American University Kyiv

A Capstone Project

THE ROLE OF FEMALE LEADERSHIP IN BUSINESS INNOVATIONS

ВПЛИВ ЖІНОЧОГО ЛІДЕРСТВА НА ІННОВАЦІЙНІСТЬ ПІДПРИЄМСТВ

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ABSTRACT

This research explores the role of female leadership in driving business innovation, addressing the critical question of how gender diversity in leadership impacts organizational creativity and innovation outcomes. Using firm-level data from the EBRD-EIB-WBG Enterprise Surveys conducted between 2018 and 2020, the study investigates the influence of female representation in top management and ownership on innovation metrics, including product and process innovations. The analysis consists of descriptive statistics, correlation analysis, and regression modeling to assess the relationships between female leadership and innovation outcomes, uncovering a critical threshold of at least 10% female representation in leadership roles. The results reveal that firms meeting or exceeding this threshold exhibit significantly higher rates of innovation, with product innovation increasing by 11.55% and process innovation by 8.45% compared to firms below the threshold. Moreover, the findings highlight the complementary role of majority women ownership in fostering innovation. Strong correlations between female leadership metrics and innovation outcomes underscore the importance of gender diversity in driving organizational performance. The study aligns with prior research, refining the understanding of critical mass in leadership diversity and its impact on innovation. Implications include the need for organizations to implement policies that elevate women into leadership positions and promote diversity as a strategic advantage. Future research could explore the effects of surpassing higher thresholds and examine industry-specific or regional variations. By demonstrating that even modest levels of female leadership can significantly enhance innovation, this study provides actionable insights for businesses and policymakers whose goal is developing inclusive and innovative organizational cultures.

Keywords: Management, female leaders, process innovation, product innovation, diversity

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CHAPTER 1. LITERATURE REVIEW

In a dynamic competitive global market innovation has become a crucial factor for business success. Companies are continuously researching ways to stay ahead, and leadership plays a central role in growing culture of creativity and forward-thinking. There are various leadership styles, female leadership among them is brought up more frequently for its unique contributions to innovation. Women leaders often demonstrate inclusive and collaborative approaches that promote diverse ideas, resulting in fresh perspectives and innovative solutions. Despite growing evidence of the positive impact of gender diversity in leadership, women remain underrepresented in top management positions, particularly in industries reliant on innovation. By understanding how female leaders contribute to innovation, organizations can enhance their creative problem-solving, product development, and strategic thinking.

1.1 Current Trends in Leadership and Innovation

Over the past decade, the demand for innovation has significantly influenced businesses. Companies are increasingly investing in research and development, technology, and talent to remain competitive (Dastin, 2022; Smith, 2021). At the same time, there is growing awareness of the importance of diversity and inclusion, particularly in leadership roles. Global initiatives and policies, such as gender quotas and corporate diversity goals, support the shift toward more equitable representation in management (Latorre Ruiz & Pérez Sedeño, 2023; Vieira et al., 2022).

Research by Boston Consulting Group (2018) demonstrates that diverse leadership teams are more likely to achieve higher levels of innovation revenue. Similarly, McKinsey & Company (2020) highlights that companies in the top quartile for gender diversity on executive teams are 25% more likely to experience above-average profitability. Prominent organizations such as SAP (n.d.), Apple (n.d.), and JPMorgan Chase & Co. (n.d.) have embraced gender diversity in leadership, illustrating the tangible benefits of inclusivity. These examples underline the need to explore how female leaders specifically contribute to innovation and how their approaches can be replicated across various industries.

Despite these positive developments, progress in achieving gender parity in leadership has been slow. Women constitute nearly half of the global workforce, yet their representation in leadership remains disproportionately low. For example, the World Economic Forum's Global Gender Gap Report 2023 reveals that only 26% of global leadership roles are held by women (World Economic Forum,

2023). This underrepresentation is particularly evident in innovation-driven sectors such as technology and engineering (Hall & Ellis, 2023; O'Connor & Liu, 2024).

1.2 Research Problem

The benefits of diversity and female leadership are increasingly acknowledged, but there is still a significant gap in understanding the mechanisms through which female leaders influence innovation. Existing studies often focus on the correlation between diversity and performance but lack depth in exploring how female leaders foster innovation at the team and organizational levels (Quintana-García et al., 2022; Vieira et al., 2022). Moreover, much of the research is concentrated in specific industries or regions, leaving a need for more comprehensive, cross-industry, and global perspectives (Latorre Ruiz & Pérez Sedeño, 2023; World Economic Forum, 2023). This research is aiming to address this gap by examining whether the presence of female leaders correlates with measurable innovation outcomes, such as revenue from new products and services.

By addressing this question, the study should provide actionable insights for businesses seeking to leverage female leadership as a driver of innovation. Additionally, it builds on prior research by expanding its focus to include global datasets and broader organizational contexts, offering new pathways for firms to achieve competitive advantages through gender-diverse leadership (O'Connor & Liu, 2024; Vieira et al., 2022).

1.3 Objectives and Hypothesis

The main objective of the research is to analyze the role of female leadership in fostering innovation across different industries. And it will provide recommendations for organizations to increase female representation in leadership roles that are backed to analysis and data.

Hypotheses lying in the core of the research:

1. Organizations with a higher proportion of women in leadership roles report higher innovation revenue compared to those with predominantly male leadership.
2. Female leaders employ inclusive practices that enhance team creativity and contribute to innovative outcomes.
3. Inclusive leadership styles practiced by female leaders are positively correlated with successful implementation of new products and services.

CHAPTER 2. INNOVATION PROCESS FROM A MANAGEMENT STANDPOINT

Innovation is applicable to every sphere in the modern world, and it is based at the core of every successful company. It is not just about coming up with new ideas but also about turning those ideas into reality. From a management perspective the innovation process is a carefully guided process, moving through stages such as idea generation, development, and implementation.

The first step, idea generation is where creativity is natural and generally expected. Teams brainstorm and share thoughts, but this happens only in supportive environments. Managers play a crucial role here by fostering open communication and encouraging employees to think outside the box. Diverse teams, in particular, excel at this stage because they bring unique perspectives that help to generate fresh ideas. Once the ideas are collected, the development phase begins. At this stage managers must evaluate and refine these ideas, selecting the most promising ones. This stage requires both vision and practicality. Managers act as decision-makers, balancing the potential risks and rewards of each idea while ensuring resources like time, budget, and talent are allocated wisely.

Finally, the implementation phase is where ideas come to life. This is often the most challenging step, as it involves coordination across teams and departments. Managers need to lead by example, ensuring everyone is aligned and motivated to see the project through. Clear goals, regular feedback, and problem-solving are key management skills at this stage.

Throughout the innovation process, leadership makes the valuable difference. Good managers not only provide structure but also inspire their teams. They create a culture of trust and collaboration, which is essential for innovation to flourish. Companies like Google and Salesforce are known for their innovative management practices, which focus on inclusivity and employee empowerment. When managed well, the innovation process can transform simple ideas into breakthroughs that drive business success.

2.1 Diversity Management Theory

Diversity is a clear and simple concept for understanding but it turns out to be challenging to reach it in the companies still. Why does it matter? On one hand, there are regulations and recommendations for modern innovative companies. On the other hand, there are studies and theories that demonstrate benefits for the results of the companies with diverse environment. No matter what the motivation is, the diverse teams lead to more innovative solutions and better financial performance. For

instanse, studies by McKinsey & Company (2020) and Boston Consulting Group (2018) have linked diversity to higher profits and better decision-making.

The term “diversity management” was introduced by Roosevelt Thomas Jr. in his seminal 1990 article, From Affirmative Action to Affirming Diversity, published in the Harvard Business Review. His subsequent book, Beyond Race and Gender: Unleashing the Power of Your Total Workforce by Managing Diversity (1991), reframed diversity management as a strategic business imperative rather than limiting it as a compliance issue. These works laid the foundation for understanding how diverse teams contribute to organizational success.

