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A Review on University-Industry Collaborations from an Institutional Theory and Institutional Resilience Perspective

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Abstract

Institutional theory posits that organizations are in a reciprocal relationship with their environment, and in this sense, organizations are both shaped by their environment and reconstruct the existing environment with their actions. In an environment where actors mutually and reciprocally influence each other, there are substantial literature studies showing that the institutional effects may be an important factor for determining interfirm collaborations. However, the literature on institutional explanations for the establishment or non-formation of collaborations between university and industry in such environmental settings is relatively limited. In that regard, we employ institutional approach as a conceptual basis for the understanding of the processes of university-industry interactions. In our conceptual study, we aim to extend the institutional perspective by focusing on interorganizational collaborations in terms of university-industry collective interactions where the actors mutually concerned with the normative, coercive, and mimetic pressures. We introduce the concept of institutional resilience to Triple Helix Model to propose some new research avenues.

Keywords: university-industry collaboration, institutional theory, isomorphism mechanisms, triple-helix model, innovation, national innovation systems, institutional resilience

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Kurumsal Kuram ve Kurumsal Dayanıklılık Perspektifinden Üniversite-Sanayi İş Birliklerine Yönelik Bir İnceleme

Öz

Kurumsal kuram, örgütlerin çevreleriyle karşılıklı bir ilişki içinde olduğunu ve bu bağlamda örgütlerin çevreleri tarafından şekillendirildiği gibi, kendi eylemleriyle mevcut çevreyi yeniden inşa ettiklerini öne sürer. Aktörlerin birbirini karşılıklı olarak etkilediği bir ortamda, kurumsal etkilerin, şirketler arası iş birliklerini belirlemede önemli bir faktör olabileceğini gösteren geniş bir literatür mevcuttur. Ancak, bu tür çevresel koşullarda üniversite ve sanayi arasındaki iş birliklerinin kurulmasına veya kurulamayışına dair kurumsal açıklamaların bulunduğu literatür nispeten sınırlıdır. Bu kapsamda çalışmamızda, üniversite-sanayi etkileşim süreçlerini anlamak için kavramsal bir temel olarak kurumsal yaklaşımı ele almaktayız. Kavramsal nitelikteki çalışmamızda, aktörlerin normatif, zorlayıcı ve taklitçi baskılarla karşı karşıya kaldığı üniversite-sanayi kolektif etkileşimleri açısından kurumsal perspektifin araçlarını kullanarak yeni çalışma önermeleri geliştirmekteyiz. Üniversite-sanayi iş birliklerini anlamada sıklıkla kullanılan Üçlü Sarmal Modeli'ne kurumsal dayanıklılık kavramını ekleyerek yeni araştırma alanları önermekteyiz.

Anahtar Kelimeler: üniversite-sanayi iş birliği, kurumsal kuram, izomorfizm mekanizmaları, üçlü sarmal modeli, inovasyon, ulusal inovasyon sistemleri, kurumsal dayanıklılık

1. INTRODUCTION

Innovation refers both to a process and an outcome (of collaborative efforts for combining resources to come up with innovative solutions) while collaboration is a process of cooperation, teamwork and coordination between university researchers and business practitioners. From a university-industry collaboration perspective, the underlying motivation for innovation is the expectation and creation of new knowledge, practices, approaches, methods, and so on for enhanced competitiveness, productivity, profitability, or scientific progress among others (Rajalo and Vadi, 2017). Innovation in this sense involves not only the creation of ideas or practices but also the diffusion of invention through commercialization of novelty, and collaborations are an increasingly effective way of this kind of innovation performance (Kobarg et al., 2018). As innovation increasingly depends on cross-sector collaboration, understanding the interactions between universities and industries become vital for national and regional innovation systems. Universities play a critical role in technology transfer and industrial research, but more clarity is needed on the implications of these university-industry collaborations (UICs). Research, such as that by Mahdad et al. (2020), highlights the significance of collaborative innovation for national economies, but further investigation is required to identify the conditions necessary for long-term UICs and to understand their broader impact on national innovation systems (Mahdad et al., 2020; Lee, 2000). The current study extends institutional theory by focusing on the role of institutional pressures in shaping UICs and introduces the concept of institutional resilience to examine how collaborations can adapt and thrive in dynamic environments. We aim to demonstrate that by understanding the institutional pressures shaping UICs, stakeholders can develop strategies that promote long-term sustainability and innovation.

Institutional theory provides insightful perspectives on the tendencies and reasons for university and industry collaborations, as well as specific behaviours adopted by actors in their institutional context, encompassing societal, cultural, legal, and economic factors. Institutional pressures—normative, coercive, and mimetic—shape organizational behavior by imposing external expectations. In the context of UICs, institutional theory is valuable for understanding how universities and industries align their goals, form collaborations, and adapt to external pressures. These collaborations are not only shaped by economic and technological factors but also by broader social, cultural, and legal forces. Normative pressures, such as societal expectations and professional standards, push organizations toward adopting practices that enhance legitimacy within their fields. Coercive pressures, stemming from government regulations and funding requirements, force organizations to comply with legal standards to maintain their operations. Mimetic pressures, often triggered by uncertainty, lead organizations to imitate successful collaboration models to remain competitive. These pressures collectively influence how UICs evolve, making institutional theory an ideal lens through which to explore the dynamics of such collaborations. Collaborations enhance the legitimation processes of actors within their different institutional fields. However, the institutional logics associated with academia (whose dominant logic is exploration) and those with industry (whose dominant logic

is exploitation) may be very different, and UICs act as mechanisms of integration of these highly disparate logics to the advantage of all.

One of the most elaborate considerations in the field of innovation is the Triple Helix Model, which began to be developed in the early 2000's by Etzkowitz and Leydesdorff. This model emphasizes the interactions of industry, university and government as significant forces of innovation and economic advancement. Since their interplay can yield results that are beneficial to industries, governments step in through provision of funds and policies to encourage these partnerships while also creating wealth and knowledge that can be used commercially. Regardless of its popularity in elucidating how an innovation ecosystem works, the Triple Helix Model has also been criticized for being too simplistic and therefore failing to adjust itself in varying contexts such as developing countries or industries with their unique and specific institutional contexts. In order to overcome these weaknesses, the evolution into Triple Helix 2.0 introduced a more culturally oriented model. As a result, 2.0 model argues that the position and relations of the universities, industries and government are not constant, and vary by the institutional environment comprising normative, coercive, or mimetic pressures, underlning the significance of regional and local embeddedness.

