be made available from the corresponding author upon request.