Successful companies like Microsoft, Google, and Salesforce take diversity management seriously. They invest in programs like employee resource groups, mentorship, and inclusive hiring practices (Vieira et al., 2022). They also measure their progress and share their results, holding themselves accountable to their goals. Diversity management today is not just about gender or race - it includes age, cultural background, neurodiversity, and more (Hall & Ellis, 2023). When companies manage diversity well, everyone benefits. Employees feel included, customers see themselves represented, and the organization becomes more resilient and innovative. As Roosevelt Thomas Jr. said, it’s about unlocking the potential of the entire workforce - not just a part of it.

2.2 Technical University of Munich Research

Research conducted by the Technical University of Munich surveyed 171 companies in Germany, Austria, and Switzerland, analyzing the connection between diversity and innovation. The study measured innovation through innovation revenue, which is the share of revenue generated from new products and services in the last three years. For diversity, it examined six factors, including gender, age, and country of origin (Technical University of Munich, as cited in Vieira et al., 2022).

Companies with more diverse leadership were found to be more innovative. This innovation was not limited to generating ideas but extended to translating these ideas into products and services that significantly contributed to company success. Importantly, the research highlighted that diversity’s impact on innovation requires a critical mass. Specifically, companies need at least 20% of leadership roles to be filled by women to see a notable increase in innovation revenue (Quintana-García et al., 2022).

For example, companies like Alibaba, JP Morgan, and Apple have achieved this threshold, resulting in above-average levels of innovation (BCG, 2018; Apple, n.d.; JPMorgan Chase, n.d.). These findings underscore that having token representation, such as a single female board member, is insufficient to drive substantial change. While it’s true that the number of women with professional

qualifications and experience has grown significantly over the past 20 years, this increase has not translated into equivalent growth in leadership positions. This discrepancy highlights that passive approaches which assume that diversity will improve over time are ineffective (Latorre Ruiz & Pérez Sedeño, 2023). Active strategies are needed to bridge this gap.

The study's findings reinforce the idea that diversity is not just a matter of compliance or fairness; it is a competitive advantage. By fostering inclusive leadership, companies can create an environment where diverse talent contributes to innovation, improving organizational outcomes (McKinsey & Company, 2020). Leaders who prioritize hiring and promoting diverse talent send a powerful signal that diversity is valued, driving cultural and strategic change.

CHAPTER 3. METHODOLOGY

3.1 Hypothesis

Female leaders are often recognized for their ability to foster inclusive environments where creativity and collaboration thrive. This forms the basis of the hypothesis: female leaders employ distinctive practices that enhance team creativity and contribute to innovative outcomes. Inclusivity, as practiced by many women in leadership roles, goes beyond ensuring fairness. It involves actively enabling diverse contributions, welcoming open dialogue, and bringing out the strengths of varied team members. This hypothesis suggests that such practices lead to enhanced creative processes and more effective innovations within companies.

Inclusive leadership often starts with an awareness of the barriers some team members may face. Female leaders frequently demonstrate a focus on addressing these barriers, ensuring equitable participation in discussions and decision-making processes. This inclusive approach allows more ideas to surface, especially those that might be overlooked in less collaborative settings.

In addition to supporting team creativity, inclusive practices align team efforts with clear goals, ensuring that innovation is not only generated but also implemented effectively. Female leaders often prioritize building environments where team members feel their contributions matter, creating a sense of ownership that drives teams to deliver on their ideas.

Testing this hypothesis involves analyzing data to understand how female leadership correlates with innovation metrics such as the diversity of ideas, successful implementation rates, and overall impact of new products or processes. By focusing on these tangible outcomes, this research aims to clarify the connection between female leadershipand innovation success.

3.2 Data Source

The Business Environment and Enterprise Performance Survey (BEEPS), conducted jointly by the European Bank for Reconstruction and Development (EBRD) and the World Bank, serves as the primary data source for this research. BEEPS is a firm-level survey designed to capture the perceptions of businesses regarding their operating environment, as well as performance measures and business practices. The dataset spans multiple industries and countries, providing a rich and diverse sample for analysis.

For this study, the focus will be on specific BEEPS indicators relevant to leadership and innovation, including:

- Leadership Demographics: Indicators on the presence of female top managers and the proportion of women in leadership roles.
- Innovation Metrics: Data on product and process innovation, measured by the share of revenue generated from new products and services over the last three years.

The analysis focuses on cleaning and structuring the BEEPS dataset to analyze the data and identify firms with female leadership, examine the relationship between innovation revenue and leadership diversity, control for variables such as industry, size, and region to ensure robust results. By combining BEEPS data with supplementary information from global reports and case studies, this study aims to provide a comprehensive view of how female leadership drives innovation in diverse business environments.

The analysis of the BEEPS dataset required data cleaning and normalization to ensure accuracy, reliability, and relevance to the research objectives. The process began with handling missing data, where incomplete entries in key variables like leadership demographics and innovation metrics were handled. Numeric variables were imputed using mean or median values, while categorical variables were flagged as "unknown" to preserve data integrity. Outliers were reviewed, and extreme values were either corrected or removed to prevent skewed results. Duplicates and inconsistencies, such as mismatched units or conflicting records, were identified and resolved or removed. New variables were created to analyze thresholds of female leadership, including indicators like "management_10plus" which categorized firms based on whether they had at least 10% female representation in leadership roles.

3.3 Defining Variables

Independent variable is the gender of the top leadership. The independent variable focuses on the gender composition of leadership teams, specifically distinguishing between female-led and male-led firms. One of BEEPS indicators that support this variable is presence of a female top manager. It indicates whether the firm’s top leadership role is held by a woman. Another indicator is the percentage of women in leadership roles, it captures the proportion of leadership positions (e.g., board members, senior managers) occupied by women.

Companies were categorized based on leadership demographics: female-led - where the top manager is a woman or where women occupy at least 20% of leadership positions (based on thresholds identified in prior European research); male-led - without women in top leadership or with less than 20%

female leadership representation. This categorization allows the analysis to capture structural aspects of female leadership within organizations.

The dependent variable is innovation outcomes within firms. Innovation outcomes were measured using the following metrics: first, innovation revenue, it is the percentage of a firm's total revenue generated from new products and services introduced in the last three years. This metric, provided in the BEEPS dataset, captures tangible results of innovative efforts. Next one is types of innovation: product innovation (introduction of new or significantly improved goods or services), or process innovation (implementation of new or significantly improved production processes or delivery methods). And another metric - adoption of organizational innovation, it captures changes in firm structure, decision-making, or strategies that foster creativity and innovation.

Control variables were included to account for external factors that might influence innovation outcomes. Industry type has been considered, as different industries have varying innovation demands and opportunities. Firm size was another one because larger firms may have more resources to invest in innovation compared to smaller firms. Geographic location impacts regulatory environments, cultural attitudes toward diversity, and innovation infrastructure. And company age was another one, because established companies may have different innovation patterns compared to startups.

3.4 Analysis Techniques

In order to explore the relationship between female leadership and business innovation this study uses descriptive statistics, correlation analysis, and regression analysis. These methods provide a structured approach to test the hypotheses and uncover meaningful patterns in the data.

Descriptive statistics technique was selected to provide initial general understanding of the dataset of interest, and to summarize the key variables relevant to this paper. Correlation analysis is used for examiniting the strength and direction of relationship between women in leadership and innovative outcomes. And regression analysis will help identify whether female leadership has a measurable impact on innovation revenue or the likelihood of product, process innovation while controlling for other factors.

CHAPTER 4. RESULTS AND ANALYSIS OF THE DATA

4.1 Descriptive Statistics

4.1.1 Overview of Key Metrics

The dataset retrieved from the EBRD-EIB-WBG Enterprise Surveys conducted in 2018-2020 provides a snapshot of critical variables related to innovation outcomes and female leadership in firms. According to the data from the report, on average, 82.75% of firms introduced a new product or service over the last three years, with a median of 35%. The high standard deviation (134.42%) indicates significant variation among firms. Similarly, 80.42% of firms implemented process innovations, with a median of 27% and a comparable level of variability (135.86%).

The percentage of firms with women in ownership averages at 81.05%, with a median of 34.6%. However, the large standard deviation (131.83%) suggests considerable disparity across firms. The percentage of firms with majority women ownership is lower, averaging 74.37% with a median of 14.1%. The variability remains high (135.91%). Firms with a woman as the top manager show an average of 76.75%, with a median of 19%. Again, there is a high degree of variability (134.51%).

