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Entrepreneurial Orientation and Business Performance: Evidence from Hungarian SMEs

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Abstract

Background: Entrepreneurial orientation (EO) is a central concept in strategic management research; however empirical evidence on its performance implications remains context dependent. In particular, studies from Central and Eastern Europe are scarce despite the economic significance of small and medium-sized enterprises in the region.

Purpose: This study examines the relationship between entrepreneurial orientation and business performance in Hungarian small and medium-sized enterprises. This study also explores whether firm performance and entrepreneurial orientation vary across managerial gender, industry affiliation, and geographic location.

Study design/methodology/approach: This research is based on a cross-sectional survey of 415 Hungarian SMEs conducted in 2024. Entrepreneurial orientation was measured using multi-item Likert scales for the three sub-dimensions, while firm performance was assessed through self-reported indicators. Linear regression and chi-square tests were used to analyze the relationships and contextual differences.

Findings/conclusions: The findings show a positive relationship between entrepreneurial orientation and firm performance. Innovation and proactivity are strongly associated with performance outcomes, whereas risk-taking exhibits a comparatively weaker relationship. Significant differences in entrepreneurial orientation and performance are observed across gender, industry and regional contexts.

Limitations/future research: This study contributes to entrepreneurial orientation research by providing evidence from a Central and Eastern European transition economy and reinforcing the multidimensional nature of entrepreneurial orientation. The results highlight the importance of contextual factors in shaping the performance of entrepreneurial behavior.

Keywords

entrepreneurial orientation, innovation, proactivity, risk-taking, firm performance, Central and Eastern Europe

Introduction

Small and medium-sized enterprises (SMEs) operate in an increasingly turbulent economic environment, characterized by technological transformation, global competition, and rapidly changing market conditions. These developments place considerable pressure on firms, especially SMEs, to continuously adapt, innovate, and refine their strategic posture to sustain growth and competitiveness (Meirinhos et al., 2023; Freihat, 2020). In this context, managerial behavior and leadership decisions become especially critical, as SMEs typically rely on limited internal resources and depend heavily on the owner-manager's strategic orientation (Roffia et al., 2022). This is particularly relevant in emerging and transition economies, where constitutional shifts and resource constraints shape firms' ability to respond effectively to environmental challenges.

Entrepreneurial orientation (EO) has long been recognized as a central strategic construct that captures a firm's propensity to innovate, proactively pursue opportunities, and engage in calculated risk-taking (Miller, 1983). Previous studies have confirmed that EO contributes to superior firm performance by fostering opportunity recognition, enhancing adaptability, and enabling firms to leverage internal capabilities more effectively (Molote et al., 2025; Sekyere & Jalali,

2024; Yahaya & Nadarajah, 2023). While a substantial body of research documents the EO-performance relationship, most empirical evidence originates from Western economies and advanced technological markets. Much less is known about how EO functions in Central and Eastern Europe (CEE), where SMEs operate under different institutional, cultural, and competitive conditions.

Despite the growing academic interest, empirical evidence on EO within the Hungarian SME sector remains scarce, and the mechanisms through which EO affects performance in this specific socio-economic environment are not yet well understood. Moreover, the potential heterogeneity of the EO-performance link across different managerial, industrial, and regional contexts has received limited scholarly attention in CEE countries to date. Existing studies rarely examine how gender, industry affiliation, or geographic location may influence either the level of EO or its effectiveness in driving firm performance, despite indications that structural and demographic factors play a significant role in shaping entrepreneurial behavior. Consequently, a systematic examination of EO in Hungary can extend the theoretical understanding and address an important empirical gap.

To address these limitations, this study investigates the following research questions:

Q1: What is the relationship between entrepreneurial orientation and the organizational performance of Hungarian SMEs?

Q2: How do managerial gender, industry classification, and geographical location influence both EO and SME performance?

This study makes several contributions to the literature. First, it provides empirical evidence from Hungary, a transition economy where EO research is still underrepresented, thereby contributing to regional diversification in EO studies. Second, by examining multiple contextual moderations (managerial gender, industry, and regional location), it extends the theoretical discussion on the contingent nature of EO, responding to recent calls for more contextualized EO research. Third, it offers practical implications for SME managers and policymakers by identifying the specific dimensions of EO that strongly influence performance within the Hungarian business environment.

The remainder of this paper is organized as follows. Section 1 reviews the theoretical foundations of EO and develops hypotheses. Section 2 outlines the methodology, data collection process, and analytical techniques. Section 3 presents the empirical results, followed by a discussion in Section 4. Finally, the conclusion contains the theoretical and practical implications, limitations, and future research directions.

1. Literature Review

1.1. Entrepreneurial Orientation as a strategic orientation

Entrepreneurial orientation (EO) is widely regarded as a core construct in strategic management that captures the strategic posture through which firms identify, evaluate and exploit entrepreneurial opportunities. One of the earliest conceptualizations of EO was provided by Miller (1983), who defined entrepreneurial firms as those that engage in innovation, proactive market behavior, and risk-taking. Covin and Slevin (1989) further developed this approach by conceptualizing EO as a firm-level strategic orientation that reflects managerial preferences and decision-making practices under conditions of uncertainty. Their seminal work demonstrated that EO is particularly critical for small firms operating in hostile or dynamic environments, where entrepreneurial behavior can compensate for limited resources and structural constraints.

A major theoretical advance was introduced by Lumpkin and Dess (1996), who emphasized the multidimensional and context-dependent nature of EO. They argued that EO consists of distinct dimensions, most notably innovation, proactivity, and risk-taking, which may vary independently and whose effects on performance depend on environmental and organizational contingencies. This perspective shifted EO research away from purely additive logic and highlighted the importance of contextual factors, such as dynamism, competitive intensity, and organizational structure.

Building on these foundations, Wiklund and Shephard (2005) proposed a configurational approach to EO, demonstrating that entrepreneurial orientation enhances small business performance by enabling firms to leverage internal resources, pursue growth opportunities, and engage in strategic learning. Their findings underscore that EO operates as part of a broader strategic system rather than an isolated determinant of performance. Together, these classical contributions establish EO as a strategic orientation linking managerial behavior, organizational capabilities, and

environmental conditions, particularly in the context of SMEs.

