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U-SHAPED RELATIONSHIP IN INTERNATIONAL ENTREPRENEURSHIP: ENTREPRENEURIAL ORIENTATION AND INNOVATION AS DRIVERS OF INTERNATIONALISATION OF FIRMS

Krzysztof WACH*, Marek MACIEJEWSKI, Agnieszka GŁODOWSKA

Department of International Trade, Cracow University of Economics, Krakow, Poland

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Abstract. This article aims to identify and verify the relationship between entrepreneurial orientation and innovation of internationalised firms from Poland as a former emerging market. The article assesses this relationship in terms of the internationalisation scope. We adopted a quantitative research design and conducted a CATI survey on a sample of 355 firms operating in Poland. To verify the various assumed relationships, we used statistical instruments, including descriptive statistics and simple linear regression. Entrepreneurial orientation influences the innovations of internationalized firms. The impact depends on the scope of internationalization and is U-shaped. The impact of entrepreneurial orientation on innovation is greater for firms with large and small scope of internationalization. A relatively lower impact of entrepreneurial orientation on innovation is visible for firms with a moderate scope of internationalization. The study is an original contribution to the literature. Firstly, we perceive entrepreneurial orientation as a variable that can determine corporate innovation. Secondly, most of the empirical research to date focuses on highly developed markets. Firms that go beyond the borders of emerging markets see internationalization as a way of gaining experience, learning, and an opportunity to improve their innovative capacity. Thirdly, the study contributes to the development of theories combining entrepreneurial orientation with innovation by applying a new concept of a U-shaped curve.

Keywords: entrepreneurial orientation, innovation, internationalisation, international entrepreneurship, U-shaped curve, Poland.

JEL Classification: F23, L26, M13.

Introduction

In an increasingly competitive global environment, internationalisation is a natural process within business development but requires engaging an increasing amount of resources for business to reach its desired market position. Both entrepreneurial orientation and innovation are now becoming critical factors in business internationalisation (Etemad, 2015; Li

*Corresponding author. E-mail: *wachk@uek.krakow.pl*

et al., 2012; Wach et al., 2018; Głodowska et al., 2019a; Karami & Tang, 2019). These factors are particularly crucial for firms in emerging markets, in which development through internationalization is crucial not only for business but also for the economy as a whole (Brathwaite, 2017; Virglerova et al., 2020).

A growing number of researchers recognize the issue of internationalization of firms from emerging markets[1] (Wach et al., 2018). However, authors devote little attention to innovation in these internationalised firms. The reason for this is the relatively low innovativeness of the local business. Meanwhile, focus on innovation in the internationalization process is becoming prevalent, and in the international arena, environmental factors are driving firms to intensify efforts to improve their innovativeness, and thus, their competitiveness (Zhai et al., 2018). It appears that innovations are becoming an essential requirement for modern international businesses. Many factors can determine the innovativeness of internationalized companies, with entrepreneurial orientation playing a pivotal role. Research shows a direct or hybrid impact of entrepreneurial orientation on innovation in such firms (Liu et al., 2014; Ejdys, 2016). A hybrid impact is understood as the effect of coincidence of many innovation-stimulating factors, with entrepreneurial orientation being a mediatory one. However, no definitive agreement has been reached so far as to the relationship between entrepreneurial orientation and innovation in the process of internationalisation.

We aim to analyse the relationship between entrepreneurial orientation and innovation of internationalised firms from the former emerging economy of Poland. We will assess this relationship in terms of the internationalisation scope criterion. Achieving these objectives will provide an answer to two fundamental research questions:

RQ1: How does entrepreneurial orientation influence the innovativeness of internationalised firms in Poland?

RQ2: How does the relationship between entrepreneurial orientation and innovativeness of Polish firms differ depending on the scope of internationalisation?

The present article is an original study which expands knowledge in the field of international business and international entrepreneurship (Głodowska et al., 2019b; Sekliuckiene et al., 2019; Maciejewski & Wach, 2019; Sułkowski & Patora-Wysocka, 2020). Firstly, a considerable number of previous studies have only considered an autonomous relationship between entrepreneurial orientation and innovation (Ejdys, 2016), or have treated this orientation only as an intermediary between innovation and other innovation-stimulating factors (Genc et al., 2019). In this study, we perceive entrepreneurial orientation as a variable that can determine company innovation, i.e. an explanatory variable. Secondly, most of the research to date focuses on developed markets (Golovko & Valentini, 2011), and research on a sample of firms from developing countries has only begun (Zonta & Amal, 2018). Firms that go beyond the borders of emerging markets see internationalisation as a way of gaining experience, learning, and an opportunity to improve their innovative capacity. The mechanism explaining how this occurs still needs exploring (Genc et al., 2019). Thirdly,

[1] Although Poland was upgraded as a developed economy by the UN in 2009, but many financial and ranking institutions still have Poland as their part of an emerging markets indexes (e.g. MSCI. S&P, EMBI, Down Jones, EMGP). In late-2018 FTSE reclassified Poland to a developed status.

the study combines entrepreneurial orientation with innovation, taking into account firms' different internationalisation scopes. In this aspect, it is probably the first study of this kind to apply the U-curve into international entrepreneurship. Fourthly, we use an original data of a tailor-made survey exploring various aspects of international entrepreneurship among Polish firms.

We used data collected from a survey on a sample of 355 businesses from Poland. We conducted the study using the CATI method. The research method used is a critical analysis of prior research results to date, which allowed us to identify the research gap and develop research hypotheses. In the empirical part of our study, we used statistical methods, including descriptive statistics, simple linear regression, logistic regression, and diagnostic tests.

We have divided the article into sections. The first section reviews prior and current research and develops our research hypotheses. The second section describes the research methods used. The next section characterizes and interprets the results of empirical study, which is followed by a scientific discussion. The article ends with conclusions and recommendations for business practice and further research.

