JOINETECH

Journal

2025

UTAMED

Nº 01

International Journal of Economic and Technological Studies

University-industry cooperation in Latin America a perspective from the obstacles

Antonio Hidalgo
Universidad Politécnica de Madrid (Spain).
ETSI Industriales.
c/ José Gutiérrez Abascal, 2,
28006 Madrid, Spain,
antonio.hidalgo@upm.es

Alberto Urueña
Universidad Politécnica de Madrid (Spain).
ETSI Industriales.
c/ José Gutiérrez Abascal, 2,
28006 Madrid, Spain,
alberto.uruena@upm.es

Citation:
Hidalgo, A., & Urueña, A. (2025). University-industry cooperation in Latin America a perspective from the obstacles. ***Joinetech (International Journal of Economy and Technology),*** 11(1), 66–75. UTAMED.

ARTICLE INFO

Keywords: Innovation, technology transfer, university–industry cooperation, Latin American countries.

ABSTRACT

This study explores the dynamics of science–industry collaboration in emerging economies, with a particular focus on university–industry partnerships in Latin America. The research aims to understand how the defining characteristics of these partnerships influence their effectiveness and what barriers must be overcome to enhance cooperation. The methodology combines secondary data analysis with primary data collection through expert consultations, including a Virtual Forum and collaborative meetings across several Latin American countries. A gap matrix was developed to identify missing data, which was then supplemented by expert input from academia, industry, and government sectors in both the EU and Latin America. Key findings reveal that fragmented innovation policies, lack of a dynamic technological environment, and limited understanding of universities' third mission significantly hinder collaboration. Cultural and institutional mismatches, differing timelines, and concerns over academic autonomy further exacerbate these challenges. The study emphasizes the need for a more cohesive legal and institutional framework, improved research and development (R&D) management, and the adoption of best practices from entrepreneurial universities.

To foster effective university–industry collaboration, the study recommends targeted policy reforms, enhanced stakeholder engagement, and a strategic focus on small and medium-sized enterprises (SMEs).

1. Introduction

The management of university–industry relationships represents a distinct aspect of the broader technology transfer process (Dill, 1990; Hidalgo and Albors, 2011; Hidalgo et al., 2025). These collaborations integrate the processes of knowledge discovery and dissemination with their practical application in the development of goods and services. There is widespread consensus that science–industry linkages contribute positively to firms, universities, and, more broadly, national innovation systems (Leydesdorff and Etzkowitz, 1996; Arvanitis et al., 2008). When effectively structured, such collaborations generate public goods that extend beyond the direct contributions of the participating entities, fostering economic growth, enhancing living standards, and expanding intellectual frontiers. Fundamentally, the objective of university–industry collaborations (UICs) should be to generate these societal benefits while concurrently fulfilling the missions and objectives of each stakeholder (O'Sullivan et al., 2007).

Research, development, and innovation (RD&I) partnerships between universities or research institutions and industries play a crucial role in national economic development. Industry gains access to cutting-edge laboratories and advanced technologies from academia, while research institutions benefit from industry-driven insights into market dynamics and real-world applications (Hidalgo et al., 2021; Hidalgo et al., 2024). Although numerous studies have examined the challenges associated with establishing and maintaining such partnerships, the findings remain fragmented (Rossoni et al., 2024; Romero-Sánchez et al., 2024). Scientific knowledge generated through collaboration between academic institutions, and the private sector is essential for economic growth. However, in less developed economies, multiple barriers hinder the effectiveness of these partnerships (Atta-Owusu et al., 2021). While the economic impact of UICs has been extensively analyzed (Bercovitz and Feldman, 2006; Yu et al., 2021), emerging industries frequently face obstacles such as weak knowledge networks and insufficient public funding for research, complicating collaboration efforts (Freitas et al., 2013). Although significant innovations have emerged from academic–industrial cooperation, relatively few studies have thoroughly examined the constraints and incentives influencing these partnerships. Further research is therefore required to better understand these challenges and improve the effectiveness of UICs.

The increasing significance of UICs is evident in their role in facilitating knowledge exchange, expertise sharing, and technology transfer. These partnerships provide mutual benefits to universities and industries by addressing real-world challenges, advancing scientific research, and fostering new research opportunities (Figueiredo and Ferreira, 2022). UICs are integral to technological progress, as they enable univer-

sities to contribute specialized expertise while granting businesses access to advanced research and development initiatives (Rossoni et al., 2024). The role of UICs in promoting regional economic growth has been widely explored, with governments playing a central role in fostering collaboration through policies such as research funding, tax incentives, and the establishment of innovation hubs (Amaral et al., 2011). Despite their substantial benefits, including access to new knowledge and enhanced innovation (Chryssou, 2020; Morales & Robalino-López, 2025), UICs face persistent challenges, including divergent institutional objectives, trust issues, and concerns regarding intellectual property rights (Alunurm et al., 2020). Addressing these barriers is essential to optimizing the potential impact of UICs on economic and technological development.

This study examines the significance, forms, and current trends in science–industry collaboration, as well as the challenges associated with such partnerships in emerging economies. The analysis focuses specifically on the defining characteristics of university–industry relationships in Latin America, with an emphasis on the key obstacles that must be addressed to improve cooperation. Although this study does not aim to provide an exhaustive analysis, it builds upon insights developed within the Seventh Framework Programme for Research (FP7) EU–Latin America Research and Innovation Networks (IncoNet EULARINET) program, in which the authors were involved, particularly in tasks related to university–industry collaboration. The primary objective of EULARINET was to enhance the bi-regional dialogue on science and technology (S&T) between European Union (EU) Member States (MS), associated states (AS), and Latin American partner countries (LAPC) at the policy, programmatic, and institutional (research entities) levels. Therefore, we define the following research questions: How do the defining characteristics, forms, and trends of science–industry collaboration in Latin America influence the effectiveness of university–industry partnerships, and what are the key challenges that must be addressed to enhance cooperation in these emerging economies?