Institutional resilience, defined as the ability of organizations to adapt to changing institutional pressures, is a critical factor for long-term sustainability of UICs. While institutional theory explains how organizations respond to external pressures, the concept of resilience extends this by focusing on how organizations not only respond but thrive under fluctuating regulatory, economic, and cultural conditions. The importance of institutional resilience in university-industry collaboration and more generally the application of the Triple Helix Model in different fields has not been adequately covered in the literature. This shortcoming represents an interesting area for additional research. We argue that resilient UICs demonstrate the ability to navigate changes by diversifying their collaboration models, such as through spin-offs, public-private partnerships, or research clusters. By contrast, non-resilient collaborations often fail to sustain themselves in the face of shifting pressures. As UICs evolve over time, institutional resilience becomes key to ensuring their continued success, and allows organizations to balance external demands with internal innovation processes. Considering and responding to pressures which shape UICs, stakeholders such as government, university, and industry can improve their collaboration. As the engagement of such activities continues to increase for the purposes of innovation, this area of research continues to be timely and relevant. Furthermore, in examining the UICs, the institutional mechanisms help to go beyond the limited view of inter-firm relationships, supporting the recommendations directed to the governmental bodies and educational institutions which aspire to enhance such relations. In this paper, we put forth propositions aimed at discussing issues related to meeting these challenges.

2. CONCEPTUAL FRAMEWORK AND PROPOSITION DEVELOPMENT

2.1. Institutional Theory and UICs

Institutional theory (IT) aims to explain how and why, despite an initially wide range of differences, organizations end up resembling each other over time within a shared institutional context (Yıldırım, 2018). Institutional theory perspective emphasizes the role of organizational isomorphism as the process through which organizations that belong to the same organizational field gradually start to resemble one another. However, institutional theory not only explains the process of organizational isomorphism, but it also reveals how organizational phenomena are essentially sociological in nature, in addition to being economic and explains how the institutional environment shapes an organization's behavior. Moreover, the new institutional theory views the environment as a legal, social, and cultural institutional environment that an organization must justify itself within, rather than an only economic and technological environment that guides its actions. Thus, organizations are shaped not only by the needs of the technological and economic environments, but also by their actions influenced by the legal, social, and cultural environments in an effort to obtain legitimacy. According to institutional framework, the environment and organizations have a reciprocal interaction. Environmental components encompass systems at many levels and provide a framework for the structure and functions of organizations. As a result, organizations both replicate and alter the current environment through their own actions and interactions with other organizations, as well as being affected by the institutional context in which they operate (Yıldırım, 2018).

When several organizations have been established within the same institutional field, they could face considerable institutional pressures to look alike, which could compel organizations to change their objectives and implement new procedures. According to DiMaggio and Powell (1983) isomorphism explains why organizations in the same organizational field are similar to one another and in that regard, isomorphism is referred as a restricting process where a unit in a population that is exposed to similar environmental conditions resembles other units in the population. Additionally, they distinguished between institutional and competitive isomorphism. Competitive isomorphism is characterized as system rationality within market rivalry, niche adaptations, and compliance measures. However, institutional isomorphism should also be considered because competitive isomorphism does not adequately represent organizational structures in the modern world. Organizations fight not just for resources and consumers, but also for institutional legitimacy and social and political influence. As a result, organizations are also striving for economic and social harmony. Thus, understanding the behavior of modern organizational structures as well as the rules and customs that spread among organizations requires an understanding of institutional isomorphism (DiMaggio and Powell, 1983). DiMaggio and Powell (1983) classify institutional isomorphic change into three mechanisms: coercive isomorphism, mimetic isomorphism, and normative isomorphism.

Coercive pressures and the resulting coercive isomorphism are an external form of pressure which entail powerful entities such as legal monopolies, funders, and state institutions. These entities sanction certain norms which organizations have to comply with, so as to be seen as legitimate and continue existing. This mostly leads towards coercive isomorphism due to the agency and societal structures pressure over an organization and its performance. One such instance relates to the circumstances that prompt universities to comply with some government-imposed rules including those associated with research or the conditions for funding. Industries too have to change and adopt the same business strategies and structures imposed by the law or the society's conscience on how business ought to be conducted. Such coercion push institutions towards a particular repertoire of actions due to the governing requirements therein and dominance forcing out all other means of implementation or operation across the institutional framework.

Mimetic pressures cause mimetic isomorphism, which is a process that is triggered because of uncertainty or ambiguity existing within an organisation's environment. When goals are vague, technologies are unknown or when the market is unstable, the organisation imitates others who it considers to be more successful or have a higher level of organisational legitimacy. This imitative behaviour minimizes uncertainty by enabling an organisation to use familiar practices, benchmarks or structures adopted from well established counterparts. For example, a junior firm might mimic the structure or some decisions that were made in a senior firm from the same industry but with a greater success. Likewise in academic mimicry may occur where universities seek to adopt the governance structures of competing institutions with better reputations and more funding. As organizations interact with each other and learn from one another, the particular problem/solution or action/response spaces become more and more bounded and the organizations behave in a more similar manner as they work within the, emerging from processes of isomorphism, throughout a field.

Normative isomorphism is driven by professionalization, which involves the establishment of shared standards and practices by professionals within a field. According to DiMaggio and Powell (1983), professionalization is defined as the collaborative effort of professionals to establish working conditions, methods of conducting business, and management practices for producers in order to provide the legitimacy and cognitive foundation for their professional autonomy. Professionalization is the source of isomorphism in two ways: one of them is predicated on formal education and the validation of the cognitive foundation disclosed by academic authorities in the institutional domain. Another is predicated on the growth and extension of professional networks, wherein organizations quickly absorb and propagate new models. The establishment of organizational norms among professional managers and their employees occurs mostly in universities and vocational education facilities. Moreover, professional, and commercial associations and chambers play a vital role in developing and disseminating normative standards for behavior on organizational and professional conduct (DiMaggio and Powell, 1983).

In environments where actors mutually and reciprocally influence one another, institutional effects emerge as critical determinants of interorganizational collaborations. Institutional logics, as a theoretical perspective employed by entrepreneurship and management scholars, provide a framework for understanding the socially constructed assumptions, values, beliefs, and principles that guide organizational behavior. These logics give meaning to daily activities, help organize resources, and shape interactions, thereby influencing how firms and individuals operate within a structured environment. Institutional logics, embedded within macro-level institutional orders such as the state, market, profession, and corporation, play a pivotal role in determining the nature and success of collaborations between firms (Zhang, 2023).