1. Literature review and development of hypotheses

1.1. Entrepreneurial orientation

Entrepreneurial orientation (EO) is a notion taken from the literature on strategic management (Mintzberg, 1973). In the theoretical perspective of strategic management, EO is a determinant of other strategic preferences that the firm adopts (Acosta et al., 2018). Developing EO is recognized as the most desirable strategic action to improve firm performance (Basso et al., 2009; Bhatti et al., 2020; Onwe et al., 2020; Zbierowski, 2019). This concept was first recognized by Miller (1983), who defines EO as a multidimensional structure that "engages in product market innovation, undertakes somewhat risky ventures and is first to come up with proactive innovations beating competitors to the punch" (Miller, 1983, p. 771). The dimensions of entrepreneurial orientation resulting from this approach relate to (i) proactiveness, (ii) risk-taking, and (iii) innovativeness (Miller, 1983; Covin & Slewin, 1989). Lumpkin and Dess (1996) propose additional two dimensions of entrepreneurial orientation: (iv) competitive aggressiveness and (v) autonomy. Finally, we observe in the literature two main approaches to conceptualizing entrepreneurial orientation. The first one is based on three basic dimensions of proactiveness, risk-taking, and innovation (Covin & Slevin, 1989; Semrau et al., 2016: Wach et al., 2018; Ahmed & Brennan, 2019). The second one is based on a multidimensional concept, in which individual dimensions of entrepreneurial orientation can appear in various combinations (Lumpkin & Dess, 1996; Boso et al., 2013; Liu et al., 2014).

Proactiveness refers to firm's efforts to take advantage of new possibilities (Zellweger & Sieger, 2012), which should be understood as an appropriate recognition of future needs and bringing products to market ahead of the competition (Lumpkin & Dess, 1996). In turn, innovation is defined as creativity and a tendency to experiment in introducing new products (Lumpkin & Dess, 1996). Risk-taking is associated with readiness to take bold actions, such as entering new, unknown markets and engaging significant resources in implementing

projects with uncertain results (Lumpkin & Dess, 1996; Wiklund & Shepherd, 2003; Kropp et al., 2008). Competitive aggressiveness refers to relations with market rivals and consists in overtaking them in satisfying the needs of customers. Autonomy stands for an entrepreneur's independence during the entire process of implementing own project (Lumpkin & Dess, 1996).

Knight (1997, 2001) was the first to transpose the concept of entrepreneurial orientation to an international level, connecting it to the presence of firms in various international cultures. He argues that the three-dimensional construct of entrepreneurial orientation is the main factor that determines firms' international results. Finally, we take the concept of entrepreneurial orientation from the three essential components (Knight, 2001; McDougall & Oviatt, 2000, 2005). McDougall and Oviatt (2000, p. 903) state that "*international entrepreneurship is a combination of innovative*, *proactive*, *and risk-seeking behavior that crosses national borders and is intended to create value in organizations*".

In the following years, research conducted from the perspective of international entrepreneurship verified the relationship between entrepreneurial orientation and internationalisation. In essence, the definition of entrepreneurial orientation suggests that firms become more internationalised through entrepreneurial activities resulting from entrepreneurial orientation (McDougall & Oviatt, 2000). Authors of initial studies assume that the influence of particular dimensions of entrepreneurial orientation on internationalisation would be equal, without considering their varying impact (Hughes & Morgan, 2007). Most empirical studies confirm the positive impact of entrepreneurial orientation on internationalisation (Yiu et al., 2007; Etemad, 2015; Swoboda & Olejnik, 2016; Tolstoy, 2018). A small group of researchers demonstrates the insignificant correlation between entrepreneurial orientation and internationalisation (Andersen, 2010; Méndez et al., 2019; Raats & Krakauer, 2020), or a clearly negative correlation between the two (Zahra & Garvis, 2000). According to Acosta et al. (2018), the international activity of firms is an entrepreneurial act as such and is inherently dependent on their entrepreneurial orientation level, as it consists in identifying new business opportunities in an international environment. This specific nature of firm internationalisation means that an international activity requires proactive and innovative behaviour and risk-taking, necessary for operating in an unknown competitive environment, where the probability of failure is higher than in domestic conditions. Other studies focus on the impact of entrepreneurial orientation on internationalisation through a mediatory factor such as knowledge, marketing activities, innovation, or institutional environment (Rahman & Kee, 2017; Jin et al., 2018; Wach et al., 2018). Etemad (2015) verifies that entrepreneurial orientation is the most notable key factor that influences the effectiveness of international firm operations. He claims that internationalisation success depends on the three components of entrepreneurial orientation. Wach et al. (2018) prove that entrepreneurial orientation, especially risk-taking, has a very significant positive impact on the internationalisation of Polish firms. On the other hand, Zahra and Covin (1995) highlight that entrepreneurial orientation is more important in a long-term approach, and we cannot identify its impact in the short term. Dai et al. (2014) underscore the fact that entrepreneurial orientation and each of its dimensions can generate high costs due to their resource consumption. Innovation is associated with costs of initial investments. In turn, proactiveness, generates costs that result from opportunity-seeking, learning, and action-taking. Moreover, there may be a need to

cover the costs of potential losses resulting from risk-taking. Based on these arguments, Dai et al. (2014) assess the impact of individual dimensions of entrepreneurial orientation on internationalisation differently. They believe that both a high and low level of innovativeness and proactiveness positively impact internationalisation and its scope. A moderate level of these EO dimensions negatively impacts internationalisation. The opposite is true for the risk-taking dimension of entrepreneurial orientation. A moderate level of risk-taking in a company stimulates the scope of internationalisation; high and low levels on the contrary (Dai et al., 2014).