This paper is organized as follows: Section 2 discusses the trends and challenges associated with university–industry collaboration, providing a global perspective on the evolving dynamics of these partnerships. Section 3 focuses specifically on university–industry collaboration within Latin America, detailing the contextual factors that shape these interactions. Section 4 outlines the methodology used to analyze the collected data. Section 5 identifies the main obstacles hindering university–industry collaboration in Latin American countries (LAC), drawing on insights from regional case studies. Finally, Section 6 presents the conclusions drawn from the study, along with a discussion of its limitations. Finally, a final section dealing with future lines of research has been included.

2. THE UNIVERSITY–INDUSTRY COLLABORATION: TRENDS AND CHALLENGES

An expanding body of literature provides valuable insights into cooperative behavior in innovation, drawing on microdata from innovation surveys (Onea, 2020; Vieira, 2023). These studies, primarily based on the European Innovation Survey, examine various determinants influencing cooperative behavior. However, identifying the precise conditions that facilitate effective research and development (R&D) collaboration remains complex. Specifically, further research is required to determine the standards of excellence, structural determinants that enhance the performance of firms and universities, and the set of incentives most conducive to fostering such cooperation (Grupp and Schubert, 2010).

Several key factors influence the likelihood of firms engaging in R&D cooperation with the scientific sector. These include firm size, the ability to appropriate returns from innovation, internal R&D capabilities (i.e., absorptive capacity), and the perceived significance of costs and risks as obstacles to innovation. From the academic perspective, various theoretical frameworks have been proposed to justify university participation in economic activities, including the national systems of innovation approach (Lundvall, 1988; Freeman, 1988; 1995), the new mode of knowledge production (Gibbons et al., 1994), and the Triple Helix model (Etzkowitz and Leydesdorff, 1995). While these perspectives differ in the emphasis they place on universities within the innovation process, they all recognize the necessity of some degree of interaction between academic institutions and industry.

A new institutional framework aimed at promoting innovation is emerging (Ankrah and Al-Tabbaa, 2015). According to Etzkowitz (2002), the traditional division between distinct institutional spheres (universities, industry, and government) has evolved into a more flexible and overlapping system, where each entity assumes roles traditionally held by others to foster both competition and collaboration (Fig. 1).

Fig. 1. Evolution of state–university–industry relationships.

In this transformed landscape, universities can function as industry actors by establishing incubators that facilitate the creation of new firms. Governments, in turn, can assume the role of industry by acting as venture capitalists through targeted programs or supporting new developments via funding mechanisms and regulatory changes. Additionally, governments have played a central role in fostering collaborative R&D efforts among firms, universities, and national laboratories to enhance national competitiveness. Conversely, industry has taken on academic functions by developing training and research programs that often match the standards of universities.

These structural shifts have led to significant transformations in institutional arrangements, intellectual property rights, and innovation legislation, thereby creating new opportunities for interaction among firms, universities, and research centers. These developments provide a novel perspective on science–industry linkages, the role of scientific inputs in industrial development, and university–industry cooperation in R&D. Consequently, the growing emphasis in advanced economies on innovation, collaboration, and public–private partnerships as central elements of policy discourse is unsurprising.

In this evolving context, university–industry linkages must encompass a broad spectrum of activities in both teaching and research. These range from traditional forms of collaboration, such as student placement programs, staff exchanges, consultancy services, continuing professional development, and joint R&D, to more recent initiatives, including the creation of spin-offs for the joint commercialization of R&D outputs, investments in university facilities, and the formation of international consortia for collaborative R&D (Henrekson & Rosenberg, 2001; Lambert, 2003; Hidalgo & León, 2006; Meissner et al., 2018) (Fig. 2).

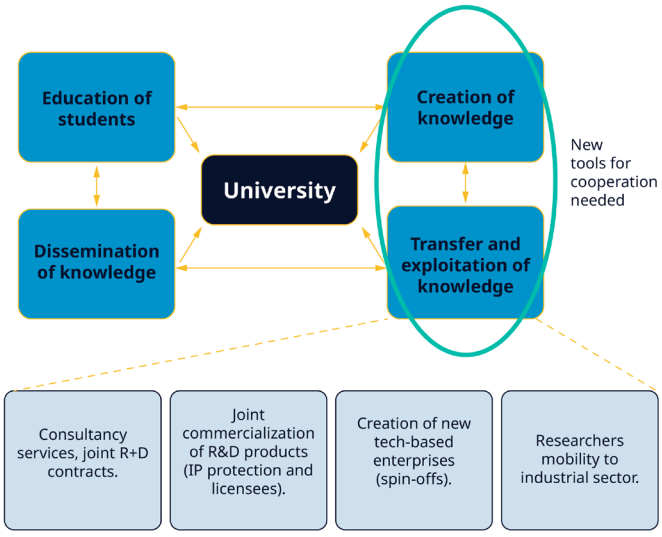

Fig. 2. The university mission. Source: Hidalgo and León, 2006.

