

The impact of Innovation and Technology on
firms' Internationalisation - Does
Workforce influence firms' Performance?

José António Miranda Pereira

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MASTER

BUSINESS MANAGEMENT AND INTERNATIONALISATION

The impact of Innovation and Technology on firms' Internationalisation - Does Workforce influence firms' Performance?

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Professor Vítor Braga

Professor Aldina Correia

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Resumo

A interação entre práticas organizacionais, força de trabalho, desempenho e inovação é altamente relevante nos negócios modernos e na sua internacionalização.

A presente dissertação de mestrado encontra-se dividida em 2 artigos com os seguintes objetivos, respetivamente: (1) analisar o impacto da Tecnologia & Inovação no processo de Internacionalização das empresas, bem como a relação entre Inovação & Tecnologia e Internacionalização; (2) analisar o impacto da inovação e da mão de obra, mais especificamente, o impacto dos trabalhadores qualificados no desempenho da empresa.

O estudo e análise do impacto da Tecnologia & Inovação no processo de Internacionalização das empresas, bem como a relação entre Inovação & Tecnologia e Internacionalização (primeiro artigo), foi feito com base na análise quantitativa de dados secundários de 30 economias da Europa e da Ásia Central, extraídos da base de dados Enterprise Surveys - The World Bank, utilizando as técnicas estatísticas multivariadas Regressão Linear Múltipla e Análise de Clusters.

Os resultados do primeiro artigo sugerem que a Inovação e Tecnologia (I&T) influenciam mútua e positivamente a internacionalização das empresas. Neste sentido, as empresas inovadoras têm mais sucesso em competir internacionalmente e a exposição a contextos empresariais alternativos e mais arriscados resulta em inovação.

O estudo e análise do impacto da inovação e da mão de obra, mais especificamente, o impacto dos trabalhadores qualificados no desempenho da empresa foi feito com base nos dados de 38 economias da Europa e Ásia Central (Enterprise Surveys - The World Bank). Neste artigo utiliza-se o método fuzzy-set de análise comparativa qualitativa (fsQCA) para explorar a complexidade causal entre força de trabalho (mão de obra qualificada), inovação (condições), e desempenho (resultado).

Os resultados do segundo artigo sugerem que nenhuma das condições é necessária para o resultado (desempenho). No entanto, os resultados salientam o papel que a inovação desempenha no desempenho da empresa.

A originalidade desta investigação baseia-se na abordagem metodológica que permitiu a identificação das variáveis mais significativas para estimular a Internacionalização de empresas baseadas na Inovação & Tecnologia. Para além disso, a aplicação do método fsQCA, ajuda a melhorar a compreensão de como a inovação e a força de trabalho interagem de formas complexas para moldar o desempenho das empresas, e, segundo o nosso conhecimento, é uma abordagem inovadora ao estudo desta relação.

Palavras-chave: Internacionalização, Inovação, Tecnologia, Força de Trabalho, Desempenho

Abstract

The interaction between organizational practices, workforce, performance, and innovation is highly relevant in modern business.

This master's thesis is divided into 2 papers with the following objectives, respectively: (1) to analyse the impact of Technology & Innovation on the Internationalisation process of firms, as well as the relationship between Innovation & Technology and Internationalisation; and to (2) analyse the impact of innovation and workforce, more specifically, the impact of skilled workers on businesses performance.

The study and analysis of the impact of Technology & Innovation on the Internationalisation process of firms, as well as the relationship between Innovation & Technology and Internationalisation (first article), was based on a quantitative analysis of secondary data collected from 30 economies in Europe and Central Asia, extracted from the Enterprise Surveys - The World Bank database, using multivariate statistical techniques: Multiple Linear Regression and Cluster Analysis.

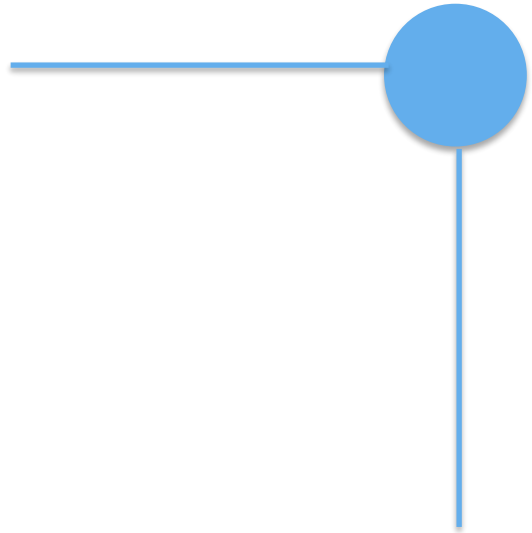
The results of the first paper suggest that Innovation and Technology (I&T) mutually and positively influence the internationalisation of firms. In this sense, innovative firms are more successful in competing internationally and exposure to alternative and more risky business contexts results in innovation.

The study and analysis of the impact of innovation and workforce, more specifically, the impact of skilled workers on firm performance was based on data from 38 economies in Europe and Central Asia (Enterprise Surveys - The World Bank database). This paper uses the fuzzy-set method of qualitative comparative analysis (fsQCA) to explore the causal complexity between workforce (skilled labour), innovation (conditions), and performance (outcome).

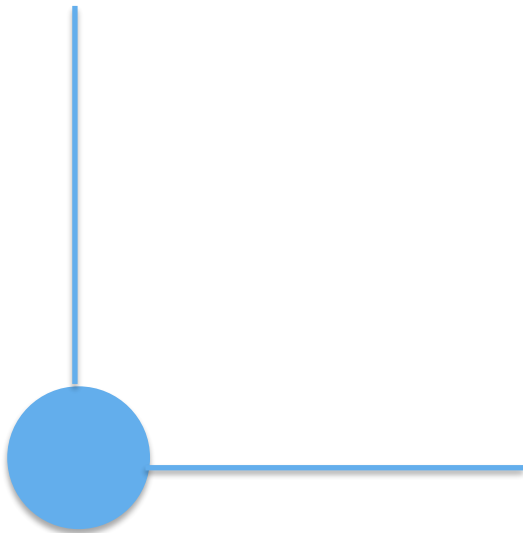
The results of the second paper suggest that none of the conditions is necessary for the outcome (performance). Nevertheless, the results highlight the role that innovation plays in firm performance.

The originality of this research is based on the methodological approach that allowed the identification of the most significant variables to stimulate the Internationalisation of Innovation & Technology based firms. In addition, the application of the fsQCA method, helps to improve the understanding of how innovation and workforce interact in complex ways to shape firm performance, and to our knowledge, is a novel approach to the study of this relationship.

Keywords: Internationalisation, Innovation, Technology, Workforce, Performance



CHAPTER I



Introduction

A rapidly changing globalized business environment, coupled with unprecedented advances on technology, requires firms to become more innovative and agile in the way they identify and respond to the changing needs and desires of their customers. Success or their survival depends on the ability to effectively and efficiently respond to the complex dynamics of the global market (Aydiner et al., 2019). The nature of the relationship between internationalisation and innovation (internationalisation-innovation relationship) is an important consideration for firms that conduct cross-border activities (Ding et al., 2021). However, Zivlak et al. (2017) state that, although there is a strong sense that both are strongly interrelated and connected, relatively few studies have been done to analyse the mutual relationship between innovation and internationalisation.

Additionally, there is a lack of consensus about the role innovation plays in the performance of firms (Jiménez-Jiménez & Sanz-Valle, 2011). According to Simpson et al. (2006), innovation is a costly and risky activity, with positive results in entrepreneurial performance, but also with negative results. In addition, it should be noted that, to date, studies have examined the impact of these antecedents in isolation from one another. Previous research provides little evidence into whether one, all, or combinations of these antecedents need to be present to positively affect firms' performance. While there are studies on the relationship between innovation and performance in isolation, or between a skilled workforce and firm performance, there is a lack of studies that study the relationship between the three variables. More specifically, on the impact that innovation and workforce have on firm performance.

Motivated by the importance of this topic for international business and in response to the identified research gap, this master's thesis has two main objectives: (1) to understand the relationship between Innovation & Technology and Internationalisation; and (2) to analyse the impact of innovation and workforce, more specifically, the impact of skilled workers on firms' performance.

The data for this research were collected from the Enterprise Surveys database - The World Bank. While for the first paper data was collected from 30 economies in Europe and Central Asia, for the second paper, 38 economies in Europe and Central Asia.

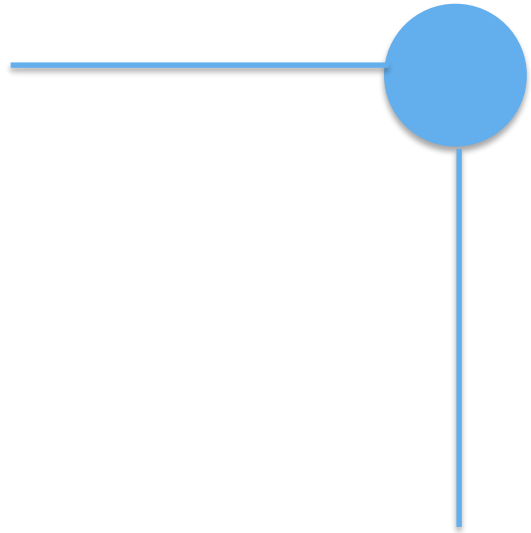
The statical analysis, and study of the data of the first paper was performed using the SPSS (Statistical Package for the Social Sciences). First, a descriptive analysis of the sample was carried out, as well as the association between the variables I&T and Internationalisation. Subsequently, a Multiple Linear Regression was performed to understand how Innovation & Technology drive the internationalisation of firms. A cluster analysis was performed to understand how the economies were distributed in terms of Innovation & Technology and Internationalisation.

To analyse the impact of innovation and workforce, more specifically, the impact of skilled workers on firm performance (second paper) the fsQCA was used.

This study contributes to theoretical development in the field of innovation and business performance by providing a more comprehensive understanding of the combinations of factors that lead to high firm performance, but also for a better understanding of the direct and indirect impact of internationalisation on innovation.

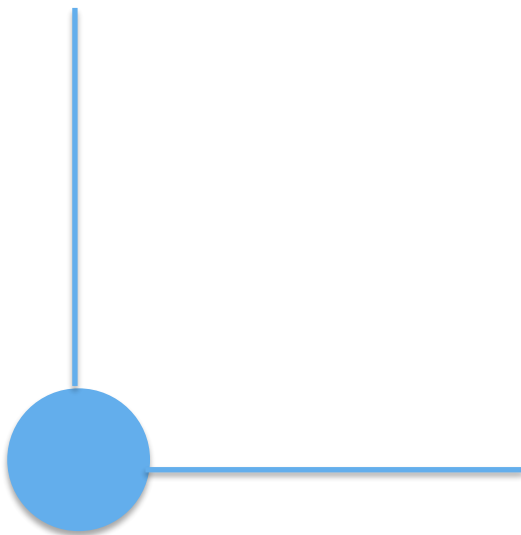
To achieve the above-mentioned objectives, the dissertation is divided into 4 fundamental parts. The First Chapter presents an introduction to the theme. The Second Chapter concerns the study named "Impact of Innovation & Technology on

Internationalisation" which aims to analyse the impact of technology and innovation on the internationalisation process of firms, as well as the relationship between Innovation & Technology and Internationalisation. Regarding the Third Chapter, the study named "Impact of Innovation and Workforce on firm Performance: A Fuzzy-set of qualitative comparative analyses" is presented, aiming to analyse the impact of innovation and workforce, more specifically, the impact of skilled workers on firm performance. At last, the Fourth Chapter, presents the main conclusions of this research work.