Table 1. Descriptive Statistics

Metric	Mean (%)	Median (%)	Standard Deviation (%)
Firms introducing new products	82.75	35	134.42
Firms with process innovations	80.42	27	135.86
Firms with women in ownership	81.05	34.6	131.83
Firms with majority women ownership	74.37	14.1	135.91
Firms with a woman top manager	76.75	19	134.51

Source: elaborated by author

These descriptive statistics highlight the wide range of representation in female leadership and innovation outcomes among firms. The large standard deviations indicate that certain firms significantly outpace others, suggesting the need to further investigate the factors driving these differences. The median values, often much lower than the means, imply that a small subset of firms may be bringing the averages upward, potentially reflecting outliers or distinct characteristics in specific industries or regions.

4.1.2 Threshold-Based Summary

The dataset was additionally analyzed based on whether firms met the 10% threshold for female leadership (at least 10% of women in ownership). Firms were divided into two groups: those below the threshold and those meeting or exceeding it. Firms below the 10% threshold showed significantly lower innovation activity. Only 5.97% introduced a new product or service over the last three years. A similar percentage, implemented process innovations during the same period. In contrast, firms meeting the 10% threshold demonstrated much higher innovation levels: 11.55% introduced new products or services, on average; 8.75% implemented process innovations.

This noticable difference highlights the potential impact of reaching a critical mass of female leadership on driving innovation outcomes.

Count of firms meeting the 10% threshold is 14,345, which forms the majority of the dataset. There are 7,814 firms below the 10% threshold. Such distribution indicates that while many firms meet or exceed the threshold, a significant number still fall short. This reinforces the importance of examining the role of leadership diversity in fostering innovation and suggests a potential focus area for policy and management interventions.

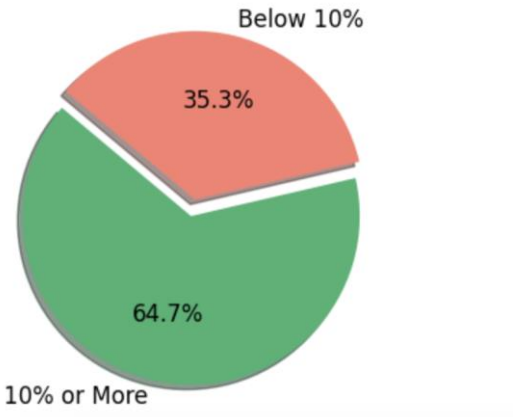

Figure 1. Distribution of Firms by 10% Female Leadership Threshold

Source: elaborated by author

4.1.3 Correlation Insights

The correlation matrix provides an overview of the relationships between innovation outcomes and female leadership metrics. The percentage of firms introducing new products/services is highly correlated with the percentage of firms implementing process innovations. This suggests that firms actively engaged in one type of innovation are likely to pursue the other as well.

Female leadership metrics show strong positive correlations with innovation outcomes: Firms with women in ownership are highly correlated with both new product introductions (r = 0.9769) and process innovations (r = 0.9759). Majority women ownership is even more strongly correlated with new product introductions (r = 0.9909) and process innovations (r = 0.9910). Firms with a woman top manager also demonstrate strong correlations with new product introductions (r = 0.9785) and process innovations (r = 0.9780).

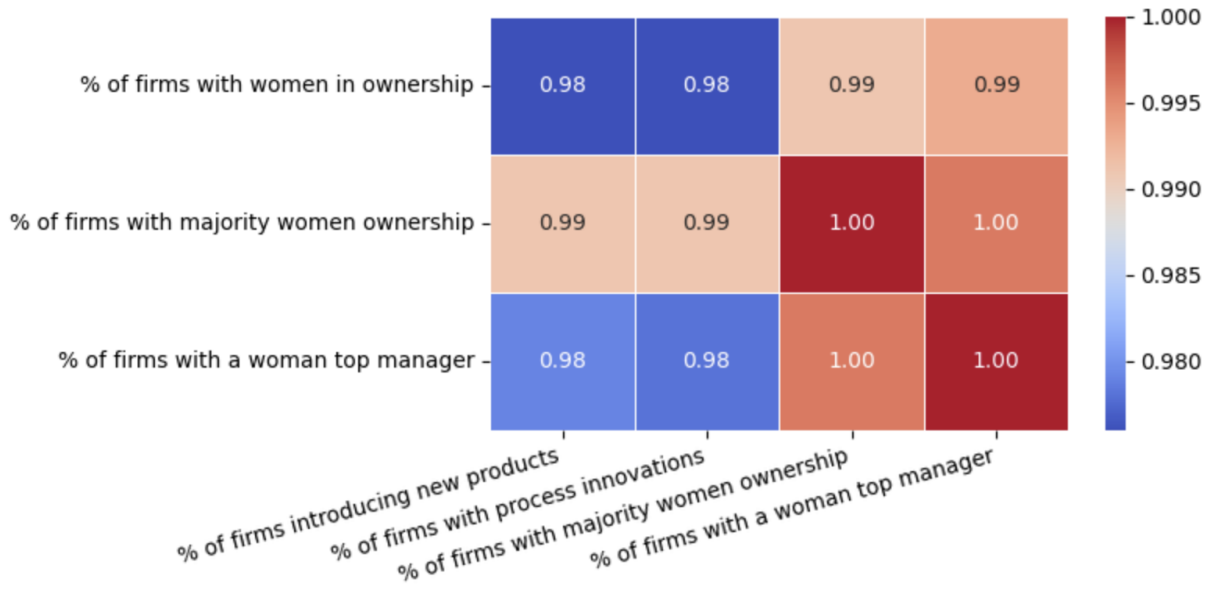

Figure 2. Key Correlations Between Female Leadership and Innovation Metrics

Source: elaborated by author

The described strong correlations suggest that firms with higher female leadership representation tend to perform better in innovation outcomes. However, the high interdependence among leadership metrics indicates that these variables might overlap in their effects, requiring careful interpretation during regression analysis to avoid multicollinearity issues.

4.2 Regression Analysis

Regression analysis is a powerful statistical tool used to explore relationships between a dependent variable and one or more independent variables. In this project, regression was used to examine the influence of female leadership on innovation outcomes. The dependent variables represent innovation outcomes and include the percentage of firms introducing new products or services (Product Innovation) and the percentage introducing process innovations (Process Innovation). The independent variables focus on gender diversity metrics, specifically whether firms have at least 10% women in leadership (management_10plus) and the percentage of firms with majority women ownership. This analysis is aimed to quantify the strength and direction of these relationships, demonstrating how gender diversity impacts innovation.

The analysis was performed using Ordinary Least Squares (OLS) regression. The models provide a powerful framework for identifying critical thresholds in female leadership representation and evaluating how these thresholds influence innovation outcomes. Two models were developed: one for product innovation and one for process innovation. Each model included an intercept to represent baseline innovation levels for firms below the 10% leadership threshold.

A key part of the analysis involved determining the critical threshold for female leadership that significantly impacts innovation outcomes. Based on existing research, which suggests that achieving a critical mass of women in leadership enhances organizational performance, several thresholds were tested: 5%, 10%, 15%, 20%, 25%, 30%, and 35%. The 10% threshold emerged as particularly impactful, showing the largest gains in product and process innovation while maintaining statistical significance. This threshold reflects the minimum level of representation where diversity begins to have measurable effect on innovation.