1.2. Innovation

Schumpeter (1934) was the first to connect innovation to entrepreneurship and indirectly even to internationalisation; i.e., introducing a product into new markets. He considered entering new markets – and foreign markets, which can also be new markets for a firm – as one of the five forms of innovation (Wach, 2016; Sell, 2020) alongside the introduction of a new product, a new production method, a new supply source, or a new organizational system. Schumpeter also proposed a linear triad of the following innovation process stages: 1) invention, 2) innovation, 3) imitation (Wach, 2019). Invention is a product of knowledge and can be described as an idea, a creative act, and a discovery. In turn, innovation means bringing new ideas and inventions to life, i.e. the implementation of an invention. On the other hand, imitation concerns the dissemination of innovation (Lewandowska et al., 2016). In its original sense, innovation refers to novelty, but its business significance in terms of application is much higher. Today we consider innovation as a determinant of competitive advantage on the market and a significant source of productivity growth for firms (Ruzzier et al., 2014; Hernández-Perlines et al., 2020; Gabrielczak & Serwach, 2018). Innovation is especially crucial during slowdowns like the recent Covid-19 pandemic (Kaszowska-Mojsa, 2020). Through innovation, businesses seek to build a competitive advantage to achieve more stable market position (Ramadani & Gerguri, 2011; Tajpour et al., 2020). This strategy is also used in foreign markets, in which innovation is the primary source of competitive advantage (Pla-Barber & Alegre, 2007; Acs et al., 2008).

Innovations can be classified and subdivided into types in different ways. We should not consider any of these innovation types as the only alternative to others. Innovations are usually a kind of related vessel system (Rubalcaba et al., 2010; Wach, 2019). According to the OECD (2018), the foundation of innovation is a new product, a new process, a new marketing activity, or a new organization method that the firm will introduce or develop as the first one on the market. However, other studies underscore the role of technological innovations, which have a very significant impact on firm development (Akbar et al., 2020; Stelmaszczyk, 2020). The productivity of a firm and its sustainable growth require technological innovations that determine its long-term operations. This requirement applies not only to new products but also to innovation management – including its various mental aspects – to implement several organizational processes. In turn, process innovations generate a competitive advantage by increasing process efficiency, while product innovations can lead to a competitive advantage, through improving product quality or product differentiation (Ruzzier et al., 2014). Rosenbusch et al. (2011) state that all investments involve initial and continuous investments,

risks, and uncertainties, but they can eventually lead to tangible benefits: differentiation from competition, customer loyalty, financial returns, and barriers to potential imitators.

The link between innovation and internationalisation is rather clear, which is due, for example, to the aforementioned typology of innovation by Schumpeter (1934). However, the link is not as evident as it may appear (Bigos & Wach, 2021). Both categories are highly complex, as there are different forms of innovation, and internationalisation itself can be analysed in multidimensional terms (Dohse & Niehbur, 2018). The direction of these categories' impact on one another is also not entirely clear. Previous empirical studies indicate a bipolar dependence – innovation may influence internationalisation but also, conversely, internationalisation may influence innovation. There are two main currents of research in this area (Lewandowska et al., 2016; Wach, 2016), that is innovation as a cause of internationalisation; or innovation as an effect of internationalisation. The positive impact of innovation on internationalisation has been confirmed by Pla-Barber and Alegre (2007), Cassiman and Golovko (2011), Li et al. (2012) and Wach (2016). The reverse relationship is observed by Pinkwart and Proksch (2014), Ribau et al. (2017), Pouresmaeili et al. (2018). Bigos and Michalik (2020) proved that process and organizational innovations stimulate exporting of born globals, while there was no such an empirical confirmation for marketing innovations. However, empirical research shows that not all companies involved in foreign markets benefit from innovation equally. The benefits of innovation are generated after exceeding a certain level of internationalisation. Internationalisation may enhance a company's innovative ability, but the scope of internationalisation determines the actual benefits of innovation (Ruzzier et al., 2014).

1.3. Entrepreneurial orientation versus innovation in internationalisation

According to Wiklund and Sheperd (2005), entrepreneurial mindset and behaviour are the critical factors for new enterprises to use emerging and existing knowledge in discovering market opportunities. Highly innovative firms are predisposed to support novelties and creative ideas, thereby increasing their commitment to developing new products and processes (Gomes et al., 2022). Similarly, Korpysa (2019) observed a positive link between entrepreneurial orientation and innovative startups. Ejdys (2016) demonstrates that two components of entrepreneurial orientation are usually the subject of research within innovation: proactiveness and risk-taking. These two dimensions are examined in the context of innovation types, innovation processes, and innovative activities of companies (Ejdys, 2016; Alegre & Chiva, 2013). A positive and robust impact on innovation is demonstrated by Ireland and Webb (2007), Wu et al. (2008), Alegre and Chiva (2013), and Ejdys (2016). Oura et al. (2016) verify a positive relationship between innovative capacity and export efficiency of SMEs. It appears that firms that adopt a proactive strategy initiate the process of internationalisation based on their internal competencies or market opportunities, which is strictly related to innovation. These internal resources are usually technological attributes, a unique product, economies of scale, and foreign market opportunities. Lisboa et al. (2011) draw similar conclusions from their empirical research. Ireland and Webb (2007) confirm the impact of entrepreneurial orientation on product and process innovation within internationalised firms.

Madhoushi et al. (2011) highlight that most previous studies verify the autonomous impact of EO on firm innovation and ignore factors that may mediate the impact of EO. Fur-

thermore, they create a conceptual model to study the relationship between EO and firms' knowledge and innovation management. The results show that EO positively influences firm innovativeness and that knowledge management plays the role of a mediatory factor intensifying this dependence. On this basis, we see that knowledge management is not only a managerial practice but also a key mechanism that takes advantage of EO's influence on innovation. Firms with a high level of EO are motivated to increase investments leading to technological innovations, such as the acquisition of new technology and the development of new products. High absorption capacity may also help firms identify and absorb new external knowledge and integrate it with existing knowledge, which in turn leads to the generation of new knowledge. Moreover, high absorption capacity can increase innovation frequency, speed, and efficiency (Zahra & George, 2002; Zhai et al., 2018). Therefore, it appears that the relationship between business orientation and innovation is not linear. Zhai et al. (2018) show that the implementation of entrepreneurial orientation in itself is an interaction between the enterprise, its components, and the environment. This non-linear process effectively integrates the firm's internal and external resources and is closely related to the acquisition, transformation, assimilation, and use of knowledge. Many studies indicate the necessity of the occurrence of an additional factor that stimulates the influence of entrepreneurial orientation on international firms' innovations. This means that this dependence may be determined by various factors and thus assume different characteristics resulting from specific reasons (Madhoushi et al., 2011; Zhai et al., 2018; Pouresmaeili et al., 2018; Benazzouz, 2019).