CHAPTER II

Submitted and presented at 2 Conferences¹²



¹ TAKE 2021 – Theory and Applications in the Knowledge Economy

² Regional Helix '21 – International Conference on Territorial Dimensions of Green and Digital Transitions

Impact of Innovation & Technology on Internationalisation

Abstract

This study aims to analyse the impact of technology and innovation on businesses internationalisation process as well as the relationship between Innovation & Technology and Internationalisation.

The study was based on quantitative analysis of secondary data from 30 economies in Europe and Central Asia, extracted from the Enterprise Surveys – The World Bank database, using the multivariate statistical techniques Multiple Linear Regression and Cluster Analysis.

The results suggest that Innovation & Technology (I&T) mutually and positively influence the internationalisation of firms. In this sense, innovative firms are more successful in competing internationally and exposure to alternative business contexts culminates in innovation.

The originality of this research is based on the methodological approach that allowed the identification of the most significant variables for stimulating the Internationalisation of firms based on Innovation & Technology.

Our results suggest a positive relationship between the percentage of firms that introduced a process innovation, the percentage of firms with websites and the businesses internationalisation.

Given the predominance of economies with higher I&T and Internationalisation in Europe, it is proposed as future research projects to ascertain the reasons for such a phenomenon.

Keywords – Internationalisation, Innovation & Technology, Europe, Central Asia, Multiple Linear Regression.

1. Introduction

The nature of global economic growth has been affected by the speed of Innovation & Technology, embodied in an organizational pillar, but also on the basis for the survival of organizations (e.g., Du Plessis, 2007; Freeman and Soete, 2007; Schuh et al., 2016; Donbesuur et al., 2020; Tsegaye et al., 2020).

The nature of the relationship between internationalisation and innovation (internationalisation-innovation relationship) is an important consideration for firms that conduct cross-border activities (Ding et al., 2021).

However, Zivlak et al. (2017) they state that, although there is a strong sense that both are strongly interrelated and connected, relatively few studies have been done to analyse the mutual relationship between innovation and internationalisation.

In recent years, research on innovation and internationalisation have linked these two concepts through linear causality (Molero, 1998), in which one concept causes another, but with difficulties to propose a cause of the latter on the former. Chiva et al. (2014)

adopt a deterministic worldview in which the universe is no more than a chain of events that follow one after another, according to the law of cause and effect. Moreover, and since some articles conclude that one concept affects another and others find otherwise, this body of research may be considered contradictory or inconsistent (Chiva et al., 2014). Therefore, a new approach is needed to clarify and understand the dynamics of this relationship.

Understanding the direct and indirect impact of internationalisation on innovation are important considerations for public and private policy. In this sense, strong evidence in this area is important for managers involved in developing international management strategies and systems, as well as for national and international policy makers concerned with promoting innovation.

Motivated by the importance of this topic for international business and in response to the identified research gap, the main objective of this paper is to understand the relationship between Innovation & Technology and Internationalisation in a group of 30 economies in Europe and Central Asia based on the Enterprise Surveys database - The World Bank.

This research consists of 4 chapters. In the first chapter the literature was reviewed to explore the impact and relationships that the variables under study have on the international behaviour of firms, culminating in the construction of a conceptual model. The methodology chapter explains the various techniques of data analysis to fulfil the purpose of the initially established research. Subsequently, in the third chapter, the results obtained with the analysis techniques are presented. Finally, in the fourth chapter the results are discussed, limitations and proposals for future research are set out.

2. Literature Review

2.1. Innovation & Technology

The fundamental change in the global business landscape and the dynamic nature of customer needs have led firms to develop new strategies and change existing ones to remain relevant and competitive in the domestic and foreign markets (Donbesuur et al., 2020).

The nature of global economic growth has been affected by the speed of innovation, which has become possible due to rapidly evolving technology, shorter product lifecycles and a higher rate of new product development (du Plessis, 2007; Schuh et al., 2016).

Drucker (1954), one of the first scholars to address the importance of innovation capacity for organizations, suggests that a firm must be innovative to survive in a volatile environment.

Innovation, however, has become increasingly complex, expensive, and risky due to changing customer needs, competitive pressure and rapid technological change (Griffin, 1997; Cavusgil et al., 2003).

Innovation is defined in many ways in the literature. Table I summarizes some of the definitions that can be found in the literature.

Table I. Innovation Definitions and their theoretical support.

Definitions	Authors
Innovation is characterized by the introduction of a new production function.	(Schumpeter, 1934)
Intention to create value and distinguish competitors.	(Teece, 1986)
Innovation can be described as a means of changing an organization, either in the form of responding to changes in the external environment or as a preventive action to influence the environment.	(Damanpour, 1996)
The innovation process encompasses the technical, physical, and knowledge-based activities that are central to the formation of product development routines.	(Cardinal et al., 2001)
Innovation is the adoption of a new idea or behaviour for the organization.	(Harkema, 2003)
Innovation refers to the introduction of a new combination of essential production factors in the production system.	(Chen and Zhu, 2004)
Innovation can be widely described as the implementation of discoveries, interventions, and the process by which new results, whether products, systems or processes, arise.	(Gloet and Terziovski, 2004)
Innovation can be a new product, a new service, or a new technology.	(du Plessis, 2007)
Innovation is often the result of a new combination of knowledge inputs, defined as the fundamental parts of knowledge that constitute innovative ideas.	(Savino, Petruzzelli and Albino, 2017; Petruzzelli, et al., 2018)

For our study, the definitions of innovation of Damanpour (1996), Harkema (2003) and du Plessis (2007) will be considered. In this sense, innovation is defined as a response to changes in the external environment through the adoption of a new idea or behaviour for the organization, which may be in the form of a new product, a new service or a new technology.

The literature on innovation fundamentally examines how the characteristics of the organization affect the choices of the innovation portfolio of firms (Christensen, 1997). While established businesses typically create more incremental innovations (Henkel et al., 2015) younger firms are more successful in introducing radical innovations (Gloet and Terziovski, 2004; Huvaj and Johnson, 2019).

Incremental innovations present themselves as line extensions or modifications of existing products. They are generally classified as innovations that attract the market (Gloet and Terziovski, 2004; Sheng and Chien, 2016). Incremental innovation does not require a significant rupture of the business practices already implemented and is, therefore, likely to enhance existing internal skills, providing the opportunity to develop know-how. On the other hand, radical innovations commonly put businesses at risk because they are more difficult to market. Radical innovations are considered crucial for

long-term success as they involve the development and application of new technologies, some of which may challenge existing market structures (Gloet and Terziovski, 2004; Sheng and Chien, 2016).

However, the previous literature reviews the relationship between the characteristics of firms and innovation portfolios in a static way (Sorescu et al., 2011).

The economic environment of enterprises has developed in an increasingly complex way in recent years. Technological innovations, especially in the field of e-business, have strengthened the process of globalisation and have threatened the internal market with strong competition from foreign actors (e.g., Hansen, 1992; Christensen, 1997; Czarnitzki and Kraft, 2004; Teirlinck, 2017; Petruzzelli et al., 2018).

Firms seek to continually innovate more effectively, both within and outside their main markets and product lines. According to Witzeman et al. (2006), this resulted in the practice of "open innovation", in which firms recognize that all components of an innovation do not need to come from within, that they can accelerate their own efforts or perhaps even broaden the scope of these efforts by externally acquiring some of the necessary technology. However, Fagerberg (1987, 1994) highlighted the emergence of the "theory of the technological gap of economic growth", due to the failure of formal theories of growth in recognizing the role of innovation and diffusion of technology in global economic growth.

These formal theories have totally ignored the spread of innovation or assumed that technology is a global public good created outside the economic sphere and therefore could (should) be ignored by economists (Fagerberg and Verspagen, 2002). However, it became obvious, to many scholars the long-term growth, that the perspective on which this formal theorization was based had little to offer for understanding the actual processes of growth. Instead of a global public good, available to all, free of charge, it became clear that there were significant technological differences (or gaps) between rich and poor countries, and that it was embodied in the technological update (reducing the technological gap). According to Fagerberg and Verspagen (2002), this was perhaps the most promising path that poor countries could follow to achieve long-term growth.

Innovation activities impose a considerable demand on a firms's information processing capabilities (Kroh et al., 2018). Information technology (IT) tools should support internal and external information flows, thereby improving a firm's information processing capabilities (Kroh et al., 2018). Innovation and information technology are critical to effective knowledge management (Kroh et al., 2018; Lecerf and Omrani, 2020).

Support in the form of collaboration, coordination and communication through IT is increasingly important for innovation (Peng et al., 2014; Kowalkowski et al., 2017; Saldanha et al., 2017). For example, website-based innovation platforms, innovation process management software and social media facilitate information flows within and across company boundaries (Marion et al., 2014; Moe and Schweidel, 2017).

In this sense, IT allows greater adaptability to the environment (Das et al., 1991) and improves the flow of information (Hansen, 1999), thus developing international competitiveness (Kroh et al., 2018). Thus, it is generally recognized that the impact of IT investment is significantly positive (Dedrick et al., 2003; Kroh et al., 2018).

2.2. Innovation & Technology and Internationalisation

Although innovation, technologies and internationalisation have been presented as key factors in the literature, their possible relationships have not been extensively studied (Donbesuur et al., 2020; Lecerf and Omrani, 2020; Vrontis and Christofi, 2019).

Previous studies have found evidence that export performance impacts on IT investment (e.g., Poon and Jevons, 1997; Etemad and Wright, 1999; Rialp and Rialp, 2001; Knight and Liesch, 2002). IT has provided new opportunities for the internationalisation of firms, for example by offering direct access to foreign markets (Lecerf and Omrani, 2020). However, IT supports internationalisation due to the high cost of innovation. IT reduces the distance and cost of contacting potential foreign business partners, enabling firms based in multiple countries to benefit from direct access to local knowledge (Lecerf and Omrani, 2020). Despite evidence of the positive impact of IT on innovation and internationalisation, substantial issues remain. Firms tend to invest considerable resources in IT. While their overall returns on investment are positive, the differences across firms are considerable. Some firms make large investments with little return, while others achieve more success. The point is to understand this heterogeneity. Few empirical studies have looked at how innovation interacts with IT resources to improve the internationalisation of firms (Lecerf and Omrani, 2020).