1.2. Entrepreneurial Orientation and SME performance

A substantial body of empirical research confirms a generally positive relationship between EO and firm performance, especially in small- and medium-sized enterprises (SMEs). Firms exhibiting higher levels of EO tend to outperform their less entrepreneurial counterparts in terms of growth, profitability, and competitive positioning (Rauch et al., 2009; Wiklund & Shepherd, 2005). EO contributes to performance by fostering innovation-driven strategies, proactive market engagement, and strategic flexibility (Octavia et al., 2020; Williams et al., 2020).

However, the EO-performance relationship is not consistent across contexts. Empirical studies indicate that its strength depends on internal resources, managerial capabilities and environmental conditions (Zarrouk et al., 2020; Rochiyati et al., 2022). In SMEs, where resource constraints are pronounced, EO often functions as a mechanism for mobilizing intangible assets such as knowledge, learning orientation, and managerial competence (Mantok et al., 2019; Meekaewkunchorn et al., 2021). Recent empirical evidence by Islam et al. (2024) confirms the positive impact of EO on SME performance, while also showing that EO dimensions contribute unevenly, with innovation and proactivity typically exerting stronger effects than risk-taking.

These findings are particularly relevant for transition economies, where SMEs face institutional volatility and have limited access to capital. In such contexts, EO may play a decisive role in sustaining competitiveness and performance; however empirical evidence from Central and Eastern Europe (and Hungary in particular) remains relatively scarce.

1.3. Entrepreneurial Orientation and SME performance in the Hungarian context

Hungarian SMEs operate in a business environment characterized by resource constraints, evolving institutional conditions, and significant regional disparities. Prior Hungarian research emphasizes that firm competitiveness and performance are strongly linked to managerial competencies, strategic decision-making and internal organizational practices (Rideg, 2017; Kurath et al., 2024). These findings suggest that EO-related behaviors may be particularly consequential in the Hungarian SME sector, where managerial discretion is high and organizational structures are relatively flexible.

Empirical evidence highlights the importance of internal organizational factors in shaping performance outcomes. Balogh et al. (2021) demonstrate that incentive systems, managerial practices and internal governance mechanisms significantly influence SME competitiveness and performance. Their results align closely with EO theory, which conceptualizes entrepreneurial orientation as a behavioral and organizational phenomenon embedded in firm-level practices rather than merely an abstract strategic intention.

Adaptation to change is also a critical managerial challenge in the Hungarian context. Change management research stresses that successful adaptation requires deliberate behavioral and organizational adjustments (Takacs, 2015), conceptually aligning with EO dimensions such as innovation and proactivity. Together, these streams of Hungarian research support the relevance of EO as a theoretical lens for explaining performance differences among SMEs and motivate the need for an empirical analysis that integrates international EO theory with local contextual insights.

1.4. Core dimensions of Entrepreneurial Orientation

1.4.1. Innovation

Innovation reflects a firm's tendency to support creativity, experimentation, and the development of new products, services, or organizational practices (Covin & Slevin, 1989). In SMEs, innovation plays a central role in differentiation, adaptability, and long-term competitiveness (Meekaewkunchorn et al., 2021; Kusa et al., 2021). Innovation enables firms to respond effectively to changing customer needs and technological developments, thereby enhancing their performance (Beltrame et al., 2022; William et al., 2020).

At the same time, innovation involves substantial costs and uncertainty. Empirical evidence suggests that innovation alone does not guarantee superior performance unless complemented by proactive behavior and effective risk management (Pisar & Tomaskova, 2020; Islam et al., 2024).

1.4.2. Proactivity

Proactivity refers to a forward-looking strategic posture aimed at anticipating future market opportunities and acting before competitors (Lumpkin & Dess, 1996). Proactive firms shape their competitive environments by introducing new products, services or processes before their rivals, thereby achieving a first-mover advantage.

In the SME context, proactivity is particularly important because of limited resources and high environmental uncertainty. Prior studies show that proactive behavior strengthens performance by improving market responsiveness and strategic alignment (Meedkaewkunchorn et at., 2021; Kusa et al., 2022). Wiklund and Shepherd (2005) further emphasized that proactivity enables SMEs to capitalize on growth opportunities more effectively than reactive competitors.

1.4.3. Risk-taking

Risk-taking reflects a firm's willingness to commit resources to uncertain initiatives that have potentially high returns (Covin & Slevin, 1989). While risk-taking is a defining element of entrepreneurial behavior, its relationship with performance is more ambiguous that of innovation and proactivity.

Empirical research reports mixed findings regarding the risk-taking – performance relationship, particularly in SMEs facing financial constraints (Dvorsky et al., 2021; Kusa et al., 2021). Recent evidence by Islam et al. (2024) suggests that risk-taking often exhibits weaker or inconsistent effects on performance, highlighting the importance of strategic moderation and contextual alignment.

1.5. Contextual and contingency perspectives on entrepreneurial orientation

Consistent with the contingency logic proposed by Lumpkin and Dess (1996) and the configurational approach of Wiklund and Shepherd (2005), contemporary EO research increasingly emphasizes the role of contextual factors in shaping entrepreneurial behavior. Managerial characteristics, industry dynamics, and regional environments influence both the level of EO and its effectiveness in driving performance (Wales et al., 2011; Arzubiaga et al., 2018).

Leadership-related factors play a particularly important role in SMEs, where decision-making authority is highly centralized. A recent systematic review and meta-analysis by Qandeel and Kurath (2025) demonstrated that leadership style and perceptions of interactional justice significantly affect employee attitudes and performance. These findings support the argument that EO-related behaviors, such as innovation and proactivity, are influenced not only by strategic intent but also by leadership practices and organizational climate.