The type of innovation may determine the impact of entrepreneurial orientation on innovation. It may also depend on the absorption capacity of target markets or the organization itself. This relationship may also vary depending on the stage, scope, and degree of internationalisation, and the firm's experience on foreign markets, which may be related to the use of specific types of knowledge in the internationalisation process. Wach et al. (2018) consider the relationship between entrepreneurial orientation and knowledge use in internationalisation by analysing four types of knowledge (market, network, socio-cultural, and entrepreneurial knowledge). Entrepreneurial orientation plays a vital role in knowledge application among international firms, but it is not a uniform process and one that depends on firm experience in foreign markets. In the initial stage of internationalisation (up to three years of experience), entrepreneurial orientation is correlated with all four types of knowledge, while for firms that are experienced on the international market (over three years), the relationship between orientation and knowledge is visible for network and entrepreneurial knowledge. One may suspect that similar relations occur between entrepreneurial orientation and innovation of firms in the process of internationalisation. Therefore, it seems reasonable to assume that the impact of entrepreneurial orientation on firm innovation may also vary depending on the internationalisation scope. Going beyond the domestic market and undertaking operations in one or more markets (small scope of internationalisation) different from the country of origin requires the firm to adapt its products to meet the needs of the new market. Firms with a high level of entrepreneurial orientation are more predisposed to experiment, promote new ideas, and move away from established existing practices. Assuming that a small scope of internationalisation is usually connected to the initial stage of internationalisation, we should remember that this internationalisation scope requires companies to gain knowledge of specific product standards on the target market, industry standards,

customer needs, and local competition practices. Therefore, we can conclude that the impact of entrepreneurial orientation on innovation may be particularly significant at this stage and, by nature, determine the internationalisation process (Sapienza et al., 2005; Cassiman & Golovko, 2011; Dai et al., 2014). However, empirical research demonstrates that exploiting entrepreneurial orientation in the context of further innovation also generates high costs (Sapienza et al., 2005; Yu et al., 2011). These costs may lead to asymmetric use of attributes and resources of the company, resulting from an excessive focus on innovation. According to Kreiser et al. (2013), this approach may make it difficult to meet current obligations, including financial obligations, and thus lead to a kind of drainage of resources from other areas that create principal value for companies with moderate scopes of internationalisation. Therefore, we hypothesize that:

H1: Entrepreneurial orientation has significant role for the innovativeness of international companies.

Firms are aware that costly investments may reduce their profitability on foreign markets and thus limit the scope of internationalisation. Internationalised firms know that the benefits of innovation are largely dependent on commercialisation (Hughes & Morgan, 2007). Following the claims of Dai et al. (2014), we may state that a firm with a moderate degree of internationalisation is "in the middle" in terms of intensifying its innovation activities because, on one hand, it invested sufficiently in internationalisation and, on the other hand, it is unable to sustain the high costs of innovation for further expansion into new markets. In other words, increasing the scope of internationalisation through innovation is too costly for a firm. At this stage, a firm may limit the exploitation of its proactiveness and innovation and reduce its willingness to take innovation risks to optimize costs. In other words, it pursues its international goals of expanding its operations into new markets, while concentrating its entrepreneurial resources on growth factors other than innovation.

Once a high degree of internationalisation is achieved, i.e. above a certain threshold, the impact of entrepreneurial orientation on a firm's innovation can once again become more important. Companies with a high degree of internationalisation, who operate in many markets, are exposed to different cultures and environmental factors, while at the same time being familiarized with business practices of the highest standard. Due to these conditions, the firm must be flexible and have the opportunity to learn new mechanisms, conduct business in various aspects, develop and use resources, competences, and networks, which in turn leads to innovation (Zahra et al., 2009; Boermans & Roelfsema, 2016; Wach et al., 2022)). At this stage, entrepreneurial orientation can again be crucial for innovation to boost a firm's productivity and competitive advantage (Bakar & Ahmad, 2010). Hence, links between business orientation and innovation of internationalised firms are not linear and, according to the above arguments, resemble the letter U. Based on the literature review, we can formulate the following research hypotheses:

H2: The relationship between entrepreneurial orientation and innovativeness of internationalised firms differs depending on the scope of internationalisation and is U-shaped: (a) The most significant impact of entrepreneurial orientation on innovation is noted for firms with a small and very large scope of internationalisation, (b) the least significant impact is noted for firms with a moderate scope of internationalisation.

The U-curve has been explored in many ways mainly in the economics literature and only later in management studies. Recently, the transfer of the U-curve to international research was observed. Park and Xiao (2016) showed the U-curve for the relationship between FDI and productivity (international economics), while Kirca et al. (2012) explored the relationship of productivity from multinationality (international business). All these articles attempted to search in a simple descriptive way for relationships that can take the shape of a U-curve in international business. The scarcity of research results, or indeed the lack of them in this respect, has inspired us to a new search and a new attempt. To the best of our knowledge, this article appears to be one of the first concerning the U-curve in international entrepreneurship, which can fully explain the above assumed hypotheses about non-linear relation (Ruigrok & Wagner, 2004; Matysiak & Bausch, 2012).