Both industry and universities serve as pivotal institutions for transforming knowledge, skills, and materials into products and services, relying on trained individuals to add value throughout the process (Sutz, 2005). In this context, both entities share several similar assets that facilitate their operations. Physical resources, such as laboratories, equipment, and facilities, are critical for conducting research and development activities. Human resources, comprising highly skilled and experienced staff, play a central role in driving innovation and knowledge creation (Woollard et al., 2007). Additionally, both sectors leverage other knowledge resources, including information, databases, ideas, and professional networks, to enhance their capabilities. Financial resources, whether derived from internal research funds or access to public funding, further enable these institutions to sustain and expand their activities. Together, these assets form the foundation for the collaborative and competitive dynamics that characterize the relationship between industry and academia (Okamuro & Nishimura, 2014).

The differences between universities and industry primarily stem from the scope and diversity of their available resources, which creates opportunities for mutually beneficial collaboration (Teirlinck & Spithoven, 2012). For instance, while companies often possess significantly greater financial resources and state-of-the-art physical infrastructure, they typically cannot rival universities in terms of the breadth of human capital and knowledge resources. Even in cases where industry and academia have comparable capabilities, the diverse expertise brought together through collaboration can generate synergies that provide a competitive advantage, ultimately leading to successful innovation.

As economic activities become increasingly knowledge-intensive, a growing number of institutions with specialized expertise contribute to the production and dissemination of knowledge (Godin, 2009). The success of enterprises and national economies is becoming progressively reliant on their ability to efficiently acquire and utilize knowledge from these institutions, whether in the private sector, the public sector, or academia (Cunningham & Link, 2015). Furthermore, each country exhibits a distinct institutional framework shaped by factors such as governance structures for enterprises, the organization of the university sector, and the level and strategic orientation of government-funded research.

Government-supported research institutes and universities serve as primary contributors to fundamental research, generating not only foundational knowledge for industry but also new methodologies, advanced instrumentation, and highly skilled professionals. Increasingly, research at these institutions benefits partnerships with enterprises, which engage in joint technology projects, contract specific research activities, or provide financial support for academic staff and researchers. However, in many developing economies, R&D intensity remains relatively low, and the proportion of researchers within the labor force is limited (Kayal, 2008).

Public funding remains the dominant source of R&D investment, as private-sector contributions tend to be minimal.

This is largely due to the prevalence of low- and medium-technology industries, whose firms frequently rely on imported technology rather than investing in domestic research and development (Chudnovsky et al., 2006). Nevertheless, the globalization of science and R&D, along with the increasing international networking of firms, is expected to enhance collaboration opportunities between universities and multinational enterprises in developing economies, particularly in the field of R&D (Carter, 2008).

3. THE UNIVERSITY–INDUSTRY COLLABORATION IN LATIN AMERICA

One of the most significant limitations of Latin America's development process over the past century has been its weak engagement in knowledge production and the limited integration of the knowledge generated into the economic system. In general, firms in these economies operate within technologically stagnant domestic environments that do not foster interactions with external knowledge sources or drive innovation (Cimoli, 2005). For over three decades, Latin American countries have implemented market-oriented structural reforms, including economic liberalization, deregulation, and privatization, albeit at different times and with varying degrees of success. These policy shifts marked a substantial departure from the inward-oriented, state-led economic models that dominated the postwar period. However, the outcomes of these market-oriented reforms have largely fallen short of the expectations that policymakers and economists held in the 1970s when these strategies were initially advocated.

During the 1980s, many countries in the region underwent a process of deindustrialization, characterized by the erosion of productive capacities and technological capabilities. This was accompanied by a decline in entrepreneurial investment in R&D and an increased reliance on imported capital goods for modernization (Cimoli et al., 2005). It has been argued that the combination of market-oriented reforms and economic globalization over the last two decades has triggered a Schumpeterian process of creative destruction, profoundly transforming production structures and social organization patterns (Katz, 2006a).

The 1990s saw further economic liberalization and deeper integration into international trade, which altered production incentives and specialization patterns across Latin America. Most countries increasingly specialized according to static comparative advantages, leading to the emergence of new economic sectors while traditional industries were gradually phased out. Employment in both manufacturing and agriculture declined, while the informal sector expanded significantly. Labor reabsorption was constrained by persistently low investment-to-GDP ratios and further exacerbated by the transition to digitally organized production systems.

Across multiple dimensions, including economic growth, competitiveness, equity, and domestic technological capability development, the new economic model implemented in Latin America delivered outcomes far below expectations (Katz, 2002, 2006b). Despite these shortcomings, the reforms did facilitate the emergence of a modern economic sector in each country. This sector contributes approximately 40% of GDP in the wealthiest nations and around 10% in the least developed ones.

In the postreform period, three distinct specialization patterns have emerged in Latin America. The first is a natural-resource-based specialization, employing state-of-the-art technologies, primarily in the Southern Cone. Examples include genetically modified soybean and vegetable oil production in Argentina, salmon farming and wine production in Chile, and fresh flower exports from Colombia. The second specialization pattern involves high-productivity service industries, including banking, telecommunications, energy, and tourism, alongside a few technology-intensive manufacturing sectors. Notable examples include aeronautical design and production in Brazil and the assembly of motor vehicles and electronic equipment, mainly from imported components, in Mexico. The third specialization pattern is centered on labor-intensive industries, particularly in Central America.

The latest edition of the Innovation–Entrepreneurship Index (IEI) developed by the World Bank (2019) highlights significant progress and challenges in Latin American countries regarding innovation and entrepreneurial ecosystems. The index, which measures factors such as R&D investment, startup activity, digital infrastructure, and regulatory frameworks, reveals a mixed picture across the region. Chile leads the ranking with a score of 68.5, driven by its robust startup ecosystem and strong government support for innovation. Brazil follows closely with a score of 64.3, benefiting from its large market size and increasing venture capital investments. Mexico, with a score of 59.8, has shown improvement in digital infrastructure and entrepreneurial activity, particularly in tech hubs such as Mexico City and Monterrey. Colombia, scoring 55.6, has made strides in fostering innovation through public–private partnerships and startup incubators.