Industry structure and regional embeddedness further influence EO effects. Borgulya and Balogh (2019) highlight the strategic role of industrial clusters and inter-organizational communication in enhancing firms' adaptive capacity and competitiveness. Therefore, firms embedded in stronger networks and knowledge-sharing environments may experience amplified EO-performance effects. Extending this perspective, Hahn, Civera, and Cavallo (2025) demonstrate that entrepreneurial orientation can be activated in response to exogenous shocks, emphasizing the contingent role of entrepreneurial exposure in shaping EO behaviors.

From a country-specific perspective, Hungarian evidence suggests that managerial competence and strategic choices are closely associated with SME competitiveness, implying that the effects of EO may vary systematically across decision-makers, industries, and regions (Rideg, 2017; Kurath et al., 2024).

1.6. Hypotheses development

Drawing on classical EO theory (Covin & Slevin, 1989; Lumpkin & Dess, 1996) configurational approaches (Wiklund & Shepherd, 2005), and recent empirical evidence (Islam et al., 2024; Hahn et al., 2025), the following hypotheses are proposed:

Hypothesis 1: Entrepreneurial orientation positively affects firm performance.

Hypothesis 2: Innovation positively affects firm performance.

Hypothesis 3: Proactivity positively affects firm performance.

Hypothesis 4: Risk-taking ability positively affects firm performance.

Hypothesis 5: Managerial gender influences firm performance and entrepreneurial orientation.

Hypothesis 6: The industrial classification affects firm performance and entrepreneurial orientation.

Hypothesis 7: Geographical location influences firm performance and entrepreneurial orientation.

In conclusion, the overarching theoretical framework of this study is depicted in Figure 1.

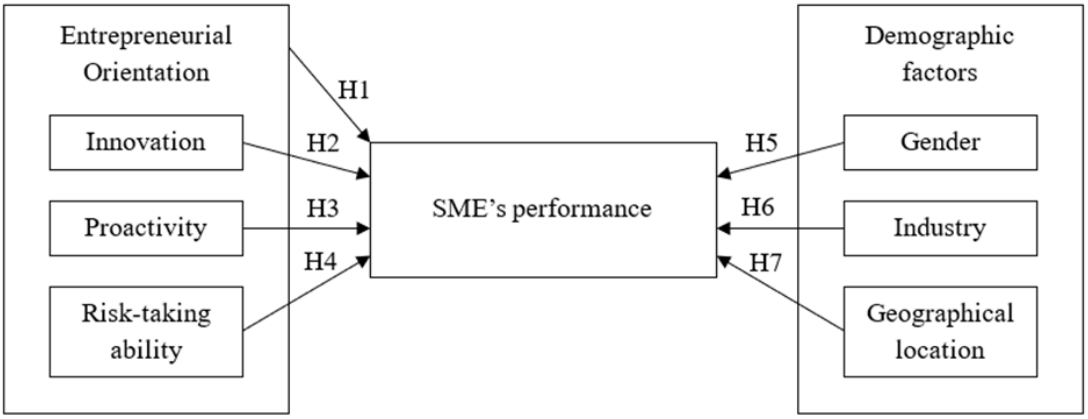


Figure 1 Theoretical framework
Source: the author

2. Methodology

2.1. Research Design

This study employs a quantitative, cross-sectional research design to examine the relationship between entrepreneurial orientation and firm performance among Hungarian small and medium-sized enterprises (SMEs). A survey-based approach was selected as being well suited for capturing managerial perceptions, strategic orientations, and organizational characteristics across a relatively large sample of firms, and it is widely used in EO research (Covin & Slevin, 1989; Wiklund & Shepherd, 2005).

The research design is explanatory in nature, aiming to test theoretically derived hypotheses concerning the impact of EO and its core dimensions (innovation, proactivity, and risk-taking) on organizational performance. In addition, this study adopts a contingency-oriented perspective by examining whether this relationship varies across contextual characteristics, including managerial gender, industry affiliation, and geographical location. This approach is consistent with prior EO research that emphasizes the context-dependent nature of entrepreneurial behavior (Lumpkin & Dess, 1996).

Data were collected at a single point in time, which allowed for the identification of statistical associations between key constructs but did not permit causal inference. This limitation is acknowledged and addressed in the discussion of the methodological constraints and future research directions. Nevertheless, the cross-sectional design is appropriate for the study's objectives, which focus on identifying patterns and relationships within the Hungarian SME sector, rather than tracking longitudinal dynamics.

2.2. Population and sample

The study population consisted of Hungarian small and medium-sized enterprises (SMEs). Industry classification was based on the industrial ecosystem framework defined by the European Commission. The final sample includes 415 enterprises distributed across multiple industries, firm sizes, and geographical regions.

Table 1 presents the distribution of enterprises by industry and size. The sample is dominated by small enterprises (286 firms), followed by medium-sized (95 firms) and micro-enterprises (34 firms). Construction represents the largest industry in the sample (128 firms), followed by freight and passenger transport, including the automotive industry (66 firms), and the agri-food sector (49 firms). Several industries, such as digital devices, electronics-related industries, renewable energy, and cultural and creative industries, are represented by smaller numbers of firms, while a few sectors (e.g., textile, defense and space, proximity-based/social economy) include only one enterprise each.

Table 1 Industry classification of enterprises by size category (number of enterprises)

Industry	Micro-enterprise	Small enterprise	Medium-sized enterprise	Total
agri-food industry	3	25	21	**49**
freight and passenger transport, automotive industry	3	51	12	**66**
digital devices industry	3	8	3	**14**
healthcare industry	2	26	6	**34**

electronics-related industries	0	9	4	**13**
energy intensive industries	4	14	7	**25**
construction industry	8	99	20	**128**
retail industry	8	23	6	**37**
cultural and creative industries	1	4	6	**11**
renewable energy sources	1	17	2	**20**
proximity-based economy / social economy	1	0	0	**1**
textile industry	0	0	1	**1**
tourism	0	9	6	**15**
defense and space industry	0	0	1	**1**
Total	**34**	**286**	**95**	**415**

Source: the author

Overall, the industry distribution indicates substantial heterogeneity, ensuring that no single sector exclusively drives the empirical results. At the same time, industries with very low representation are interpreted with caution in subsequent analysis.