Nakamura and colleagues (1997) have described and explained how organizational environments and national cultures affect R&D partnership between firms. They concluded that large scale collaborative research consortia cannot obtain scale economies, risk sharing or benefits from firm specific complementary assets without legal/institutional backing. Based on comparative studies of the United States and Japan, Nakamura et al. (1997) indicated that national culture significantly influences the strategic pattern of organizations, organization forms, and cooperative interfirm R&D outcomes. Regarding such contexts, the government plays a significant role of unearthing hurdles; instituting legal frameworks that assist in containing opportunism; and providing explanations on grey areas in partnerships. However, the extent and type of the government's role depends on the macro institutional structure and the accepted norms of a society. Thus, it is important in this study to elucidate the nature of macro institutional forces when studying innovation success in R&D collaborations in a cross national/cross cultural environment.

Furthermore, Adomako and colleagues' (2021) study on the subject of institutional voids, whereby institutions operate concerning specific regulatory uncertainties and inadequate support structures. It discovered that where institutional voids are noticeable, firms are known to depend heavily on government support in the form of R&D funding (as a substitute for a formal institutional structure). In such circumstances it becomes evident that through government funding programs particularly subsidies, tax credit and even loans contribute significantly to fostering firm level collaboration and innovation. This is the reason why market imperfection requires government interventin to provide the right incentive for cooperatives innovation (Adomako et al., 2021).

Further research by Hoejmose et al. (2014) confirms that cooperative supply chain management is often a direct outcome of institutional pressures, including regulations and social expectations. Supplier collaborations, as examined by Khurshid and colleagues (2021), are found to be mediated by coercive pressures, with mimetic influences also playing a role in driving the adoption of collaborative practices. These findings collectively emphasize the intricate interplay of institutional forces in shaping interorganizational collaborations, particularly in R&D and supply chain contexts, where coercive, normative, and mimetic pressures act as key drivers of partnership formation and innovation.

From an interorganizational collaboration section, supplier partnerships in R&D contexts epitomize the institutional conditions that influence innovation. Supplier and research institute relationships are critical to product and process developments and its success is subject to the institutional context. For example, normative pressures from local communities and civil society groups, as identified by Hofman et al. (2020), often exert a greater impact than regulatory pressures in fostering supplier collaboration aimed at developing eco-innovations and improving production processes. Such normative pressures press towards achieving sustainable solutions and integrating the firms' operations into the society's values, thus, disclosing the various institutions affecting supply chain collaborations.

Moreover, a review of the literature shows that the part of institutional theory concerning the interorganizational collaborations remains one of the most studied aspects of inter-firm relations (Brito, 2001, Nakamura et al, 1997; Adomako et al., 2021) but most frequently related to supply chain collaborations (Hofman et al., 2020; Hoejmose et al., 2014; Khurshid et al., 2021; Mellat-Parast, 2015). Till now, research investigating collaborations through an institutional theory perspective primarily targets supply chain cooperation (Hofman et al., 2020) and there are countless academic works that explore partnerships between academia and business entities in terms of university business relationship. However, to the best of our knowledge, there is a lack of empirical research that applies social network terminology hand in hand with institutional theory to explain the different institutional contexts inside the scientific domains that shape the university–industry search strategies and networks in different manners (Bergenholtz and Bjerregaard, 2014). There are also works based on what is considered in the interactions between university and industry, but the impacts of institutional factors are often mentioned insufficiently. Previous research on university–industry collaborations have identified how failure to manage cultural differences poses a potential threat to knowledge transfer processes and raises challenges to effective project management. Explicit examination of how changes in institutional logics of R&D practice impact on grounded U-I interactions between engaged academics at the micro level has been minimal especially in the context of R&D collaborations between public university departments and SMEs (Bjerregaard, 2010). Accordingg to institutional theory, organizations experience outside pressures from other organizations that mandate them to perform specific behaviors in a manner that is consistent with their environment (DiMaggio and Powell, 1983). Universities and industry are likely to be influenced by these pressures in order to align with societal expectations and are subject to social sanction in the form of institutional pressures (Ankrah and AL-Tabbaa, 2015).

Additionally, both universities and the industry actors may be surrounded by different institutional dynamics and institutional pressures related with university specific and industry specific cultures, policies, values, regulatory expectations, industrial and educational norms which may require each actor to adapt and comply with the expectations of these institutional dynamics (Peksatici and Ergun, 2019). There are studies revealing that these different values and expectations of university and industry, which are shaped by the institutional dynamics; result in a gap between what the industry values and what the academy offer. Thus, the gap

resulting from university specific and industry specific cultures, policies, values, regulatory expectations, industrial and educational norms that require each actor to adapt and comply with the expectations of these institutional dynamics is found to hinder to effective collaboration between industry and academy (Peksatici and Ergun, 2019). Considering that insufficient research has been conducted in the literature to offer institutional explanations for the emergence or absence of collaborations between academic institutions and industry, the significance of analyzing collaborations not just between inter-firm actors, but also between universty and industry actors from the standpoint of institutional theory becomes apparent. Thus, in our conceptual study, we aim to extend the institutional perspective by focusing on interorganizational collaborations in terms of university industry collective interactions where the actors mutually concerned with the normative, coercive, and mimetic pressures.

2.2. Triple-Helix 2.0 and Institutional Pressures

The Triple Helix Model, proposed by Etzkowitz and Leydesdorff (2000), has long been used to describe the dynamic and reciprocal relationships between universities, industries, and government as essential drivers of innovation. Nevertheless, one of the main criticized aspects of the original model is its apparent indifference towards local contexts and institutional dynamics. This drawback makes it rather useful in several places and industries but not fully relevant to specific areas of several developing economic systems that may not be parallel to the outlined model. In response to these criticisms, the Triple Helix 2.0 framework offers a more adaptable and situational contingency model for analyzing University-Industry Collaborations that deploys the variable institutional logics of academia, industry, and government across the regional and sectoral spectrum.