The index also underscores persistent gaps in the region. Argentina, despite its highly skilled workforce and strong academic institutions, scores 53.2 owing to economic instability and limited access to financing for startups. Peru, with a score of 49.7, faces challenges in scaling its entrepreneurial ecosystem, though it has seen growth in sectors such as financial technology (fintech) and agricultural technology (agrotech). Ecuador and Bolivia lag, scoring 45.3 and 40.1, respectively, owing to weaker institutional frameworks and lower R&D spending.

Latin American countries, even the richer countries in the region, are still living in a world in which the islands of modernity are not enough to hide the great dimension of the ocean of poverty and social dissatisfaction in which LAC are sunk. In 2021, LAC experienced a significant surge in venture capital investments, totaling USD 15.7 billion, making it the fastest-growing region globally in this sector. This influx of capital led to the emergence of 47 companies achieving unicorn status, with 10 of them going public or being acquired

by 2022. Despite these advancements, the region continues to face challenges in fostering innovation. A 2013 World Bank report highlighted that, while entrepreneurship is prevalent in LAC, it often lacks an innovative component, with many new businesses.

The Global Innovation Entrepreneurship Index (GEI) provides a comprehensive assessment of the entrepreneurial ecosystems across various countries, reflecting their capacity to foster innovation-driven enterprises. In the USA, the GEI score stands at 83.6, underscoring its robust ecosystem characterized by high levels of venture capital investment, advanced R&D infrastructure, and a culture of risk-taking. Japan, with a GEI score of 62.4, demonstrates strong technological capabilities and institutional support, though it faces challenges in cultural attitudes toward entrepreneurship and risk tolerance. Spain, scoring 48.7, shows moderate performance, with strengths in human capital and innovation output but lagging in access to finance and market dynamics. In Latin America, Chile leads with a GEI score of 35.2, reflecting its relatively stable economy and proactive government policies supporting startups. Brazil follows at 29.8, benefiting from a large domestic market but hindered by bureaucratic inefficiencies. Mexico and Argentina score 27.4 and 25.6, respectively, with both nations showing potential in innovation but struggling with economic instability and limited access to funding. These figures highlight the disparities in entrepreneurial ecosystems, emphasizing the need for targeted policies to enhance innovation infrastructure, access to capital, and entrepreneurial education, particularly in Latin America, to bridge the gap with more advanced economies such as the USA and Japan.

According to World Bank (2019), Latin American countries generally lag advanced economies in terms of R&D intensity (R&D expenditure as a percentage of GDP). For instance, while countries such as Brazil and Argentina spend around 1.2% and 0.5% of GDP on R&D, respectively, this is far below the Organisation for Economic Co-operation and Development (OECD) average of 2.7%. This low investment reflects structural challenges that limit the depth and impact of science–industry collaboration. Several structural characteristics determine the probability of firms engaging in R&D with universities in Latin America. First, the size and sector of firms play a critical role; larger firms in high-tech industries are more likely to collaborate owing to their greater resources and innovation needs. Second, institutional frameworks, such as intellectual property rights and government incentives, are often weak or inconsistently enforced, discouraging collaboration. Third, the quality of human capital and research output from universities are disparate, with limited alignment between academic research and industry needs. Finally, access to financing for innovation remains a significant barrier, as highlighted by World Bank reports on the region's underdeveloped venture capital markets and limited public funding for R&D. While science–industry links exist, their relevance is often constrained by these structural factors. Strengthening these collaborations requires targeted policies to improve institutional frameworks, increase R&D investment, and align academic research with industrial priorities (Thorn & Soo, 2006).

Firms engaged in R&D primarily collaborate with suppliers, clients, and consultants, while universities, training institutions, public and private laboratories, and technology transfer offices (TTOs) play a much smaller role in their innovation processes. The limited engagement between public research institutions and industry is often attributed to concerns about research quality and the insufficient responsiveness of public-sector researchers to industrial needs. Despite efforts by governments to establish and support key science and technology (S&T) agencies, R&D activities in most Latin American countries remain concentrated in public research institutes and universities. These institutions typically focus on strategic sectors such as agriculture, energy, mining, forestry, and aeronautics, while large state-owned enterprises drive innovation in critical infrastructure industries such as telecommunications and transport. This selective industrial approach reflects long-standing policy priorities in the region.

The structural framework for cooperation is based mostly on S&T laws, which are supported by different government institutions. These institutions define different types of schemes for university–industry cooperation and look for "customers" to use them. In most countries the structure to support the laws is very heterogeneous and covered by different public institutions at different levels (such as ministries, councils, or agencies), through which the S&T programs are regulated, promoted, coordinated, distributed, and executed.

Finally, the literature regarding production, innovation, and networking in Latin American countries (Reinhardt & Peres, 2000; Sutz, 2000; Melo, 2001; Cimolli et al., 2009) has extensively addressed the weaknesses in collaboration among firms, universities, and public institutions. Sector studies highlight that universities in the region prioritize undergraduate education, which is crucial for developing countries seeking to enhance workforce skills. However, postgraduate education and research remain peripheral activities for many universities, despite ongoing reforms aimed at fostering closer ties with industry. Despite these efforts, private-sector underinvestment in R&D remains unchanged. Studies indicate that firms adopting open search strategies and investing in R&D are more likely to collaborate with universities (Laursen & Salter, 2004; Méndez et al., 2024), emphasizing the role of managerial decisions in determining university–industry linkages. Firms often possess limited knowledge of available technological options and tend to innovate within their existing competencies, which in Latin America are generally distant from the global knowledge frontier.