The research hypotheses result from the literature review and the identified research gap at the same time. We may assume that this article offers the first study to verify the relationship between entrepreneurial orientation and innovation based on the scope of internationalisation. The theoretical basis for this research direction is the strategic management and resource-based view (RBV) approach. According to RBV, firms that possess and accumulate appropriate – irreplaceable, rare, unique, and valuable – resources can achieve sustainable competitive advantage and achieve success over competitors on foreign markets (Camisón & Villar, 2009; Bujan, 2019). A particularly crucial strategic resource is knowledge, which on the one hand, is a key factor contributing to innovation, and on the other hand, allows for the effective use of entrepreneurial orientation in internationalisation (Wach et al., 2018), also for innovation. Firms must engage their resources, if they take advantage of new opportunities that arise from international diversification and implemented innovations. Both forms of diversification are based on existing resources and capabilities (Kusa, 2020), so naturally, we may conclude that these categories must be interrelated (Kyläheiko et al., 2011). The conceptual model verified in the study is presented in Figure 1.

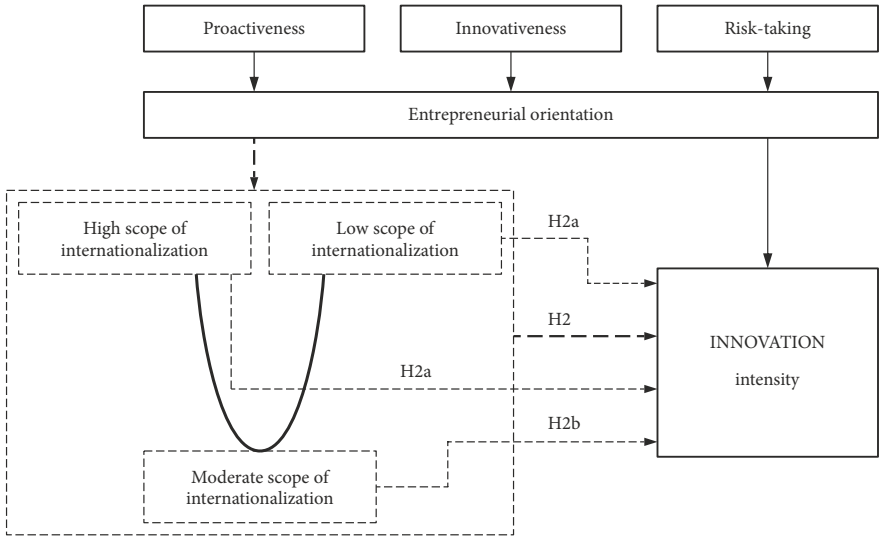

Figure 1. Conceptual model for hypotheses testing (source: own elaboration)

2. Research framework and methods

2.1. Survey and sampling

A stratified random sample selection was applied by meeting the following criteria:

1. The sample included only internationalised firms (which are at least exporters);
2. The sample included firms of different sizes, yet it was reflective of the research needs, i.e. (a) with a small share of micro-enterprises as the least internationalised entities, although they are the largest group in the studied population, (b) with a relatively small share of large enterprises, which are the smallest group in the population; however, they are the most typical research objects in the field of internationalisation. Each of these two groups should constitute about 10–15% of the research sample, (c) with a relatively large share of both small and medium-sized enterprises, which should amount to 25–45% of the sample.

We drew the research sample from the REGON statistical register of firms registered in Poland, from which initially we randomly selected 7,100 firms, to which we directed the questionnaire. We conducted the survey using the CATI technique and divided the questionnaire into four thematic parts, namely (i) business characteristics, (ii) forms and scope of internationalisation, (iii) patterns and strategies of internationalisation, (iv) resources and competences, (v) domestic and foreign environment, (vi) entrepreneurial orientation, and (vi) entrepreneur characteristics.

Some of the addresses and phones number in the REGON register were not valid anymore and we didn't reach these entities. Out of 7,100 firms, only 355 agreed to participate in the survey (response rate 5%, however eliminating the lost firms, the actual return rate was 10.7%).

Regarding the size of the firms, the sample was selected purposively and was not representative of the entire population of Polish businesses (micro 14.1%, small 43.1%, medium 29.9%, large 13.0%). Regarding the economy sector, the sample was more or less representative of the entire population (manufacturing and industrial processing 56%, commerce and services 40%, agriculture 2%). As many as 60% of firms declared only domestic capital.

2.2. Used variables

For statistical calculations and questionnaire use, the following variables were adopted (see Table 1 for the typology and Table 2 for descriptive statistics of these variables):

1. EO: the firm's entrepreneurial orientation, estimated based on its three dimensions (Covin & Slevin, 1989);
2. INNO_INDEX: the firm's innovation index, developed with the use of original questions concerning innovative activities that have been undertaken in the last three years (Wach, 2016);
3. INT_SCOPE: number of markets (countries) in which the firm operates.
4. SECTOR: the basic business activity of the firm.
5. EMPLOYEES: the average number of employees in investigated firms.

Table 1. Used variables (source: own elaboration)

Abbr.	Full name	Measures	Scale	Usage
Dependent variables				
INNO-index	Innovation index	In 0–100%, a composite index evaluated by 8 innovations and four scopes, then standardized as the index	quasi-continuous variable	Wach (2016)
INNO-state	Innovation state	0/1 based on a median for the Innovation index	Dunny variable	–
Control variables				
INT_SCOPE	Internationalization scope	Number of foreign markets the firm operate in	continuous variable	Ripollés-Meliá et al. (2007)
SECTOR	Core business of the firm	1 – Agriculture, 2 – Manufacturing and industrial processing, 3 – Construction, 4 – Trade, 5 – Services	nominal variable	–
EMPLOYEES	Number of employees	In numbers	continuous variable	–
Independent variable				
EO	Entrepreneurial orientation	A composite index of 3 variables (innovativeness, risk-taking and proactiveness) evaluated by 9 various questions on a 7-point Likert scale each, and then standardized as the index	ordinal variable	Covin and Miller (2014)

We used a very popular and often used in various empirical investigations in the literature the Miller/Covin and Slein EO scale (M/C&S Scale) based on nine questions, three for each of three dimensions of EO, which was published by Covin and Miller (2014, p. 36). This means that we determined the level of IE by calculating the arithmetic mean of proactiveness, risk-taking, and innovativeness scores on a 7-point Likert scale based on survey questions. Therefore, the index assumes values within the range of 1–7 (the arithmetic average for 9 questions), while in the examined sample, we established that only 18% of the analysed firms were characterized by a high (above 5) level of entrepreneurial orientation.

