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Original research article

NAVIGATING ENTREPRENEURSHIP AND INNOVATION: THE IMPORTANCE OF INSTITUTIONAL QUALITY IN CEE

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Abstract: *The research examines the impact of institutional quality on entrepreneurship and patenting activity in Central and Eastern European (CEE) countries, utilizing the Economic Freedom indicators from the Fraser Institute. We hypothesize that higher institutional quality, characterized by limited government intervention, an effective legal system and property rights, capital market and trade institutions, and regulatory framework positively influence entrepreneurial endeavors and patenting outcomes. Strong institutions facilitate access to resources, reduce bureaucratic barriers, and foster an environment conducive to innovative behavior. Employing a panel regression, the paper examines the relationship between various institutions and entrepreneurial and innovation performance in the CEE countries. The results reveal a significant positive correlation between higher levels of economic freedom and increased rates of entrepreneurship and the production of patents. However, the impact of institutional quality is greater in determining entrepreneurship than innovation activities. The findings underscore the importance of institutions in shaping economic development in the CEE region and highlight the need for policy reforms to enhance institutional frameworks to support entrepreneurship better and stimulate patenting activity. Overall, the research contributes to understanding how institutional quality affects economic outcomes, emphasizing the vital role of economic freedom as a driver of innovation and entrepreneurship.*

Keywords: *Innovation, Entrepreneurship, Institutional Quality, CEE*

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1. INTRODUCTION

The relationship between institutions, entrepreneurship, and innovation is a topic of growing interest in the field of economic development (Harraf et al., 2020). Institutions, defined as the formal and informal rules that govern economic and social interactions, play a crucial role in shaping the incentives and opportunities for entrepreneurial and innovative activities (Harraf et al., 2020). The transition from centrally planned to market-oriented economies in Central and Eastern Europe (CEE) has brought institutional quality to the forefront of economic discourse. As these countries strive to achieve sustainable economic growth, the role of institutions in shaping entrepreneurial and innovation outcomes has gained increasing scholarly and policy attention. Institutions - encompassing legal frameworks, property rights, regulatory environments, and financial market systems - serve as the foundation for economic activity. They establish the rules and incentives that guide the behavior of entrepreneurs and innovators. This study investigates how these institutional dimensions, as measured by the Economic Freedom indicators from the Fraser Institute, influence entrepreneurship and patenting activity in the CEE countries.

Institutional quality is critical in reducing uncertainty and providing the necessary support structures for economic agents to thrive. Robust institutions facilitate access to resources, streamline administrative processes, and safeguard the returns on investments in innovation. Prior studies highlight the significant impact of judicial independence, property rights, and business regulations in fostering environments conducive to entrepreneurial growth and technological advancement (Jurlin & Čučković, 2010; Lubacha-Sember & Godlewska, 2018). However, the link between institutional quality and innovation remains complex, particularly as reflected in patenting activity. While entrepreneurship often responds quickly to improvements in governance and regulatory frameworks, innovation tends to depend on long-term investments and specialized financial mechanisms (Krammer, 2017; Tebaldi & Elmslie, 2008).

This research aims to contribute to the ongoing discourse by analysing the relationship between institutional quality and economic performance in 11 CEE countries over the period 2009 to 2020. By examining key institutional dimensions such as judicial independence, property rights, credit market regulations, and business regulations, the study seeks to provide a deeper understanding of how institutional quality supports entrepreneurship and innovation. In doing so, it offers valuable insights for policymakers seeking to strengthen institutional frameworks and foster sustainable economic development in the region.

The structure of the paper is as follows. After the introduction, the relevant empirical literature on the research topic is reviewed. The next section provides a detailed explanation of the data and methodology employed. This is followed by a presentation of the test results and discussion. Finally, the paper concludes by summarizing the main results and recommendations.

2. LITERATURE REVIEW

The intricate relationship between institutional quality and economic outcomes, particularly in the realms of entrepreneurship and innovation, has been a focal point in scholarly research. In the context of CEE, this relationship is particularly salient due to the region’s transition from centrally planned to market economies. The exploration of institutional quality and its impact

on patent activity—a key indicator of innovation—has yielded valuable insights. Tebaldi (2005) laid the groundwork by highlighting the complexity of establishing a direct empirical link between institutions and economic growth, emphasizing that institutional arrangements can significantly stimulate innovation. His work underscores the challenges faced by countries with institutional constraints, which often lag in patent production and broader economic performance. Building on this, Tebaldi and Elmslie (2008) demonstrated through econometric analysis that institutions, particularly those ensuring corruption control and property rights protection, play a pivotal role in fostering technical innovation and enhancing patent output.

