Journal of Effective Teaching and Learning Practices. 2025; 2(2); 97-109
eISSN: 3048-9601

The Evolution of University Industry Relations: Fostering Innovation and Economic Development in Georgia through the Triple Helix Model

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DOI: https://doi.org/10.70372/jeltp.v2.i2.5

Abstract

This study explores the dynamics between universities and industries within Georgia's economic landscape, particularly shaped by the political and social transformations following independence in the early 1990s. The transition from a centralized Soviet system to an autonomous educational framework has fostered collaborations aimed at innovation and economic progress. Utilizing the Triple Helix model as a theoretical framework, we emphasize the interconnectedness of academia, industry, and government. A survey of 50 top company CEOs in Georgia reveals that while university engagement scores a high mean of 3.508, indicating robust involvement from academic institutions, industry engagement lags significantly at 2.409. Notably, a negative correlation of -0.268 between university and industry engagement suggests that improvements in one do not necessarily lead to enhancements in the other, highlighting a complex relationship that challenges prevailing assumptions. This study also considers the implications of the recent halting of the EU integration process, which may pose challenges to the progress achieved in fostering university-industry relations and economic development. This study advocates for a systemic approach to policy development that integrates the needs of all three helices, focusing on strengthening the weaker components, particularly industry engagement. Recommendations include enhancing institutional support mechanisms and developing adaptive policy frameworks for flexible collaboration models. This research contributes to the Triple Helix theory by underscoring the importance of contextual adaptation and capacity building, suggesting a revised model for emerging economies like Georgia to maximize the impact of university-industry relations on innovation and economic development.

Keywords— Economic Development; Innovation; Triple Helix Model; University-Industry Relations

1. HISTORICAL CONTEXT

1.1 Development of University-Industry Relations: Global and Local perspectives

UIRs have evolved significantly over the past century, marked by shifting paradigms in education, research, and economic development. Initially, universities operated primarily as centers of knowledge and education, with limited interaction with industry. However, post-World War II, particularly in the United States and Europe, the rise of research universities and the need for technological innovation led to closer ties between academia and industry. The establishment of technology transfer offices and collaborative research initiatives became common, facilitating the commercialization of research findings.

In the late 20th century, the Triple Helix model emerged, emphasizing the interconnected roles of academia, industry, and government in fostering innovation. This model gained traction as countries recognized the importance of knowledge transfer and collaboration for economic growth. Today, university-industry relations are characterized by strategic partnerships, joint research initiatives, and a focus on entrepreneurship, reflecting a global trend towards leveraging academic research for societal and economic benefits, particularly in the context of rapid technological advancements and globalization.

In Georgia, this evolution has been shaped by various political and social transformations, particularly following the country's independence in the early 1990s (Davitadze, 2019; Kikutadze et al., 2022; Kikutadze & Lekishvili, 2024; Tsiklashvili & Poladashvili, 2022).This has seen a shift from a highly centralized Soviet system to a more autonomous educational framework that has allowed for the cultivation of collaborative ties between universities and industries, all aimed at fostering innovation and economic development. Older universities, such as Tbilisi State Medical University, which traces its roots back to 1918, transformed into comprehensive institutions in 1992, marking a significant milestone in the evolution of higher medical education and its linkages with industry in Georgia (Shonia & Trzmielak, 2022).