Table 2 reports the geographical distribution of participating enterprises by firm size at the NUTS 3 (county) level. The sample shows a clear territorial concentration, with Budapest (87 firms) and Pest County (58 firms) accounting for a substantial share of observations. Other counties, such as Fejér, Győr-Moson-Sopron, Baranya, Bács-Kiskun, and Csongrád-Csanád, each contributed between 20 and 23 firms, and several counties were represented by fewer than 15 enterprises.

Table 2 The participating enterprises by size and county (NUTS 3) level

NUTS 3	Micro-enterprise	Small enterprise	Medium-sized enterprise	Total
Bács-Kiskun	1	16	3	**20**
Baranya	0	14	6	**20**
Békés	1	10	7	**18**
B.-A.-Z.	0	16	1	**17**
Budapest	9	55	23	**87**
Csongrád-Csanád	0	14	6	**20**
Fejér	3	16	4	**23**
Gy.-M.-S.	0	22	1	**23**
Hajdú-Bihar	4	13	4	**21**
Heves	1	9	3	**13**
J.-N.-Sz.	0	3	5	**8**
Komárom-Esztergom	0	9	3	**12**
Nógrád	0	1	0	**1**
Pest	6	41	11	**58**
Somogy	2	7	1	**10**
Sz.-Sz.-B.	2	10	2	**14**
Tolna	1	9	1	**11**
Vas	0	4	5	**9**
Veszprém	2	11	3	**15**
Zala	2	6	5	**13**
Total	**34**	**286**	**95**	**415**

Source: the author

Across regions, small enterprises constitute the largest share of firms, followed by medium-sized enterprises, with micro-enterprises appearing less frequently. This regional structure reflects the broader spatial concentration of economic activity in Hungary and provides sufficient variation for examining geographical differences in entrepreneurial orientation and performance.

With regard to managerial characteristics, the sample is predominantly male-led; 306 firms (74%) are managed by men and 109 firms (26%) by women. Gender representation varies across industries, firm age categories, and regions, supporting the inclusion of gender as a contextual factor in the empirical analysis. Detailed comparisons related to gender, industry, and regional patterns are addressed in the Results and Discussion sections.

2.3. Measures and variable operationalization

This section describes the operationalization of the main study variables, entrepreneurial orientation and firm performance, and explains how abstract theoretical constructs were translated into measurable indicators that are suitable for empirical analysis.

2.3.1. Entrepreneurial orientation

Entrepreneurial orientation (EO) was operationalized as a multidimensional construct reflecting firms' strategic attitudes and behavioral tendencies toward entrepreneurial activity. Consistent with classical EO theory (Covin & Slevin, 1989; Lumpkin & Dess 1996), the EO scale captures three core dimensions: innovation, proactivity, and risk-taking.

The measurement items were adapted from established empirical studies that examined the relationship between entrepreneurial orientation and firm performance in different contexts (Mantok et al., 2019; Oni et al., 2019; Nuryakin, 2021; Kim, 2022; Kusa et al., 2022; Rochiyati et al., 2022). Rather than adopting a single standardized scale, the questionnaire was constructed by selecting and adapting relevant items that reflect the conceptual content of EO while aligning with the specific characteristics of Hungarian SMEs.

The original items were translated into Hungarian using a direct translation approach, with particular attention to conceptual equivalence, linguistic clarity, and managerial relevance. During the adaptation process, terminology was

adjusted to fit the Hungarian business context and ensure that items were easily interpretable by SME managers. All EO items were measured on a five-point Likert scale (1=strongly disagree, 5=strongly agree). Separate indices were calculated for innovation, proactivity, and risk-taking, as well as an aggregated EO index representing overall entrepreneurial orientation.

Table 3 presents the operationalization of the EO dimensions, illustrating the specific behavioral and strategic aspects captured under innovation, proactivity and risk-taking.

Table 3 Aspects of entrepreneurial orientation (innovation, proactivity, risk-taking ability)

Aspects of innovation	Aspects of proactivity	Aspects of risk-taking
search for new opportunities	time of new programs, services	tolerating failure
new programs / services / administrative techniques	time of new administration technologies	undertaking high-risk projects
creative operation	taking advantage of opportunities provided for businesses	employee attitude towards risk
new tasks	analysis of the external environment	taking risks for above-average profits
new developments, innovations	identification of market needs	encouraging employees to take risks
	initiative skills	exploring opportunities, experimenting

Source: the author

2.3.2. Firm performance

Firm performance was measured using a subjective performance index reflecting managers' self-assessment of their firms' competitive outcomes. The use of subjective performance measures is well-established in SME research, particularly when objective financial data are difficult to obtain or firms are reluctant to disclose sensitive information (Wiklund & Shepherd, 2005; Rauch et al., 2009).

The performance measurement instrument was not based on a single standardized scale but was constructed by adapting performance-related dimensions commonly used in international EO performance studies (Mantok et al., 2019; Oni et al., 2019; Nuryakin, 2021; Kim, 2022; Kusa et al., 2022; Rochiyati et al., 2022). The selected items capture multiple aspects of firm performance, including growth, profitability, market position, and overall competitive performance, thereby enabling a comprehensive assessment of organizational outcomes.

The items were translated and adapted to the Hungarian SME context following the same principles applied to the EO scale, ensuring conceptual clarity and contextual relevance of the translation. Respondents evaluated each statement using a five-point Likert scale (1=strongly disagree, 5=strongly agree). Based on the responses, a composite performance index was constructed by aggregating the individual items with equal weighting across dimensions. This approach allows for a meaningful comparison across firms while maintaining consistency with prior empirical research.

The performance-related indicators included in Table 4 illustrate how firm performance was conceptualized as a multidimensional construct, enabling a comprehensive assessment of organizational outcomes beyond purely financial measures.

Table 4 Aspects of performance

Aspects of performance
profitability
productivity
customer base
brand awareness
products and services
supports

Source: the author

2.4. Reliability and validity tests

The reliability of the measurement instruments was assessed using Cronbach's alpha coefficients, which evaluate the internal consistency of multi-item scales. Reliability analyses were conducted separately for the firm performance scale and the entrepreneurial orientation (EO) scale, including its three core dimensions: innovation, proactivity, and risk-taking.