Technological resources can significantly influence the internationalisation and international activities of firms (Rodríguez and Rodríguez, 2005). This interaction between internationalisation and innovation was explicitly addressed by several scholars (Filippov, 2011). Saarenketo et al. (2004), argue that internationalisation is mandatory for firms in some high-tech sectors that only have a few potential domestic customers. Similarly, Kafouros et al. (2008), state that firms need to be sufficiently present in various markets to capture the fruits of innovation. In other words, they see internationalisation as a necessary condition for innovation. Others, such as Kyläheiko et al. (2011), position innovation and Internationalisation as a trade-off.

In fact, the literature on innovation suggests that technological and organizational innovation individually boosts the company's performance (Damanpour and Aravind, 2012), including international performance (Donbesuur et al., 2020).

According to Keeble et al. (1998), internationalisation is a very important process that sustains the innovative activities and technological dynamism of firms. The return of innovation may be affected by the internationalisation (Kafouros et al., 2008; Pittiglio et al., 2009). Hitt et al. (1997), illustrated that international firms can benefit from geographical and product diversification through economies of scale. Criscuolo et al. (2005) e Wagner (2006), demonstrated that international firms innovate more thanks to access to a greater flow of ideas from external sources.

It has been claimed that firms operating in many countries learn from different contexts of innovation and therefore can benefit from them (e.g., Criscuolo et al., 2005; Wagner, 2006; Kafouros et al., 2008; Pittiglio et al., 2009; Filippetti et al., 2011; Filippov, 2011; Kyläheiko et al., 2011; Nosi et al., 2017). The sources of learning and knowledge acquisition can be many. If a country's firms are highly internationalised, it is likely to display a higher innovation performance (Filippetti et al., 2011; Kafouros et al., 2008) because: (1) its resources, products and institutions are exposed to alternative contexts of innovation, which allows firms and people to learn in different environments; and (2) competition forces firms to innovate (Filippetti et al., 2011). In this sense, knowledge transmission mechanisms can be many and engage relationships between customers and

vendors, principals and contractors, academic research networks or employees who work for various institutions or move between different employers. These mechanisms operate at national and international level (Filippetti et al., 2011). At the international level, transnational firms have a specific and additional transmission mechanism that operates through the company's internal network. Knowledge is transmitted through contacts between each transnational unit (whether subsidiary or headquarters) and exchanged with the local environments in which the units operate (Filippetti et al., 2011).

Considering, specifically the interaction between innovation and internationalisation, it seems that innovation may be the necessary condition for internationalisation or may be the target of external expansion (Filippov, 2011; Lecerf and Omrani, 2020).

Pittiglio et al. (2009), suggest that firms operating in the international market generate more knowledge than their counterparts that sell only on the domestic markets. This can be justified essentially by two reasons, namely: (1) international firms employ more knowledge inputs, such as higher spending on innovation; and (2) international firms are more innovative because they can have access to a larger flow of ideas from external sources (Pittiglio et al., 2009).

In a way, innovative firms are more successful in competing internationally and exposure to alternative business contexts leads to innovation (Filippetti et al., 2011).

Based on the literature, we constructed a model to test the mutual relationship between innovation & technology, and internationalisation (see Figure 1). This leads us to formulate the following hypotheses:

H1: As the level of innovation and technology increases, the likelihood of internationalising is higher.

H2: As the firm increases its involvement with foreign markets, the level of innovation and technology is higher.

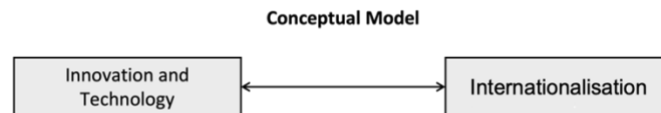


Figure 1. Conceptual model.

In this sense, it is intended to ascertain not only what is the impact of technology and innovation on the process of internationalisation of firms, but also the influence of internationalisation on innovation.

3. Methodology

The literature review was important not only for the proposal of the conceptual model of research and understanding of the object of study, but also for setting out the rationale and choice of variables that best defined I&T and Internationalisation (see Table II).

Data were extracted from the Enterprise Surveys – The World Bank database. The sampling methodology leading to business research is based on stratified random sampling, i.e., all population units are grouped homogeneously, and simple random

samples are selected within each homogeneous group. The sample resulted in a group of 30 economies in Europe and Central Asia.

The treatment, analysis and study of the data was performed using the SPSS (Statistical Package for the Social Sciences). First, a descriptive analysis of the sample was carried out, as well as the association between the variables I&T and Internationalisation. After that, a Multiple Linear Regression was performed to understand how Innovation & Technology drive the internationalisation of firms.

Table II. Explanatory variables/Theoretical support

Explanatory variables	Measurement	Acronym	Theoretical support
Internationalisation	“Percent of firms exporting directly or indirectly (at least 10% of sales)”	T1	(Chowdhury, 2018; Joahanson and Vahlne, 1977; Johanson and Wiedersheim-Paul, 1975; Morgan and Katsikeas, 1997; Rutashobya and Jaensson, 2004)
	“Percent of firms exporting directly (at least 10% of sales)”	T2	
Innovation & Technology	“Percent of firms using technology licensed from foreign companies”	IT1	(Mansfield, 1968; Teece, 1986; Damanpour, 1996; Castellani and Zanfei, 2007; Pittiglio et al., 2009; Damanpour and Aravind, 2012; Sarfaraz et al., 2014; Alves et al., 2017; Suarez-Perales et al., 2017)
	“Percent of firms having their own Web site”	IT2	
	“Percent of firms that introduced a new product/service”	IT3	
	“Percent of firms whose new product/service is also new to the main market”	IT4	
	“Percent of firms that introduced a process innovation”	IT5	
	“Percent of firms that spend on R&D”	IT6	

4. Results

4.1. Descriptive Analysis

The sample consists of firms from 30 different economies in Europe and Central Asia extracted from the World Bank Enterprise Surveys database in 2019 and 2020.

Regarding the characteristics of the firms, more specifically their age, on average, they are 17 years old. Nevertheless, it is possible to see that the 50% of the firms under analysis have 18 or more years of activity. The countries with the oldest firms have an average age of 58 years. In this set of variables, it is also possible to conclude that, on average, the countries have 6.5% of firms that held in at least 10% of foreign capital. Finally, according to the database we can see that, on average, the countries have 18.6% of firms that are characterized by having an internationally recognized quality certificate.

As for the variables associated with **innovation and technology**, it is verified that: (1) on average, the countries have (1) 17% of firms that use technology licensed from foreign firms; (2) approximately 61% of firms that have their own *website*; (3) approximately 30% of firms that seek to introduce new products/services on the market, with (4) 64% of firms introducing new products/services on the market, also new to the main market; (5) approximately 16% of the firms that implement/introduce innovative processes; and finally, (6) only 8.55% of firms that have spent on Research & Development.

Regarding the variables related to **internationalisation**, it is observed not only that, on average, the countries hold 20.55% of firms that export directly or indirectly at least 10% of their sales, but also that, on average, approximately 16% of firms that have direct export relationships in at least 10% of sales.

4.2. Association between variables

4.2.1. *Interdependence between Innovation & Technology and Internationalisation*

Since the variables under analysis are quantitative, for the study of their interdependence, we used the variable association test, using the scatter diagram and Pearson's r .

It should be noted that two variables were created, namely "Innovation and Technology" (InTec) and "Internationalisation", as a result of the sum of the variables that are associated with them (Table II).

$$InTec = \frac{IT1 + IT2 + IT3 + IT4 + IT5 + IT6}{6}$$

$$Internationalisation = \frac{T1 + T2}{2}$$

According to the Shapiro-Wilk normality test there is statistical evidence to consider that the variables follow a normal distribution.

Table III. Correlation between variables.

		Innovation and Technology	Internationalisation
Innovation and Technology	Pearson Correlation	1	,632**
	Sig. (2-tailed)		,000
	N	30	30
Internationalisation	Pearson Correlation	,632**	1
	Sig. (2-tailed)	,000	
	N	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

Considering table III, for a confidence level of 95%, the variables Innovation and Technology and Internationalisation are correlated.

According to Maroco (2011) it is concluded that there is a strong positive relationship between the two variables since Pearson's r is between $0.5 < r < 0.75$. In this sense there is statistical evidence to consider that as Innovation & Technology increases, Internationalisation also increases.

4.3. Multiple Linear Regression

4.3.1. How does Innovation & Technology drive the Internationalisation of firms?

To study how Innovation & Technology drive the Internationalisation of firms, the multivariate analysis method (Multiple Linear Regression) was used.

The variables used in the method were as follows:

- (1) Dependent variable – Internationalisation.
- (2) Independent variables – IT1, IT2, IT3, IT4, IT5 e IT6 (see Table II).

In this sense, multiple linear regression was initially approached by the **Enter method**.

Table IV. Summary of the model.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,815 ^a	,664	,577	6,86786	2,239

Adjusted R Square shows that approximately 57.7% of the variation in "Internationalisation" is explained by the independent variables IT1, IT2, IT3, IT4, IT5 and IT6.

The analyses of coefficients allow to conclude that the variables "Percent of firms having their own web site", "Percent of firms that introduced a process innovation" and "Percent of firms that spend on R&D" are the ones that most promote the internationalisation of firms. However, according to the Bonferroni correction (0.05/6) no variable is significant for the model. Thus, linear regression is again performed by the **Stepwise** approach.

After having performed the linear regression by the **stepwise** approach only the variables "Percent of firms that introduced a process innovation" and "Percent of firms having their own web site" enter the regression equation, embodying those that contribute most to the firms' internationalisation.

Table V. Summary of the model.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,691 ^a	,477	,459	7,76669	
2	,791 ^b	,626	,599	6,68757	2,196

The adjusted R Square shows that approximately 59.9% of the variation in "Internationalisation" is explained by the independent variables "Percent of firms that introduced a process innovation" and "Percent of firms having their own web site".

From the analysis of the ANOVA test table there is statistical evidence to consider the model significant, since there is, at least, one of the variables having a significant effect on the dependent variable "Internationalisation".

Table VI. Coefficients.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6,943	2,631		2,639	,013		
	Percent of firms that introduced a process innovation	,707	,140	,691	5,058	,000	1,000	1,000
2	(Constant)	-6,725	4,742		-1,418	,168		
	Percent of firms that introduced a process innovation	,595	,125	,582	4,764	,000	,926	1,079
	Percent of firms having their own Web site	,253	,077	,401	3,281	,003	,926	1,079

a. Dependent Variable: Internationalization

It is concluded that for a $\alpha = 0.05/2$ (Bonferroni correction) the variables "Percent of firms that introduced a process innovation" and "Percent of firms having their own web site" are significant, resulting in the following equation of the adjusted model:

$$Y = - 6,725 + 0,595X_1 + 0,253X_2$$

From the above, it is noticed that the increase of the variable X₁ (Percent of firms that introduced a process innovation) represents an increase of 0.595 units in the variable Y (Internationalisation). In addition, an increase in the variable X₂ (Percent of firms having their own web site) represents an increase of 0.253 units in the variable Y (Internationalisation).