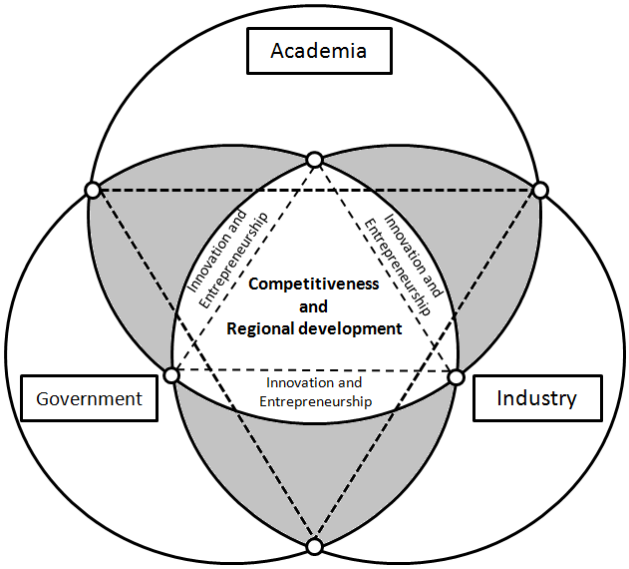
The initiative to enhance university-industry collaboration has been propelled by a recognition of the critical role these linkages play in driving technological advancement and economic competitiveness(Kikutadze et al., 2022; Shonia & Trzmielak, 2022). Research has indicated that effective university-industry collaborations are essential for technology transfer and innovation(Davitadze, 2019). This is equally true for developing countries such as Georgia, where traditional business practices often dominate the economic landscape(Kikutadze et al., 2022; Shonia & Trzmielak, 2022). Over the years, the establishment of formal channels for knowledge transfer and the encouragement of collaborative research initiatives have become priorities for many Georgian universities (Shonia & Trzmielak, 2022) to stimulate economic growth and address local industry needs in a fast-changing global work environment (Tsiklashvili & Poladashvili, 2022).

The EU integration process has been a crucial driver of economic reform and development in Georgia due to the regional support from EU member countries, access to funding and facilitating of industry and university linkages in more competitive spaces(Mardaleishvili et al.; Slaughter & Cantwell, 2012). The recent halting of this process raises concerns about potential setbacks in university-industry collaborations, access to funding, and the adoption of European standards(Chkhikvishvili et al., 2023).

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

The conceptual framework for this study is grounded in the Triple Helix model, which illustrates the interactions between universities, industries, and government as key players in fostering innovation and economic development(Leydesdorff & Etzkowitz, 1998). This model posits that the synergy created by these three entities can lead to enhanced knowledge transfer, improved research commercialization, and increased entrepreneurial activities. See illustration below in fig 1.

Fig 1: Triple helix model



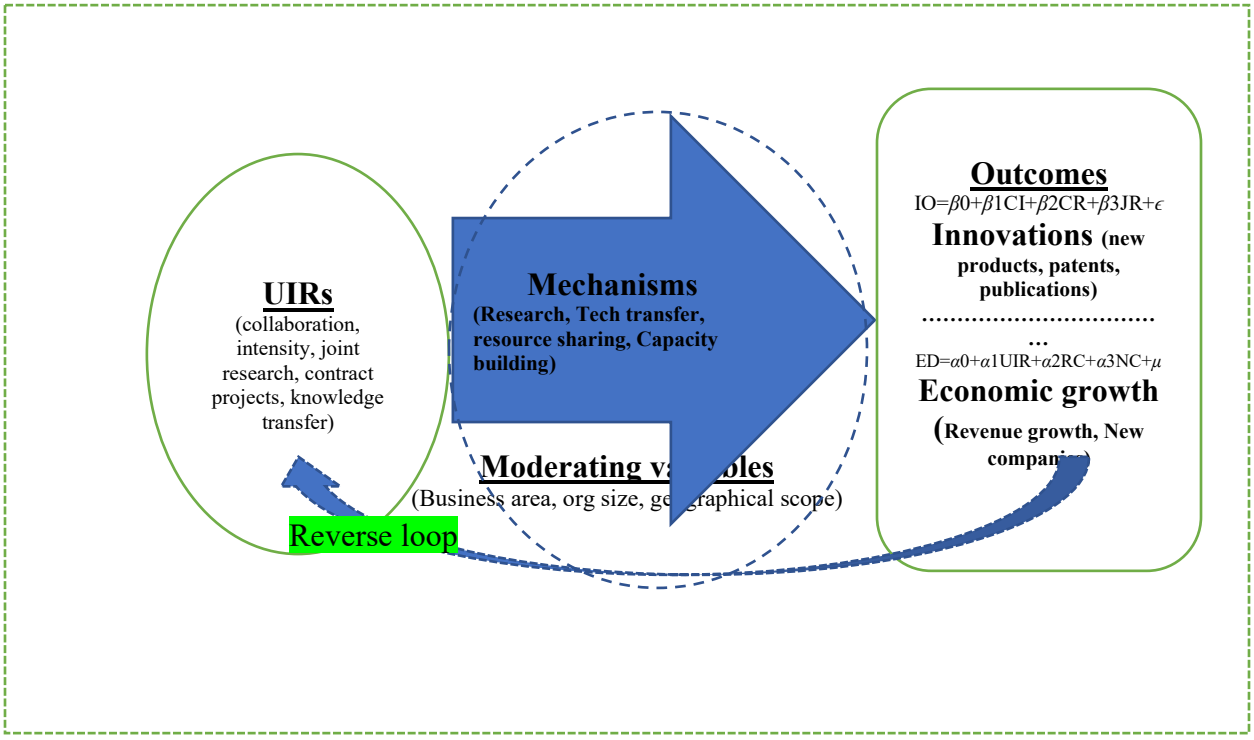
In the context of Georgia, the Triple Helix model provides a lens through which to examine the complexities of university-industry relations. The framework emphasizes the need for collaboration among these sectors to address the unique challenges faced by the Georgian economy, particularly in light of the recent halt in EU integration. By focusing on the relationships and interactions among the helices, we can better understand how to leverage university-industry collaborations to drive innovation and economic growth.

