

# The External Factors Leading to Product Innovation Outcomes in the Visegrad Group-Structural Equation Model Approach

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**Abstract:** This paper empirically investigates the role of external factors which drives small and medium enterprises product innovation in the Visegrad Group. An empirical analysis is based on the Business Environment and Enterprise Performance Survey conducted by the World bank with a combined sample of 2002 small and medium enterprises (SMEs) in the Czech Republic, Slovakia, Poland, and Hungary. The results of the Structural Equation Model indicate that product innovation performance is slightly higher among SMEs that are proactive in strengthening their relationships with innovative suppliers, users, and consumers. Furthermore, the findings of this paper support the view that SMEs will have better new product development results if they improve their relationships with foreign-owned firms and collaborate with external research firms. Again, the empirical study will give insights into the SME's product innovation outcomes in the Visegrad Group and a wake-up call to SME's practitioners and stakeholders on the need to collaborate externally across the European regions.

**Keywords:** Product Innovation, innovation outcomes, SMEs, Visegrad countries, structural equation model

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## 1. Introduction

Product innovation refers to a new breed of products that evolves from an existing product with existing technologies and provide substantial consumer satisfaction (Kim et al., 2018). With the potential to ensure keen competition among competitors, product innovation drives firms' growth and ensures a greater market share (Medda, 2020). Product innovation development across the Visegrad is therefore enticing numerous research efforts. Several studies have drivers to product innovation, among which extent R&D has received prominent attention in recent literature (Zajac et al., 2000; Albert 2016). For example, some studies emphasize that external R&D contributed to product innovation (Kim et al., 2018; De Marchi et al., 2018).

Despite the great interest in this literature, few studies have paid less attention to the role of external markets, technology licensed from foreign-based firms and external knowledge with other firms. Prior studies tend to conceptualize internal factors rather than those that stabilize small and medium enterprises within the Visegrad countries. However, the content of firms' external factors is essential since innovation can never be materialized without external collaborations with other firms (López-Cabarcos et al., 2019). Based on different classifications of knowledge, we classify external knowledge into two: external knowledge from other firms and external knowledge on R&D with foreign-owned firms and assess how they contribute to product innovation within the Visegrad countries.

Secondly, most extant literature has asserted that external learning is beneficial to innovation (Wu, 2021; Odei & Stejskal, 2018; Odei et al., 2021): yet fewer studies have assessed how adequate knowledge from external firms has been helpful to small and medium enterprises (Odei et al., 2020). According to Zajac et al. (2000), the contingency theory asserts the effectiveness of SME strategy depends on the strategic plans and the business environment. Thus, the impact of external learning, technology license acquisition with foreign-owned firms and how the external markets contribute to product innovation across the Visegrad countries.

The study aims to address these two research gaps. It assesses the effects of the two types of external learning (i.e., R&D with other firms and sharing of knowledge with foreign firms) on product innovation and the role played by the external market and technology acquisition from foreign-owned firms.

## 2. Literature review

### 2.1 External learning perspective

Small and medium enterprises' organizational learning happens either within or beyond the boundary of firms (Odei et al., 2021). Within the firms, employees are compelled to learn from the experience. Externally, firms collaborate with research and development (R&D) and share knowledge with foreign-owned firms. External

collaborations open up avenues that promote product development and ensure higher turnover (Albert, 2016). Again, external knowledge increases small and medium enterprises' chances of being involved in radical innovation, while internal knowledge enables employees to have sufficient knowledge and novel ideas.

Consistent with the literature on organizational learning (De Marchi et al., 2018), we define external knowledge as sharing R&D with other firms and ideas with external or foreign-owned firms. Knowledge can be grouped into two types: administrative and technical (Bao et al., 2012). Technical knowledge entails employing the technical knowledge systems in operating the firm. In contrast, administrative knowledge refers to firms' management system using employees to develop products through reward systems and internal competition (Bao et al., 2012). This knowledge classification scheme forms the basis of different focuses of external learning. In particular, technical learning refers to external R&D activities with other firms. For example, Visegrad firms are famous their innovation capability based on collaboration with other foreign-owned companies, which enables them to learn new technologies from stronger innovator countries such as Germany and the United (Ivanová & Masárová, 2018; Odei et al., 2021). Organizational learning refers to learning management systems and improving services within the firm. For instance, some firms conduct weekly and monthly training for employees to be well equipped about their business operations (Anderson & Odei, 2018).