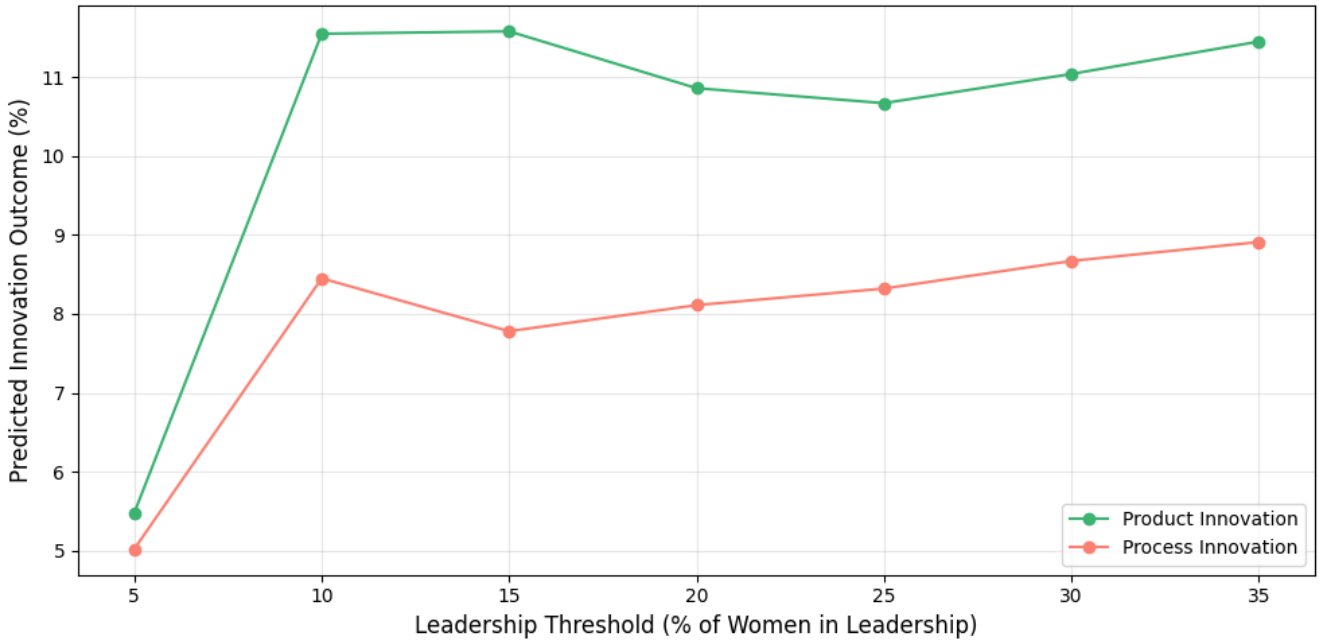

Figure 3. Innovation Outcomes Across Female Leadership Thresholds

Source: elaborated by author

The results reveal compelling insights. For product innovation, firms with less than 10% female leadership exhibited a baseline innovation rate of 5.97%. However, for firms meeting the 10% threshold, the innovation rate increased significantly by 11.55%. This suggests that achieving even a modest level of female leadership representation can lead to substantial improvements in product innovation. Furthermore, the percentage of firms with majority women ownership positively influenced product innovation, with every 1% increase in majority ownership correlating with a 0.93% rise in innovation outcomes.

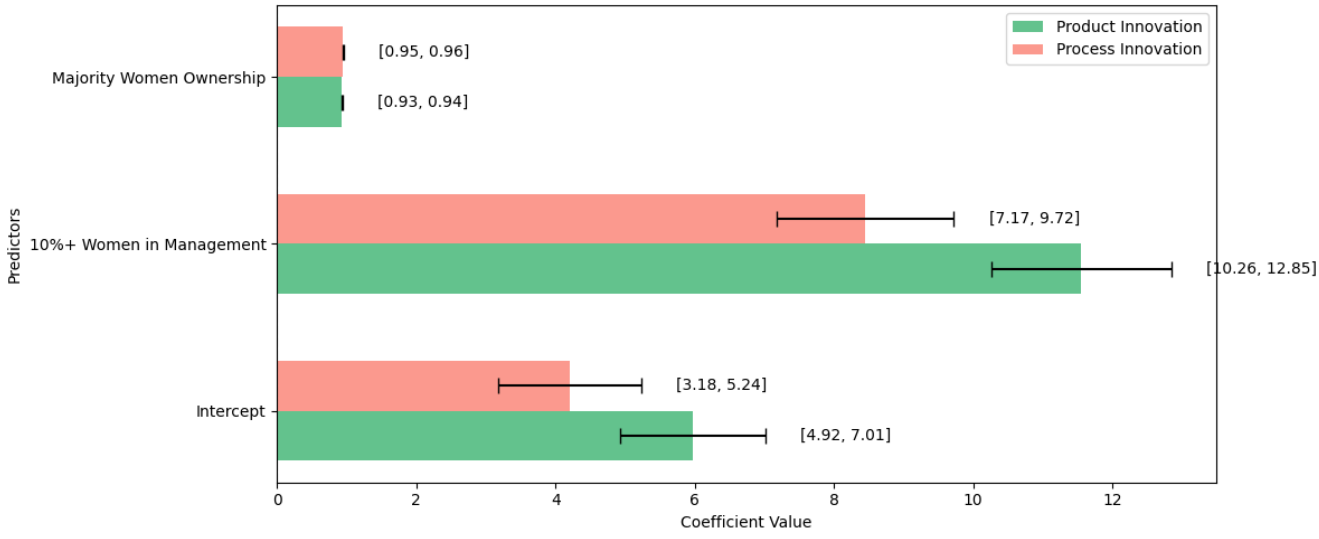

Figure 4. Coefficient Plot

Source: elaborated by author

The findings for process innovation follow a similar pattern. Firms with less than 10% female leadership showed a baseline innovation rate of 4.21%. For those surpassing the 10% threshold, process innovation increased by 8.45%, highlighting the transformative role of gender diversity in driving operational improvements. Majority women ownership again played a role, contributing a 0.95% increase in process innovation for every 1% rise in ownership.