The firm performance construct was measured using nine-item scale that captures multiple aspects of business operations. The reliability analysis yielded a Cronbach's alpha value of 0.835 (Table 5), indicating strong internal consistency. This value exceeds the commonly accepted threshold of 0.70 and suggests that the items form a coherent and reliable performance index. This result supports the use of an aggregated performance measure in subsequent analyses and indicates that the respondents interpreted the performance-related items consistently.

Table 5 Testing the reliability of questions on performance and entrepreneurial orientation

Dimension	Cronbach α
Performance	0.835
Innovation	0.873
Proactivity	0.821
Risk-taking	0.644

Source: the author

The reliability of the entrepreneurial orientation measurement was examined at the overall construct level and the level of its individual dimensions (Table 5). The overall entrepreneurial orientation scale demonstrated acceptable internal consistency, with a Cronbach's alpha value of 0.779, supporting its suitability for empirical analysis.

At the dimensional level, the reliability results varied across the EO components. The innovation dimension exhibited very high internal consistency (Cronbach's alpha=0.873), while the proactivity dimension also demonstrated excellent reliability (Cronbach's alpha=0.821). These values indicate that the items associated with innovation and proactivity reliably capture the coherent underlying constructs. The risk-taking dimension yielded a lower Cronbach's alpha value (0.644), which is slightly below the conventional 0.70 threshold but still within the range considered acceptable in exploratory and SME-focused research. Given the conceptual complexity of risk-taking and its context-dependent manifestation in SMEs, this level of internal consistency is consistent with prior EO studies and does not preclude the scale's use in future analyses.

The content validity of the measurement instruments is supported using items adapted from established EO-performance studies and by grounding the constructs in well-established theoretical frameworks. Construct validity is reinforced by the multidimensional operationalization of EO, which aligns with classical and contemporary EO theory. Given the cross-sectional survey design and the use of established scales, reliability and validity were primarily ensured through careful scale construction and internal consistency assessment rather than through additional factor-analytic procedures.

2.5. Regression Assumption

Prior to estimating the regression models, the main assumption of linear regression was systematically assessed to ensure the robustness and interpretability of the empirical results. Diagnostics were conducted separately for the aggregated entrepreneurial orientation (EO) model and the dimension-level EO model, including innovation, proactivity, and risk-taking. A summary of the diagnostic results is provided in Table 6.

Table 6 Summary of Regression Assumption Diagnostics

Assumption	Diagnostic Method	Model A: EO → performance	Model B: Innovation, Proactivity, Risk-taking - → performance
Multicollinearity	Variance Inflation Factor (VIF)	VIF = 1.000	VIF = 1.23 – 1.94
Autocorrelation of residuals	Durbin-Watson test	DW = 1.856	DW = 1.901
Normality of residuals	Histogram, Normal P-P plot	Approximately normal distribution	Approximately normal distribution
Homoscedasticity	Scatterplot of standardized residuals vs. predicted values	Nonsystematic pattern observed	Nonsystematic pattern observed
Influential outliers	Standardized residuals	No influential outliers detected	Standard residuals
Sample size adequacy	Number of observations	N = 415	N = 415

Source: the author

As shown in Table 6, multicollinearity was not a concern in either model. In the aggregated EO model, the VIF value was 1.000, reflecting the absence of linear dependency among the predictors. In the dimension-level model, the VIF values ranged between 1.23 and 1.94, which are well below the commonly accepted threshold levels, indicating that the EO dimensions can be jointly included in the regression without distorting coefficient estimates.

The autocorrelation of the residuals was assessed using the Durbin-Watson test. The obtained values (1.856 for Model A and 1.94 for Model B) fell within the acceptable range, suggesting that the residuals were not serially correlated.

The normality assumption was evaluated through graphical inspection of standardized residual histograms and normal probability plots. In both models, the residuals displayed an approximately normal distribution with mean values close to zero and standard deviations close to one. Given the relatively large sample size (N=415), minor deviations from normality were not considered problematic.

Homoscedasticity was examined by plotting the standardized residuals against the standardized predicted values. No systematic patterns or funnel-shaped distributions were observed, indicating that the assumption of a constant error variance was reasonably satisfied in both models.

Finally, the influential outliers were assessed using standardized residuals. Although a small

number of observations approached the conventional threshold of |3|, no cases exceeded the critical values to a degree that would justify exclusion. Therefore, all observations were retained for subsequent analyses.

Overall, the diagnostic results summarized in Table 6 indicate that the key assumptions of linear regression were adequately met for both estimated models. This supports the reliability of the regression estimates reported in the next section.

2.6. Analysis method

To test the proposed hypotheses, a combination of linear regression analysis and categorical association tests was applied. This mixed analytical approach allows for the examination of both the performance effects of entrepreneurial orientation and the structural differences across firm characteristics.

2.6.1. Linear regression analysis

Linear regression models were used to examine the relationship between entrepreneurial orientation and firm performance. Two complementary model specifications were applied to capture both the overall and dimension-level effects of entrepreneurial orientation.

First, the aggregated entrepreneurial orientation Model A was estimated, in which firm performance served as the dependent variable, and the aggregated entrepreneurial orientation index was included as the main explanatory variable. This specification captures the overall strategic orientation of the firm toward entrepreneurial behavior.

Second, a dimension-level entrepreneurial orientation model (Model B) was estimated to assess the relative contributions of individual EO dimensions. In this model, innovation, proactivity, and risk-taking were simultaneously included as independent variables, with firm performance as the dependent variable. This approach allows for identifying which specific entrepreneurial behaviors are most strongly associated with performance outcomes while controlling for the remaining dimensions.

The estimated regression models can be expressed in the following general form:

Model A (aggregated entrepreneurial orientation):

$$Perfromance_i = \beta_0 + \beta_1 EO_i + \varepsilon_i$$

Model B (dimensions of entrepreneurial orientation):

$$Perfromance_i = \beta_0 + \beta_1 Innovation_i + \beta_2 Proactivity_i + \beta_3 Risk - taking_i + \varepsilon_i$$

where $\varepsilon_i$denotes the error.