The primary weakness of the existing Triple Helix Model is that this model does not consider the difference in the involvement of government, university, and industry for different economic and institutional contexts (Cai, 2015). Triple Helix 2.0 on the other hand responds to such differences by identifying government involvement in the area of weak institutional environments as dynamic essential for supporting the emergence of UICs through policy, financial, and logistic means. On the other hand, in more advanced regions institutions like the university and industries are capable of bringing innovation without the need for government intervention. This approach acknowledges the fact that one has to look at the National Innovation System (NIS) working or not and legal cultural and market coordination enablers or barriers identified as identified in Watkins and colleagues (2015). As Lundvall (2007) explained, elements of NIS are, for instance, education systems, labor markets, intellectual property rights and financial markets in which firms and universities develop their innovative capabilities.

This same shift also speaks to the value of local engagements within knowledge structures, in which universities, public policy, and private actors work collectively on innovation (Fritsch and Stephan, 2005). Unlike the previous model, these interactions suggest that the cooperation

considered through the Triple Helix approach 2.0 views the processes that occur within various regional and local contexts, which is why the approach offers more versatility. The socially constructed knowledge that guide organizations emerge as useful for explaining the dynamics of these innovation ecosystems. For instance, firms may use knowledge for their financial benefits, while using the knowledge for exploration of new knowledge is more characteristic for universities. In fact, when these logics interconnect through various collaborative mechanisms, it is likely that the relative outputs will be enriched, especially where institutional heterogeneity between partners is present (Messeni Petruzzelli and Rotolo, 2015). Furthermore, research by Johnston and Huggins (2018) sheds light on how credibility is a key determinant of successful UICs. The credibility of potential university partners is judged not at the institutional level but at the individual level, emphasizing the importance of specific expertise and knowledge provided by academic partners. This micro-level focus complements the broader Triple Helix 2.0 framework by highlighting how individual actors within institutions contribute to the overall dynamics of collaboration, particularly in sectors where trust and expertise are critical to forming sustainable partnerships. Other works including Rybnicek and Königsgruber (2019) have also used literature reviews to identify other factors which have influenced successful UICs: the institutional, relationship, output, and framework factors. Such research calls for a more nuanced tool such as Triple Helix 2.0, which replaces the broad models of the first version with frameworks that take into account diverse contexts of the systems in need. Gibson and Foss (2017) build on this discussion further by analysing how universities relate to their institutional context to create entrepreneurial webs. They identify five key aspects of these architectures: structures; systems; leadership; strategies; and culture They further explain how institutional pressures condition these factors at the regulative, normative, and cognitive levels. The given approach is similar to the objectives of the Triple Helix 2.0 where the adjustment of institutions significantly matters to support innovation in various settings.

On the other hand, the Triple Helix Model has received limited attention in addressing the question of institutional mechanisms that either enable or hinder the development of new forms of knowledge production. For this reason, Benner and Sandström (2000) extended the theoretical explanation of the Triple Helix model with an institutional dimension. They were interested in how practice in university research is governed by institutions of norms; and funding regulations as norms, arguing that support strategies play an important role in research performance and assessment, thereby situating funding as an agent for change to the normative structures at the university level. Although the specifics of how their work matters tell a story of funding not only underwriting research but also driving a significant portion of change to norms in the academy and by extension knowledge production. Similarly, Brundin et al. (2008) applied the Triple Helix model through the lens of institutional theory to examine its implementation in the Western Cape Region of South Africa. The study had a dual aim: first, to adapt the Triple Helix model to the South African context; and second, to identify both the facilities and the obstacles that influence the implementation of the model in a developing country. Through surveys and three long-term case studies, Brundin and colleagues highlighted

the dynamics of collaboration between university, industry, and government. Thire study revealed that while the Triple Helix model offers a useful conceptual framework, its application in the South African context is often hindered by institutional impediments. These obstacles, rooted in the conflicts between institutional thinking and the Triple Helix intention, frequently block long-term collaboration and innovation. This finding is consistent with institutional theory, which underscores how institutional barriers—such as rigid norms, regulations, or lack of support—can inhibit collaboration and prevent the effective interaction between government, industry, and academia, all of which are critical for fostering innovation.

Further research has expanded on the scope of Triple Helix Model and introduced the Quadruple Helix. The Triple Helix and Quadruple Helix models both aim to explain the dynamics of innovation but differ significantly in their scope and focus (Cai and Lattu, 2022). The Triple Helix centers on the interactions between universities, industry, and government, and it emphasizes formal institutional collaborations that drive technological advancement and knowledge transfer. In contrast, the Quadruple Helix extends this framework by incorporating civil society and broadens its scope to include public engagement and societal influence. This makes it particularly relevant for social innovation and sustainability-focused projects. While both models recognize the importance of collaboration among key stakeholders, the Quadruple Helix offers a more inclusive approach. It acknowledges that societal values and public participation are critical in modern innovation ecosystems. However, this inclusivity may dilute the clear institutional focus that the Triple Helix provides, especially in empirical studies that prioritize technological innovation or sector-specific research. Given our study's emphasis on understanding institutional dynamics and formal partnerships in innovation, the Triple Helix model is more appropriate for our conceptual development. Its focus on structured interactions between academia, industry, and government aligns better with the objective of examining institutional pressures and resilience in university-industry collaborations. Therefore, we chose the Triple Helix to frame our analysis.

Boardman (2009) explored the impact of various types of university research centers on individual-level university-industry (UI) relationships using data from a national survey of academic researchers in the US. The study found that researchers affiliated with industry-related centers were more likely to engage with private companies on research matters. Furthermore, the degree of industry involvement was particularly high when researchers were affiliated with government-sponsored centers, regardless of whether these centers also had ties to private companies. To frame this discussion, Boardman adopts the scientific and technical human capital approach, which, unlike resource-based or institutional perspectives, focuses on the research capacities of individual academic researchers. This approach highlights why government involvement in academia is crucial, as it shapes researchers' interactions with industry and enhances their human capital (Boardman, 2009).

Freitas and colleagues (2013) examined two governance models that define university-industry relations: first private contractual governance and second, institutional governance. The former

comprises research collaborations between university-based researchers and firms directly, the latter, takes place through KTOs or university departments. Some of the key working conceptualizations highlighted in the study include the fact that choice between the governance modes depends on size and innovation strategy of the firm. Small firms, being receptive to changes, and new ways of performing new technologies and innovations, offer their employees personal contracts with researchers. Conversely, the large firms that exhibited greater absorptive capacity are more likely to undertake institutional governance reflecting a much more structured collaborative venture. Bergenholtz and Bjerregaard (2014) continued this discussion by looking at the effect institutional context has across various forms of scientific fields on search behaviours for UIs while the network structure. They applied their research on two different scientific fields and observed that institutional pressures influence the formation of both network topology and search patterns differently. The study also notes that it is these institutional factors that define the nature of the network they created and the results of the cooperation between universities and industries.