Linear regression application assumes that errors follow a normal distribution with zero mean and constant variance and that they are independent.

Regarding Multicollinearity there are no problems since the VIF value is less than 3 and the tolerance value is close to 1.

4.3.2. Multiple Linear Regression conclusion

Our findings support the view that there is indeed a strong positive relationship between Innovation & Technology and Internationalisation, corroborating the literature and highlighting the importance of internationalisation for innovation and vice versa. In this sense, hypotheses 1 and 2 are confirmed. That is, as the level of innovation and technology increases, the probability of internationalisation is higher, and as the company increases its involvement with the foreign market, the level of innovation and technology is higher.

Additionally, our study contributes to the literature in the extent that, it studies the relationship between Innovation & Technology and Internationalisation, which needs to be more extensively studied according to several authors (e.g., Vrontis and Christofi, 2019; Donbesuur et al., 2020; Lecerf and Omrani, 2020).

As stated by Kafouros et al. (2008), firms need to be sufficiently present in multiple markets to capture the fruits of innovation, i.e., internationalisation is a necessary condition for innovation. Kyläheiko et al. (2011), on the other hand, position innovation and internationalisation as a trade-off.

In this sense, our results are in line with the literature. Firms operating in many countries learn from and therefore can benefit from different innovation contexts. There are basically two ways in which (successful) innovation can cause the firm to start exporting, namely: (1) the creation of improved products or processes may increase the competitive advantage of the business, i.e., the firm may come up with better products or more efficient processes (resulting in faster services or lower prices), which may attract demand across borders (Hitt et al., 1997) and (2) firms that have invested in innovation may find their domestic markets too small to recoup the amounts invested and therefore may seek more buyers in other countries (Freixanet and Churakova, 2018).

In fact, the literature on innovation suggests that technological and organizational innovation individually boosts the company's performance (Damanpour and Aravind, 2012), including international performance (Donbesuur et al., 2020).

In the other hand, Criscuolo et al. (2005) and Wagner (2006), demonstrated that international firms innovate more thanks to access to a greater flow of ideas from external sources.

4.4. Cluster Analysis

4.4.1. Europe and Central Asia according to Innovation & Technology

By applying the Cluster Analysis method, it is intended to investigate whether there are differences between countries considering the variables representing innovation & technology. The aim was to group the countries using the K-means clustering method and discover structures in the data that separate the countries according to the above-mentioned variables. The number of clusters used in the K-means clustering method (two clusters) is based on the dendrogram (see Figure 2) that previously resulted from the hierarchical cluster analysis.

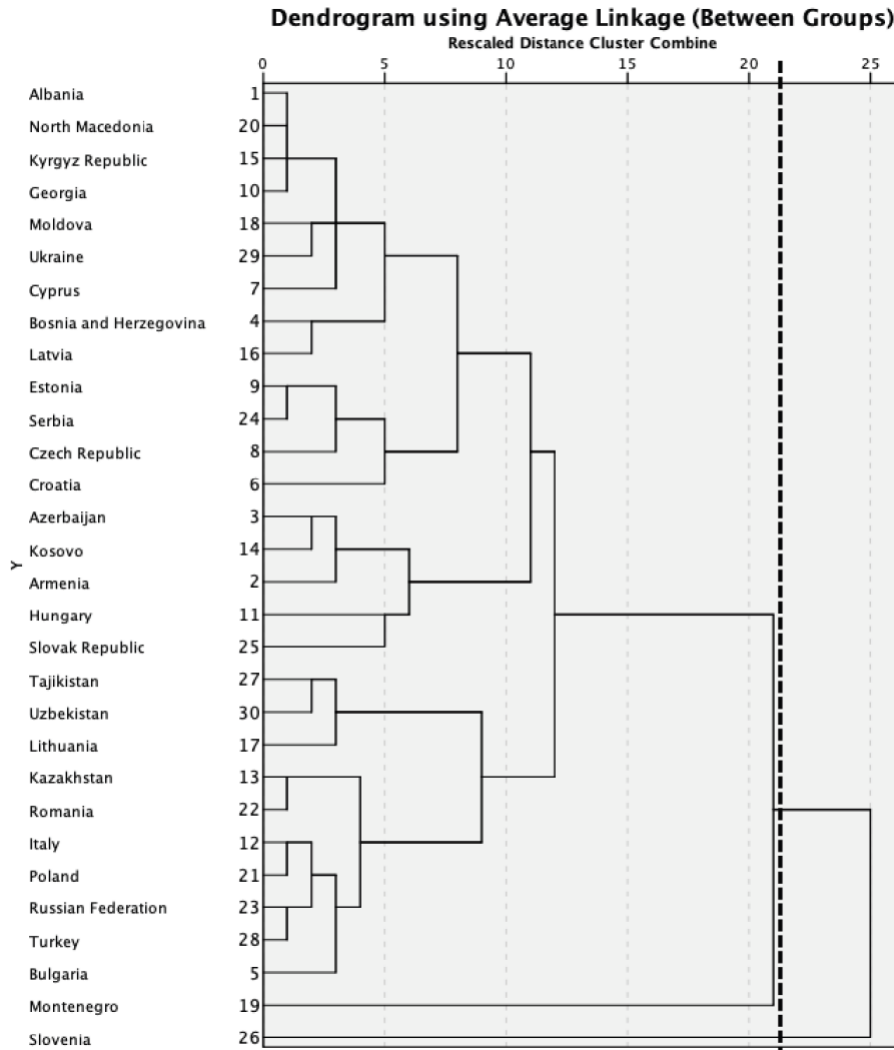


Figure 2. Dendrogram

We can conclude the existence of 2 clusters, namely: (1) Albania, Armenia, Azerbaijan, Bulgaria, Croatia, Hungary, Italy, Kazakhstan, Kosovo, Lithuania, Moldova, Montenegro, Poland, Romania, Russia Federation, Slovak Republic, Tajikistan, Turkey, Ukraine, Uzbekistan; (2) Bosnia and Herzegovina, Cyprus, Czech Republic, Estonia, Georgia, Kyrgyz Republic, Latvia, North Macedonia, Serbia, Slovenia (see Table VII).

Using **k-means**, countries are grouped to the clusters whose centroids they are closest to.

According to iteration history there are no differences in the classification resulting from the hierarchical cluster analysis.

Table VII. Cluster Composition

Cluster 1		Cluster 2	
Economy	Distance	Economy	Distance
Albania	1,917	Bosnia and Herzegovina	0,553
Armenia	2,354	Cyprus	2,095
Azerbaijan	3,480	Czech Republic	2,270
Bulgaria	1,433	Estonia	1,531
Croatia	2,444	Georgia	1,780
Hungary	1,710	Kyrgyz Republic	1,313
Italy	1,724	Latvia	1,777
Kazakhstan	1,341	North Macedonia	1,356
Kosovo	2,224	Serbia	1,486
Lithuania	2,509	Slovenia	3,120
Moldova	1,697		
Montenegro	3,503		
Poland	1,223		
Romania	0,875		
Russia Federation	1,822		
Slovak Republic	2,638		
Tajikistan	2,220		
Turkey	1,737		
Ukraine	1,366		
Uzbekistan	1,878		

Table VIII. Cluster centroids

	Cluster	
	1	2
Zscore: Percent of firms using technology licensed from foreign companies	,07205	-,14410
Zscore: Percent of firms having their own Web site	-,31159	,62318
Zscore: Percent of firms that introduced a new product/service	-,51985	1,03971
Zscore: Percent of firms whose new product/service is also new to the main market	-,03165	,06331
Zscore: Percent of firms that introduced a process innovation	-,49024	,98048
Zscore: Percent of firms that spend on R&D	-,48013	,96026

It can be observed that in cluster 1 there are economies with a percentage of firms that use licensed technology from foreign firms above the global average (because the value associated with the centroid is positive). On the other hand, there are economies in which the percentages of firms with their own website; introducing new products/services; introducing new products/services also new to the main market; introducing innovation processes; and, finally, investing in R&D are below the global average (because the value associated with the centroid is negative). As for cluster 2, the opposite is true.

From the above, we conclude that the economies in cluster 2 are characterized by greater innovation and technology than cluster 1.

According to the ANOVA test there is a good discrimination between the two clusters meaning that except for the variables mentioned above there is statistical evidence to consider that the means of the variables differ for the two clusters.

4.4.2. Cluster Analysis Validation

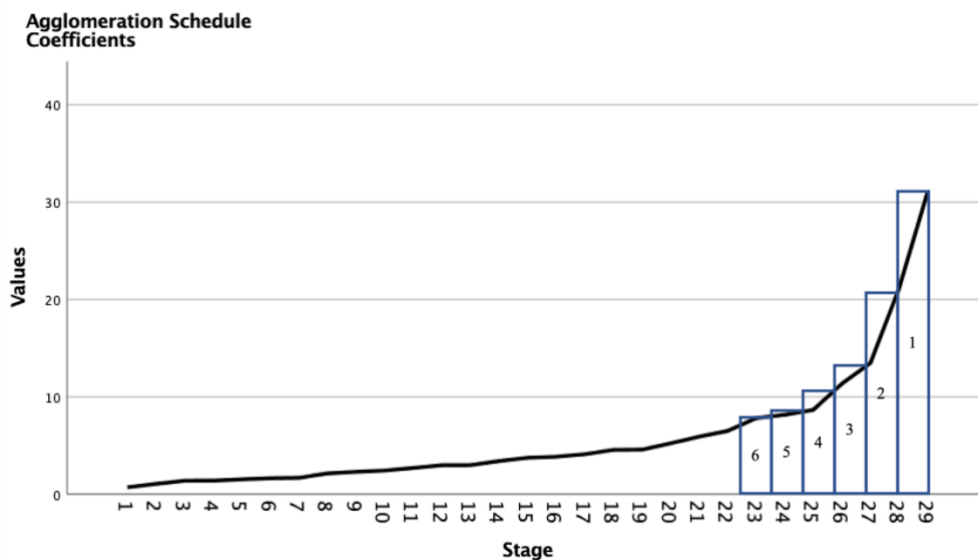


Figure 3. Crowding Schedule Coefficients

By analysing the figure above, we conclude that there is no significant difference between 4, 5 or 6 clusters. However, from 2 to 3 clusters there is an appreciable decrease. We conclude that the economies could be better grouped in 3 clusters.

Furthermore, according to the history of iterations the number of clusters is adequate because by the third iteration the method converges to zero.