The framework also highlights the importance of contextual adaptation, suggesting that the traditional model may require modifications to reflect the specific realities of emerging economies like Georgia. This includes recognizing the impact of local socio-economic factors, institutional capacities, and the evolving nature of industry needs on the effectiveness of UIRs.

3. METHODOLOGY

The study employed a descriptive research design administering a survey to 50 top company CEOs from various industries across the country, selected based on their reported annual turnover for the year 2022/23. However, only 44 responses were complete and used for analysis. The research emphasis drew primarily from two links, the connection between universities and industry, specific focus was on how industries respond to the efforts by the universities to broker these relations and the outcomes overtime as witnessed by these CEOs. The conceptual flow drawn for this is as here explained.

Fig 2: Conceptual model against which research was built.



This conceptual framework highlights four interconnected components—Relations, Channels, Moderators, and Outcomes—that collectively explain how University-Industry Relations (UIRs) foster innovation and economic development. UIRs involve key measures such as collaboration intensity, joint research, contract projects, and knowledge transfer. These elements drive process activities like technology transfer, research collaboration, resource sharing, and capacity building, which enhance cooperation between universities and industries.

The Outcomes component is split into innovation output and economic development, each modeled mathematically to show the influence of various inputs. Moderating variables such as business area, organization size, and geographic scope affect these relationships. Visual cues in the framework—big thick arrow for direct effects, a dotted circle for moderating effects/environment, and reverse loop—depict how these dynamics interact further enhancing UIRs. Altogether, the framework offers a structured lens to understand and optimize the impact of UIRs.

The survey comprised three key sections, approaches used in UIRs, which section assessed the types of collaborations and partnerships established between universities and industries. Secondly were the mechanisms for collaboration, a section that examined the processes and structures that facilitate effective collaboration, including communication channels and resource sharing and lastly a section for satisfaction levels with UIRs where the perceptions of CEOs regarding the effectiveness and outcomes of their collaborations with academic institutions were assessed.

Responses were coded numerically for analysis using the R environment, allowing for both quantitative and qualitative insights into the nature of UIRs in Georgia. The focus on industry perspectives is particularly significant, as it provides a unique vantage point on the effectiveness of university collaborations and their impact on innovation and economic development. The study tested two hypotheses in this direction a below indicated.

- H 1: There is a positive relationship between university-industry collaboration and innovation output.

- H 2: Enhanced university-industry relations lead to increased economic development indicators (e.g., job creation, revenue growth).

However, as will be observed later in the findings present a notable contradiction to the conventional expectations of the Triple Helix model. Ordinarily, it is anticipated that stronger university engagement would correlate positively with industry outcomes, our analysis reveals a negative correlation of -0.268 between university and industry engagement. Therefore, this suggests that improvements in university collaboration do not necessarily lead to enhanced industry participation, challenging the assumption that increased university involvement will automatically benefit industry innovation and economic growth. Notably, the slow adoption of indigenous technological practices and reliance on traditional trades(Shonia & Trzmielak, 2022) further complicate these relationships. The push for stronger university-industry linkages aims to overcome these barriers and promote a culture of research and innovation(Davitadze, 2019; Kikutadze et al., 2022) despite numerous government initiatives and strategic partnerships, the existing disconnect between university engagement and industry responsiveness highlights the need for a nuanced understanding of these dynamics(Kikutadze & Lekishvili, 2024).