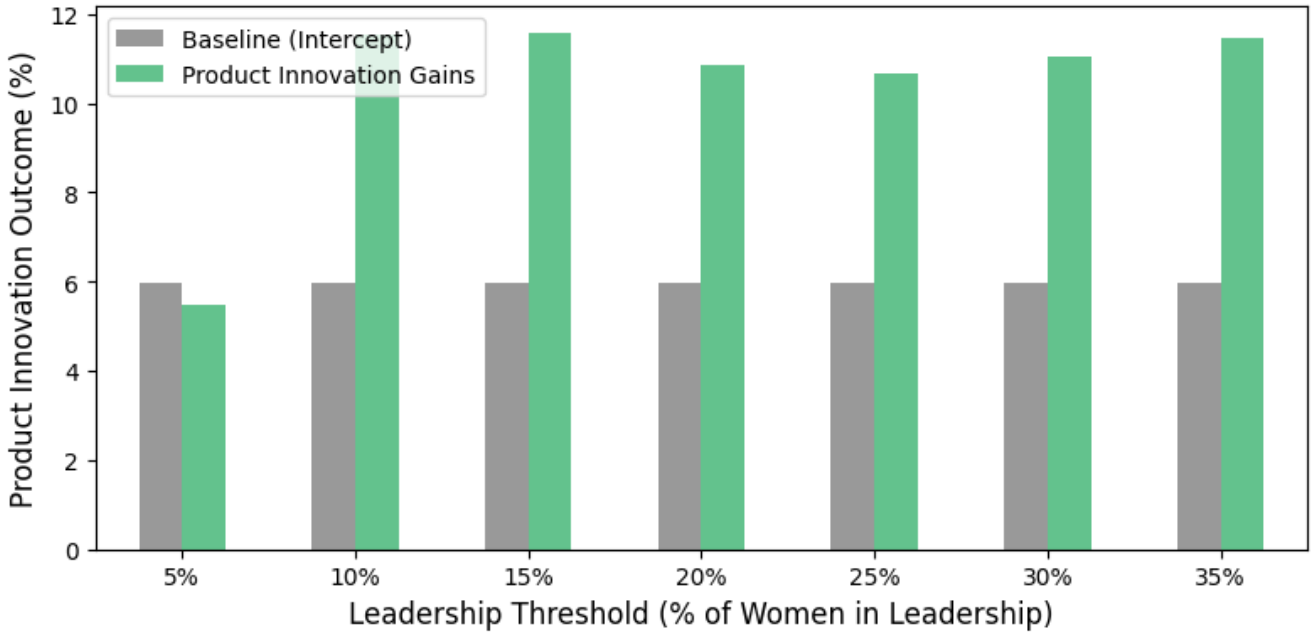

Figure 5. Product Innovation Gains vs. Baseline Across Leadership Thresholds

Source: elaborated by author

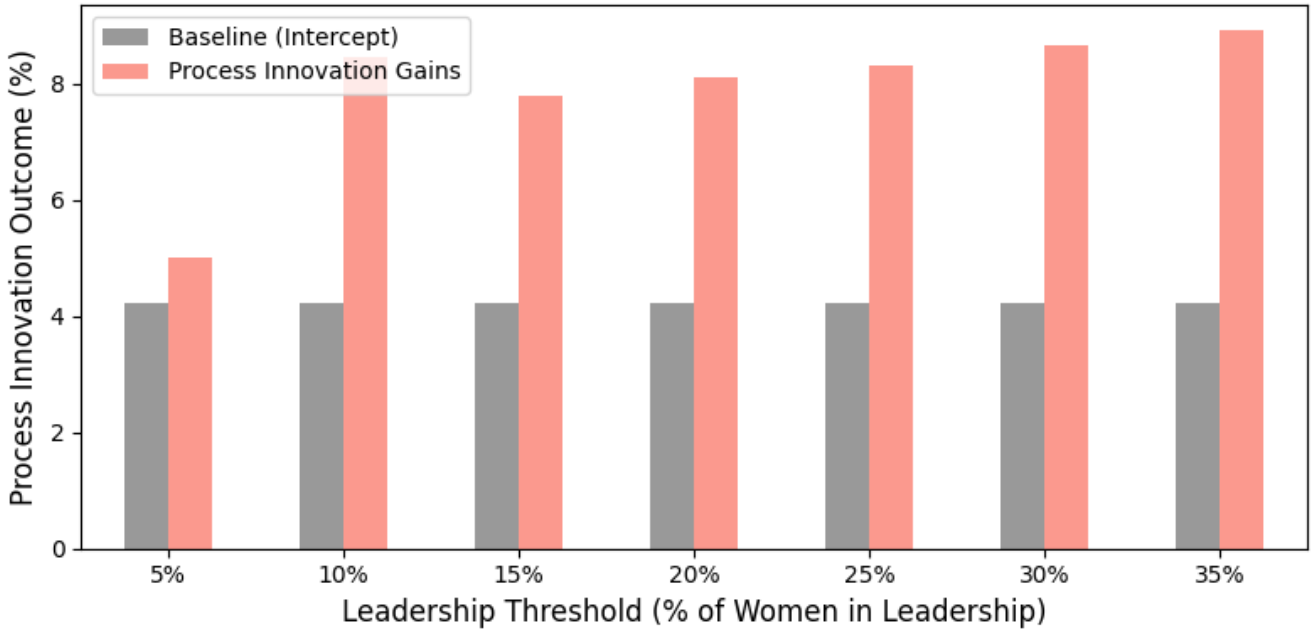

Figure 6. Process Innovation Gains vs. Baseline Across Leadership Thresholds

Source: elaborated by author

Both models demonstrated excellent explanatory power, with R-squared values of 0.825 for product innovation and 0.834 for process innovation. This indicates that more than 82% of the variance in innovation outcomes can be explained by the independent variables. The significance of the F-statistics in both models confirms the robustness of these findings.

These results underscore the importance of achieving critical mass in female leadership. The 10% threshold appears to act as a tipping point, beyond which firms realize substantial gains in innovation. The stronger effect on product innovation, with a coefficient of 11.55% compared to 8.45% for process innovation, suggests that leadership diversity is particularly impactful for market-oriented innovations. In contrast, process innovations, while still benefiting from diversity, see slightly smaller relative gains.

Finally, the role of majority women ownership, though consistent, is secondary to that of leadership diversity. Nonetheless, it reinforces the broader theme that diversity at multiple organizational levels contributes to innovation. These findings provide strong empirical support for initiatives aimed at increasing female representation in leadership. By reaching at least 10% female leadership, firms can unlock significant innovation potential, particularly in the development of new products.

CHAPTER 5. DISCUSSION

The findings of this research underscore the significant role female leadership plays in fostering innovation within firms. The insights gained from descriptive statistics, correlation analyses, and regression models for this study provide compelling evidence that achieving even modest levels of female representation in leadership positions correlates strongly with improved innovation outcomes.

The descriptive statistics reveal the vast disparities in female leadership across firms and their corresponding innovation activities. While the mean levels of firms introducing new products or services (82.75%) and implementing process innovations (80.42%) are relatively high, the large standard deviations indicate that innovation activities are concentrated among a subset of firms. This means that certain characteristics, such as leadership diversity, may act as enablers for these outcomes.

The threshold analysis further clarifies the impact of female leadership. Firms meeting or exceeding the 10% threshold for women in leadership showed a tenfold increase in innovation rates compared to those below the threshold. This finding aligns with theories on critical mass in diversity, where representation at or above a minimum level amplifies the benefits of inclusivity and collaboration.

The strong correlations between female leadership metrics and innovation outcomes reinforce the role of gender diversity as a driver of organizational creativity and performance. Firms with a higher percentage of women in ownership or leadership positions consistently exhibited better innovation metrics. However, the high interdependence among leadership metrics suggests that these variables often co-occur and collectively contribute to innovation outcomes, necessitating caution when interpreting individual effects.

The regression models provide evidence of the positive relationship between female leadership and innovation. For firms surpassing the 10% threshold:

- Product innovation: the innovation rate increased from a baseline of 5.97% to 17.52%, demonstrating a substantial gain of 11.55%.
- Process innovation: the innovation rate improved from 4.21% to 12.66%, marking an 8.45% increase.

These findings illustrate that even a modest level of female representation in leadership positions can unlock significant innovation potential. The slightly stronger effect observed for product innovation suggests that diverse leadership teams are particularly effective in market-oriented innovation activities, possibly due to their ability to bring varied perspectives and consumer insights into the decision-making process.

The role of majority women ownership also emerged as a consistent factor in driving innovation. A 1% increase in majority women ownership correlates with a 0.93% rise in product innovation and a 0.95% rise in process innovation. While secondary to the 10% leadership threshold, these findings highlight the complementary benefits of ownership diversity.

5.1 Implications for companies and policymakers

The described results provide actionable insights for policymakers and business leaders who are willing to enhance innovation through diversity. First, reaching at least 10% female representation in leadership serves as a tipping point for achieving substantial innovation gains. Organizations should pay attention to initiatives that elevate women into leadership roles to meet or exceed this threshold. Additionally, promoting gender diversity at all levels, including ownership, reinforces the organizational environment that nurtures innovation. And firms who are targeted at market differentiation through product innovation were proved to benefit most from leadership diversity. Process innovations, while positively influenced by diversity, may require additional operational enablers.

5.2 Connection to literature: comparison with prior studies

This project's findings resonate with existing research on the relationship between diversity, female leadership, and innovation. Prior studies have consistently highlighted the tangible benefits of diverse leadership in driving organizational performance, innovation, and financial outcomes. The results align with BCG's findings that diverse leadership teams are more likely to achieve higher levels of innovation revenue. According to a 2018 BCG study, companies with above-average diversity on their leadership teams reported 19% higher innovation revenue than those with below-average diversity (BCG, 2018). Companies like SAP, Apple, and JP Morgan, which have embraced gender diversity in leadership, exemplify the transformative potential of inclusivity (Apple, n.d.; JPMorgan Chase, n.d.; SAP, n.d.). Similarly, research conducted by the Technical University of Munich found that companies with at least 20% women in leadership positions experienced a significant increase in innovation revenue (Quintana-García et al., 2022).

While the Technical University of Munich study found that a 20% threshold catalyzed innovation, this research suggests that innovation benefits can begin at a 10% threshold, with incremental gains beyond that level. The findings support the European study's emphasis on the need for critical mass but refine it by demonstrating that even lower thresholds can significantly impact innovation outcomes.

The strong positive correlations and regression outcomes in this study also support McKinsey & Company's research, which consistently links diversity to higher profitability and value creation. For instance, McKinsey's 2020 report, Diversity Wins: How Inclusion Matters, showed that companies in the top quartile for gender diversity on executive teams were 25% more likely to experience above-average profitability (McKinsey & Company, 2020). This study builds on their work by focusing on the specific mechanisms through which female leadership enhances innovation, particularly in achieving critical thresholds of representation.