In terms of cluster size, clusters 1 (12 economies) and 3 (12 economies) are balanced, while cluster 2 (6 economies) is not.

Table IX. Test for independent samples

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Zscore: Percent of firms using technology licensed from foreign companies	Equal variances assumed	3,817	,061	,551	28	,586	,21614995	,39203130	-,58688977	1,01918967
	Equal variances not assumed			,646	26,637	,524	,21614995	,33466687	-,47096847	,90326837
Zscore: Percent of firms having their own Web site	Equal variances assumed	,987	,329	-2,653	28	,013	-,93477175	,35234935	-1,6565267	-,21301683
	Equal variances not assumed			-2,936	23,643	,007	-,93477175	,31836723	-1,5923753	-,27716818
Zscore: Percent of firms that introduced a new product/service	Equal variances assumed	1,351	,255	-5,959	28	,000	-1,5595600	,26170954	-2,0956477	-1,0234723
	Equal variances not assumed			-6,427	22,140	,000	-1,5595600	,24267096	-2,0626447	-1,0564753
Zscore: Percent of firms whose new product/service is also new to the main market	Equal variances assumed	2,785	,106	-,241	28	,811	-,09496286	,39374493	-,90151280	,71158707
	Equal variances not assumed			-,286	27,127	,777	-,09496286	,33203964	-,77610245	,58617673
Zscore: Percent of firms that introduced a process innovation	Equal variances assumed	7,144	,012	-5,262	28	,000	-1,4707204	,27947538	-2,0431997	-,89824101
	Equal variances not assumed			-4,060	10,439	,002	-1,4707204	,36223131	-2,2732479	-,66819280
Zscore: Percent of firms that spend on R&D	Equal variances assumed	,706	,408	-5,053	28	,000	-1,4403902	,28506116	-2,0243115	-,85646884
	Equal variances not assumed			-4,570	14,138	,000	-1,4403902	,31519858	-2,1158052	-,76497510

It is denoted that the Levene test proof value is greater than 0.05 for all variables except for the variable "Percent of firms that introduced a process innovation". Thus, there is statistical evidence to consider the equality of variances in this set of variables. On the other hand, there is statistical evidence to consider the inequality of variances for the variable "Percent of firms that introduced a process innovation".

Regarding the t-test for $k=2$ we conclude the non-rejection of the equality of means in the two clusters observed for (1) "Percent of firms using technology licensed from foreign firms" and (2) "Percent of firms whose new product/service is also new to the main market". On the other hand, there is an inequality of means in the two clusters observed regarding (3) "Percent of firms having their own web site", (4) "Percent of firms that introduced a new product/service", and (5) "Percent of firms that spend on R&D". As for the variable (6) "Percent of firms that introduced a process innovation", it is considered that there is statistical evidence suggesting the inequality of the averages in the two clusters observed.

In summary, it is verified that the averages differ in the two clusters for most of the variables.

The analysis for $k=3$ shows that few variables present significantly different averages for the 3 clusters.

Therefore, it is considered appropriate to group the economies into 2 clusters.

4.4.3. Europe and Central Asia according to Internationalisation

In terms of Internationalisation the economies of Europe and Central Asia under analysis are grouped into 2 clusters.

Clusters by Internationalization

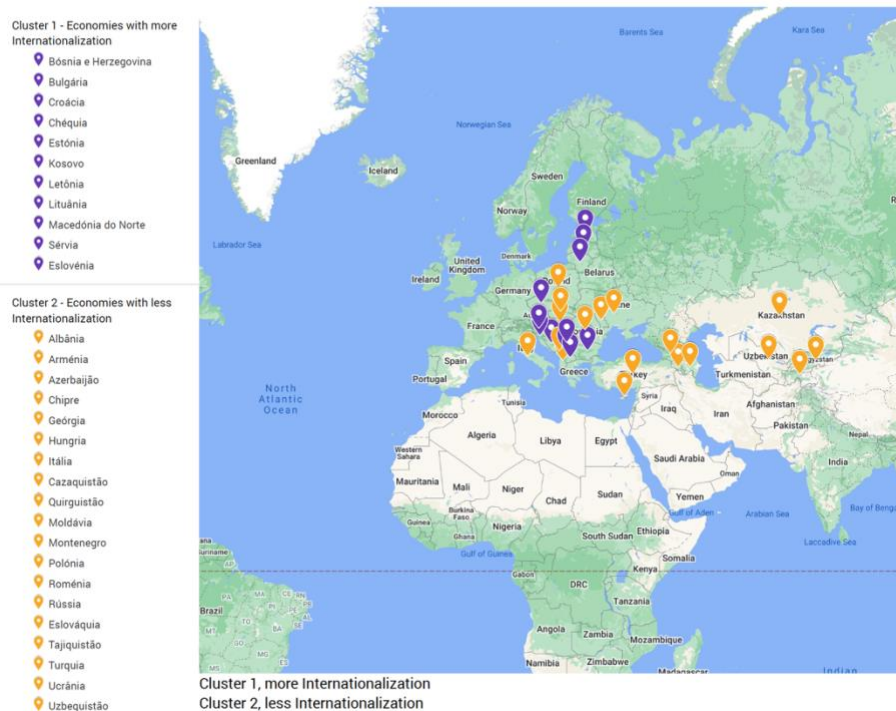


Figure 4. Grouping into clusters according to Internationalisation

As can be seen, the economies that make up cluster 1 (economies with higher internationalisation) are found in Europe, while the economies that make up cluster 2 (economies with lower internationalisation) are distributed across the 2 regions (Europe and Central Asia).

4.4.4. Cluster Analysis Conclusion

From the study carried out by the cluster analysis, the main conclusion is that the grouping of clusters according to Innovation & Technology results in 2 clusters, cluster 1 being characterized by less innovation and technology in relation to cluster 2. Regarding the grouping of clusters according to Internationalisation, 2 clusters also result, cluster 1 being characterized by greater internationalisation.

From the above, it appears that except for 7 economies (Bulgaria, Croatia, Cyprus, Georgia, Kosovo, Kyrgyzstan and Lithuania) the cluster characterized by greater innovation and technology (cluster 2) corresponds to the cluster characterized by greater internationalisation (cluster 1), as shown in the table.

Table X. Cluster Composition

Economy	Internationalization		Innovation & Technology	
	Cluster 1	Cluster 2	Cluster 1	Cluster 2
	+	-	-	+
Albania		X	X	
Armenia		X	X	
Azerbaijan		X	X	
Bosnia and Herzegovina	X			X
Bulgaria	X		X	
Croatia	X		X	
Cyprus		X		X
Czech Republic	X			X
Estonia	X			X
Georgia		X		X
Hungary		X	X	
Italy		X	X	
Kazakhstan		X	X	
Kosovo	X		X	
Kyrgyz Republic		X		X
Latvia	X			X
Lithuania	X		X	
Moldova		X	X	
Montenegro		X	X	
North Macedonia	X			X
Poland		X	X	
Romania		X	X	
Russian Federation		X	X	
Serbia	X			X
Slovak Republic		X	X	
Slovenia	X			X
Tajikistan		X	X	
Turkey		X	X	
Ukraine		X	X	
Uzbekistan		X	X	

5. Conclusion

Business competition is increasingly based on innovation (Freeman and Soete, 2007), and the literature on innovation suggests that technological and organizational innovation individually drives the company's performance (Damanpour and Aravind, 2012), including international performance (Donbesuur et al., 2020).

In fact, according to the Association between Variables it is concluded that there is a strong positive relationship between the variables Innovation & Technology and Internationalisation. Thus, if a country is highly internationalised, it is likely to have a higher innovation performance (Filipetti et al., 2011; Kafouros et al., 2008).

The Multiple Linear Regression (**Stepwise** method) demonstrates that the variables "Percent of firms that introduced a process innovation" and "Percent of firms having their own web site" are the ones that most contribute most to the internationalisation of firms explaining approximately 59.9% of the variation of "Internationalisation". These conclusions are in line with the literature in the sense that IT allows greater adaptability

to the environment (Das et al., 1991) and improves the flow of information (Hansen, 1999), developing international competitiveness (Kroh et al., 2018). The literature also suggests that technology and innovation strategies are the precursors for firms to expand and compete in foreign markets (Kyläheiko et al., 2011; Ren et al., 2015; Amankwah-Amoah et al., 2018), emphasizing the importance of creating websites and implementing innovation in organizational processes. In other words, specifically considering the relationship between I&T and Internationalisation, it appears that I&T may be the precondition necessary for internationalisation or may be the result of external expansion (Filippov, 2011; Lecerf and Omrani, 2020).

From the Cluster Analysis we obtain that the grouping of clusters according to Innovation & Technology results in 2 clusters, cluster 1 being characterized by less innovation and technology in relation to cluster 2. Regarding the grouping of clusters according to Internationalisation also results in 2 clusters, cluster 1 being characterized by greater internationalisation than cluster 2. It should be noted that the economies with greater internationalisation are in Europe while the less internationalized are distributed in Eastern and Southern Europe and Central Asia. Furthermore, the results suggest that, except for 7 economies, the economies in the most internationalized cluster also belong to the cluster of economies with the greatest innovation and technology.

These findings agree with Pittiglio et al. (2009) and Filippetti et al. (2011) who argue that international firms are more innovative because they can access a greater flow of ideas from external sources (Pittiglio et al., 2009), but also that innovative firms are more successful in competing internationally and exposure to alternative business contexts leads to innovation (Filippetti et al., 2011).

Both hypotheses formulated are confirmed, that is, **H₁** – as the level of innovation and technology increases, the likelihood of internationalising is higher; and **H₂** – as the firm increases its involvement with foreign markets, the level of innovation and technology is higher.

The results provide some insights for managers and policy makers. In addition, our study responds to requests to improve the research design to increase the validity and reliability of the results (Ding et al., 2021). According to Ding et al. (2021), findings on the importance of contextual issues and addressing key data analysis techniques imply that studies that consider these issues may provide enhanced evidence that can enrich theory development to help better understand the relationships within the nexus. This would provide better guidance for public and private policy makers. In this sense, our study being focused on the Geographic area of Europe and Central Asia, allows a better understanding of country contexts that can help develop theoretical and policy perspectives on the relationship between internationalisation and innovation.

To deepen the scientific knowledge in this field of research, it is suggested as a proposal for future research to investigate the factors that explain the distribution of clusters, seeking to understand why in European countries there more internationalised firms with more innovation and technology are, but also whether these success factors could be implemented in economies where firms are less internationalized and characterized by less innovation and technology.

Finally, it should be emphasized that the present study has as main limitation the restriction to the database Enterprise Surveys – The World Bank, so that in future investigations it is suggested the adoption of a greater variety of economies.