4. METHODOLOGY

This study primarily relied on secondary data sources, including published reports, academic studies, and institutional documents related to the topic. However, to ensure a comprehensive understanding and to fill potential information gaps, primary data were also integrated into the research design. This approach allowed for the triangulation of findings, enhancing both the depth and reliability of the analysis.

The first phase of the methodology involved an extensive review of existing literature and reports to identify the available data landscape. To systematically assess gaps within these secondary sources, a gap matrix was developed. This matrix was subsequently disseminated among EULARINET participant countries, enabling a structured identification of missing or incomplete data. This step was critical for aligning the study's focus with real-world data availability and for highlighting areas where supplementary primary data might be required.

To address the identified data gaps and validate preliminary findings, primary insights were sought from experts through a virtual forum conducted between September and October 2009. This forum brought together 62 participants, including academics, industry professionals, and government representatives from both the European Union (EU) and Latin America (LA). This diverse group provided firsthand insights that enriched the study's contextual understanding and practical relevance.

The inclusion criteria for participation required direct experience in university–industry collaboration, active involvement in science and technology (S&T) policy, academic research, or industrial innovation, as well as affiliation with organizations participating in the EULARINET program. In contrast, individuals without relevant sector experience, representatives from regions outside the EU and LAC, and those not involved in decision-making or strategic roles were excluded from the sample. The final group consisted of a diverse mix of academics (e.g., researchers, professors, and university administrators), industry professionals (e.g., R&D managers, innovation directors, and business executives), and government officials (e.g., policymakers, funding agency representatives, and science advisors). This composition ensured a balanced perspective, providing valuable, firsthand insights that enriched the study's contextual understanding and practical relevance.

To refine the study's methodology and validate the collected data, a series of collaborative meetings was organized (Argentina, Brazil, Uruguay, Chile, Colombia, Nicaragua, and Mexico) to identify missing information, and in addition, firsthand information was obtained from feedback from expert (academics, businessmen, and government officials) from EU and LAC countries. Initial discussion on the draft methodology included the framework for the gap matrix and primary data collection strategies. Throughout the research process, informal communications via telephone and email supported continuous dialogue and feedback among participants, reinforcing the collaborative nature of the study.

5. RESULTS AND DISCUSSION

Applying the methodology outlined, we have identified several key obstacles that hinder closer collaboration between universities and firms. One of the most significant challenges is the fragmented innovation policy and the dispersion of instruments for technological cooperation, which prevent a cohesive approach to fostering research partnerships. Additionally, firms often lack a technologically dynamic domestic environment that would encourage them to seek external sources of innovation, leading to limited engagement with academia.

Firm-specific factors such as size, the ability to appropriate returns from innovation through proprietary mechanisms, internal R&D capacities, and risk aversion further influence the likelihood of establishing cooperative relationships with universities. Moreover, the private sector frequently lacks confidence in the quality and relevance of academic research; this is coupled with an absence of awareness among business leaders regarding the strategic importance of innovation and the potential benefits of university collaboration. Differences between operating times for companies, which often require rapid solutions, and universities, which adhere to longer research cycles, create additional barriers to collaboration. Furthermore, the commercial potential of university-generated technologies remains underappreciated, contributing to mutual mistrust and a persistent imbalance between technological supply and demand.

Beyond these structural and perceptual barriers, several institutional and economic factors further inhibit effective collaboration (Urueña et al., 2024; Salazar-Elena et al., 2023). Many universities do not prioritize R&D owing to budget constraints and limited human resources, which diminishes their capacity to engage in partnerships with firms. The reluctance to exchange research results is exacerbated by concerns over delayed publication, confidentiality issues, the absence of innovation capabilities in the productive sector, and financial and institutional barriers. Additionally, R&D in many Latin American countries is heavily dependent on public funding, as private investment in research remains minimal, largely because most enterprises operate within low and medium technology industries.

A fundamental issue is the limited understanding of universities' third mission, which involves knowledge transfer and industry engagement, as well as the absence of an entrepreneurial mindset among researchers. Many in academia do not prioritize market-oriented applications of their work, leading to a disconnect between scientific advancements and industrial needs. Moreover, universities and industrial organizations seek different types of information and operate on distinct timelines, further complicating their ability to work together effectively. The asymmetry between coordination efforts and the specialized nature of scientific research and production further widens this gap, while concerns over the potential loss of university autonomy also serve as a deterrent to stronger collaborations.

To enhance R&D management practices, strategically develop capabilities, and advance the state of innovation in Latin American countries, several areas require further research and improvement. The legal framework governing interactions between firms, institutions, and prevailing national innovation systems must be thoroughly examined to better understand how knowledge generation and diffusion

occur. Additionally, the structures and instruments necessary for effective university–industry collaboration must be clearly defined and implemented, ensuring that key structural functions facilitate rather than hinder cooperation. Best practices from the most entrepreneurial and dynamic universities should be analyzed to identify successful models of technology transfer and commercialization. Another crucial aspect is evaluating the extent to which all relevant stakeholders, including government agencies, private enterprises, and academic institutions, are actively involved in the innovation process. Addressing these challenges will require a concerted effort to reform policies, improve institutional structures, and foster a cultural shift toward greater collaboration between academia and industry, ultimately driving economic development and technological advancement in the region.