The Innovation Index (INNO_INDEX) ranges from 0 to 100 and is based on the number of innovative actions undertaken (out of the eight proposed in the survey) and one of the their four scopes: from company level through regional and national scale to global scale. The scope was measured from 1 to 4. The calculations of eight types of innovation by maximum 4 resulted in 32 points. In order to get an index, we recalculated the sum of values for actual innovation type by multiplying the scope and then we divided it by the possible maximum points. The overall standardized indicator was from 0 to 1 or 0 to 100 (when in %). We used exactly the same method as Wach (2016, p. 158) used for researching into innovativeness of 263 high-tech firms from Poland (see Appendix).

As a measure of the firm's internationalisation, we took the number of foreign markets (INT_SCOPE) where the firm marks its presence. To achieve the research objective, we divided the firms into four groups, based on their scope of internationalisation, which was diversified and ranged from 1 to 55 markets. Quartile 1 (Q1), quartile 2 (Q2) and quartile 3 (Q3) were assumed to be the limits of the ranges, distinguishing the following firm groups (*xi*):

1. INT_SCOPE_1: $x_i \leq Q1$;
2. INT_SCOPE_2: $Q1 < x_i \leq Q2$;
3. INT_SCOPE_3: $Q2 < x_i \leq Q3$;
4. INT_SCOPE_4: $Q3 < x_i$.

Table 2. Descriptive statistics for the applied variables (source: own calculations based on a survey (n = 355))

Variable	Min	Q1	Me	Q3	Max	Mean	SD
INT_SCOPE	1.00	4.00	8.00	15.00	55.00	11.0	10.5
EO	1.00	3.44	4.11	4.78	6.67	4.07	0.99
INNO-index	3.12	25.00	40.62	62.50	100	43.91	24.16
EMPLOYEES	1.00	15.00	35.00	120.00	3000	144.4	350.6

For each of the firm groups distinguished, we analysed the impact of entrepreneurial orientation levels (EO) on their innovativeness, expressed by the innovation index (INNO_INDEX). To verify the research hypotheses, we carried out a simple linear regression analysis, estimating the parameters of the following equation:

$$\text{INNO\_INDEX}_i = \alpha_0 + \alpha_1 EO_{ij} + \varepsilon, \tag{1}$$

in which i denotes the analysed firm groups, distinguished by their scope of internationalisation (i = INT_SCOPE_1,..., INT_SCOPE_4), j denotes the analyzed firms in particular groups

The logistic regression models take the form: (2)

$$P\left(\text{INNO} - \text{state}\right)_i = \frac{e^{\beta_0 + \beta_1 EO_{ij}}}{1 + e^{\beta_0 + \beta_1 EO_{ij}}}, \tag{2}$$

in which i denotes the analysed firm groups, distinguished by their scope of internationalisation (i = INT_SCOPE_1,..., INT_SCOPE_4), j denotes the analyzed firms in particular groups.

The study based on cross-sectional data that resulted from the survey of internationalised firms. We used the classic least squares method, focusing on the importance of one independent variable, which is the level of firms' entrepreneurial orientation (EO). We diagnosed the model in terms of normality of residuals distribution and heteroscedasticity based on Doornik-Hansen and Wald tests.

Based on Table 3, it can be observed that there is no strong correlation between the independent and control variables used in the analysis. The highest correlation occurs between number of employees and internationalization scope variables (0.346).

Table 3. Correlation matrix for control and independent variables (source: own calculations based on a survey (n = 355))

Variable	INT_SCOPE	EO	EMPLOYEES	SECTOR
INT_SCOPE	1	0.163	0.346	–0.155
EO	0.163	1	0.037	–0.052
EMPLOYEES	0.346	0.037	1	–0.130
SECTOR	–0.155	–0.052	–0.130	1

3. Results and discussion

The linear regression results of parameter estimation for the analysed firm groups are presented in Table 4. For all firm groups with different scopes of internationalisation, the influence of entrepreneurial orientation on innovation was positive and statistically significant. However, parameter values and the degree of statistical significance of the variables are different in particular firm groups. The highest and the most statistically significant influence of EO on innovation is seen in the group of firms that operate in the largest number of foreign markets (ITN_SCOPE_4), i.e. in 15 and more countries. The second place concerns firms present in the smallest number of markets (INT_SCOPE_1) up to 4 countries. In both cases, the level of the innovation index is relatively well-demonstrated by the model: R^2 equal to 29.5% and 19.4%, respectively.

Table 4. Results of the linear regression model for the dependent variable "innovation index" (source: own elaboration based on a survey (n = 355))

Variable	Parameter	Model 0	Model 1	Model 2	Model 3	Model 4
		INT_SCOPE	INT_SCOPE_1	INT_SCOPE_2	INT_SCOPE_3	INT_SCOPE_4
Const	α_0	24.109 (1.653)	-6.838 (6.792)	12.961 (8.364)	12.732 (11.118)	-18.832 (11.999)
EO	α_1	0.711*** (0.109)	8.076*** (1.706)	3.760* (2.032)	5.168** (2.588)	14.920*** (2.777)
R^2		0.108	0.194	0.036	0.043	0.295

Note: estimated standard errors appear in parentheses. *** p < 0.01; ** p < 0.05; * p < 0.10.

In firms whose scope of internationalisation is average between the first and third quartiles (INT_SCOPE_2 and INT_SCOPE_3), i.e. between 4 and 15 countries, the parameter values are significantly lower, the statistical significance of the variable is lower, and the determination coefficient (R2) does not exceed 5%.

The H1 hypothesis that entrepreneurial orientation is important for the innovation of internationalised firms is therefore validated, as shown by the statistical significance of the EO variable in general and in all firm groups.