Werle (2011) takes this discussion further by examining how institutional frameworks facilitate incremental learning processes within firms. His analysis highlights the importance of collaborative interactions between firms, universities, and public research organizations, emphasizing that sectoral specialization driven by institutional quality can enhance technological advancement. Dolfsma and Leydesdorff (2011) add a methodological dimension by using patent data to map innovation systems, revealing how institutional frameworks shape patent networks and facilitate cross-country comparisons. Ugur (2012) critiques the normative assumptions of the national innovation systems (NIS) approach, arguing for more rigorous hypothesis testing to better understand the interplay between institutional factors and market structures. His work stresses the multifaceted nature of innovation incentives, calling for a deeper examination of institutional dynamics.

The role of governance in scientific and technological progress is further explored by Poege et al. (2019), who highlight the importance of scientific quality governance through metrics like citation counts. They argue that such governance structures are crucial for building robust innovation capabilities. Taalbi (2022) introduces a nuanced perspective on the role of intellectual property rights (IPR), suggesting that while strengthened IPR influences patenting behavior, significant innovation often occurs outside these legal frameworks. This complexity is further underscored by AlMalki and Durugbo (2023), who explore biases in institutional innovation and advocate for a multi-level management model to better navigate these complexities.

Parallel to the discourse on innovation, the relationship between institutional quality and entrepreneurship has also garnered significant attention. Bhat and Khan (2014) highlight how institutional environments shape entrepreneurial behavior, arguing that well-structured institutions channel entrepreneurial efforts toward productive activities. Their study emphasizes the importance of private property protection, taxation, and labor market regulations in fostering entrepreneurship. Li (2018) expands on this by examining the mediating role of governance quality, revealing that variations in national institutions influence the levels of entrepreneurial activity. His findings highlight the need for effective governance mechanisms to leverage institutional strengths for entrepreneurial growth.

Chowdhury et al. (2019) refine the discussion by distinguishing between necessity-driven and growth-oriented entrepreneurship, asserting that institutional quality plays a more substantial role in promoting the latter, which has a greater impact on innovation and economic development. Boudreaux et al. (2021) add to this by exploring the resilience of entrepreneurship following natural disasters, emphasizing that economic freedom can mitigate challenges faced by small firms in crises.

Collectively, these studies underscore the multifaceted impact of institutional quality on entrepreneurship and innovation. They reveal that robust institutions, characterized by effective governance, secure property rights, and streamlined regulatory frameworks, are essential for fostering a conducive environment for entrepreneurial and innovative activities.

3. METHODOLOGY

The study employs panel data covering the period from 2009 to 2020, focusing on eleven CEECs: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. The primary objective is to examine the relationship between institutional quality and its influence on entrepreneurial activity and patenting outcomes. To capture these aspects, two dependent variables are used. The first is the logarithmic value of the number of patent applications by residents (variable - lpat), which measures innovation output and is sourced from the World Development Indicators. The second is the logarithmic value of the number of enterprise births (variable - lent), which reflects new entrepreneurial activity and is obtained from Eurostat database. The study utilizes institutional quality indicators from the Fraser Institute's Economic Freedom dataset, specifically focusing on Judicial Independence, Protection of Property Rights, Credit Market Regulations, and Business Regulations. These indicators were chosen due to their direct relevance to the institutional environment that supports entrepreneurship and innovation. Judicial Independence (variable - JI) ensures that courts operate without external influence, offering a reliable mechanism for enforcing contracts and resolving disputes. This fosters a legal environment that encourages both entrepreneurs and innovators by safeguarding their investments and intellectual property. Similarly, the Protection of Property Rights (variable - PRP) provides security over tangible and intangible assets, reducing uncertainty and incentivizing investment in new ventures and innovative activities. Both indicators are essential for fostering confidence among entrepreneurs and innovators. Credit Market Regulations (variable - CMR) capture the accessibility and efficiency of financial markets, which are critical for funding entrepreneurial ventures and supporting innovation. Access to credit lowers financial barriers for startups and allows innovators to develop and commercialize their ideas. Lastly, Business Regulations (variable - BR) assess the administrative and procedural ease of starting and operating a business. Streamlined regulations reduce bureaucratic hurdles, enabling faster business formation and facilitating innovation by freeing up resources that can be redirected toward research and development.