Altogether, these works can provide rich insights into how institutional contexts and governance structures condition the relationships between the university, industry and government and the applicability of the Triple Helix model in particular, as well as highlight the role of individual researcher capabilities and institutional contexts in which they operate, and the need to address institutional constraints when applying the Triple Helix model especially when the institutional environment of certain region is in a state of development. The realization that funding structures and institutional barriers impend knowledge production and collaboration or alternatively enable it, helps develop a further understanding of some of the challenges and opportunities of the Triple Helix approach in promoting innovation in different environments. In summary, Triple Helix 2.0 is a reasoned adaptation of the original framework for capturing institutional logics and for acknowledging the varied role of government, industry, and academia in different space. This model offers a framework for understanding how local and regional forces impact invention; an asset to policy makers and researchers aiming toward enhancing UICs in myriad contexts.

The theoretical rationale for the following propositions lies in the differentiated roles these pressures play within institutional theory. Normative pressures, driven by professional norms, educational standards, and societal expectations, shape the behaviors of universities and industries in distinct ways. These pressures often encourage organizations to adopt practices that align with broader societal values, thereby promoting legitimacy. By formulating Proposition 1a, we emphasize that normative pressures are instrumental in aligning the goals of universities and industries, as they push both actors to comply with shared professional and societal standards. This alignment fosters trust and strengthens collaborations, particularly in environments where reputation and legitimacy are key drivers. Following propositions is based on the contention that institutional pressures are key in explaining why organizations collaborate and how they adapt to external conditions:

Proposition 1a: Normative pressures—expectations derived from professional norms, educational standards, and societal expectations— influence how universities and industries align their goals, form collaborations, and sustain relationships.

Coercive pressures, on the other hand, arise from legal mandates, funding requirements, and regulatory frameworks, and often force organizations to adapt or risk losing resources or legitimacy. Proposition 1b would highlight how these pressures compel universities and industries to collaborate out of necessity, particularly in response to external regulations or policy directives. This can lead to more formalized and structured partnerships, where compliance with regulatory demands ensures the sustainability of collaborations. However, these collaborations may lack the flexibility seen in relationships primarily influenced by normative pressures.

Proposition 1b: Coercive pressures— regulatory requirements or legal mandates imposed by governments or external authorities—influence how universities and industries align their goals, form collaborations, and sustain relationships.

Finally, mimetic pressures occur in environments of uncertainty, where organizations imitate successful models to reduce ambiguity and maintain competitiveness. Proposition 1c would explore how universities and industries, particularly when facing ambiguity in market conditions or technology adoption, adopt similar collaboration strategies seen in more successful institutions. This mimicry promotes convergence in UIC practices, driving organizations to replicate models that have demonstrated effectiveness in other contexts.

Proposition 1c: Mimetic pressures—the tendency to imitate successful models or competitors, driven by uncertainty or competition—influence how universities and industries align their goals, form collaborations, and sustain relationships.

Table 1. Types of institutional pressures and impact on collaborations

Institutional Pressure	Definition	Examples in UICs	Impact on Collaborations
Normative Pressures	Expectations derived from professional norms, educational standards, and societal expectations.	Academic norms, standards for research excellence, professional expectations.	Aligns universities and industries towards fulfilling educational and research quality expectations. Promotes legitimacy in academic and professional communities.
Coercive Pressures	Regulatory requirements or legal mandates imposed by governments or external authorities.	Government regulations, funding requirements, intellectual property laws.	Forces universities and industries to comply with legal standards, fostering formal partnerships to meet regulatory demands.
Mimetic Pressures	The tendency to imitate successful models or competitors, driven by uncertainty or competition.	Universities or industries adopting practices from successful collaborations seen in other institutions.	Encourages organizations to mimic successful UIC models, leading to convergence in organizational practices and collaboration structures.

The cultural and operational divide between academic institutions, which prioritize research and knowledge generation, and industry, which prioritize exploitation and commercialization, is a significant barrier for UICs. The application of institutional theory can be further expanded to investigate the ways in which intermediary organizations, such as innovation centers and technology transfer offices, mediate institutional logics. Serving as cultural interpreters, intermediaries bring colleges' experimental spirit into line with the industry's exploitative objectives. The first set of propositions in our review aims to provide a framework for bridging institutional logics and propel ideas for more seamless interactions by integrating the role of these intermediaries.

2.3. Institutional Resilience and UICs

Institutional resilience—the ability of universities and industries to adapt to changing institutional pressures over time focuses on how organizations sustain and enhance collaborations despite shifting regulatory, economic, and cultural environments. This concept is particularly valuable in dynamic, fast-changing industries like technology and software, where regulatory landscapes can change rapidly. Institutional resilience highlights how universities and industries can maintain collaboration through adaptive strategies. A comparison of resilient versus non-resilient UICs, and their response to institutional pressures over time is displayed in Table 1.

Organizational isomorphism explains how universities and industries gradually adopt similar behaviors in response to institutional pressures. Expanding this, the concept of institutional resilience—the ability to adapt to changing pressures—can offer insights into how UICs not only respond but also thrive despite shifts in regulatory, economic, and cultural contexts. Institutional theory explains the pressures that shape collaborations, but little research has been done on how UICs evolve over time under fluctuating institutional environments. The concept of institutional resilience can provide a novel framework for understanding the long-term sustainability of UICs.

In order for an organization to remain resilient over time, it must make innovative sociocultural adjustments to maintain its networks, inclusivity, and trust norms. Institutional resilience in these sociocultural adjustments is generated and supported by state-society connections and expectations, which are only made feasible by adaptable and polycentric institutional processes. As an institutional development, institutional resilience is not separate from other characteristics; rather, it is entwined with cultural norms, performance, legitimacy, and local history. Identifying and leveraging domestic sources of resilience, building on what already exists and replicating and scaling-up what works, adopting local social norms and values where feasible, taking advantage of institutions' social capital are refferred as practical methods of institutional development for building institutional resilience. The development of cooperation actors, who are encouraged to recognize and build upon local knowledge, experience, and sources of resilience, is a key component of institutional resilience. As such, resilience

encompasses not only the ability to produce and improve results over time in a credible, legitimate, and adaptive manner, but also the ability to handle shocks and change. A key component of institutional resilience is the development of cooperation actors who recognize and build upon local knowledge, experiences, and sources of resilience. This approach not only enhances the institution's ability to adapt but also equips it to handle external shocks and changes effectively. Furthermore, institutional resilience relies on linkages between actors and the integration of development cooperation actors, ensuring long-term viability through localized, adaptable, and responsive interventions that move beyond bureaucratic blueprints (OECD, 2020).