Similar results appear in previous empirical studies, and the positive impact of innovation on internationalisation was already confirmed by Pla-Barber and Alegre (2007) who used a

sample of 121 companies in the French biotechnology industry. Moreover, both Cassiman and Golovko (2011), who research a panel of Spanish manufacturing companies, and Li et al. (2012), who use a sample of 278 small firms in technology-intensive industries from the USA, empirically observe and demonstrate similar results. Lisboa et al. (2011) confirm the impact of business orientation on innovation among companies that operate foreign markets in a sample of 267 Portuguese firms and concludes that innovation and orientation are essential in the process of company internationalisation. In Poland, Korpysa (2019) on a sample of 382 startups observed that particular dimensions of EO has impact on innovative behaviour of these entitles. Therefore, the results obtained in this article (Poland) are consistent with the results of earlier research conducted in other countries (USA, France, Spain, Portugal, and also for a preliminary results for Polish startups).

In order to validate the results, we used also logistic regression, which does not need to meet many mathematical assumptions. We assigned a rank of 0 or 1 to each firm (out of all firms) depending on the level of the innovation index. We used the median (INNO-index): half of the firms below the median (with a worse innovation index) received a rank of 0, and the other half – above the median (with a better innovation index) – received a rank of 1. We did a logistic regression (5 such regression models: separately for all firms together and for 4 groups of firms divided into groups due to INT_SCOPE by quartiles), where the explanatory variable is the zero-one innovation and the explanatory variable is the level of the EO index (Table 5).

The logistic regression indicates how the level of the explanatory variable (in our case EO) affects the probability of success, i.e. in this case the qualification of the firm to the group of firms with a high innovation index (with rank 1).

The significance of the regression function is determined by the *p* level for the Chi-square test ($p < 0.05$). The significance of regression coefficients is indicated by the *p*-value for individual parameters. The regression estimations turned out to be statistically significant for all firms (INT_SCOPE) and for groups INT_SCOPE_1 (below quartile 1 in terms of INT_SCOPE) and INT_SCOPE_4 (above quartile 3 in terms of INT_SCOPE). In all these cases, an increase in EO resulted in an increasing probability of achieving a high level (rank 1) of innovation.

Table 5. Results of the logistic regression model for the dependent variable "innovation" (source: own elaboration based on a survey (n = 355))

Variable	Parameter	Model 0	Model 1	Model 2	Model 3	Model 4
		INT_SCOPE	INT_SCOPE_1	INT_SCOPE_2	INT_SCOPE_3	INT_SCOPE_4
Const	β_0	–2.786 (0.525)	–4.259 (1.130)	1.456 (0.914)	–2.080 (1.093)	–3.259 (1.395)
EO	β_1	0.685*** (0.125)	0.827*** (0.271)	–0.341 (0.221)	0.463 (0.254)	1.055*** (0.343)
Chi-square (p)		34.259 p = 0.000	12.866 p = 0.000	2.492 p = 0.114	3.504 p = 0.061	11.277 p = 0.001

Note: estimated standard errors appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

This can also be seen in the graph, where the x-axis defers the value of the EO index and on the y-axis the value of the probability (Figure 2). Firms from the INT_SCOPE_4 group (above quartile 3 in terms of INT_SCOPE) respond to the increase in this probability at the highest level: the EO index already at the level of 4.0 gives a 72.3% probability of achieving a high innovation index (rank 1). For INT_SCOPE_1 companies this probability is 31.6%.

The obtained results allowed us to use similar solutions for drawing a U-curve as in many previous studies on different aspects in business and/or economics. We are aware that it is not a quantitative way of determination of graphs, but it is widely accepted and used in prior studies (Haans et al., 2016; Park & Xiao, 2016; Kirca et al., 2012; Liu et al., 2016; Zheng & Yung, 2014), therefore we applied the same logic and reasoning as previous publications which were considered novelty and having their own contribution in their fields.

Our study confirms the validity of the H2 hypothesis, which assumes a differentiated relationship between business orientation and innovation, based on the level of internationalisation. This relationship is the most significant (parameter α_1) for firms with a low and very high internationalisation scope (H2a hypothesis) and the least significant (parameter α_1) for moderately internationalised firms (H2b hypothesis). We may conclude that the strength of entrepreneurial orientation's influence on innovation changes in the process of internationalisation of firms, and its graphical form is similar in shape to the letter U (Figure 3). In the Figure 3, we presented the values of the parameter α_1 for the simple linear regression (equation 1) for the groups of firms, distinguished by their scope of internationalisation (i = INT_SCOPE_1,..., INT_SCOPE_4).

In firms at an early stage of internationalisation, entrepreneurial orientation significantly influences innovation (left arm of the letter U), which is directly related to the concentration of entrepreneurial resources on creating new product and organizational and marketing solutions related to entering new markets. Achieving a higher level of internationalisation shifts the entrepreneurial resources to activities related to maintaining and strengthening the market position through knowledge and experience gained in new markets. This experience allows the company to continue the internationalisation process based on previously made innovations, which leads to the entrepreneurial orientation of firms at this stage, having a smaller impact on innovation. This reflects the bottom of the letter U in Figure 2. A growing level of firm internationalisation is associated with entering new markets, more distant in terms of geography and culture. Presence in such markets, alongside the need to meet the challenges of a demanding global market, is the reason company entrepreneurial resources are again used for innovative activities, which is reflected by the right arm of the U letter.

Comparison of the U-curve results with the results of previous studies is difficult, because these results are our original observations of such dependences, and the present study is innovative in this respect. Similarly, the work of Haans, Pieters, and He (2016) is perhaps the first article in management to explicitly discuss theoretical concept properties and U-shaped relationships phenomenon. Nevertheless, they noted that strategic management research increasingly explores U- and inverted U-shaped relationships. Some U- or inverted U-shaped relationships appeared in various international contexts, for example, for FDI and performance (Park & Xiao, 2016; Barłożewski & Trąpczyński, 2021) or multinationalism and performance (Kirca et al., 2012). In the literature, a U- or inverted U-shaped relationship also appeared between innovation and performance (Liu et al., 2016; Zheng & Yung, 2014).