Disparities highlight the need for targeted policies to address structural barriers and promote inclusive growth in innovation and entrepreneurship. The World Bank's report emphasizes the importance of regional collaboration and knowledge sharing to bridge these gaps. It calls for increased investment in education and digital infrastructure, as well as reforms to streamline regulatory processes and improve access to financing. Countries such as Chile and Brazil serve as models for leveraging innovation to drive economic growth, while others can learn from their experiences. The IEI underscores that fostering a vibrant entrepreneurial ecosystem is crucial for Latin America to compete globally and achieve sustainable development in the digital age (World Bank, 2019).

Enhancing cross-sectoral research collaboration in Latin America requires fostering trust, improving communication, and reinforcing incentives. A key strategy involves promoting research excellence through targeted funding mechanisms while also reforming incentive structures at the individual-researcher level. Notably, adjusting the incentives that guide academic engagement can significantly contribute to addressing these challenges. With few exceptions, universities and research agencies in the region have yet to fully leverage their capacity to revise personnel policies and practices in ways that encourage faculty members to collaborate with external partners and explore entrepreneurial opportunities.

For university–industry collaborations to succeed, companies must develop the ability to collaborate beyond their organizational boundaries and establish effective partnerships with entities of differing characteristics (Rossoni, 2024). Managing these relationships requires adaptation and mutual learning. Academics and industry professionals must navigate the complexities of their initial interactions, understand each other's organizational cultures, and work toward common ground. Reconciling differences and fostering trust are crucial steps in ensuring the long-term success of these partnerships (Bruneel et al. 2010).

The renewed focus on science and technology policies should extend beyond widely accepted objectives, such as promoting R&D cooperation, networking, and strengthening science–industry linkages, to also emphasize increasing R&D expenditures and supporting scientific advancement. In Latin American countries, where both universities and firms often exhibit limited scientific and technological capabilities, policies aimed at enhancing science–industry collaboration must be complemented by targeted interventions designed to strengthen and upgrade these capabilities.

6. CONCLUSIONS AND LIMITATIONS

For Latin American countries to advance knowledge generation and dissemination, it is essential to address financial limitations, human capital deficiencies, and institutional barriers that have historically impeded the development of effective innovation ecosystems (Cimoli, Ferraz & Primi, 2005; Katz, 2006a). While increasing investments in R&D is a critical objective, it is equally vital to enhance the efficiency and impact of existing resources dedicated to knowledge and technology production.

Moreover, fostering greater private-sector engagement in R&D and enhancing firms' capacity to absorb and apply technological advancements should be a strategic priority (Atta-Owusu et al., 2021). In particular, university–industry collaboration has been identified as a key mechanism to bridge the gap between academic knowledge and industrial innovation, especially in environments marked by resource constraints (Rossoni et al., 2024). However, such collaborations often face multiple barriers (cultural, structural, and strategic) that must be carefully addressed (Romero-Sánchez et al., 2024).

Policy efforts and institutional frameworks must focus on small and medium-sized enterprises (SMEs), which are central to the economic and social fabric of Latin American countries. These firms, more than large corporations, require targeted support in accessing technology transfer mechanisms, as their capacity for R&D tends to be limited (Morales & Robalino-López, 2025). Large firms often have established routines and partnerships for innovation, while SMEs are the "true clients" of technology transfer initiatives that can stimulate broader economic welfare (Salazar-Elena et al., 2023).

Given the increasing complexity of innovation ecosystems, it is also advisable to analyze and adapt successful cooperation models, such as those implemented in Europe, to the Latin American context. This includes studying both institutional arrangements and policy instruments to foster university–industry–government synergies (Vieira, 2023). By extracting transferable lessons while respecting endogenous capacities, Latin American countries can design context-sensitive strategies that promote sustainable, inclusive, and innovation-driven development.

6.1. Limitations

A limitation of this methodology is reliance on secondary sources, which may introduce biases or limitations in data comprehensiveness and accuracy. While efforts were made to identify information gaps through a gap matrix and to supplement findings with expert opinions, the absence of extensive primary data collection may have constrained the depth

of analysis. Additionally, the dependence on expert feedback and virtual discussions introduces potential subjectivity, as perspectives may be influenced by individual experiences or institutional affiliations. Furthermore, the geographical distribution of meetings and informal communication channels could have impacted the inclusivity and representativeness of stakeholder input, potentially limiting the generalizability of the findings.

7. FUTURE LINES OF RESEARCH

Building on the findings of this study, several promising directions for future research can be identified to address the challenges facing university–industry collaboration in Latin America. Further investigation into the legal structures and policy frameworks that govern university–industry collaborations in Latin America is needed. Understanding how these frameworks either enable or constrain knowledge transfer and innovation will be crucial for crafting effective policies. This includes examining intellectual property regulations, contractual norms, and public funding mechanisms that influence collaboration dynamics.

Research should focus on the organizational capabilities required for effective collaboration, including the capacity of universities to manage R&D projects and the ability of firms to absorb external knowledge. Comparative studies across countries with varying levels of technological development could provide insights into the best practices for building robust innovative ecosystems. Research should assess how existing incentive structures impact the willingness of academic researchers to engage with industry partners. This includes understanding the role of career progression, publication pressure, and financial rewards in shaping collaboration behavior. Insights from regions that have successfully aligned academic incentives with market-oriented research could inform policy reforms in Latin America.

Addressing these future research directions will not only enhance the understanding of the complex dynamics shaping university–industry collaborations in Latin America but also contribute to the development of more effective policies and institutional practices, ultimately fostering a more innovative and globally competitive regional economy.