Resilience, in terms of organizational management, has been conceptualized along three main dimensions: preparedness, agility, and robustness (Gherghina et al., 2023). These dimensions represent an organization’s level of preparedness before a crisis, its ability to respond quickly (agility) once a crisis arises, and its capacity to continue functioning or recover after the crisis (robustness). Gherghina and colleagues (2023) also emphasize the importance of stakeholder engagement as a central aspect of resilience. Effective resilience-building relies on public-private cooperation to meet collective challenges, balancing efficiency (often achieved through centralization) with legitimacy. In sectors such as healthcare, large-scale stakeholder cooperation facilitates decision-making while ensuring legitimacy, highlighting the critical role of cooperation between public and private actors in enhancing institutional resilience. Specifically, the arguments rest on the fact that the most resilient institutional actors—both public and private—engage with one another in a significant way to help develop a broader resilience that will benefit sectors like healthcare systems during times of crisis (Gherghina et al., 2023).

Using a longitudinal approach, Cruz et al. (2015) examined how institutional work contributes to resilience in extreme operating environments, using a case study of Desjardins International Development before and after the 2010 earthquake in Haiti. Their research focused on the role of political, technical, and cultural institutional work in generating social capital, which in turn supported new forms of institutional work that enabled resilience. They showed how organizations can build resilience by leveraging their social capital and adjusting institutional practices to their operating environment. The authors highlight the ways in which political, technical, and cultural forms of institutional work triggered the emergence of social capital, which in turn supported the rise of new forms of institutional work that enabled institutional resilience.

On the other hand, Balbachevsky and Kohtamaki (2020) argued that a strong source of institutional resilience is the university’s dependence on the reputation that its academics- and academic units- build up in wider networks. Because of this dependence, the central administration cannot unilaterally set the ultimate standards by which the university's reputation will be evaluated; rather, it must negotiate these standards with academic leaders in particular as well as with other academics in general. As a result of this dependence, there is pressure on

the university environment to rise above mere administrative demands and acknowledge the collaborative norms in order to meet the objectives, requirements, and other dynamics crucial to the academic advancement. Moreover, the evolving norms and values within science, driven by shifts in the normative domain of science, are reshaping the role of universities, resulting in a new definition of the entrepreneurial university (Balbachevsky and Kohtamaki, 2020).

In an attempt to bridge the premises of institutional theory and institutional resilience in the context of UICs, we offer the following propositions, arguing for different approaches by resilient versus nonresilient institutions as well as by resilient interorganizational collaborations. Institutional resilience, as explored in the study, emphasizes an organization's ability to sustain collaboration amidst evolving regulatory, social, and competitive landscapes. The propositions break down the mechanisms by which normative, coercive, and mimetic pressures influence UICs' strategies, trying to address how diverse collaboration models can emerge in response to each type of pressure.

Normative pressures, stemming from academic standards, societal expectations, and professional norms, encourage UICs to align their goals with widely accepted values and practices. These pressures promote legitimacy and credibility, which are vital for fostering trust and ensuring the long-term sustainability of collaborations. A resilient UIC that responds to normative pressures will proactively integrate academic values, adhere to research standards, and form partnerships that emphasize shared educational and ethical principles, leading to models such as spin-offs and knowledge transfer offices:

Proposition 2a: UICs use strategies to adapt to shifting normative pressures—derived from professional norms and societal expectations. A more resilient UIC is one that proactively adapts to these pressures through shared research standards and ethical collaboration models, such as spin-offs, and is more likely to sustain long-term partnerships.

Table 2. Institutional pressures and examples of resilient/nonresilient reactions

Characteristics	Resilient UICs	Non-Resilient UICs
Response to Regulatory Change	Proactively adapt strategies (e.g., diversify funding sources).	Struggle to comply with changing regulations.
Sustainability	Long-term collaboration despite shifts in funding or policy.	Short-term, collapses when institutional context shifts.
Flexibility in Partnership	Flexible, adaptable to new collaboration forms (e.g., spin-offs, start-ups).	Rigid structures, resistant to change.
Integration of Institutional Logics	Successful blending of academic and industrial goals.	Conflict between academic and industrial cultures.

Coercive pressures, including legal mandates, government regulations, and funding requirements, compel UICs to adapt to remain compliant and sustain collaboration. These pressures often necessitate formalized, structured partnerships, such as public-private partnerships or contract-based collaborations. A resilient UIC responds to coercive pressures

by diversifying funding sources, ensuring legal compliance, and remaining adaptable to changes in regulatory frameworks:

Proposition 2b: UICs use strategies to adapt to shifting coercive pressures—derived from regulatory requirements and government policies. A more resilient UIC is one that proactively adapts to shifting regulatory frameworks through structured partnerships, such as public-private collaborations and is more likely to sustain long-term partnerships.

Mimetic pressures arise in environments of uncertainty, where UICs may imitate successful collaboration models to reduce risk and maintain competitiveness. In such contexts, resilient UICs adopt practices from more established partnerships, mimicking their structures to create adaptive strategies. These imitative behaviors can lead to the adoption of innovative collaboration models, such as research clusters, innovation hubs, or global partnerships. UICs can enhance their capacity to adapt to institutional pressures and ensure the longevity of their collaborations by replicating proven approaches.

Proposition 2c: UICs use strategies to adapt to mimetic pressures—driven by uncertainty and the need for competitive alignment. A more resilient UIC is one that proactively encourages the adoption of successful collaboration models and imitate effective strategies from established partnerships, such as research clusters or innovation hubs, and is more likely to demonstrate greater adaptability and long-term success.