This study aims to contribute to the Triple Helix theory by emphasizing the importance of contextual adaptation and capacity building, suggesting that a revised model is necessary for emerging economies like Georgia. By recognizing and addressing the complexities and contradictions inherent in UIRs, particularly the unexpected negative correlation between university and industry engagement, we can better understand how to maximize the impact of these relationships on innovation and economic development.

5. LITERATURE REVIEW

5.1 University-Industry Relations and their role in Economic Development

The interaction between industry and universities is widely recognized as a crucial driver of industrial innovation and economic development. Numerous studies have emphasized the importance of university-industry relations (UIRs) in fostering technological advancements and enhancing competitiveness in both developed and developing economies (Mikhailov & Puffal, 2023). In developed economies, UIRs have been shown to facilitate knowledge transfer, promote research commercialization, and stimulate entrepreneurship (West et al., 2014). However, the dynamics of these relationships can differ significantly in developing contexts, where traditional business practices often dominate the economic landscape (Osano & Koine, 2016).

Research indicates that effective UIRs are essential for technology transfer and innovation, particularly in developing countries like Georgia(Davitadze, 2019; Kikutadze & Lekishvili, 2024). However, the observed reality in Georgia reveals a gap between theoretical expectations and actual outcomes. While the literature suggests that strong university engagement should correlate positively with industry responsiveness and innovation output, our findings indicate a negative correlation between university and industry engagement. This discrepancy highlights the complexities of UIRs in Georgia and underscores the need for a more nuanced understanding of the factors influencing these relationships.

5.2 Evolving frameworks for Collaboration, Policy, and Institutional response

The landscape of university-industry collaboration is evolving significantly, influenced by advancements in technology and a growing emphasis on innovation (Rossoni & de Castilho Rossoni, 2024). Future partnerships are expected to embrace digital transformation, utilizing artificial intelligence (AI) and data analytics to streamline research and development processes. Such technological integration is poised to enhance the ability of universities and industries to collaborate effectively, facilitating the swift translation of academic research into practical applications that address pressing global issues, such as healthcare and climate change (Hajrizi & Shaqiri, 2024)

However, the application of these evolving frameworks in Georgia reveals a disconnect between theoretical models and practical realities. The Triple Helix model, which emphasizes the interconnectedness of academia, industry, and government, suggests that effective collaboration among these sectors should lead to significant advancements in economic development(Leydesdorff & Etzkowitz, 1998). Yet, our findings indicate that the anticipated positive relationship between UIRs and economic development is not evident in the Georgian context, where a negative correlation exists. This suggests that the traditional model may require adaptation to better reflect the unique challenges and opportunities present in emerging economies such as this.

5.3 Addressing capacity gaps and socioeconomic factors

A critical aspect of UIRs in developing countries is the need to address capacity gaps and socioeconomic factors that can hinder effective collaboration. Research has shown that while universities are charged with advancing knowledge and training skilled scientists, many developing countries struggle with insufficient resources and institutional frameworks to support meaningful UIRs(Bruneel et al., 2010; Guimón, 2013; Rossoni et al., 2024). In Georgia, the slow adoption of indigenous technological practices and reliance on traditional trades further complicate these dynamics (Tsiklashvili & Poladashvili, 2022).

The literature also highlights that innovation is not solely the responsibility of individual firms but rather a collective process involving multiple stakeholders(Henton & Held, 2013). This perspective underscores the importance of fostering a collaborative ecosystem that encourages knowledge sharing and joint problem-solving. However, the observed reality in Georgia suggests that such collaborative environments are still in their infancy, with many universities and industries operating in silos rather than engaging in meaningful partnerships.

5.4 Theoretical expectations vs. observed reality

Despite the theoretical frameworks that advocate for strong UIRs as a pathway to innovation and economic growth, the empirical evidence from Georgia reveals a stark contrast. The expectation that increased university engagement would lead to enhanced industry outcomes is not supported by our findings, which indicate a negative correlation between the two. This contradiction raises important questions about the applicability of existing theoretical models in the Georgian context and highlights the need for further research to explore the underlying factors contributing to these discrepancies.