All regression models were estimated using the Enter method. Standardized regression coefficients were reported to facilitate the comparison of effect sizes across explanatory variables. Model fit was evaluated using $R^2$and adjusted R^2values, while statistical significance was assessed at the conventional threshold level. Prior to interpretation, regression assumptions were systematically tested, as reported in Section 2.5.

2.6.2. Chi-square test and effect size measures

In addition to regression analysis, chi-square test (χ^2) of independence was conducted to examine associations between entrepreneurial orientation variables and selected categorical firm characteristics, including the gender of the manager, industry affiliation, and regional location. These analyses were applied to explore whether entrepreneurial orientation and its dimensions differ systematically across the structural firm attributes.

Cramer's V was calculated as an effect size measure to assess the strength of statistically significant associations. Cramer's V provides a standardized interpretation of association strength and allows for comparison across contingency tables of different sizes, complementing the result of the χ^2tests.

2.6.3. Additional analytical considerations

The empirical analysis focuses on the direct effect of entrepreneurial orientation on firm performance. Although moderation effects (e.g., by firm size, firm age, industry, or region) were not formally estimated using interaction terms in the present study, the applied analytical framework allows for such extensions in future research.

Overall, the combined use of regression analysis and categorical association tests provides a robust and methodologically consistent basis for evaluating the proposed hypotheses and aligns with the established empirical practices in entrepreneurship and strategic management research.

3. Results

This section presents the study's empirical findings. First, the results related to the relationship between entrepreneurial orientation and firm performance are discussed. Second, the role of selected contextual factors, including gender, industry, and regional location, is examined.

3.1. Main results for Q1: Relationship between entrepreneurial orientation and firm performance

This subsection reports the results of the regression analyses conducted to examine the relationship between entrepreneurial orientation and firm performance at the aggregated level and across individual EO dimensions.

3.1.1. Aggregated entrepreneurial orientation (H1)

Table 7 reports the linear regression examining the relationship between aggregated entrepreneurial orientation and firm performance. The results indicate a positive and statistically significant relationship between the two variables (β=0.593; p <0.001). The model explains 23.2% of the variance in firm performance (R^2=0.232). Consequently, Hypothesis 1 was accepted.

Table 7 Linear regression calculation of the relationship between entrepreneurial orientation and SME performance

Aspects	Significance level	Beta	R^2
entrepreneurial orientation x performance	<0.001	0.593	0.232

Source: the author

3.1.2. Entrepreneurial orientation dimensions (H2-H4)

Tables 8-10 present the results of separate regression analyses examining the relationship between individual EO dimensions and firm performance.

Innovation exhibits a positive and statistically significant effect on firm performance (β=0,436; p<0,001) (Table 8), explaining 24.1% of the performance variance (R^2=0,241). Consequently, Hypothesis 2 was accepted.

Table 8 Linear regression analysis of the relationship between innovation and SME performance

Aspects	Significance level	Beta	R^2
innovation x performance	<0.001	0.436	0.241

Source: the author

Proactivity is also positively and significantly associated with firm performance (β=0.466; p<0.001) (Table 9), with an explanatory power of R^2=0.220. Therefore, based on these results, Hypothesis 3 was accepted.

Table 9 Linear regression analysis of the relationship between proactivity and SME performance

Aspects	Significance level	Beta	R^2
proactivity x performance	<0.001	0.466	0.220

Source: the author

Risk-taking shows a positive but relatively weak relationship with firm performance (β=0.215; p<0.001) (Table 10). The explanatory power of the model was limited (R^2=0.032), indicating a modest association. Nevertheless, the relationship is statistically significant; therefore, H4 is accepted.

Table 10 Linear regression analysis of the relationship between risk-taking and SME performance

Aspects	Significance level	Beta	R^2
risk-taking x performance	<0.001	0.215	0.032

Source: the author

3.2. Main results for Q2: Contextual factors

The analysis presented in subsection 3.2. provides an answer to the second research question by examining whether entrepreneurial orientation and firm performance differ across the gender of the managers, the industry classification of the enterprise, and geographical location.

3.2.1. Gender

The chi-square test results indicate a statistically significant association between managerial gender and firm performance (p<0.001) (Table 11). The corresponding Cramer's V value (0.709) suggests a strong association.

Table 11 Gender of respondents and business performance

Pearson's Chi-square test				Cramer's V test		
<0,001				0,709		
Gender	0 – 19%	20 – 39%	40 – 59%	60 – 79%	80 – 100%	Total
Female	7	15	16	20	50	108
Male	13	30	46	62	156	307
Total	20	45	62	82	206	415

Source: the author

A similarly strong and statistically significant relationship was observed between gender and entrepreneurial orientation (p<0.001; Cramer's V=0.713) (Table 12).

Table 12 Gender of respondents and entrepreneurial orientation

Pearson's Chi-square test				Cramer's V test		
<0.001				0.713		
Gender	0 – 19%	20 – 39%	40 – 59%	60 – 79%	80 – 100%	Total
Female	8	21	37	27	15	108
Male	17	56	72	103	59	307
Total	25	77	109	130	74	415

Source: the author

Therefore, H5 is accepted.