3. DISCUSSION

In this review paper, we attempted to provide a novel perspective on university-industry collaborations (UICs) from an institutional theory perspective, with a particular focus on how normative, coercive, and mimetic pressures shape the formation and evolution of these collaborations, and the role that institutional resilience has to play. By highlighting the importance of these pressures in fostering organizational isomorphism, where universities and industries gradually adopt similar behaviors and structures in response to shared institutional environments and by integrating the role that institutional resilience plays in interorganizational collaborations, we offer two propositions. This process is crucial for understanding the alignment between the goals of academia and industry in UICs, which is often driven by the need for legitimacy within the broader societal, legal, and economic context.

Specifically, we try to conceptualize a better understanding of university-industry collaborations (UICs) by positioning them within the evolving frameworks of institutional theory and institutional resilience. Institutional theory has long been concerned with the ways in which organizations are shaped by external pressures—normative, coercive, and mimetic—that lead to isomorphic behaviors. However, we argue that research has to extend beyond static isomorphism by incorporating the dynamic nature of institutional resilience, emphasizing the capacity of organizations to not only conform to external pressures but also to adapt and innovate in response to them.

One of the main things that arises from our conceptual propositions is the understanding that while organizations are forced to engage in organizational behaviors in order to gain legitimacy, the concept of resilience adds an essential dynamic of adaptation. University as an organization needs to frequently adjust its practices to cope with environments characterized by uncertainty where rules, standards and culture change, and the economy fluctuates. It is important not to view this process of adaptation as solely organisational and often defensive as organisations try to function under institutional pressures while sustaing institutional formations. In this sense, we consider that one of the major theoretical contributions of this research lies in its argument about the nature of institutional resilience as a complex process which cannot be understood solely through the lens of the enactment of institutional pressures. The concept of institutional resilience as argued here is not simply about the ability to endure constraint but about organizing to flourish in constraint. Resilience manifests in several forms ranging from universities adjusting their research focus due to changes in available funding, to industries changing their strategies to engage with academia due to the emergence of new technologies. Recognizing that organizations can manage internal change processes to maintain external pursuits for legitimacy while simultaneously engaging in innovation points to the inherent flexibility of the institutional response mechanism. This is most relevant in cases where long-term success of an UIC is a result of consciously managing conflicting requirements of external institutionalization and internal differentiation.

The well-known Triple Helix Model of innovation coherent to highly formalized interplays between universities, industries, and the government is criticized for its inattention to context conditions. In this respect, the Triple Helix 2.0 model avoids such a shortcoming by giving consideration to the context sensitivity of institutional logics of academia, industry and government across regions as well as sectors. In this paper, we have relied on past research such as Boardman (2009) and Freitas et al. (2013) for being informed about institutional factors governing UICs. Boardman's (2009) findings revealed the importance of government-sponsored research centers in initiating and supporting university-industry relations through the strengthening of human capital of its individual scholars. This is in accord with the scientific and technical human capital approach, that is focused not on organizational aspects but on individual researchers. On the other hand, Freitas et al.'s (2013) study considered different forms of governance in UICs, including personal contractual governance and institutional governance. Their research demonstrated how these various factors, in particular the size of the firm and choice of innovation strategy, determines form of governance adopted. Direct contracts with researchers are preferred by smaller firms while larger companies prefer more structured arrangements, such as through Knowledge Transfer Organizations (KTOs). Furthermore, Bergenholtz and Bjerregaard (2014) explored how institutional contexts within various scholarly fields affect the search process and networks of universities and industries. They showed that variations in institutional pressures have extended impacts on both networks and UIC outcomes. Their findings highlight the relevance of institutional context when

assessing the effectiveness of UICs, particularly in the high-tech sector where creativity is related to capacity to operate within institutional conditions.

A recurring theme in the literature is the credibility of UICs, as highlighted by Johnston and Huggins (2018) who argue that the credibility of university partners is often judged at the individual level, rather than the institutional level. This emphasizes the role of specific expertise and knowledge in fostering successful collaborations. This micro-level focus complements the broader institutional perspective, reinforcing the idea that individual actors within universities and industries play a critical role in shaping the success of UICs.

D'Este and Perkmann (2011) reviewed the literature on academics' motivations for interacting with industry and revealed variations between two author groups. While the first group highlights the utility-maximizing commercialization behavior of academics, others discover that academics work in a highly institutionalized environment with norms and values unique to the scientific community. The former group believes that academics work with industry to pursue commercialization, while the latter thinks that academics work with industry largely to support their research rather than as entrepreneurs. Based on these variations, D'Este and Perkmann (2011) aim to clarify which of the above perspectives is prevailing and how university industry interactions are motivated by research-driven behavior under the influence of institutionalized norms or commercialization behavior, respectively. Their research provided evidence that universities were able to maintain their unique character as entities under the "republic of science" in a highly institutionalized environment with norms and values unique to the scientific community rather than engaging in a "sellout". Research also indicates that collaborating with industry is not always motivated by entrepreneurial goals, such as seizing financial chances (D'Este and Perkmann, 2011; Bercovitz and Feldman, 2008; Göktepe-Hultén and Mahagaonkar, 2009). The adherence of faculty members to entrepreneurial conduct can be significant or merely symbolic, according to Bercovitz and Feldman (2008). Academics act in an entrepreneurial way, in specific situations—such as when there are local entrepreneurial norms supporting entrepreneurship. Studies showing that researchers attitudes are not always directly related to financial ties but also specific norms that shapes their research driven behaviors (D'Este and Perkmann, 2011; Göktepe-Hultén and Mahagaonkar, 2009). Researchers patent their inventions to announce their accomplishments and build reputations within their academic and industry-related networks, not for personal financial gain, according to a study of German academic researchers (Göktepe-Hultén and Mahagaonkar, 2009). Additionally, researchers report allocating the licensing fees from their patents to research endeavors rather than to personal gain. This indicates that they prioritize institutional and scientific interests over commercial and individual ones, which again aligns with the institutional boundaries that are socially constructed between academic and commercial science (Biscotti et al., 2012). Hillerbrand and Werker (2019) highlighted value conflicts and opposing goals by tackling normative concerns that were framed in terms of ethical and social values, transcending the typical social science approach of university-industry collaboration. Different value conflicts and purposes, such as the university's dissemination of knowledge and industry's appropriation

of knowledge, may result in complex situations and conflicts of interest not only in research but also in education and job training.