Moreover, the literature suggests that collaborations are particularly vital in sectors where market-oriented research can thrive (Guimón, 2013; Rossoni & de Castilho Rossoni, 2024; Tsiklashvili & Poladashvili, 2022). However, the reality in Georgia demonstrates that the potential for UIRs to drive innovation is often hampered by systemic barriers, including insufficient institutional support, lack of alignment between academic research and industry needs, and cultural differences that may inhibit collaboration.

5.5 Future directions for research

To address the gaps identified in the literature, future research should focus on exploring the unique contextual factors that influence UIRs in Georgia. This includes examining the role of informal collaborations, the impact of government policies on fostering partnerships, and the significance of institutional frameworks in facilitating effective knowledge transfer. Longitudinal studies that track the evolution of UIRs over time will provide valuable insights into how these relationships develop and their impact on innovation and economic development.

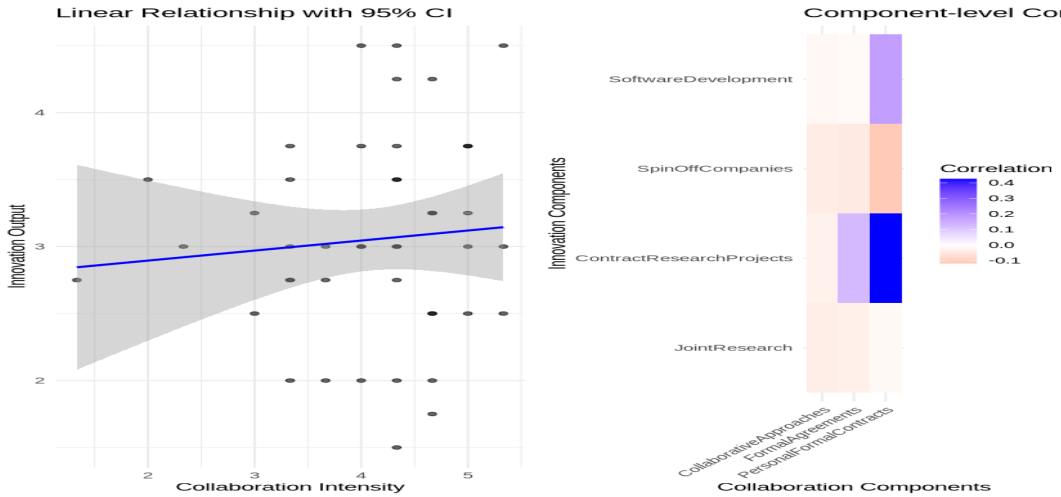
Additionally, there is a need for a more nuanced theoretical framework that accounts for the complexities and contradictions inherent in UIRs, particularly in emerging economies. By recognizing the unique challenges faced by countries like Georgia, researchers can contribute to the development of tailored strategies that enhance collaboration and drive economic growth.

6. RESULTS AND DISCUSSION

6.1 Hypothesis 1: Relationship Between University-Industry Collaboration and Innovation Output

The first hypothesis posited a positive relationship between university-industry collaboration (UIC) and innovation output. To test this hypothesis, we analyzed survey data from 44 CEOs of top companies in Georgia, focusing on their perceptions of UIC and its impact on innovation. Contrary to our expectations, the results indicated a weak correlation between UIC and innovation output, with a correlation coefficient of only 0.088. This finding suggests that the anticipated benefits of collaboration in fostering innovation may not be as straightforward as previously assumed.

Fig 3: General impression of the relationship between UIRs and innovation in Georgia



Further analysis revealed an R^2 value of just 0.008, indicating that UIC accounts for a minimal fraction of the variance in innovation output. The non-significant F-statistic ($p > 0.05$) reinforces the notion that we cannot assert a positive relationship based on these findings alone. This outcome challenges the conventional wisdom embedded in the Triple Helix model, which suggests that increased university engagement should lead to enhanced innovation outcomes in industry.

In exploring potential non-linear relationships, we employed various modeling techniques, including quadratic, logarithmic, and exponential models. However, each approach yielded low R^2 values (0.012, 0.006, and 0.003, respectively), suggesting that more complex relationships may not exist within the data. This lack of significant findings underscores the need for a deeper contextual understanding of the dynamics between UIC and innovation.