References

Alunurm, R., Rõigas, K. & Varblane, U. (2020). The relative significance of higher education–industry cooperation barriers for different firms. ***Industry and Higher Education,*** 34(6), 377-390.

Amaral, M., Ferreira, A. & Teodoro, P. (2011). Building an entrepreneurial university in Brazil: the role and potential of university–industry linkages in promoting regional economic development. ***Industry and Higher Education,*** 25(5), 383-395.

Ankrah, S. & Al-Tabbaa, O. (2015). Universities–industry collaboration: A systematic review. ***Scandinavian Journal of Management,*** 31(3), 387-408.

Arvanitis, S., Kubli, U. & Woerter, M. (2008). University-industry knowledge and technology transfer in Switzerland: what university scientists think about co-operation with private enterprises. ***Research Policy,*** 37, (10), 1865–1883.

Atta-Owusu, K., Fitjar, R.D. & Rodríguez-Pose, A. (2021). What drives university-industry collaboration? Research excellence or firm collaboration strategy? ***Technological Forecasting and Social Change,*** 173, 121084.

Bercovitz, J. & Feldman, M. (2006). Entprepreneriall universities and technology transfer: A conceptual framework for understanding knowledge-based economic development. ***The journal of technology transfer,*** 31, 175-188.

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.

Carter, L. (2008). Globalization and science education: The implications of science in the new economy. ***Journal of Research in Science Teaching,*** 45(5), 617-633.

Chudnovsky, D., Lopez, A. & Pupato G. (2006). Innovation and productivity in developing countries: A study of Argentine manufacturing firms' behavior (1992–2001), ***Research Policy,*** 35(2), 266-288.

Cimoli, M. (2005). Heterogeneidad estructural, asimetrías tecnológicas y crecimiento en América Latina, Santiago, Chile, ***Economic Commission for Latin America and the Caribbean*** (ECLAC)/Inter-American Development Bank (IDB).

Cimoli, M., Ferraz, J.C. & Primi, A. (2005). Science and technology policy in open economies: the case of Latin America and the Caribbean. ***Desarrollo Productivo Series,*** No. 165 (LC/L.2404), Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC). United Nations.

Cimoli, M., Ferraz J.C. & Primi A. (2009). Science, Technology and Innovation Policies in Global Open Economies: Reflections from Latin America and the Caribbean. ***Journal of Globalization, Competitiveness and Governability,*** 3(1), 32-60.

Chryssou, C.E. (2020). University–industry interactions in the Sultanate of Oman: Challenges and opportunities. ***Industry and Higher Education,*** 34(5), 342-357.

Cunningham, J.A. & Link, A.N. (2015). Fostering university-industry R&D collaborations in European Union countries. ***International Entrepreneurship and Management Journal,*** 11, 849-860.

Dill, D. (1990). University-industry research collaborations: an analysis of interorganizational relationships. ***R&D Management,*** 20(2), 123-129.

Etzkowitz, H. & Leydesdorff, L. (1995). The triple helix–university–industry government relations: a laboratory for knowledge-based economic development, ***EASST Review,*** 14(1), 14-19.

Etzkowitz, H. (2002). Incubation of incubators: innovation as a triple helix of university-industry-government networks. ***Science and Public Policy,*** 29(2), 115-128.

Figueiredo, N.L. & Ferreira, J.J. (2022). More than meets the partner: a systematic review and agenda for University–Industry cooperation. ***Management Review Quarterly,*** 72(1), 231-273.

Freeman, C. (1988). Japan: A new National Innovation Systems? in Dosi, G., Freeman, C., Nelson, R.R., Silverberg, G. and Soete, L. (eds.), ***Technology and economic theory,*** London: Pinter Publishers.

Freeman, C. (1995). ***The 'National System of Innovation' in historical perspective Cambridge Journal of Economics,*** 19(1), 5-24.

Freitas, B., Geuna, A. & Rossi, F. (2013). Finding the right partners: Institutional and personal modes of governance of university–industry interactions. ***Research Policy,*** 42(1), 50-62.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. & Trow, M. (1994). ***The New Production of Knowledge,*** Sage: London.

Godin, B. (2009). National Innovation System: The system approach in historical perspective. ***Science, Technology & Human Values,*** 34(4), 476-501.

Grupp, H. & Schubert, T. (2010). Review and new evidence on composite innovation indicators for evaluating national performance. ***Research Policy,*** 39(1), 67-78.

Henrekson M. & Rosenberg N. (2001). Designing Efficient Institutions for Science-based Entrepreneurship: lesson from the US and Sweden, ***Journal of Technology Transfer,*** 26, 207-231.

Hidalgo, A. & León G. (2006). La importancia del conocimiento científico y tecnológico en el proceso innovador, ***Revista Sistema Madri+d, Revista de Investigación en Gestión de la Innovación y Tecnología,*** 17, 7-20.

Hidalgo, A. & Albors, J. (2011). University-industry technology transfer models: an empirical analysis. ***International Journal Innovation and Learning,*** 9(2), 204-223.

Hidalgo, A., Penas, G.& Urueña, A. (2021). ***Análisis de la aplicación práctica de las patentes en España.*** Fundación Cotec para la Innovación. ISBN: 978-84-92933-44-0.

Hidalgo, A., Penas, G., & Urueña, A. (2024). Evidence of the use and licensing of patents in Spain: a comparative analysis. ***International Journal of Technoentrepreneurship, 5***(2), 115-136.