Bercovitz and Feldman (2008) further elaborate on this idea, suggesting that academics' engagement in entrepreneurial activities is context-dependent, with substantial entrepreneurial behaviour occurring only in environments where local norms support such conduct. In less supportive settings, entrepreneurial actions may be more symbolic than substantial. Göktepe-Hultén and Mahagaonkar (2009) also emphasize that researchers often patent their inventions not for personal financial gain, but to enhance their academic reputations within both academia and industry. Their study of German academic researchers revealed that licensing fees from patents are frequently reinvested in research, underscoring the priority given to institutional and scientific interests over individual commercial gains. This pattern reflects the socially constructed boundaries between academic and commercial science (Biscotti et al., 2012). Hillerbrand and Werker (2019) add a normative dimension to this discussion by examining the value conflicts and opposing goals inherent in university-industry collaborations. They highlight how differing motivations—such as the university's mission to disseminate knowledge and industry's goal of appropriating knowledge for profit—can create complex conflicts, not only in research but also in education and job training. These conflicts suggest that ethical and social values must be considered alongside economic and scientific goals in managing collaborations.

In the context of technology development zones (TDZs), Yılık and Kondakçı (2024) focused on the structural and functional properties of TDZs, to explore factors leading to advancement of science and technology, and the conflicts that arise from these features. Data derived from three universities and their TDZs show that they adopt institutional controls over their organizational structures and functioning, which has a homogenization effect on higher education institutions and a similarization effect on the entire TDZ ecology. The results demonstrate that structural and functional characteristics of the TDZs validate the fundamental principles of the neo-institutional theory. They find that universities and their TDZs aim for legitimacy or socio-cultural acceptance in order to protect their assets and maintain their status as important institutions with TDZs. For instance, universities and TDZs adopt internationalization goals in order to achieve recognition and status, which is essentially a search for legitimacy nationally. The findings demonstrate that coercive isomorphism is effective in the similarization of TDZs regarding basic structural characteristics. Nevertheless, only a small number of successful TDZs serve as a source of mimetic isomorphism, leading to a greater tendency of TDZ structural and functional similarity. Although only a select few TDZs are effective, a quantitative increase in their frequency indicates that ceremonial concerns (other institutional pressures) are the driving force behind the TDZ policy (Yılık and Kondakçı, 2024).

Literature points to the significance of differences between norms toward knowledge creation among public (universities) and private (industry) sectors, which are known as barriers to university and industry collaborations. The institutional standards that academics observe in

scientific institutions under conditions of intense competition are different from those of commercial enterprises operating under time constraints and disclosing information requirements (Bruneel et al., 2010). On the other hand, to promote technology transfer, universities are increasingly managing their partnerships with industry in a more proactive manner and aiming to generate valuable intellectual property. While the literature on university-industry links has acknowledged both of these elements, relatively few research has looked into the types of barriers and potential mitigating factors. Although governments offer a variety of programs to encourage academic institutions to acquire and utilize intellectual property, there are studies indicating that a decline in joint research collaborations has coincided with an increase in university patenting (Bruneel et al., 2010). As another issue, numerous obstacles to successful collaborations were identified, including cultural clashes, bureaucratic inflexibility, poorly designed reward systems, and ineffective management of university technology transfer offices (TTOs). These findings were based on 98 structured interviews with key stakeholders, including university administrators, academic and industry scientists, business managers, and entrepreneurs, at five research universities in two US regions (Siegel et al., 2002). In summary, these studies reveal the complex interplay between institutional norms, commercial motivations, and structural challenges in shaping university-industry collaborations. While academic researchers are often motivated by institutional values that prioritize research and reputation over financial gain, the broader institutional environment—including the structure of TDZs and the management of TTOs—also plays a crucial role in determining the success of these collaborations. Addressing these challenges will require a deeper understanding of how institutional pressures, norms, and governance structures impact university-industry interactions.

4. CONCLUSION

A central theme of this paper is the introduction of institutional resilience as a key concept for understanding how UICs sustain themselves in the face of changing institutional pressures. The concept of resilience, which focuses on the ability of organizations to adapt to shifts in regulatory, economic, and cultural environments, is particularly relevant in dynamic and fast-changing industries such as technology and software. The ability of universities and industries to proactively adjust their strategies emerges as a critical factor in the long-term sustainability of UICs.

In sum, we argue in favor of the need for a more contextualized approach to understanding UICs, as proposed by the Triple Helix 2.0 framework. By incorporating the concepts of institutional resilience and context-specific institutional dynamics, such a framework has the potential to provide a more robust tool for analyzing and optimizing UICs in diverse settings. Future research should continue to explore how institutional pressures and governance models influence the long-term sustainability of UICs, with particular attention to the local and regional dynamics that shape these collaborations.

From a practical perspective, the current study integrates institutional theory with the concept of institutional resilience, and thus highlights the significance of adapting to external pressures as a strategic necessity for both academic and industrial actors. The theoretical framework attempts to conceptualize how institutional environments shape collaborations, with universities often driven by normative academic standards and industries motivated by commercialization. However, bridging this gap requires more than simple alignment. The role of intermediaries, such as innovation centers and technology transfer offices, emerges as critical in mediating these divergent logics. The Triple Helix 2.0 model informs decision-making, offering a more context-sensitive approach that acknowledges the fluidity of institutional logics across regional and sectoral boundaries. This adaptability is essential, as governments can support these ecosystems with tailored policies that recognize the varying institutional dynamics in different settings. Without an understanding of the institutional pressures at play, UICs risk being short-lived or constrained by misaligned goals, but with strategic resilience, they can thrive even amidst shifting environments.

This study is not without limitations. First, the absence of empirical data to back up the current study's propositions is a major limitation that we hope future researchers will address. Second, the propositions outlined in the study is subject to boundary conditions and these should be addressed both conceptually and practically, such as the role of culture, industry, and other internal or external ecosytem variables. Testing these propositions pose challenges in terms of accessing data across various industries. Additionally, the concept of institutional resilience is relatively underexplored in U-I interactions and developing country contexts. The current study incorporates a functionalist perspective of institutional theory to contextualize UICs and institutitonal resilience, and a more cultural and value-based institutional environment perspective might offer a useful lens (Suddaby et al., 2010). Last but not the least, the study briefly mentions UIC barriers and the role of intermediary organizations for overcoming them, yet their role in institutional logics is not elaborated upon. While we acknowledge that the current study provides a useful conceptual framework, future research should focus on empirical validation and the development of more context-specific models to enhance our understanding of university-industry collaborations.

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