We therefore propose the following;

*H1: External Knowledge with other firms contributes to Product innovation among SMEs in the Visegrad countries,*

*H2: Research and development(R&D) with other firms contributes to Product innovation among SMEs within the Visegrad countries*

## **2.2 Technology license acquisition and product innovation**

Prior studies identify small and medium enterprises merging with foreign-owned firms as a critical factor for the successful development of product innovation. According to (López-Cabarcos et al., 2019), acquiring technology licenses with other firms strongly impacts product innovation because this protects firms' innovation activities from being directly copied by competitors. Thus, there is a need to diversify their technology license with other firms. Product innovation would be fully developed and can achieve its potential in the business environment when small and medium enterprises form a strong partnership (Odei et al., 2020). Again, acquiring a technology license externally leads to a high level of technological munificence and expands the scope of technical knowledge available for learning, contributing to the product innovation firm. To insulate core competence from the threat of external technological changes, small and medium enterprises may have to switch resource allocation from internal knowledge and acquire technology licenses from foreign-owned firms. Firms need to collaborate with external and trusted firms to avoid fearing the potential threat from competitors as teaming up ensures explosive growth of the product. We, therefore, propose that,

*H3: Technology licensed with foreign firms with other firms contribute significantly to SMEs product innovation*

## **2.3 External Markets and Product innovation**

External markets refer to the rate at which small and medium enterprises engage their consumers on the domestic and international front to develop their products. In the presence of competitive pressures, firms tend to narrow their focus on established markets and pay attention to the needs of existing consumers (Odei et al., 2020; Amponsah et al., 2020). According to Zajac et al. (2000), developing effective corporate strategies depends on financial stability and market dynamics. Firms conduct market research to develop existing products and meet the international product standards to ensure more significant profit margins. Again, firms involved in market research would enable them to discover new markets and plan adequately on products based on living standards to meet consumer demands (Odei et al., 2021). Thus, there is a need to protect the firm's territory and its environments to ensure idea findings and products' technical and commercial development processes. We therefore propose that

*H4: Markets in which products are sold ensures product innovation among SMEs within the Visegrad countries.*

## **3. Data and methodology**

Data for the empirical study was from the Business Environment and Enterprise Performance Survey (BEEPS V), conducted by the World Bank and the European Bank for Reconstruction and Development (EBRD), from 2017 to 2019 with 2002 sample SME firms combined from Poland, Czech Republic, Slovakia and Hungary. The dataset provides variables for comparative innovation measurement scores and analysis for all member countries of the world bank. This dataset comprises an annual analysis of the SMEs sector across the Visegrad Countries. It

reveals some external factors that drive product innovation performance and inform policymakers on the need for rapid changes in product branding across the Visegrad groups.

The study subsequently adopted the Structural Equation Model (SEM) to develop a model to analyze and test the hypothesis. SEM was chosen due to its distribution-free assumption, predictive focus, and explanatory model development approach for understanding how external factors drive product innovation (Kock, 2015). Path analysis in SEM allows researchers to assess all the coefficients and establish a causal relationship as seen in multiple regression models (Kock & Lynn, 2012; Kock, 2010).

## 4. Results

This study carried out various measurements to determine the reliability of the constructs and the internal consistency of the model. These include convergent validity, composite reliability, and discriminant validity. According to Hair et al. (2017), construct reliability uses Cronbach's alpha coefficient to determine the actual composite weights and estimate error terms. Hair et al. (2017) emphasized that a Cronbach alpha equal to or greater than 0.7 is acceptable. Table 1 and Table 2 below show that all the constructs used have demonstrated this result. The model has shown that all the constructs were above 0.7 thresholds. The convergent validity measures the extent to which items are placed together in the structural model, which can be assessed by the Average Variance Extracted (AVEs) with at least minimum loading 0.50 and composite reliability (CR) with an acceptable minimum of 0.70 (Kock, 2015). All our constructs in this model have loadings higher than the 0.50 threshold.

### 4.1 Construct Reliability Tests

The construct reliability test which comprises of composite reliability, cronbach's alpha, average variance extracted, full collinearity variance inflation factor was 1.000.

**Table 1:** Combined loadings and cross-loadings

	MKT	TEC	INO	EXT	R&D
MKT	1	0.1416	0.0905	0.1084	0.1837
TEC	0.1416	1	0.0832	0.2637	0.1843
INO	0.0905	0.0832	1	0.1788	0.1346
EXT	0.1084	0.2637	0.1788	1	0.2443
R&D	0.1837	0.1843	0.1346	0.2443	1

Source: Own processing

### 4.2 Structural model results

Figure 1 below shows the results of the hypothesis testing. It can be seen that the strongest external factor that drives product innovation activities was firms' external knowledge with other firms (0.146). This result was followed by firms' external R&D activities with foreign-owned firms ( $\beta=0.09$ ), which was closely followed by external markets ( $\beta= 0.06$ ) and technology license from foreign firms (0.021) being the least. According to Cohen 1988 has posited that path coefficients can be very indicative depending on the effect sizes employed by researchers (i.e., whether the effects are minimal, moderate, or large). A value of 0.35 indicates a larger effect size, 0.15 indicates moderate, while 0.02 indicates a weaker effect size, which can be considered significant from a practical research point of view (Cohen, 1988). This means that this model has almost moderate predictive values except for 0.021.