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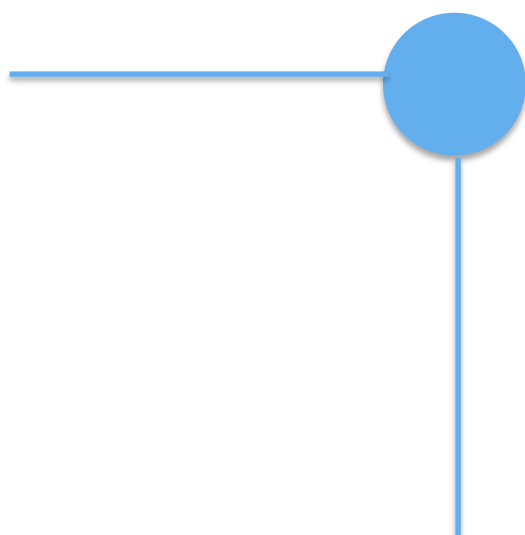
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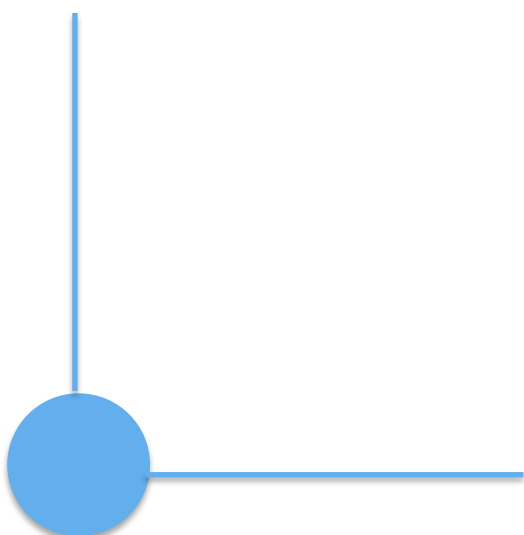
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CHAPTER III



Impact of Innovation and Workforce on firm Performance:

A Fuzzy set of qualitative comparative analyses

Abstract

The interaction between organizational practices, workforce, performance, and innovation is highly relevant in modern business.

This paper aims to analyse the impact of innovation and workforce, more specifically, the impact of skilled workers on firm performance.

Collecting data from the World Bank for 38 economies, this study uses the fuzzy-set method of qualitative comparative analysis (fsQCA) to explore the causal complexity between workforce (skilled labour force), innovation (conditions), and performance (outcome).

The results suggest that neither condition is necessary for the outcome (performance). Nevertheless, the results highlight the role that innovation plays in firm performance.

The study contributes to theoretical development in the field of innovation and performance by providing a more comprehensive understanding of the combinations of factors that lead to high firm performance.

The originality of the article is based on the application of the fsQCA method, which helps to improve the understanding of how innovation and the workforce interact in complex ways to shape the performance of firms.

Keywords: Innovation, Workforce, Performance, World Bank, Qualitative Comparative Analysis Fuzzy set

1. Introduction

Innovation has been a central concern for both academic researchers and management professionals because it is considered a critical source of sustainable competitive advantage and superior performance for firms (Moon & Acquaah, 2022). A rapidly changing globalized business environment, coupled with unprecedented advances on the technological fronts, forces firms to become more innovative and agile in the way they identify and respond to the changing needs and desires of their customers. Success or mere survival depends on the ability of these firms to respond effectively and efficiently/quickly to the complex dynamics of the global market (Aydiner et al., 2019).

To develop or not to develop innovation activities is an important decision to be made by firms because it implies an investment whose financial return is usually obtained in the medium or long term and is not always successful (Vincenzi & da Cunha, 2021).

Additionally, the interaction between organizational practices and innovation is highly relevant in modern business (Franco & Landini, 2022). The work environment is constantly changing with the working population increasing in terms of aging, feminization, and immigration, bringing new opportunities along with new emerging risks (Varianou-Mikellidou et al., 2021). In the knowledge-based economy, skilled workers can create ideas and innovations, as well as drive economic growth (Zhang & Lucey, 2019).

There is a lack of consensus about the role innovation plays in the performance of firms. According to Simpson et al. (2006), innovation is a costly and risky activity, with positive results in company performance, but also with negative results. In addition, it should be noted that, to date, studies have examined the impact of these antecedents in isolation from one another. That is, previous research provides little insight into whether one, all, or combinations of these antecedents need to be present to positively affect firm performance. While there are studies that study the relationship between innovation and performance in isolation, or between a skilled workforce and firm performance, there is a lack of studies that study the relationship between the three variables. More specifically, on the impact that innovation and workforce have on firm performance.

In this sense, to fill this gap in the literature, this paper aims to analyse the impact of innovation and workforce, more specifically, the impact of skilled workers on firm performance, using the fsQCA approach.

This study uses quantitative data for the years 2019/2020 from The World Bank Enterprise Surveys platform, built on a sample of 38 countries in Europe and Central Asia.

FsQCA is a method that employs qualitative research with quantitative exploration using configurational analysis to explain complex phenomena (Kraus et al., 2018).

The present study contributes to theoretical development in the field of innovation and performance by providing a more comprehensive understanding of the combinations of factors that lead to high firm performance.

This research is composed of 4 chapters. In the first chapter, a literature review was conducted to explore the impact and relationships that the variables under study have on firm performance. The methodology chapter explains the methodological approach. Subsequently, in the third chapter, the results obtained from the statistical analysis are presented. Finally, in the fourth chapter the results are discussed, limitations and proposals for future research are established.

2. Literature Review

2.1. Innovation

Innovation is considered a driver of growth and an important 21st century competence (Morad et al., 2021). The harmonious exchange of ideas, learning and technology around the world has led to an explosive attention to creativity and innovation in organizations as an important means of business success and sustained competitive advantage (Hartono & Kusumawardhani, 2019; Johannessen et al., 2001). Academics and industry experts are increasingly focused on understanding, operationalizing, and implementing innovation in organizations (Liu & Shao, 2022; Singh & Aggarwal, 2021).

It is now widely accepted that innovation is one of the key factors for economic development and a driver of competitiveness in today's business environment, which seems more complex than ever (Brown & Eisenhardt, 1997; Zivlak et al., 2017).

Innovation involves the adoption or creation of something new in products, services, work processes, or management procedures to gain competitive advantage (Thornhill, 2006). One of the first definitions was given by Schumpeter (1934) who associates

innovation with "something new", an aspect that appears repeatedly over the years (Morad et al., 2021). According to Damanpour (1996, p.694), "innovation is conceived as a means of changing an organization, either in response to changes in the external environment or as a preventive action to influence the environment." Furthermore, it is defined as a new product or service, new process technology, new organizational structure, or administrative systems, new plans or programs concerning the members of the organization (Damanpour, 1996). Recently, innovation has been defined as the operationalization of creative potential with a commercial and/or social motive, through the implementation of new adaptive solutions that create value, harness new technologies or inventions, contribute to competitive advantage and economic growth (Singh & Aggarwal, 2021). According to García et al. (2019), innovation is defined as a process inherent to any organization that converts ideas and knowledge, available both inside and outside the organization, into changes that are recognized by the market and society for the value they generate.

Previous literature argues that innovation is an outcome driven by (i) knowledge affected by firms' strategic choice (Cassiman & Veugelers, 2006), (ii) behavioural characteristics (Liao et al., 2008) and (iii) technology implementation (Vaccaro et al., 2010).

On the other hand, the faster and better a company can innovate, the more likely it is to meet market needs and business objectives (Kessler & Chakrabarti, 1996; Tseng & Wu, 2007).

Innovation has typically been considered a key factor in organizational differentiation and growth and a parameter of management discretion (Feng et al., 2020; Helkkula et al., 2018; Wang et al., 2021).

2.2. Performance

Organizations need to adopt different strategic approaches to survive and compete with powerful new players entering the market (Amhalhal et al., 2022).

In this sense, measuring the performance of business processes has become a central issue in both academia and business, since organizations are challenged to achieve effective and efficient results (Khlif et al., 2019; van Looy & Shafagatova, 2016).

Business performance was extolled as the ultimate dependent variable in empirical terms (Chakravarthy, 1986), advanced as a theoretically confusing construct (Khlif et al., 2019) and a constantly moving target in a management sense (Aggarwal, 2001; Durand & Coeurderoy, 2001; Morgan & Strong, 2003). For example, according to the High-Performance Systems Model (Porter, 1991), firms are considered high-performing when their business performance is superior to that of directly comparable organizations: "superior implies that firms seek a level of performance that exceeds that of their referents, often their closest competitors" (Hunt & Morgan, 1995, p.6).

Performance is then the ultimate measure of organizational outcome and is affected by many market contingencies and organizational conditions. Being a complex construct, performance has been measured in several ways (Kafetzopoulos et al., 2020).

Perhaps the best-known multidimensional performance measurement model is the Balanced Scorecard (BSC) developed by Kaplan e Norton (2000, 2001) which adopts a four-dimensional approach to organizational performance, namely: (1) financial perspective, (2) customer perspective, (3) internal business process perspective, and (4) "learning and growth" perspective. The BSC helps translate an organization's strategy

into operational indicators by form (also called performance measures or metrics) and objectives with targets for each of these performance perspectives.

Given the lack of guidance regarding existing performance indicators and how they can be realized in practice, authors van Looy & Shafagatova (2016) conducted a structured literature review to find patterns or trends in research on measuring business process performance, culminating in the documentation of a comprehensive list of 140 process-related performance indicators in a systematic way. Additionally, the authors categorized this list into 11 performance perspectives in order to obtain a holistic view. According to van Looy & Shafagatova (2016), these indicators can be classified into performance factors (or lead indicators): (1) Overall process performance; (2) Time-related process performance; (3) Cost-related process performance; (4) Internal quality-related process performance; (5) Flexibility-related process performance; (6) Innovation (Digital) performance; (7) Employee performance; or into performance outcomes (or lag indicators): (8) Financial performance for shareholders and top management; (9) Customer performance; (10) Supplier performance; and (11) Society/Environment performance.

Consistent with previous research, this study relies on two performance measures to achieve robustness of results, so two performance-related dimensions were chosen: financial performance (for shareholders and top management) and overall process performance (non-financial).

2.3. Innovation and Performance

Innovation helps the company cope with turbulence in the external environment and is therefore a key driver of long-term business success, particularly in dynamic markets (Baker & Sinkula, 2002; Hartono & Kusumawardhani, 2019; Liu & Shao, 2022; Zivlak et al., 2017). To survive in Schumpeterian environments, organizations must be able to cope with increasing complexity and high-speed change (Brown & Eisenhardt, 1995). In these contexts, firms with innovative capabilities will be able to respond to challenges faster and exploit new products and market opportunities better than non-innovative firms (Brown & Eisenhardt, 1995; Miles et al., 1978).