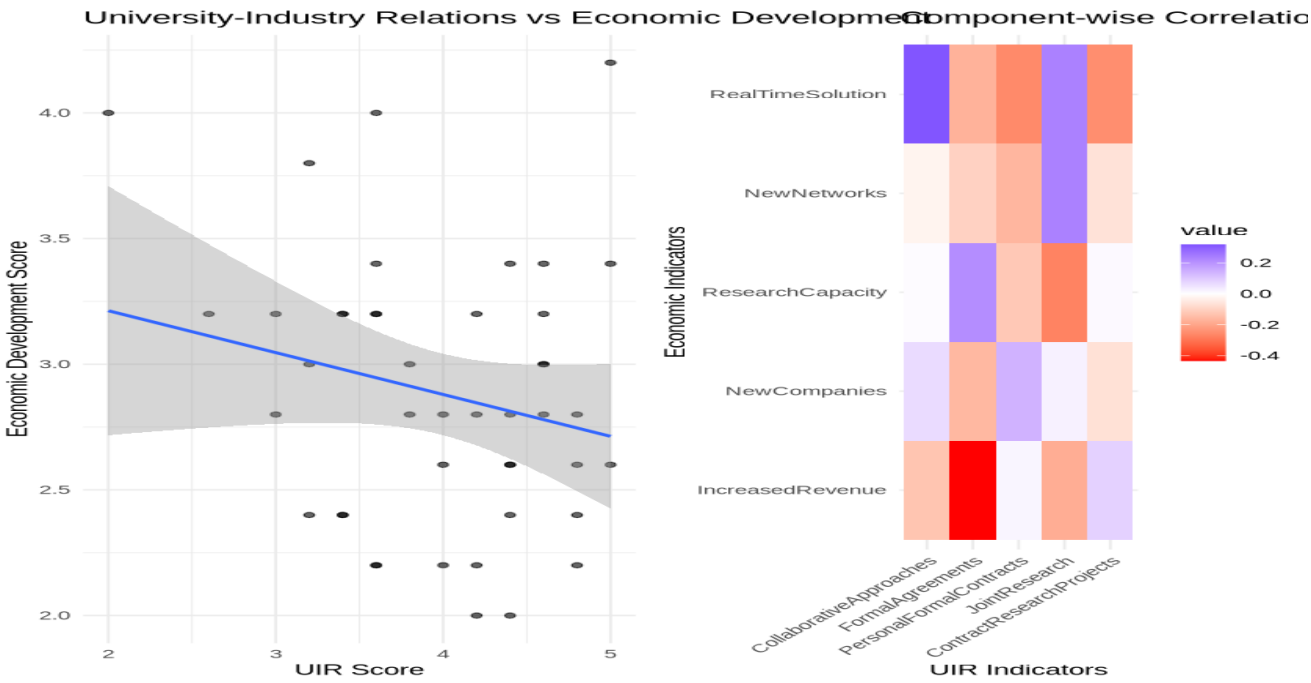
At the component level, we observed weak to moderate correlations among individual elements of collaboration and innovation. Notably, the highest correlation was found between personal contracts and contract projects, with a coefficient of 0.425. However, this relationship alone is insufficient to establish a consistent pattern across the various components of collaboration, indicating that the dynamics of UIC and innovation are more intricate than initially expected.

These findings highlight the complexities inherent in university-industry relationships, particularly in the context of Georgia's evolving economic landscape. While the expectation of a direct positive relationship between UIC and innovation output is prevalent in existing literature, our results suggest that such assumptions may not hold true in practice. The quality of collaboration, rather than merely the quantity or intensity, may play a more significant role in influencing innovation outcomes.

6.2 Hypothesis 2: Impact of University-Industry Relations on Economic development

The second hypothesis examined whether enhanced university-industry relations lead to increased job creation and revenue growth, key indicators of economic development. Initial expectations were that a strong positive relationship would exist, given the established role of UIC in driving economic progress in many contexts. However, our findings reveal a slight negative correlation of -0.215 between UIR and economic development indicators, with an R^2 value of 0.0462. This suggests that only 4.62% of the variance in economic development outcomes can be explained by university-industry relations, indicating a weak explanatory power.