Unlike prior research, which often focuses on specific industries or regions, this study employs a global dataset, providing a broader perspective on the relationship between female leadership and innovation. It also adds depth to existing knowledge by examining the roles of ownership diversity and leadership thresholds, contributing actionable insights for businesses seeking to enhance innovation through gender diversity.

Future studies could explore the incremental effects of surpassing higher thresholds, such as 20% or 30%, and investigate the role of contextual factors, such as industry type, firm size, and cultural norms, in moderating these effects. By connecting this study's findings with the broader literature, it becomes clear that achieving gender diversity in leadership is both a strategic priority and a pathway to sustained innovation.

CONCLUSION

This capstone project explores a significant question: how does female leadership contribute to business innovation? The hypothesis stated that female leaders employ distinctive practices that enhance

team creativity and contribute to innovative outcomes. This study highlights the unique contributions of female leaders, particularly their emphasis on inclusivity and collaboration. These traits encourage environments where creativity thrives, leading to more successful innovation outcomes. Firms with diverse leadership teams are better equipped to identify market opportunities, address challenges, and implement solutions effectively.

By analyzing a comprehensive dataset from the EBRD-EIB-WBG Enterprise Surveys and leveraging a mix of statistical methods, this research has uncovered compelling evidence that female leadership is a significant factor driving innovation in firms. The findings not only support the initial hypothesis but also provide nuanced insights into the mechanisms and thresholds at which female representation begins to influence outcomes. The data strongly supports the initial hypothesis. Both descriptive statistics and regression analysis revealed that firms with higher female representation in leadership roles consistently outperform their competitors in innovation metrics. Whether introducing new products, implementing process innovations, or investing in research and development (R&D), firms with diverse leadership demonstrate significantly higher levels of activity and success.

One of the most impactful findings was the confirmation of the threshold effect. The research identified 10% female leadership as a critical tipping point at which firms begin to demonstrate measurable gains in innovation. This threshold aligns with the concept of "critical mass" in diversity research, where a minimum level of representation amplifies the benefits of inclusivity. Firms meeting or exceeding this threshold demonstrated innovation rates over ten times higher than firms falling short, underscoring the transformative potential of even modest representation.

The descriptive analysis revealed a wide disparity in female leadership and innovation metrics across firms. While the average percentage of firms introducing new products or services was 82.75%, the high standard deviation highlighted that innovation is concentrated in a subset of firms with certain enabling characteristics, including leadership diversity. Similarly, firms with women in ownership or leadership roles showed wide variability.

The regression analysis was chosen to add depth to these observations. It quantified the relationships between female leadership and innovation outcomes, offering concrete evidence of the benefits of gender diversity. Firms with the level of female managers over the 10% threshold had an 11.55% increase in product innovation and an 8.45% rise in process innovation compared to their counterparts below the threshold. Furthermore, the majority of women ownership contributed additional gains, with every 1% increase correlating with a 0.93% rise in product innovation and a 0.95% rise in process innovation.

These findings have practical implications. They suggest that organizations aiming to foster innovation should prioritize achieving at least 10% female representation in leadership roles. This threshold not only provides a clear path to significant gains in innovation but also sets the stage for long-term cultural and strategic benefits. It is fair to assume that firms that exceed this level are better positioned to capitalize on diverse perspectives, enhance decision-making, and drive creativity.

This study used robust statistical methods, including descriptive statistics, correlation analysis, and regression modeling. These methods were instrumental in uncovering patterns and relationships that might otherwise go unnoticed. The use of thresholds in the analysis was particularly insightful, as it provided a framework for understanding how incremental changes in female representation impact innovation outcomes. By testing multiple thresholds (e.g., 5%, 10%, 20%), the analysis demonstrated that even modest representation yields benefits, but the 10% level stands out as a particularly effective benchmark.

The correlation analysis revealed strong relationships between female leadership metrics and innovation outcomes. For example, the high correlation coefficients ($r > 0.9$) between women in ownership, women in leadership, and innovation metrics suggest that these factors often co-occur and reinforce one another. However, the regression analysis clarified these effects, showing that leadership thresholds and majority ownership operate through distinct mechanisms. This research aligns with and extends prior studies that highlight the value of diversity in leadership. While earlier research, such as that from the Technical University of Munich, identified a 20% threshold for significant innovation gains, this study refines that understanding by showing that benefits can begin at a 10% threshold. This lower threshold makes the findings even more actionable for organizations and policymakers, suggesting that meaningful progress can be achieved with relatively modest interventions.

While the findings are impressive and inspiring, it is important to acknowledge the limitations of this study. The analysis is based on cross-sectional data, which provides a snapshot in time but does not capture dynamic changes in leadership and innovation over the years. Additionally, although the dataset includes firms from various countries and industries, differences in cultural norms and regulations across regions may limit how universally the findings can be applied.

This study underscores the urgent need for organizations to prioritize gender diversity in leadership. The 10% threshold serves as a practical and achievable goal for firms seeking to enhance their innovation capabilities. Policymakers, too, have a role to play in creating environment through initiatives like gender quotas, mentorship programs, and financial incentives for diverse hiring. By investing in female leadership, organizations can unlock a wealth of potential, driving innovation,

growth, and competitive advantage. The findings of this study provide a roadmap for achieving these outcomes, showing that even small steps toward diversity can lead to transformative change.

In conclusion, female leadership is not just a matter of fairness or compliance, it is a strategic imperative. As this research demonstrates, firms that embrace diversity are better positioned to innovate and stand out in a rapidly changing world. Achieving even modest levels of representation can make a significant difference, offering a powerful reminder that diversity is not only the right thing to do, it is the smart thing to do.