Innovation has a considerable impact on company performance by producing an improved market position that conveys competitive advantage and superior performance (Walker, 2004). Many studies focusing on the innovative performance-innovation relationship provide a positive assessment of increased innovative capacity, resulting in increased business performance (e.g., Brown & Eisenhardt, 1995; Camisón & Villar-López, 2014; Damanpour & Evan, 1984; Donbesuur et al., 2020; Freixanet & Churakova, 2018; Freixanet & Rialp, 2022; Gök & Peker, 2017; Hansen et al., 1999; Jiménez-Jiménez & Sanz-Valle, 2011; Rajapathirana & Hui, 2018; Thornhill, 2006). In complex and rapidly changing business environments, speed, and quality, the two main characteristics of innovation, are closely associated with company performance (Liao et al., 2010).

In general, innovation, in addition to making full use of existing resources, improving efficiency and potential value, provides new intangible assets for the organization (Wang & Wang, 2012). Firms with greater capacity for innovation will be more successful in meeting customer needs and developing new capabilities that enable them to achieve better performance or higher profitability (Calantone et al., 2002; Sadikoglu & Zehir, 2010). Innovation is key to achieving operational efficiency as well as raising

service quality (Feng et al., 2020; Hsueh & Tu, 2004; Parasuraman, 2010; Wang et al., 2021).

However, Simpson et al. (2006) point out that, innovation is a costly and risky activity, with positive results on company performance, but also with negative results, such as increased exposure to market risk, increased costs, employee dissatisfaction or unjustified changes. Moreover, some studies come to contradictory conclusions (Jiménez-Jiménez & Sanz-Valle, 2011). For example, Wright et al. (2004), in their study, using a sample of small firms, conclude that innovation production does not affect performance in benign environments, but has a positive effect on performance in hostile environments. Additionally, Rosenbusch et al. (2011), through their study of small and medium-sized firms, concluded that the relationship between innovation and performance is context dependent. In this sense, factors such as the age of the company, the type of innovation, and the cultural context greatly affect the impact of innovation on company performance (Rosenbusch et al., 2011).

Despite the likely detrimental effects resulting from an innovative orientation and some contradictory evidence, theory and most empirical studies suggest a positive relationship between innovative activity and firm performance. Thus, we propose the following hypothesis:

H₁: Innovation relates positively to company performance.

2.4. Workforce and Performance

The main objective of an organization is to improve and sustain its performance (Bashir et al., 2021). To achieve this goal, a competent/qualified workforce is a basic and most critical resource (Liang, 2012).

According to Małachowski & Korytkowski (2016), competent workforce is a source of competitive advantage for the company. Anyone with the appropriate resources can acquire machinery, equipment, and tools since they are all readily available. The differentiating factor for firms is the know-how of their employees, which is also the company's main asset. With the knowledge and intelligence of its employees, a company can effectively manage its own resources, take steps to improve its performance, and innovate (Małachowski & Korytkowski, 2016).

In contrast, the skills gap of the workforce is an issue that threatens the success of any organization (Sitek, 2012). Some leaders understand the importance of closing the workforce skills gap and consider it a major pressing concern. Moreover, in both developed and developing countries, the workforce skills gap is a barrier to industry growth, innovation, and the timely delivery of services and products, achieving required quality standards, and meeting economic and social requirements (Othman & Sokkar, 2019). Reducing the workforce skills gap has a direct relationship with improved productivity, human resource development, and economic growth (Aring, 2012).

In this sense, closing the skills gap in the workforce plays a significant role in increasing the productivity of workers with higher quality (Othman & Sokkar, 2019). According to Othman & Sokkar (2019), There are several advantages to closing the workforce skills gap, including: (i) increased ability to adopt new production technologies and higher levels of innovation; (ii) increased internal talent pool for management; (iii) increased pool of potential employees; (iv) increased job security; (v) increased employee satisfaction and motivation; (vi) increased retention; (vii) easier

access to markets; (viii); reduced operational risk; (ix) improved company reputation; and (x) improved government and community relations.

It can be seen, then, that the workforce, more specifically the skilled workforce, is the one that must improve organizational performance the most, and that employee performance can be improved through human resource management policies (Bashir et al., 2021; Haile, 2021; Liang, 2012; Małachowski & Korytkowski, 2016; Petermann & Zacher, 2022).

Thus, we propose the following hypothesis:

H₂: The labour force, more specifically the skilled labour force, relates positively to company performance.

3. Methodology

3.1. FsQCA

Qualitative Comprehensive Analysis (QCA) emerged from political science and sociology and is a methodology that is characterized by causal asymmetry and good applicability to small samples because it looks at causal conditions or their combinations that can lead to an equifinal result (Ragin, 2000; Rihoux & Ragin, 2008).

A methodology developed to obtain linguistic summaries from case-related data, developed by social scientist Charles Ragin, is fsQCA (Ragin, 2000). It is a more recent and extended version of QCA that can be used for contextual analysis, which investigates how causal relationships depend on contextual conditions, and is much closer to statistical approaches (Denk & Lehtinen, 2014; Mas-Verdú et al., 2015; Pappas & Woodside, 2021; Stokke, 2007).

FsQCA is a diversity-oriented approach that proposes different alternative paths to understand the construction of an outcome and is, moreover, well suited to observe stochastic but complex phenomena (Henik, 2015; Kent, 2005; Shipley et al., 2013).

Woodside (2010), points out that, in addition to other methods, fuzzy set achieves both high generalizability and high precision. fsQCA compensates for critical aspects of the case study research method by obtaining high-precision representations of real-world processes and on top enables high generalizability across other contexts (Kraus et al., 2018).

In conclusion, given that the purpose of this study is to identify the causal complexity between innovation, skilled workforce, and performance, and at the same time, to analyse the impact of innovation and workforce, on firms' performance, fsQCA is the ideal methodology for this study. Therefore, we use the fsQCA software, version 3.0, for the analysis in our study.

3.2. Data and Measurement

The data were extracted from Enterprise Surveys - the database of The World Bank. The sampling methodology leading to the enterprise survey is based on stratified random sampling, i.e., all population units are grouped homogeneously, and simple random samples are selected within each homogeneous group. The sample resulted in a group of 38 economies in Europe and Central Asia.

Table I details the variables and data sources used.

Table XI: Description of variables and data source

Variables	Acronym	Variable description	Data source
Innovation	IN	The mean of 4 indicators: (1) <i>Percent of firms that introduced a new product/service</i> ; (2) <i>Percent of firms whose new product/service is also new to the main market</i> ; (3) <i>Percent of firms that introduced a process innovation</i> ; (4) <i>Percent of firms that spend on R&D</i>	The World Bank Enterprise Surveys
Workforce	WF	<i>Proportion of skilled workers (out of all production workers) (%)</i>	
Performance	PF	The mean of 2 indicators: (1) <i>Real annual sales growth (%)</i> ; (2) <i>Real annual labor productivity growth (%)</i>	

In this fuzzy-set study, we aim to investigate the impact of innovation and workforce on firm performance. In this sense, performance is the outcome while innovation and workforce are the antecedent conditions.

According to Kafetzopoulos et al. (2020), since performance is a complex construct, it has been measured in various ways. Consistent with previous research, specifically, the studies by Kaplan and Norton (2000, 2001) and Looy & Shafagatova (2016), this study relies on two performance measures to achieve robustness of results, so two performance-related dimensions were chosen: (1) financial performance (for shareholders and top managers), measured through actual annual sales growth, and (2) overall process performance (non-financial), measured through actual annual growth in labour productivity.

Regarding the innovation measure used for this study, taking into account the definitions of Damanpour (1996) and Singh & Aggarwal (2021), we measure innovation through the average of the following indicators: (1) percentage of firms that introduced a new product/service; (2) percentage of firms whose new product/service is also new in the core market; (3) percentage of firms that introduced a process innovation; and (4) percentage of firms that invest in R&D.

Regarding workforce, we measure this variable considering the proportion of skilled workers (out of all production workers). According to Bashir et al. (2021) and Liang (2012), the main goal of an organization is to improve and sustain its performance and to achieve this goal, a competent/qualified workforce is the basic and most critical resource.

3.3. Calibration

The central step in fsQCA is to transform the raw variable scores into fuzzy membership scores ranging from 0.0 to 1.0 (Ragin, 2008). In the direct calibration method, which is the most used and recommended (Pappas & Woodside, 2021), should be established, three qualitative cut-off points for full adherence (1.0), not full adherence (0.0), and crossover (0.5).

According to previous studies (e.g., Beynon et al., 2021; Cheng et al., 2019; Xie & Wang, 2020), We set the full adherence threshold, crossover point, and non-adherence threshold at the 95th, 50th, and 5th percentiles, respectively. Table II presents the calibration thresholds, as well as the descriptive analysis of the variables under study.

Table XII: Fuzzy-set membership calibrations and descriptive statistics

Variables	Fuzzy set calibration			Descriptive statistics					
	Fully in	Crossover	Fully out	Mean	Std. Dev.	Minimum	Maximum	N Cases	Missing
IN	57.73	31.9	16.97	33.26579	11.30862	12.6	62.2	38	0
PF	9.43	1.45	-4.755	1.528947	3.380821	-7.7	10	38	0
WK	90.22	78.05	65.595	77.83684	7.864392	63.6	94.4	38	0

4. Results

4.1. Necessity Analysis

Once all conditions are calibrated, the next step is to identify the conditions necessary for the occurrence of outcomes. A causal condition is necessary when the outcome is its subset. Conventionally, to imply that a condition is "necessary "or "almost always necessary, "the consistency score must be greater than 0.9 or 0.8 (Ragin, 2000, 2008).

Table XIII: The necessity of conditions for high and not-high PF

Conditions	PF		~PF	
	Consistency	Coverage	Consistency	Coverage
IN	0.679763	0.705587	0.627188	0.680447
~IN	0.692142	0.639801	0.728630	0.703980
WF	0.617869	0.613248	0.700824	0.727030
~WF	0.724973	0.698652	0.627188	0.631743

Note: “~” indicates the absence of the condition

From the table III it follows that none of the conditions alone is necessary, or almost always necessary, for high performance since the consistency of each condition is no more than 0.8 nor 0.9.

4.2. Sufficiency Analysis

Subsequently, we perform the analysis of sufficient conditions. A causal condition is sufficient when it is a subset of the outcome. We set 0.80 as the consistency cut-off value and assign a value of 1 to each outcome when the consistency of this configuration exceeds 0.8 and a value of 0 otherwise.

FsQCA produces three types of solutions, namely complex, intermediate, and parsimonious. As suggested by Ragin (2008), we present intermediate solutions (Table IV) in our study, which are often the most interpretable.

Table XIV: Sufficient configurations for high PF and not-high PF

Conditions	PF	~PF
	1	2
IN	●	⊗
WF	⊗	●
Consistency	0.82467	0.848809
Raw coverage	0.503768	0.531926
Unique coverage	0.503768	0.531926
Overall solution consistency	0.82467	0.848809
Overall solution coverage	0.503768	0.531926
Countries	Denmark, Slovenia, Bosnia and Herzegovina, Kyrgyz Republic, Cyprus, Azerbaijan, Czech Republic	Russian Federation, Croatia, Montenegro, Turkey, Hungary, Ukraine, Portugal

Notes: Black circles indicate the presence of a condition and the circle with “x” indicates its absence.