The descriptive statistics in Table 1 highlight significant disparities in institutional quality and economic indicators across the CEECs. Innovation, measured by the log of patent applications (lpat), shows notable variation, with a mean of 5.74 and a range from 2.99 to 8.45. Entrepreneurial activity, captured by the log of enterprise births (lent), is more consistent but still varies, with a mean of 10.52. Institutional indicators such as Judicial Independence (JI) and Protection of Property Rights (PPR) exhibit moderate variability, reflecting differences in legal and property protections. Credit Market Regulations (CMR) are relatively high and consistent, while Business Regulations (BR) show wider variation, indicating diverse regulatory environments that may impact entrepreneurship and innovation differently across the region.

Aligned with the study's objective, two models are developed, where patents and entrepreneurship are expressed as linear functions of control variables, including Judicial

Independence, Protection of Property Rights, Credit Market Regulations, and Business Regulations:

$$\text{lpat}_{it} = \beta_0 + \beta_1 \text{JI}_{it} + \beta_2 \text{PRP}_{it} + \beta_3 \text{CMR}_{it} + \beta_4 \text{BR}_{it} + \varepsilon_{it} \quad (1)$$

$$\text{lent}_{it} = \alpha_0 + \alpha_1 \text{JI}_{it} + \alpha_2 \text{PRP}_{it} + \alpha_3 \text{CMR}_{it} + \alpha_4 \text{BR}_{it} + \omega_{it} \quad (2)$$

Where β_i and α_i represent the parameters to be estimated, and ε_{it} and ω_{it} enote the error terms.

Table 1. *Descriptive statistics*

Variable	Obs	Mean	Std. Dev.	Min	Max
lpat	132	5.736504	1.252203	2.995732	8.450198
lent	132	10.524690	0.994222	8.334951	12.507180
JI	132	6.302285	0.822902	4.741918	7.983740
PRP	132	6.461325	1.099230	4.361182	8.786045
CMR	132	9.019231	0.765734	6.115799	10.000000
BR	132	6.107198	1.004717	3.578563	8.635305

Source: Authors' calculations

To assess the presence of cross-sectional dependence in the panel dataset, the Pesaran Cross-Sectional Dependence (CD) was employed. This test is critical for panel data analysis as it evaluates whether the error terms across different cross-sectional units, in this case, the eleven CEECs, are correlated. Cross-sectional dependence is a common feature in regional or globally connected economies, where shocks or policy changes in one country may influence others. The test examines the null hypothesis of no cross-sectional dependence against the alternative that such dependence exists (De Hoyos & Sarafidis, 2006). Detecting cross-sectional dependence is essential, as its presence can lead to biased standard errors and invalid statistical inference if unaddressed. If significant cross-sectional dependence is detected, it signals the need for robust estimation techniques that can account for these interdependencies to ensure the reliability of the model's results. Further, the study employs the Cross-Sectional Augmented Im, Pesaran, and Shin (CIPS) test, developed by Pesaran (2007), to assess the stationarity of the data. As a second-generation unit root test, the CIPS test is specifically designed to account for cross-sectional dependence, ensuring more reliable and robust results under such conditions. In addition to testing for cross-sectional dependence, the analysis also examined the issues of heteroscedasticity and serial correlation. The Wald test for heteroscedasticity was used to assess whether the error variances are consistent across different sections. Heteroscedasticity can undermine the efficiency of estimators and lead to invalid statistical inferences within the standard regression framework. Additionally, the Wooldridge test was applied to detect first-order serial correlation in the panel data. The presence of serial correlation in the error terms violates key assumptions of the regression model, resulting in inefficient estimators and biased standard errors.

The first two equations will be established using Feasible Generalized Least Squares (FGLS). If the results of any of these tests suggest the presence of heteroscedasticity or serial correlation, the application of the Generalized Least Squares (GLS) method becomes necessary. GLS is a robust estimation technique designed to address issues of both heteroscedasticity and autocorrelation in error terms (Bai, Choi, & Liao, 2020). By transforming the model, GLS adjusts the error structure, ensuring that the transformed error terms are homoskedastic (having constant variance) and uncorrelated across observations. This transformation improves the efficiency of the estimators, making them more precise and

reliable compared to those obtained through ordinary least squares (OLS), which may be biased or inefficient under the presence of heteroscedasticity or serial correlation.