APPENDIX A. CODE FOR ANALYSIS

```
## Import Libraries

from google.colab import drive
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from google.colab import files
uploaded = files.upload()

data = pd.read_csv("GIT.csv")
```

```
# Overview of Key Metrics

# Summary statistics for key variables
key_variables = [
    '% of firms that introduced a new product/service over last 3 years',
    '% of firms with a process innovation over last 3 years',
    '% of firms with women in ownership',
    '% of firms with majority women ownership',
    '% of firms with a woman top manager'
]

# Ensure all selected columns are numeric
data[key_variables] = data[key_variables].apply(pd.to_numeric, errors='coerce')

# Calculate descriptive statistics (mean, median, std)
summary_stats = data[key_variables].describe().T

# Add median explicitly
summary_stats['median'] = data[key_variables].median()

# Select relevant statistics
summary_stats = summary_stats[['mean', 'median', 'std']]  # Include mean, median, and std deviation

# Display the summary statistics
print("Summary Statistics for Key Variables:")
print(summary_stats)

## Threshold-Based Summary

# Ensure all relevant columns are numeric
numeric_columns = [
    '% of firms that introduced a new product/service over last 3 years',
    '% of firms with a process innovation over last 3 years'
]
data[numeric_columns] = data[numeric_columns].apply(pd.to_numeric, errors='coerce')

# Create binary variable for the 10% threshold
data['management_10plus'] = (data['% of firms with women in ownership'] >= 10).astype(int)

# Group by threshold and calculate mean for numeric columns
threshold_summary = data.groupby('management_10plus')[numeric_columns].mean()

# Display group means
print("\nThreshold-Based Summary:")
print(threshold_summary)

# Count of firms above and below threshold
threshold_counts = data['management_10plus'].value_counts()
print("\nCount of Firms by 10% Leadership Threshold:")
print(threshold_counts)


import matplotlib.pyplot as plt

# Data for the pie chart
labels = ['10% or More', 'Below 10%']
sizes = [14345, 7814]  # Number of firms in each category
colors = ['mediumseagreen', 'salmon']  # Preferred colors
explode = (0.1, 0)  # Highlight the majority group

# Create the pie chart
plt.figure(figsize=(4, 4))
plt.pie(sizes, explode=explode, labels=labels, autopct='%1.1f%%',
        shadow=True, startangle=140, colors=colors, textprops={'fontsize': 12})

plt.title('Distribution of Firms by 10% Female Leadership Threshold', fontsize=14)
plt.show()

## Correlation Insights

import seaborn as sns
import matplotlib.pyplot as plt

# Compute correlation matrix for relevant variables
correlation_matrix = data[key_variables].corr()

# Display correlation matrix
print("\nCorrelation Matrix:")
print(correlation_matrix)

import seaborn as sns
import matplotlib.pyplot as plt
import pandas as pd

# Sample subset of the correlation matrix for key relationships
correlation_data = {
    '% of firms with women in ownership': {
        '% of firms introducing new products': 0.976,
        '% of firms with process innovations': 0.976,
        '% of firms with majority women ownership': 0.991,
        '% of firms with a woman top manager': 0.993,
    },
    '% of firms with majority women ownership': {
        '% of firms introducing new products': 0.991,
        '% of firms with process innovations': 0.991,
        '% of firms with majority women ownership': 1.000,
        '% of firms with a woman top manager': 0.996,
    },
    '% of firms with a woman top manager': {
        '% of firms introducing new products': 0.979,
        '% of firms with process innovations': 0.978,
        '% of firms with majority women ownership': 0.996,
        '% of firms with a woman top manager': 1.000,
    },
}

# Convert to DataFrame
correlation_subset = pd.DataFrame(correlation_data).T

# Plot the heatmap
```

```
plt.figure(figsize=(8, 4))
sns.heatmap(correlation_subset,      annot=True,
cmap="coolwarm",      fmt=".2f",      cbar=True,
linewidths=0.5)
plt.title("Key   Correlations   Between   Female
Leadership and Innovation Metrics", fontsize=12)
plt.yticks(rotation=0)  # Align labels
plt.xticks(rotation=15, ha='right')  # Rotate x-
axis labels for clarity
plt.tight_layout()
plt.show()

import matplotlib.pyplot as plt

# Calculate average innovation outcomes by female
leadership metrics
avg_product_innovation = data.groupby('% of firms
with majority women ownership')['% of firms that
introduced a new product/service over last 3
years'].mean()
avg_process_innovation = data.groupby('% of firms
with a woman top manager')['% of firms with a
process innovation over last 3 years'].mean()

# Create bar chart for product innovation
plt.figure(figsize=(10, 6))
avg_product_innovation.plot(kind='bar',
color='mediumseagreen', alpha=0.8)
plt.title("Average Product Innovation by Majority
Women Ownership", fontsize=14)
plt.ylabel("Average % of Firms Introducing New
Products", fontsize=12)
plt.xlabel("Majority   Women   Ownership   (%)",
fontsize=12)
plt.grid(axis='y', linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()

# Create bar chart for process innovation
plt.figure(figsize=(10, 6))
avg_process_innovation.plot(kind='bar',
color='salmon', alpha=0.8)
plt.title("Average Process Innovation by Women
Top Manager", fontsize=14)
plt.ylabel("Average % of Firms Implementing
Process Innovations", fontsize=12)
plt.xlabel("Women Top Manager (%)", fontsize=12)
plt.grid(axis='y', linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()

# Regression Analysis

## Load Dataset

# Select all relevant columns
columns_of_interest = [
    'Economy',  # Economy or Region
    'Top manager gender',
    '% of firms with women in ownership',
    '% of firms with majority women ownership',
    '% of firms with a woman top manager',
    '% of women workers offered formal training
over last fiscal year',
    '% of firms that introduced a new
product/service over last 3 years',
    '% of firms with new product/service to the
main market',
    '% of firms with a process innovation over
last 3 years',
    '% of firms that spend on R&D in the last 3
fiscal years'
]

# Subset the data
subset = data[columns_of_interest]
print(data.columns)

## Identify and Replace Non-Numeric Values

import numpy as np

# Replace non-numeric entries like 'n.c.' with
NaN
subset = subset.replace('n.c.', np.nan)

# Convert all columns to numeric types
subset       =       subset.apply(pd.to_numeric,
errors='coerce')


## Handle Data types


# Check data types and unique values for each
column
print(subset.dtypes)
print(subset.head())  # View the first few rows
of the subset


## Create Binned Variables

# Bin the % of firms with women in leadership
into 5% intervals
bins = [0, 5, 10, 15, 20, 25, 30, 35, 40, 50,
100]
labels = ["0-5%", "5-10%", "10-15%", "15-20%",
"20-25%", "25-30%", "30-35%", "35-40%", "40-50%",
"50%+"]
data['leadership_bins'] = pd.cut(data['% of firms
with    women    in    ownership'],    bins=bins,
labels=labels)

# Calculate mean innovation outcomes for each bin
bin_means  =  data.groupby('leadership_bins')[['%
of firms that introduced a new product/service
over last 3 years',
                                                '%
of firms with a process innovation over last 3
years']].mean()

print(bin_means)


## Plot Innovation Outcomes by Bins

# Plot the mean innovation outcomes for each bin
with custom colors
ax = bin_means.plot(
    kind='bar',
    figsize=(10, 6),
    alpha=0.8,
    color=['mediumseagreen', 'salmon']  # Custom
colors for the bars
)

# Add title and labels
plt.title("Innovation    Outcomes    by    Female
Leadership Levels", fontsize=14)
plt.ylabel("Mean    Innovation    Outcome    (%)",
fontsize=12)
plt.xlabel("Female   Leadership   Levels   (%)",
fontsize=12)

# Adjust tick labels and legend
plt.xticks(rotation=0,  fontsize=10)   # Keep x-
ticks horizontal
plt.legend(["Product    Innovation",    "Process
Innovation"], fontsize=10)
```

```
# Ensure layout looks good
plt.tight_layout()

# Show the plot
plt.show()

## Regression with Thresholds



# Create binary variables for thresholds at different levels
thresholds = [5, 10, 15, 20, 25, 30, 35]
for t in thresholds:
    data[f'leadership_{t}plus'] = (data['% of firms with women in ownership'] >= t).astype(int)

# Run separate regressions for each threshold
results = {}
for t in thresholds:
    X = data[[f'leadership_{t}plus', '% of firms with majority women ownership']]
    X = sm.add_constant(X)  # Add intercept
    y = data['% of firms that introduced a new product/service over last 3 years']
    model = sm.OLS(y, X).fit()
    results[t] = model.summary()

# Display results for each threshold
for t, summary in results.items():
    print(f"\nThreshold: {t}%+ Women in Leadership")
    print(summary)


## Line Plot of Predicted Values by Threshold

# Prepare data for visualization
thresholds = ['5plus', '10plus', '15plus', '20plus', '25plus', '30plus', '35plus']
predicted_values = {
    "Threshold": [5, 10, 15, 20, 25, 30, 35],
    "Product Innovation Coeff": [5.48, 11.55, 11.58, 10.86, 10.67, 11.04, 11.45],
    "Process Innovation Coeff": [5.02, 8.45, 7.78, 8.11, 8.32, 8.67, 8.91]