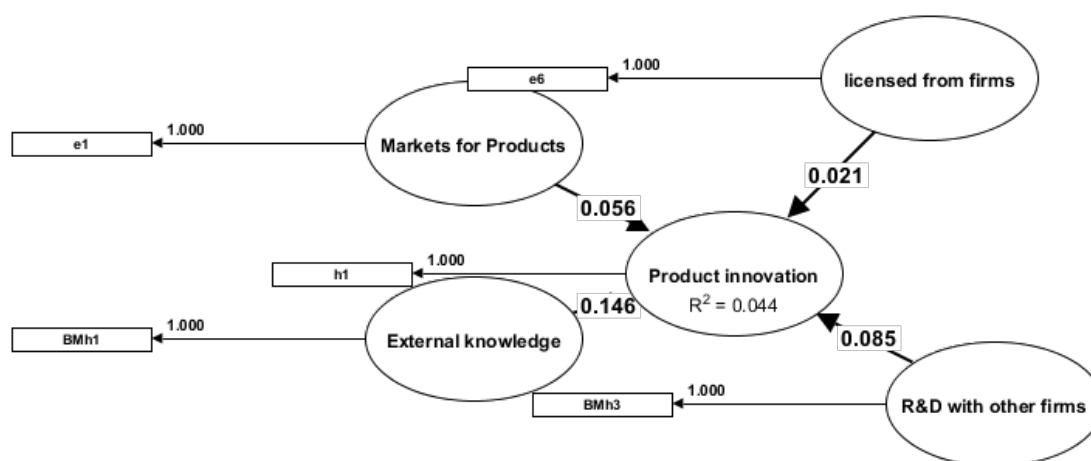


Figure 1: Results of hypothesis testing

Note: Dependent variable=Product innovation, H1(BMh1) =EXT (External Knowledge with other firms), H2(BMh3) =R&D (Research and development with other firms), H3(e6) =TEC (Technology licensed with foreign firms), H4(e1) =MKT (Markets for Products)

Source: Authors own processing based on Adanco 2.1 software

Table 2: Path Estimates and Hypotheses Testing

Hypothesis	Regression weights	P values	Remarks
H1(BMh1)>R&D	1.000	0.085***	Supported
H2(BMh3)>EXT	1.000	0.146*	Rejected
H3(e6)>TEC	1.000	0.021***	Supported
H4(e1)>MKT	1.000	0.056***	Supported

The path estimates indicate a positive and significant relationship between external research and development (with a p-value of 0.085), external technology licensed with foreign firms (with a p-value of 0.021) and external market for products (with a p-value of 0.056). However, external knowledge with other firms was insignificant, with a p-value of 0.146.

Source: Own processing

## 5. Conclusion

In conclusion, this paper established a link between external factors that drive product innovation within the Visegrad countries. The strongest positive influence on product innovation is external knowledge technology licenses from other firms and markets in which products are sold. The least determinant factor which was insignificant was the external research and development. Authors identified that external knowledge (H1) significantly contributed to product innovation. Firms hiring the services of consultants enables the firm to come up with new ideas as to how to contribute to product innovation. External consultants have always been helpful as they have sufficient knowledge about the field. They have always conducted research and contributed to SME's expansion the best. Firms utilize this new idea from consultants to maximize turnover. A study conducted by Be & Vavra (2020) affirms that external knowledge increases product innovation.

Again, the study discovered that external research and development with other firms (H2) does not contribute significantly to product innovation. This means that when SMEs collaborated with external research organizations, it was not beneficial for their product innovation. Our result contradicts similar research conducted by Odei et al. (2021), whose findings affirm that firms collaborating with research organizations contributed successfully to firms' product innovation.

Again, H3 support the study showing that technology licensed acquisition from other firms contributes to product innovation. This result is not surprising because all inventions need to be protected and prevented from emulating. The license acquisition also helps SMEs register their innovations to have a credible trademark record and instils trust in customers. However, our results are similar to findings by Knell (2017), who discovered that

licensed acquisition from the technology transfer offices contributed significantly to business innovation within the Visegrad countries.

Furthermore, the results of the empirical analysis have demonstrated that markets in which products are sold within the Visegrad countries contribute significantly to product innovation. SMEs should not overlook the market (*H4*) is an external factor that SMEs should not ignore. Whether products would be sold locally or on the international front, firms need to have their research team conduct a survey to know consumer preferences and adapt quickly to the market. Our results have shown that SMEs within the Visegrad countries conduct a market survey which has enabled them to satisfy their customers with business innovation (i.e., they factor standard of living and consumers demands to create product innovation). This supports *H4* and other research conducted by Odei et al. (2021), whose work concluded that the products' markets determine the level of product innovation within the Visegrad countries.

From the preceding discussion, this study strongly asserts that external factors that drive product innovation within the Visegrad countries are external knowledge technology licenses from other firms and markets in which products are sold. Given these factors, the necessary attention will help transform the SME sector for quality products which would help strengthen the rate at which customers patronize products. These factors buttress and form the basis of SMEs in the adoption of product innovation. The Visegrad countries are transition economies; therefore, forming an exclusive innovation policy will help facilitate innovation culture to promote a firm's competitiveness. We recommend future research should explore some governmental policies that drive product innovations. Again, other studies can also explore funding policies and limitations in adopting product innovation. Knowledge of this will broaden why most firms are unwilling to shift from their traditional production method and adopt new products.

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