Overall, the values for consistency and coverage for high performance are 0.82 and 0.50, respectively. For low performance the values for consistency and coverage are 0.85 and 0.53, respectively. These values are higher than the minimum thresholds of 0.74 for solution consistency and 0.25 for solution coverage, indicating that both models are informative (Ragin, 2008; Woodside, 2013).

Thus, table IV shows the causal paths for high performance (configuration 1) and for low performance (configuration 2).

Only 1 combination is sufficient for high performance, at 82% covering 50%. In this sense, a high level of innovation combined with a low level of skilled labour force leads to high performance. The countries in the sample include Denmark, Slovenia, Bosnia and Herzegovina, Kyrgyz Republic, Cyprus, Azerbaijan, Czech Republic. The opposite behaviour can be seen in configuration 2 (low performance).

4.3. Robustness check

According to Skaaning (2011), there are 3 types of robustness tests for fsQCA results, namely: (1) change in calibration thresholds; (2) change in case frequency; and (3) change in consistency of configurations. In this study, the change in case frequency was used (see Table V). Thus, the case frequency threshold of 3 was used instead of 1, while keeping the same calibration thresholds and consistency threshold of 0.75. The results are the same as the previous results.

Table XV: Robustness check results

Conditions	PF 1	~PF 2
IN	●	⊗
WF	⊗	●
Consistency	0.82467	0.848809
Raw coverage	0.503768	0.531926
Unique coverage	0.503768	0.531926
Overall solution consistency	0.82467	0.848809
Overall solution coverage	0.503768	0.531926
Countries	Denmark, Slovenia, Bosnia and Herzegovina, Kyrgyz Republic, Cyprus, Azerbaijan, Czech Republic	Russian Federation, Croatia, Montenegro, Turkey, Hungary, Ukraine, Portugal

Notes: Black circles indicate the presence of a condition and the circle with “x” indicates its absence.

5. Discussion and Conclusion

Innovation helps the company cope with turbulence in the external environment and is therefore a key driver of long-term business success, particularly in dynamic markets (Baker & Sinkula, 2002; Hartono & Kusumawardhani, 2019; Liu & Shao, 2022; Zivlak et al., 2017).

Firms with greater capacity for innovation will be more successful in meeting customer needs and developing new capabilities that enable them to achieve better performance or higher profitability (Calantone et al., 2002; Sadikoglu & Zehir, 2010).

According to Małachowski & Korytkowski (2016), a competent workforce is a source of competitive advantage for the company. Anyone with the appropriate resources can acquire machinery, equipment, and tools, as they are all readily available. The differentiating factor for firms is the know-how of their employees, which is also the company's main asset.

This paper aims to analyse the impact of innovation and workforce, more specifically, the impact of skilled workers on firm performance, using the fsQCA approach. In addition, it contributes to theoretical development in the field of innovation and performance by offering a more comprehensive understanding of the combinations of factors that lead to high firm performance.

Overall, our results show that none of the conditions alone are necessary, or almost always necessary, for high performance. This also means that a high level of innovation or a high level of skilled labour force alone are not necessary conditions for high performance. Given Configuration 1 a high level of innovation combined with a low level of skilled workforce leads to high performance. In contrast, in view of Configuration 2, it is found that a low level of innovation combined with a high level of skilled labour force leads to low performance.

In this sense, it is possible to conclude that innovation positively influences performance, in line with the literature. In fact, innovation has a considerable impact on corporate performance by producing an improved market position that conveys

competitive advantage and superior performance (Walker, 2004). Our findings are in line with the findings of several studies (e.g., Brown & Eisenhardt, 1995; Camisón & Villar-López, 2014; Damanpour & Evan, 1984; Donbesuur et al., 2020; Freixanet & Churakova, 2018; Freixanet & Rialp, 2022; Gök & Peker, 2017; Hansen et al., 1999; Jiménez-Jiménez & Sanz-Valle, 2011; Rajapathirana & Hui, 2018; Thornhill, 2006). This positive relationship can be easily justified by the fact that innovation provides greater success in meeting customer needs and developing new capabilities that enable them to achieve better performance or higher profitability (Calantone et al., 2002; Sadikoglu & Zehir, 2010). In this sense, hypothesis 1 is verified.

Nevertheless, there is an opposite relationship between performance and the skilled labour force. A low level of skilled labour force is not a necessary condition for high performance. However, looking at the sufficient conditions, as mentioned above, it turns out that the combination of a low skilled labour force and a high level of innovation is a sufficient condition for high performance. Although the literature indicates that a skilled workforce should improve organizational performance (Bashir et al., 2021; Haile, 2021; Liang, 2012; Małachowski & Korytkowski, 2016; Petermann & Zacher, 2022), our results show that there is no such positive relationship. However, our analysis relies on a "reduced form" approach that needs further exploration to identify causal relationships between skill composition and firm productivity/performance.

This study contributes to theoretical development in the field of innovation and performance by providing a more comprehensive understanding of the combinations of factors that lead to high firm performance.

Despite covering an existing gap in the literature, this study has several limitations that may inspire future research. First, it is important to note that the main limitation of this study may be the restriction to the Enterprise Surveys - The World Bank database. Future studies should attempt to replicate and confirm the robustness and generalizability of the results with alternative measurements based on other data sources. Second, the data used in this study was collected only in Europe and Central Asia. Since different research settings and other samples may lead to different conclusions, researchers may want to examine this relationship using data from other economies. Third, cross-country comparisons may be another research opportunity. Future investigations could examine and even compare the relationship between innovation, skilled workforce, and performance across geographies.

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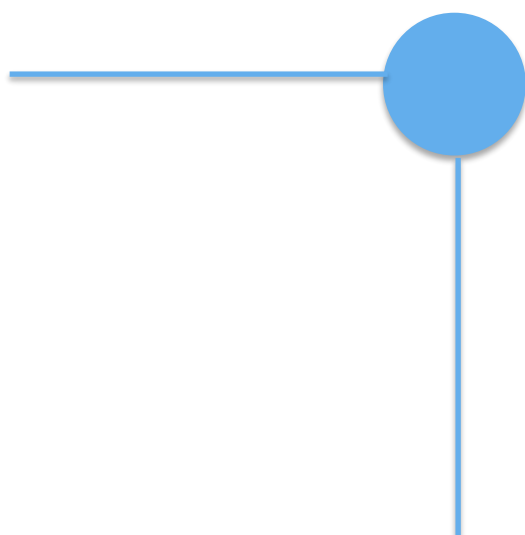
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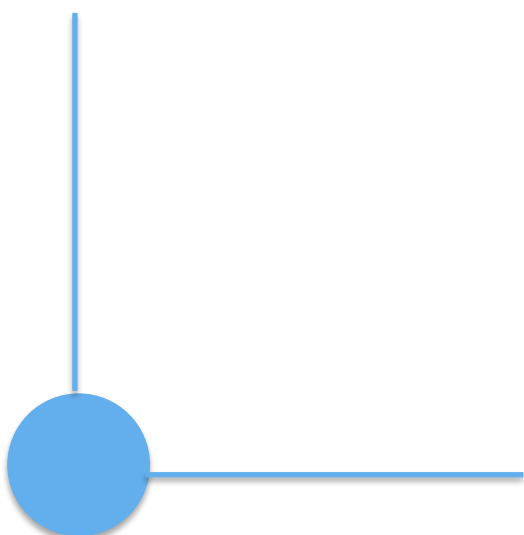
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CHAPTER IV



Conclusion

Business competition is increasingly based on innovation (Freeman and Soete, 2007), and the literature on innovation suggests that technological and organizational innovation individually drives the firms' performance (Damanpour and Aravind, 2012), including international performance (Donbesuur et al., 2020).

Innovation helps firms coping with turbulence in the external environment and is therefore a key driver of long-term business success, particularly in dynamic markets (Baker & Sinkula, 2002; Hartono & Kusumawardhani, 2019; Liu & Shao, 2022; Zivlak et al., 2017).

Firms with greater capacity for innovation are more likely to be successful in meeting customer needs and developing new capabilities that enable them to achieve better performance or higher profitability (Calantone et al., 2002; Sadikoglu & Zehir, 2010).

The **first paper** concludes that **(1)** if a country is highly internationalized, it is likely to display a higher innovation performance (Filippetti et al., 2011; Kafouros et al., 2008); **(2)** IT allows greater adaptability to the environment (Das et al., 1991) and improves the flow of information (Hansen, 1999), developing international competitiveness (Kroh et al., 2018); **(3)** not only that the economies with greater internationalization are in Europe while the less internationalized are distributed in Eastern and Southern Europe and Central Asia, but also that except for 7 economies, the economies in the most internationalized cluster also belong to the cluster of economies with the greatest innovation and technology.

Both hypotheses formulated are confirmed, that is, **H₁** – as the level of innovation and technology increases, the likelihood of internationalising is higher; and **H₂** – as the firm increases its involvement with foreign markets, the level of innovation and technology is higher.

From the **second paper** it follows that none of the conditions alone are necessary, or almost always necessary, for high business performance. This also means that a high level of innovation or a high level of skilled labour force alone are not necessary conditions for high performance. A high level of innovation combined with a low level of skilled workforce leads to high performance. In contrast, it is also found that a low level of innovation combined with a high level of skilled labour force leads to low performance.

Therefore, it is possible to conclude that innovation positively influences performance, in line with the literature. In fact, innovation has a considerable impact on corporate performance by producing an improved market position that conveys competitive advantage and superior performance (Walker, 2004).

The results of the papers provide insights for managers and policy makers, but also contribute to theoretical development in the field of innovation and performance by providing a more comprehensive understanding of the combinations of factors that lead to higher firm performance.

This dissertation has some limitations and can be a starting point for future research. The main limitation of this study is based on the restriction to the business survey database - the World Bank. Future studies should attempt to replicate and confirm the robustness and generalization of the results with alternative measurements based on other data sources. Second, the data used in this study was collected only in Europe and Central Asia. Since different research settings and other samples may lead to different

conclusions, researchers might want to examine this relationship using data from other economies. Third, cross-country comparisons may be another research opportunity. Future research could examine and even compare the relationship between innovation, technology, internalisation, skilled labour, and performance across geographies.

To deepen scientific knowledge in this field of research, it is suggested as a proposal for future research to investigate the factors that explain the distribution of clusters, seeking to understand why in European countries there are more internationalized firms with more innovation and technology, but also whether these success factors could be implemented in economies where firms are less internationalized and characterized by less innovation and technology. Furthermore, it is suggested to look for reasons why a skilled workforce does not seem to positively influence organizational performance, as the literature suggests otherwise. Since our analysis is based on a "reduced form" approach, it would be interesting to replicate the study considering a different database.