Fig 4: General impression of the relationship between UIRs and Economic development (Job creation and revenue increase) in Georgia



Further analysis highlighted significant differences between formal and informal collaboration approaches, with a p-value of 0.0063 indicating that the type of collaboration significantly influences outcomes. Our temporal analysis revealed that longer-term partnerships, particularly those lasting between three to five years, yield higher economic development scores. For instance, collaborations lasting three to five years achieved a mean economic development score of 2.95, while early-stage collaborations of zero to two years garnered a mean score of only 2.43. This contrast illustrates that the benefits of UIRs may take time to materialize, emphasizing the importance of patience and sustained investment in these relationships.

Moreover, informal collaborations consistently scored higher than formal ones, suggesting that the nature of the relationship significantly impacts effectiveness. This finding underscores the necessity of focusing on the quality of relationships rather than merely their quantity. The complexities of these relationships highlight the need for tailored approaches that recognize the unique contexts and dynamics at play in Georgia's economic landscape.

6.3 Addressing the contradictions

The findings from both hypotheses reveal a significant contradiction to the expectations established by the Triple Helix model. While the model suggests that increased university engagement should correlate positively with both innovation and economic development, our results indicate otherwise. The negative correlation between university and industry engagement, along with the weak relationships observed in both hypotheses, challenges the assumption that improvements in one sector will inherently benefit the other.

This contradiction points to the necessity for a more nuanced understanding of university-industry relations in Georgia. Factors such as the slow adoption of indigenous technological practices, reliance on traditional trades, and the evolving nature of both sectors may contribute to these unexpected outcomes. As Georgia continues to transition from a post-Soviet economy, the

complexities of these relationships must be acknowledged and addressed within policy frameworks and institutional support mechanisms.

6.4 Implications for Policy and Practice

The results of this study suggest important directions for policy development and practical applications. To enhance the effectiveness of university-industry collaborations, it is crucial to focus on fostering quality relationships rather than merely increasing their quantity. Policymakers should consider implementing targeted initiatives that encourage industries to actively participate in university partnerships, emphasizing the long-term benefits of collaboration.

Additionally, awareness campaigns can be launched to highlight successful case studies that demonstrate the potential returns on investment from effective UIRs. Improving industry absorption capacity and university entrepreneurial capabilities, alongside strengthening institutional governance mechanisms, will be essential for fostering a more dynamic and productive collaboration environment.

In conclusion, while our findings do not support the straightforward hypotheses regarding the relationships between UIC and innovation or economic development, they illuminate a more intricate reality. The complexities and contradictions inherent in these relationships call for a reevaluation of existing theoretical frameworks and the development of context-sensitive policies that address the unique challenges and opportunities present in Georgia.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

This study has yielded several key findings that significantly enhance our understanding of the dynamics involved in university-industry relations (UIRs) within the Georgian context. Through the lenses of the Triple Helix theory, we observed that university engagement achieves the highest mean score of 3.508, indicating a robust level of involvement from academic institutions. In contrast, industry engagement is notably lower, with a mean score of 2.409, suggesting that industries may not be as actively participating in these collaborations.

A central theme that emerged from our findings is the complicated interaction dynamics between university engagement and economic development indicators. Notably, a negative correlation of -0.268 between university and industry engagement indicates that enhancements in university collaboration do not necessarily lead to improvements in industry responsiveness. This contradiction challenges the conventional expectations of the Triple Helix model, which posits that stronger university engagement should correlate positively with enhanced innovation and economic outcomes.

Additionally, we found a weak positive correlation of 0.131 between university engagement and the institutional framework, while a negative correlation of -0.224 was noted between industry engagement and the institutional framework. These correlations suggest a need for a more nuanced understanding of the relationships within the Triple Helix model, particularly in the context of Georgia. The traditional model requires contextual adaptation to better suit the unique challenges and opportunities present in the Georgian landscape.

Furthermore, our analysis revealed an asymmetric development of the helices, particularly between university and industry engagement. The prominence of the institutional framework in Georgia appears more significant than in developed economies, highlighting the necessity for balanced development across all dimensions of the Triple Helix. This imbalance underscores the need for a systemic approach to policy development that integrates the needs of all three helices, focusing on strengthening the weaker components, especially industry engagement.