3.2.2. Industry

Tables 13 and 14 present the distribution of firm performance and entrepreneurial orientation across industries. Pearson's chi-square test indicates statistically significant associations between industry classification and both firm performance ($p<0.001$; Cramer's V=0.482) and entrepreneurial orientation ($p<0.001$; Cramer's V=0.488)

Table 13. Industry classification and business performance

Pearson's Chi-square test				Cramer's V test		
<0.001				0.482		
Industry	0 – 19%	20 – 39%	40 – 59%	60 – 79%	80 – 100%	Total
agri-food industry	4	8	11	12	14	49
freight and passenger transport, automotive industry	3	5	13	15	30	66
digital devices industry	1	2	3	3	5	14
healthcare industry	3	2	3	7	19	34
electronics-related industries	1	3	0	1	8	13
energy intensive industries	1	7	5	2	10	25
construction industry	4	13	20	24	67	128
retail industry	1	2	2	8	24	37
cultural and creative industries	1	1	2	1	6	11
renewable energy sources	0	1	1	7	11	20
proximity-based economy / social economy	0	0	0	0	1	1
textile industry	1	0	0	0	0	1
tourism	0	1	2	2	10	15
defense and space industry	0	0	0	0	1	1
Total	20	45	62	82	206	415

Source: the author

Table 14 Industry classification and entrepreneurial orientation

Pearson's Chi-square test				Cramer's V test		
<0.001				0.488		
Industry	0 – 19%	20 – 39%	40 – 59%	60 – 79%	80 – 100%	Total
agri-food industry	8	12	8	17	4	49
freight and passenger transport, automotive industry	5	9	20	21	11	66
digital devices industry	0	5	2	3	4	14
healthcare industry	3	1	10	11	9	34
electronics-related industries	0	2	4	5	2	13
energy intensive industries	3	5	6	9	2	25
construction industry	5	21	31	36	24	128
retail industry	0	4	15	10	8	37
cultural and creative industries	0	3	3	4	1	11
renewable energy sources	0	2	6	5	7	20
proximity-based economy / social economy	0	0	1	0	0	1
textile industry	1	0	0	0	0	1
tourism	0	2	3	9	2	15
defense and space industry	0	0	0	0	1	1
Total	20	45	62	82	206	415

Source: the author

These values have moderate effect sizes, suggesting that the industry context is related to variations in performance and entrepreneurial orientation.

Accordingly, H6 is accepted.

3.2.3. NUTS 3

Table 15 reports the regional differences in firm performance. Pearson's chi-square test results indicated a statistically significant association between geographic location and performance ($p<0.001$), with a moderate effect size (Cramer's V=0.485).

Table 15 Geographical location and business performance

Pearson's Chi-square test				Cramer's V test		
<0.001				0.485		
NUTS 3	0 – 19%	20 – 39%	40 – 59%	60 – 79%	80 – 100%	Total
Bács-Kiskun	1	2	2	3	12	20
Baranya	0	1	1	5	13	20
Békés	1	1	3	5	8	18

Borsod-Abaúj-Zemplén	0	2	2	4	9	17
Budapest	2	6	14	19	46	87
Csongrád-Csanád	1	3	2	5	9	20
Fejér	2	5	2	4	10	23
Győr-Moson-Sopron	2	0	1	5	15	23
Hajdú-Bihar	2	3	6	1	9	21
Heves	0	0	3	1	9	13
Jász-Nagykun-Szolnok	0	1	1	2	4	8
Komárom-Esztergom	0	0	3	3	6	12
Nógrád	0	0	0	0	1	1
Pest	4	9	11	10	24	58
Somogy	1	2	1	3	3	10
Szabolcs-Szatmár-Bereg	0	2	2	1	10	15
Tolna	1	1	2	4	3	11
Vas	2	4	1	2	0	9
Veszprém	1	2	3	4	6	16
Zala	0	1	2	1	9	13
Total	20	45	62	802	206	415

Source: the author

Table 16 shows a similar pattern for entrepreneurial orientation, with significant regional differences ($p<0.001$) and Cramér's V (0.487).

Table 16 Geographical location of the enterprise and entrepreneurial orientation

Pearson's Chi-square test				Cramer's V test		
<0.001				0.487		
NUTS 3	0 – 19%	20 – 39%	40 – 59%	60 – 79%	80 – 100%	Total
Bács-Kiskun	1	5	4	5	5	20
Baranya	1	1	6	10	2	20
Békés	0	3	6	7	2	18
Borsod-Abaúj-Zemplén	0	5	4	6	2	17
Budapest	2	13	21	34	17	87
Csongrád-Csanád	1	2	7	6	4	20
Fejér	1	3	5	9	5	23
Győr-Moson-Sopron	3	4	2	7	7	23
Hajdú-Bihar	2	3	8	6	2	21
Heves	1	3	3	4	2	13
Jász-Nagykun-Szolnok	0	1	2	4	1	8
Komárom-Esztergom	2	0	3	3	4	12
Nógrád	0	0	0	1	0	0
Pest	5	19	18	8	8	58
Somogy	0	3	3	4	0	10
Szabolcs-Szatmár-Bereg	1	1	5	5	3	15
Tolna	1	2	4	2	2	11
Vas	3	3	1	1	1	9
Veszprém	1	2	5	4	4	16
Zala	0	4	2	4	3	13
Total	25	77	109	130	74	415

Source: the author

Accordingly, H7 is also accepted.

4. Discussion

This study investigates the relationship between entrepreneurial orientation and firm performance in Hungarian SMEs, emphasizing its multidimensional structure and contextual embeddedness. The results extend existing EO research by offering empirical evidence from a Central and Eastern European (CEE) transition economy.

4.1. Interpretation of main findings

The results confirm a positive and statistically significant relationship between aggregated entrepreneurial orientation and firm performance. This finding supports the core EO theory, which conceptualizes entrepreneurial orientation as a strategic posture that enhances opportunity recognition and exploitation (Covin & Slevin, 1989; Lumpkin & Dess, 1996). This aligns with prior empirical evidence from small business research (Wiklund & Shepherd, 2005; Rauch et al., 2009).

At the dimensional level, innovation and proactivity exhibit strong and positive associations with firm performance. These findings highlight that innovation and proactivity are key drivers of competitive advantage in resource-constrained SME. Consistent with the multidimensional EO framework (Lumpkin & Dess, 1996), the dimensions do not equally contribute to performance. These effects are dimension-specific and context-dependent.

Overall, the results support the view that entrepreneurial orientation functions as a strategic capability rather than a uniform behavioral bundle. Firms that actively pursue innovation and proactivity and anticipate market changes are better positioned to translate entrepreneurial intent into tangible performance gains.

4.2. Context-specific findings

A key finding is the comparatively weak relationship between risk-taking and firm performance. Although statistically significant, its explanatory power was substantially lower than that of innovation and proactivity. While classical EO studies emphasize risk-taking (Covin & Slevin, 1989), recent research indicates that its performance impact may be context-dependent.