4. RESULTS AND DISCUSSION

The results in Table 2 reveal a significant level of interdependence among the CEECs, with the null hypothesis of cross-sectional independence being decisively rejected at the 1% significance level. This suggests that economic shocks in one CEE country are likely to propagate and affect others in the region. Additionally, the panel unit root tests show that the variables become stationary after first differencing, reinforcing the effectiveness of this transformation in accurately capturing the underlying economic dynamics within the countries under study.

Table 2. *Cross-Sectional Dependence and Unit Root Tests Results*

Variables	CD test	CIPS	
		level	first difference
lpat	7.675***	-1.686	-3.140***
lent	2.416**	-2.388*	-3.222***
JI	2.498***	-1.191	-3.050***
PPR	6.533***	-1.580	-2.411**
CMR	9.439***	-2.613***	-3.416***
BR	15.034***	-2.152	-3.675***
Notes: *, **, and ***denote significance at 10%, 5%, and 1%, respectively.			

Source: Authors' calculations

Table 3 presents the results of several diagnostic tests, including the Pesaran CD test, the Wald test for heteroscedasticity, and the Wooldridge test for serial correlation. The Wald test provides strong evidence of group-wise heteroscedasticity in the data. Additionally, the Wooldridge test confirms the presence of autocorrelation in the error terms over time, while the Pesaran CD test reveals significant cross-sectional dependence. These findings suggest that the error terms are interrelated across sections, which may lead to unreliable standard errors for the estimated coefficients.

Table 3. *Diagnostic test results*

Test	Statistics	p-value	Indication
Pesaran CD	3.065	0.0022	Presence of cross-sectional dependence
Wald test	299.52	0.0000	Presence of group heteroscedasticity
Wooldridge test	F(1, 10) = 17.395	0.0019	Presence of autocorrelation

Source: Authors' calculations

Considering the results of the diagnostic tests, the model was estimated using the FGLS method, and the findings are presented in Table 4. The high Wald chi-squared values confirm the strong overall explanatory power of the models.

The results provide compelling evidence on the relationship between institutional quality and both innovation, measured by the number of patent applications (lpat), and entrepreneurial activity (lent) in the CEECs. Judicial Independence (JI) and Protection of Property Rights (PRP) emerge as the most significant predictors, with positive and highly significant coefficients for both dependent variables. The coefficient for Judicial Independence is 0.52 for lpat and 0.47 for lent, indicating that a one-unit increase in judicial independence is

associated with a 0.52% increase in patent applications and a 0.47% increase in entrepreneurial activity, respectively. Similarly, the coefficient for Protection of Property Rights is 0.55 for lpat and 0.49 for lent, suggesting that improvements in property rights protection lead to a 0.55% increase in patenting and a 0.49% increase in enterprise births. This underscores the critical role of strong legal frameworks and property rights in fostering environments conducive to innovation and entrepreneurship, aligning with findings by Nyström (2008) and Aidis et al. (2012), who similarly emphasize the importance of institutional quality in transition economies. Business Regulations show positive and significant coefficients for both dependent variables (0.33 for lpat and 0.38 for lent). This implies that a one-unit reduction in regulatory burden leads to a 0.33% increase in patenting and a 0.38% rise in new business formations. These findings align with Aidis (2005), reinforcing the idea that streamlined regulatory environments promote both innovation and entrepreneurial activity.

As expected from economic theory, Credit Market Regulations (CMR) have no significant impact on patents (p-value = 0.922), as patent applications generally do not require substantial investment and are less dependent on credit. However, the results reveal that credit market regulations have a positive and statistically significant impact on entrepreneurship (p-value = 0.000). Specifically, a one-unit improvement in CMR is associated with a 0.11% increase in entrepreneurial activity. This finding underscores the critical role of favorable credit conditions in fostering business creation and supporting entrepreneurial growth. This result aligns with studies like Beck et al. (2003), which highlight that while access to credit is crucial for supporting new business ventures, it may not directly drive R&D-intensive activities like patenting. Also, this aligns with findings from Braunerhjelm et al. (2023), who highlight the nuanced effects of regulatory frameworks on innovation and entrepreneurship. In contrast, entrepreneurship, which includes starting and expanding businesses, is more directly influenced by access to credit as it facilitates initial capital needs and operational scaling (Beck et al., 2003). Krammer (2009) similarly emphasizes that while financial development is crucial for fostering business growth, its role in innovation-driven processes like patenting may require targeted support. These findings suggest that institutional reforms aimed at improving judicial systems, securing property rights, and reducing regulatory burdens are pivotal for enhancing both entrepreneurial and innovative performance.