Hidalgo, A., Urueña, A., & Gabaly, S. (2025). ***Análisis de la aplicación práctica de las patentes en España.*** Centro de Estrategia y Prospectiva Industrial (CEPI) EOI -Ministerio de Industria y Turismo. ISBN: 978-84-15061-95-3.

Katz, J. (2002). Efficiency and equity aspects of the new Latin American economic model, ***Economics of Innovation and New Technologies,*** 11(4-5), 423-439.

Katz, J. (2006a). Structural change and domestic technological capabilities, ***CEPAL Review,*** 89.

Katz, J. (2006b). Market-oriented reforms, globalisation and the recent transformation of the production and social structure of developing countries**,** ***International Journal of Technology Management,*** 36(1-3), 21-24.

Kayal, A.A. (2008). National innovation systems a proposed framework for developing countries. ***International Journal of Entrepreneurship and Innovation Management,*** 8(1), 74-86.

Lambert, R. (2003). Lambert review of business-university collaboration. ***University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.***

Laursen, K. & Salter A. (2004). Searching high and low: what types of firms use universities as a source of innovation? ***Research Policy,*** 33:1201–1215.

Leydesdorff, L. & Etzkowitz, H. (1996). Emergence of a triple helix of university-industry-government relations. ***Science and Public Policy,*** 2(3 and 5), 279–286.

Lundvall, B.-Å. (1988). Innovation as an interactive process: From user-producer interaction to the National Innovation Systems, in Dosi, G., Freeman, C., Nelson, R.R., Silverberg, G. & Soete, L. (eds.), ***Technology and Economic Theory,*** London: Pinter Publishers.

Meissner, D., Cervantes, M. & Kratzer, J. (2018). Enhancing university-industry linkages potentials and limitations of government policies. ***International Journal of Technology Management,*** 78(1/2), 147-162.

Melo, A. (2001). Industrial Policy in Latin America and the Caribbean at the Turn of the Century, RES Working Papers 4281, Inter-American Development Bank.

Méndez, M., Versino, M. & Varela, S. (2024). Studying university-industry collaboration in Latin America: A systematic review of the period 1993-2022. ***Multidisciplinary Journal for Education, Social and Technological Sciences,*** 11(2), 108-136.

Morales, V. & Robalino-López, A. (2025). Measuring the Innovation Potential of Organizations in Andean Countries and the Applicability of the Capabilities, Results, and Impacts of Innovation Model: A Comparative Approach. ***Economies, 13***(5), 133.

Okamuro, H. & Nishimura, J. (2014). Not just financial support? Another role of public subsidy in university–industry research collaborations. ***Economics of Innovation and New Technology,*** 24(7), 633–659.

Onea, I.A. (2020). Innovation indicators and the innovation process. Evidence from the European Innovation Scoreboard. ***Management & Marketing. Challenges for the Knowledge Society,*** 15(4), 605-620.

O'Sullivan, D., Mulligan, D. & Dooley, L. (2007). Collaborative information system for university-based research institutes. ***International Journal of Innovation and Learning,*** 4(3), 308–322.

Reinhardt, N. & Peres, W. (2000). Latin America's new economic model: micro responses and economic restructuring, ***World Development,*** 28(9), 1543-1566.

Romero-Sánchez, A., Perdomo-Charry, G. & Burbano-Vallejo, E.L. (2024). Exploring the entrepreneurial landscape of university-industry collaboration on public university spin-off creation: A systematic literature review. ***Heliyon,*** 10(19).

Rossoni, A.L., de Vasconcellos, E.P.G. & de Castilho, R.L. (2024). Barriers and facilitators of university-industry collaboration for research, development and innovation: a systematic review. ***Management Review Quarterly,*** 74(3), 1841-1877.

Salazar-Elena, J.C., Castillo, Y.Y. & Álvarez, I. (2023). Overcoming innovation barriers through collaboration in emerging countries: the case of Colombian manufacturing firms. ***Industry and Innovation, 30***(4), 506-529.

Sutz, J. (2000). The university–industry–government relations in Latin America, ***Research Policy,*** 29(2), 279-290.

Sutz, J. (2005). The role of universities in knowledge production, Science and Development Network (SciDevNet), ***Science & Innovation Policy,*** 1 April 2005.

Teirlinck, P. & Spithoven, A. (2012). Fostering industry-science cooperation through public funding: differences between universities and public research centres. ***Journal of Technology Transfer,*** 37, 676–695.

Thorn, K. & Soo, M. (2006). Latin American universities and the third mission: trends, challenges, and policy options, Policy. ***Research Working Paper Series 4002.*** World Bank.

Urueña, A., Sáenz, M., & Hidalgo, A. (2024). Agency conflicts in innovation adoption: Lessons from the airline industry. ***Journal of Innovation & Knowledge, 9***(3), 100543.

Vieira, E.S. (2023). The influence of research collaboration on citation impact: the countries in the European Innovation Scoreboard. ***Scientometrics,*** 128, 3555–3579.

Woollard, D., Zhang, M. & Jones, O. (2007). ***Creating Entrepreneurial Universities: Insights from a new university business school.*** Institute for Small Business & Entrepreneurship, Glasgow.

World Bank (2019). Innovation & Entrepreneurship. ***Innovation and entrepreneurship are recognized as key building blocks of competitive and dynamic economies.*** https://www.worldbank.org/en/topic/innovation-entrepreneurship

Yu, S., Zhang, S. & Yuizono, T. (2021). Exploring the influences of innovation climate and resource endowments through two types of university–Industry collaborative activities on regional sustainable development. ***Sustainability,*** 13(14), 7559.