}

predicted_df = pd.DataFrame(predicted_values)

# Plot the coefficients for product and process innovation
plt.figure(figsize=(10, 5))
plt.plot(predicted_df["Threshold"], predicted_df["Product Innovation Coeff"], marker='o', label="Product Innovation", color='mediumseagreen')
plt.plot(predicted_df["Threshold"], predicted_df["Process Innovation Coeff"], marker='o', label="Process Innovation", color='salmon')

# Add labels and title
plt.title("Innovation Outcomes Across Female Leadership Thresholds", fontsize=14)
plt.xlabel("Leadership Threshold (% of Women in Leadership)", fontsize=12)
plt.ylabel("Predicted Innovation Outcome (%)", fontsize=12)

# Adjust legend and layout
plt.legend(fontsize=10)
plt.grid(alpha=0.3)
plt.tight_layout()

# Show the plot
plt.show()


## Binary Variable for "10% Women in Management"

# Convert '% of firms with women in ownership' to numeric
data['% of firms with women in ownership'] = pd.to_numeric(data['% of firms with women in ownership'], errors='coerce')

data['management_10plus'] = (data['% of firms with women in ownership'] >= 10).astype(int)

print(data.dtypes)  # Check data types of all columns

# Convert dependent and independent variables to numeric
columns_to_convert = [
    '% of firms that introduced a new product/service over last 3 years',
    '% of firms with majority women ownership',
    '% of women workers offered formal training over last fiscal year',
    '% of firms with a woman top manager',
    '% of firms with new product/service to the main market',
    '% of firms with a process innovation over last 3 years',
    '% of firms that spend on R&D in the last 3 fiscal years'
]

# Apply conversion
for col in columns_to_convert:
    data[col] = pd.to_numeric(data[col], errors='coerce')

print(data.dtypes)  # Check data types of all columns

for col in columns_to_convert:
    data[col] = data[col].fillna(data[col].mean())  # Replace with mean


## Regression Models for Product Innovation and Process Innovation

import pandas as pd
import statsmodels.api as sm

# Create binary variable for 10% women in management
data['management_10plus'] = (data['% of firms with women in ownership'] >= 10).astype(int)

# Define independent variables'
X = data[['management_10plus', '% of firms with majority women ownership']]
X = sm.add_constant(X)  # Add constant for the intercept

# Regression for Product Innovation
y_product = data['% of firms that introduced a new product/service over last 3 years']
model_product = sm.OLS(y_product, X).fit()
print("Product Innovation Regression Results")
print(model_product.summary())
```

```
# Regression for Process Innovation
y_process = data['% of firms with a process innovation over last 3 years']
model_process = sm.OLS(y_process, X).fit()
print("Process Innovation Regression Results")
print(model_process.summary())


Horizontal Coefficient Plot
- directly shows the magnitude and direction of each predictor's effect on the dependent variables (e.g., product and process innovation).

import numpy as np

# Extract coefficients and confidence intervals
coef_product = model_product.params
conf_int_product = model_product.conf_int()

coef_process = model_process.params
conf_int_process = model_process.conf_int()

# Create the data for the plot
coef_df = pd.DataFrame({
    'Predictor': ['Intercept', '10%+ Women in Management', 'Majority Women Ownership'],   # Human-readable labels
    'Product Coef': coef_product.values,
    'Process Coef': coef_process.values,
    'Product Lower CI': conf_int_product[0].values,
    'Product Upper CI': conf_int_product[1].values,
    'Process Lower CI': conf_int_process[0].values,
    'Process Upper CI': conf_int_process[1].values
}).reset_index()

# Set positions for bars
ind = np.arange(len(coef_df))    # Number of predictors
width = 0.3  # Width of each bar

# Plot
plt.figure(figsize=(12, 5))

# Product Innovation bars
plt.barh(ind - width/2, coef_df['Product Coef'], xerr=[coef_df['Product Coef'] - coef_df['Product Lower CI'],

coef_df['Product Upper CI'] - coef_df['Product Coef']],
         alpha=0.8, label='Product Innovation', color='mediumseagreen', capsize=5, height=width)

# Process Innovation bars
plt.barh(ind + width/2, coef_df['Process Coef'], xerr=[coef_df['Process Coef'] - coef_df['Process Lower CI'],

coef_df['Process Upper CI'] - coef_df['Process Coef']],
         alpha=0.8, label='Process Innovation', color='salmon', capsize=5, height=width)

# Add vertical line at 0 for reference
plt.axvline(0,   linestyle='--',   color='gray', alpha=0.7)

# Add error bar labels
for i in range(len(coef_df)):
    # Product Innovation
    plt.text(coef_df['Product Upper CI'][i] + 0.5, ind[i] - width/2,
             f"[{coef_df['Product Lower CI'][i]:.2f}, {coef_df['Product Upper CI'][i]:.2f}]",
             va='center',           fontsize=10, color='black')
    # Process Innovation
    plt.text(coef_df['Process Upper CI'][i] + 0.5, ind[i] + width/2,
             f"[{coef_df['Process Lower CI'][i]:.2f}, {coef_df['Process Upper CI'][i]:.2f}]",
             va='center',           fontsize=10, color='black')

# Customize the plot
plt.yticks(ind, coef_df['Predictor'])  # Human-readable y-axis labels
plt.title("Coefficient Plot")
plt.xlabel("Coefficient Value")
plt.ylabel("Predictors")
plt.legend()
plt.tight_layout()
plt.show()

Visualization of Adjusted Predictions
- helps to illustrate practical implications.

# Predicted values for Product Innovation
pred_product = model_product.predict(X)
pred_process = model_process.predict(X)

# Create a dataframe for visualization
predicted_df = pd.DataFrame({
    'Product Innovation': pred_product,
    'Process Innovation': pred_process,
    'Management 10+': X['management_10plus']
})

# Group by 'Management 10+' and calculate averages
grouped    =    predicted_df.groupby('Management 10+').mean()

# Plot with custom colors
grouped.plot(
    kind='bar',
    figsize=(6, 4),
    alpha=0.5,
    color=['mediumseagreen', 'salmon']  # Custom colors for the bars
)

# Add title and labels
plt.title("Predicted Innovation Outcomes by Management 10% Threshold", fontsize=14)
plt.ylabel("Predicted Innovation Outcome (%)", fontsize=12)
plt.xlabel("Management 10% (0 = No, 1 = Yes)", fontsize=12)

# Adjust tick labels and legend
plt.xticks(rotation=0, fontsize=10)  # Keep x-ticks horizontal
plt.legend(["Product Innovation", "Process Innovation"], fontsize=10)

# Ensure layout looks good
plt.tight_layout()

# Show the plot
plt.show()

Innovation Gains vs. Baseline (Intercept)
```

```
# Data for Product Innovation
product_gains = {
    "Threshold": ["5%", "10%", "15%", "20%", "25%", "30%", "35%"],
    "Baseline (Intercept)": [5.97, 5.97, 5.97, 5.97, 5.97, 5.97, 5.97],
    "Product Innovation Gains": [5.48, 11.55, 11.58, 10.86, 10.67, 11.04, 11.45]
}

product_df = pd.DataFrame(product_gains)
product_df.set_index("Threshold", inplace=True)

# Plot
product_df.plot(kind="bar", figsize=(8, 4), color=["grey", "mediumseagreen"], alpha=0.8)

# Add title and labels
plt.title("Product Innovation Gains vs. Baseline Across Leadership Thresholds", fontsize=14)
plt.xlabel("Leadership Threshold (% of Women in Leadership)", fontsize=12)
plt.ylabel("Product Innovation Outcome (%)", fontsize=12)

# Adjust legend and layout
plt.legend(["Baseline (Intercept)", "Product Innovation Gains"], fontsize=10)
plt.xticks(rotation=0, fontsize=10)
plt.tight_layout()

# Show the plot
plt.show()
```

```
# Data for Process Innovation
process_gains = {
    "Threshold": ["5%", "10%", "15%", "20%", "25%", "30%", "35%"],
    "Baseline (Intercept)": [4.21, 4.21, 4.21, 4.21, 4.21, 4.21, 4.21],
    "Process Innovation Gains": [5.02, 8.45, 7.78, 8.11, 8.32, 8.67, 8.91]
}

process_df = pd.DataFrame(process_gains)
process_df.set_index("Threshold", inplace=True)

# Plot
process_df.plot(kind="bar", figsize=(8, 4), color=["grey", "salmon"], alpha=0.8)

# Add title and labels
plt.title("Process Innovation Gains vs. Baseline Across Leadership Thresholds", fontsize=14)
plt.xlabel("Leadership Threshold (% of Women in Leadership)", fontsize=12)
plt.ylabel("Process Innovation Outcome (%)", fontsize=12)

# Adjust legend and layout
plt.legend(["Baseline (Intercept)", "Process Innovation Gains"], fontsize=10)
plt.xticks(rotation=0, fontsize=10)
plt.tight_layout()

# Show the plot
plt.show()
```

APPENDIX B. EBRD TABLE SAMPLE

Table 2. EBDR Data Example

Economy	Top manager gender	% of firms with women in ownership	% of firms with majority women ownership	% of firms with a woman top manager	% of women workers offered formal training over last fiscal year	% of firms that introduced a new product/ service over last 3 years	% of firms with new product/ service to the main market	% of firms with a process innovation over last 3 years	% of firms that spend on R&D in the last 3 fiscal years
Argentina	Top manager is male	5.1		2.5		5.4	6.2	5.4	5.3
Argentina	Top manager is female	30.4		6.9		70.5	42.5	56.8	51.1
Bosnia and Herzegovina		16	13	16		16	35	16	46
Afghanistan	Top manager is female	1.4	0	1.4		8.3	13.5	8.6	19.5
Afghanistan	Top manager is male	64	64	63		62	26	58	12

Source: elaborated by author

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