In the Hungarian SME context, cautious strategic behavior may reflect economic volatility, financing constraints and regulatory uncertainty. Under such conditions, excessive risk-taking may

generate a disproportionate downside risk. Therefore, SMEs may benefit more from calculated innovation and proactive market positioning than aggressive risk-taking strategies. This finding underscores the importance of contextualizing EO dimensions rather than assuming their universal effectiveness in institutional settings.

4.3. Contribution to entrepreneurial orientation theory

This study makes three main contributions to the EO literature. First, it provides evidence from a CEE transition economy, a region that is still underrepresented in EO research. By focusing on Hungarian SMEs, this analysis highlights how entrepreneurial orientation operates in a post-transition economy characterized by evolving institutions and heterogeneous market conditions.

Second, the findings reinforce the multidimensional interpretation of the EO construct. The differential effects of innovation, proactivity, and risk-taking abilities provide empirical support for the argument that EO dimensions should be analyzed separately rather than aggregated indiscriminately. This aligns with theoretical debates emphasizing configurational and contingency-based interpretations of EO (Lumpkin & Dess, 1996; Wiklund & Shepherd, 2005).

Third, the results show that EO and performance vary across gender, industry, and region, underscoring the contextual embeddedness of EO. Although these variables were not modelled as formal statistical moderators, the observed associations indicate that EO-performance relationships are embedded in broader organizational and institutional contexts. This insight opens avenues for future research employing interaction models or multilevel approaches to explore these contingencies further.

4.4. Practical implications

The findings have direct implications for SME managers operating in Hungary and the broader Central and Eastern European (CEE) region. First, the results indicate that performance gains are more strongly associated with innovation and proactivity than with heightened risk-taking. In practical terms, SME leaders should institutionalize opportunity-recognition routines such as regular market-scanning meetings, structured customer feedback analysis, and internal idea-generation mechanisms. Establishing simple but formalized evaluation criteria for new projects can help balance innovation initiatives with financial stability, which is particularly important in resource-constrained environments.

Second, given the comparatively weaker performance impact of risk-taking, SME managers in CEE economies should adopt a calculated, rather than an aggressive, risk posture. Instead of pursuing high-risk expansion strategies, firms may benefit from incremental innovation, pilot testing new products and services, and phased market entry approaches. This is especially relevant in transition economies, which are characterized by regulatory volatility, limited access to external financing, and uneven regional development.

Third, the observed gender, industry, and regional differences suggest that entrepreneurial strategies should not be applied uniformly. SME leaders are encouraged to align innovation practices with industry-specific dynamics and regional market conditions. Firms from peripheral regions may benefit from inter-firm collaboration, cluster participation, and knowledge-sharing networks to compensate for their structural disadvantages.

From a policy perspective, the results underline the importance of targeted and context-sensitive SME-support instruments. Policymakers in Hungary and the broader CEE region should prioritize innovation vouchers, regional incubation programs, digitalization grants, and accessible micro-financing schemes that lower the perceived costs of entrepreneurial experimentation. Special attention should be paid to female-led enterprises and firms in less developed regions to reduce structural disparities. By strengthening innovation ecosystems and improving access to financial and advisory support, policymakers can enhance SMEs' ability to translate entrepreneurial orientation into sustainable-performance outcomes.

Conclusions

This study examines the relationship between entrepreneurial orientation and firm performance among Hungarian SMEs, with particular attention to the multidimensional structure of EO and the roles of gender, industry, and geographical location. By combining regression and categorical analyses, this study provides empirical evidence on how entrepreneurial orientation relates to performance outcomes in a Central and Eastern European context.

Summary of the findings

The results confirm a positive and statistically significant relationship between aggregated entrepreneurial orientation and firm performance. At the dimension level, innovation and proactivity emerge as the primary drivers, whereas risk-taking shows a positive, but comparatively weak, effect. The findings also reveal significant variations in EO and performance across gender, industry, and regional location, underscoring contextual heterogeneity.

Overall, entrepreneurial orientation contributes to SME performance in Hungary; however, its effects are uneven across dimensions and are embedded in structural and institutional contexts.

Theoretical contributions

This study makes three main theoretical contributions to the literature. First, it extends EO research to a CEE transition economy, addressing a geographical gap in the literature on EO. The Hungarian context illustrates how EO operate under heterogeneous institutional and market contributions.

Second, the findings reinforce the multidimensional conceptualization of entrepreneurial orientation. The strong effects of innovation and proactivity, combined with the weak role of risk-taking, provide empirical support for contingency-based and configurational perspectives of EO.

Third, the variation across gender, industry, and region highlights the contextual embeddedness of the EO. These results suggest that EO should be understood not only as a firm-level strategic posture but also as context-sensitive capability.

Practical implications

From a management perspective, the findings indicate that SME performance gains are more likely to result from innovation-oriented and proactive strategies than from increased risk-taking alone. SME leaders should prioritize opportunity recognition, structured innovation practices and balanced risk management.

For policymakers, the findings emphasize the need for context-sensitive SME support instruments. Initiatives aimed at strengthening innovation capabilities, reducing financing constraints, and supporting proactive market engagement may be particularly effective in enhancing SME competitiveness. Regional disparities indicate the need for targeted development programs in peripheral areas.

Limitations

Despite these contributions, this study has several limitations. First, the analysis relies on cross-sectional survey data, which limits the ability to draw causal inferences. Second, firm performance was measured using subjective indicators that may have introduced respondent bias. Third, the contextual differences were not tested using formal interaction models. Finally, this study focused on a single national context, which may limit the generalizability of the findings.

Future research directions

Future research should employ longitudinal designs to capture the causal dynamics between EO and performance. The use of objective performance indicators strengthens empirical robustness. Future studies should model moderation and mediation effects, such as firm size, age, digitalization level, and institutional support. Comparative cross-country analyses within the CEE region would clarify whether the observed patterns are context-specific or generalizable to other nations.

Declarations

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Conflict of Interest

The author declares no conflict of interest.

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