7.2 Recommendations

Based on the findings and the identified contradictions, we propose several actionable recommendations to enhance university-industry relations in Georgia:

i. To strengthen university-industry relations (UIRs), a multipronged approach is required, beginning with enhancing institutional support mechanisms. Universities should establish dedicated support units to facilitate partnerships and invest in training programs that align staff capabilities with industry expectations. These efforts will streamline collaboration processes and make academic institutions more industry-responsive.
ii. Simultaneously, developing adaptive policy frameworks is vital. Policymakers must design flexible engagement models that accommodate a range of collaboration types—from formal research alliances to informal networking. These frameworks should also consider the diversity in industry scale and sector to ensure inclusive and effective participation.
iii. Equally important is the need to foster quality collaborations. Focus should shift from the number of partnerships to their depth and sustainability. Long-term engagements have been shown to yield greater innovation and economic impact, as they allow trust and mutual understanding to mature over time.
iv. To generate greater interest in UIRs, institutions and policymakers should promote awareness and success stories. Highlighting real-world examples of successful collaborations and their returns on investment can inspire industries to pursue similar engagements. This awareness can be further supported by improving industry absorption capacity, ensuring that firms are well-equipped to implement academic research through targeted training and resource provision.
v. In parallel, universities must encourage entrepreneurial initiatives by building innovation hubs and supporting student and faculty-led startups in partnership with industry. These entrepreneurial ecosystems can accelerate knowledge transfer and generate new economic opportunities.
vi. For a more nuanced understanding of UIR dynamics, researchers should conduct longitudinal studies that examine how Triple Helix interactions evolve over time. Such studies will shed light on both formal and informal mechanisms of collaboration and their long-term impacts on innovation and economic development.
vii. Finally, there is a clear need for contextual adaptation of the Triple Helix model to suit Georgia's specific environment. This includes reinforcing institutional frameworks, emphasizing relationship quality, and building industry and academic capacity. A tailored approach will ensure that the model remains relevant and effective in emerging economies

In conclusion, while the Triple Helix model provides a valuable framework for understanding university-industry-government relations in Georgia, our findings highlight the need for a modification of the model that accounts for the complexities and contradictions inherent in these relationships. By adopting a dynamic perspective that accounts for the evolution of relationships over time and the significance of capacity building, we can gain a more comprehensive

understanding of how university-industry relations foster innovation and drive economic development in Georgia. Ultimately, this study contributes to the Triple Helix theory by underscoring the importance of contextual adaptation, temporal dynamics, institutional frameworks, relationship quality, and capacity building, suggesting a need to revise the model for emerging economies to emphasize these critical factors.

Acknowledgments

This article is the product of both intellectual inquiry and collaborative engagement. I extend my sincere appreciation to the faculty and students of specifically my host University -Caucasus University, whose openness to innovation and dialogue continues to shape my understanding of university-industry relations in the Georgian context.

I am especially grateful to colleagues in both academic and private sector circles - within and beyond Georgia - whose insights into the evolving dynamics of the Triple Helix Model have sharpened my perspectives and enriched this work.

I also acknowledge the broader community of practitioners and policymakers striving to bridge academia and industry toward meaningful economic development. Your efforts remain an inspiration and a driving force behind this research.

Finally, to the many students, entrepreneurs, and educators whose questions and critiques have challenged and refined my thinking: thank you. Your voices are woven into every layer of this work and more to come.

Author Bio

Dr. Fred Kasirye, PhD, is a development practitioner and educator with over 18 years of experience in higher education, policy engagement, and institutional transformation. His expertise lies in bridging academia, industry, and community through innovative approaches that foster inclusive growth and sustainable development.

As an Assistant Professor at Caucasus University, Dr. Kasirye's teaching and research explore university-industry collaboration, innovation ecosystems, and the role of education in economic advancement. His approach is shaped by practical experience, cross-sector collaboration, and a deep commitment to reflective leadership.

Whether working with students, policymakers, or entrepreneurs, Dr. Kasirye is passionate about turning theory into action and creating learning spaces where knowledge becomes impact.

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