Table 4. *FGLS Results*

Dependent variables:	lpat	lent
Variables	Coefficients	Coefficients
JI	0.52***	0.47***
PRP	0.55***	0.49***
CMR	0.00	0.11***
BR	0.33***	0.38***
Wald chi2	888.60***	3146***
Notes: Coefficients: Generalized Least Squares; Panels: Heteroskedastic with Cross-Sectional Correlation; Correlation: AR(1) *, **, and ***denote significance at 10%, 5%, and 1%, respectively.		

Source: Authors' calculations

Moreover, the study's results align with broader empirical literature. For example, Krammer (2009) found that institutional quality positively affects national innovation in transition economies, while Zádor (2019) observed a similar dynamic in CEECs, noting that

institutional reforms post-EU accession have significantly enhanced innovation outputs, including patenting. Prokop et al. (2021) also highlighted the role of property rights and regulatory frameworks in driving innovation processes in CEECs. These results collectively demonstrate the significant interplay between robust institutions and economic dynamism, further underscoring the necessity of institutional quality for sustainable growth in emerging economies.

The results indicate that while higher levels of economic freedom positively impact both entrepreneurship and patent production, the effect is more pronounced for entrepreneurship. This is particularly evident from the statistically insignificant coefficient of CMR for patent production. Patenting activities often depend on long-term R&D investments and specialized funding mechanisms that go beyond general credit availability. Innovators typically seek venture capital, government grants, or industry-specific funding sources, which are not fully captured by broader measures of credit market efficiency. In contrast, entrepreneurship, which includes starting and expanding businesses, is more directly influenced by access to credit as it facilitates initial capital needs and operational scaling. This finding suggests that while institutional quality supports both entrepreneurship and innovation, its mechanisms—such as financial infrastructure—may play a more critical role in the early stages of business formation than in driving high-risk, capital-intensive innovation processes like patenting.

5. CONCLUSIONS AND RECOMMENDATIONS

The study provides evidence on the significant role of institutional quality in fostering entrepreneurship and innovation within CEE countries. By utilizing the Economic Freedom indicators from the Fraser Institute, the analysis reveals that higher levels of economic freedom—reflected in judicial independence, secure property rights, efficient credit markets, and streamlined business regulations—positively influence both entrepreneurial activity and patent production. However, the findings indicate that institutional quality has a stronger effect on entrepreneurship than on innovation outcomes such as patenting. This distinction highlights the different mechanisms through which institutional frameworks support these two facets of economic dynamism.

Entrepreneurial activity benefits directly from institutional improvements, as reduced bureaucratic barriers, better access to credit, and a more predictable legal environment create immediate opportunities for business formation and growth. In contrast, innovation processes, which culminate in patenting, rely on longer-term investments and more specialized funding mechanisms beyond general credit access. These results align with existing literature, including studies by Nyström (2008), Aidis et al. (2012), and Krammer (2009), which emphasize the critical role of institutional quality in supporting economic performance, particularly in transition economies.

Based on the findings, several concrete policy recommendations can be made to further enhance institutional quality and support both entrepreneurship and innovation in the CEECs. Strengthening judicial independence and property rights should be a priority, ensuring that businesses and innovators can operate in a fair and predictable legal environment. Simplifying business regulations will reduce the bureaucratic burden, making it easier to start and grow enterprises. Furthermore, although Credit Market Regulations have a limited direct impact on innovation, improving access to credit remains essential for supporting entrepreneurial ventures, which often rely on initial capital for growth. Expanding targeted financial

instruments such as venture capital, R&D grants, and tax incentives could complement these institutional improvements by addressing specialized funding needs for innovation. By implementing these measures, policymakers can create a more dynamic and competitive economic environment in the CEECs, driving sustained growth in both entrepreneurship and innovation.

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