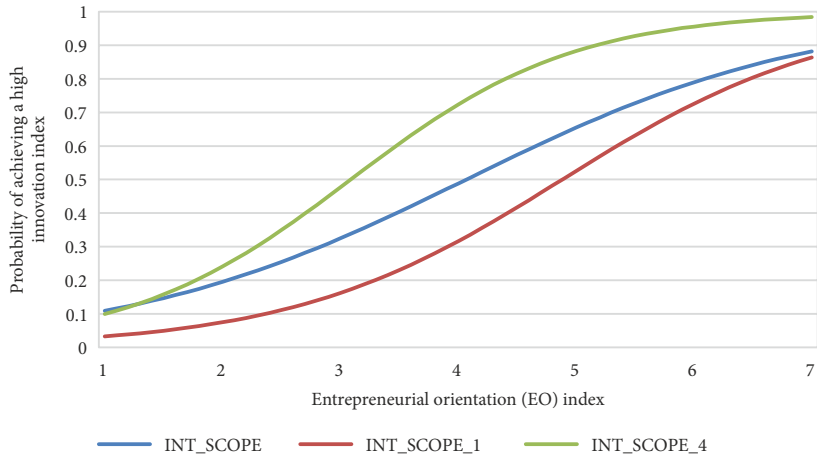

Figure 2. Influence of entrepreneurial orientation on the probability of innovation success (source: own elaboration based on a survey (n = 355))

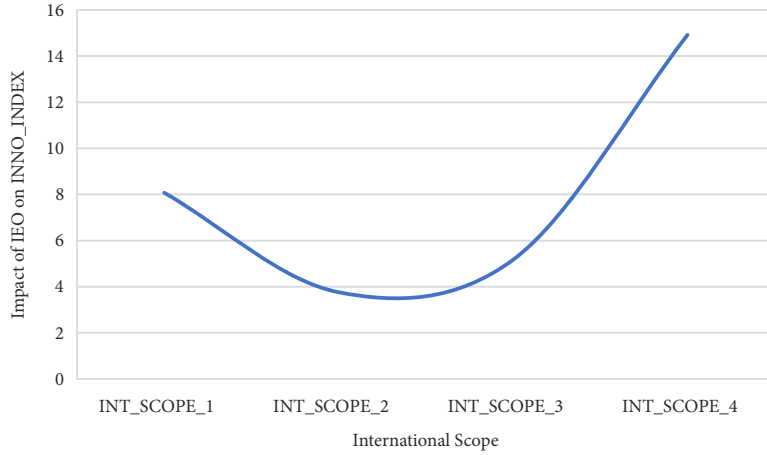

Figure 3. Influence of entrepreneurial orientation on innovation for groups of enterprises with different scopes of internationalisation (source: own elaboration based on a survey (n = 355))

Nevertheless, this article and its empirical findings seem to be among the first to combine international entrepreneurship with entrepreneurial orientation and innovation, which is the main contribution of this article. It will be very interesting to replicate our research in other parts of the globe, in both developed economies and emerging markets, even in other countries of Central and Eastern Europe. Probably future empirical investigations will focus on decision-making processes (theoretically conceptualised in Sieja & Wach, 2019), especially in the context of dominant logic of causation and effectuation (theoretically conceptualised in Pawęta, 2016) or the role of the entrepreneur in this process (Wach & Głodowska, 2021).

Conclusions

The literature review show that international entrepreneurship is becoming the leading research approach to business internationalisation. Exploring many aspects of international business from an entrepreneurial perspective is now natural and obvious. One of the research trends is to explain the role of EO and its impact on many different aspects of internationalisation of the firm. This article also makes such an approach by combining EO with innovation and with the scope of internationalisation as the number of markets on which the firm operates.

For the investigated firms from Poland, the influence of entrepreneurship orientation on innovativeness is positive, but different in individual firm groups according to their scope of internationalisaion. The highest and the most statistically significant impact of the EO on innovation appears in the group of firms that operate in the most significant number of foreign markets or the smallest number of markets, and the impact is less significant in the group of firms that declare their activity in an average number of markets. Empirical data confirm a diversified relationship between business orientation and innovation, based on the scope of internationalisation. At the same time, we can assume that this relationship is similar in shape to the letter U, which constitutes a contribution of this article to the international entrepreneurship literature. Therefore, we can assume that the research hypotheses have been verified positively and confirmed. Entrepreneurial orientation has significant role for the innovativeness of internationalised firms among the investigated businesses (H1). The relationship between entrepreneurial orientation and innovativeness of internationalised firms varies depending on the scope of internationalisation and is U-shaped (H2) among the investigated firms. The most significant impact of entrepreneurial orientation on innovation is noted for firms with a small and very large scope of internationalisation (H2a).

Like any study, especially an empirical one, the results presented in this article has its own research limitations. They are mainly dependent on the sampling method and the measuring instruments. The main reservation is the lack of representativeness of the research sample, it is not representative for the whole population of enterprises from Poland; hence, the results are not absolute, i.e. adequate for the whole population. Secondly, the survey forced the use of managerial perception, i.e. not using measurable data but only the perception by the managerial staff of the phenomena described in the survey questionnaire – which is typical of surveys in business, management or generally social sciences, – hence it is not possible to absolutize the results. The managerial perception depends on many factors, including basic characteristics and traits of entrepreneurs and managers. Thirdly, another limitation of the presented results lies in static analyses, so the future exploration and explanations of this research problem need the dynamic approach. However, it is a considerable challenge to gather panel data for analysis on an international microeconomic level (firms). Therefore, there is still a need for in-depth research on the subject.

The problem undertaken in the article and our results may have important practical implications. The findings confirm the importance of entrepreneurial orientation in internationalization. The findings revealed that entrepreneurial orientation is particularly crucial for innovation, but it depends on the scope of internationalization. We think that the research results can be helpful for managers and owners of firms that are already internationalized

or intend to enter the international market. They should take our observations into account when making decisions about firms' development depending on the scope of their internationalization. It is essential that they focus on entrepreneurial orientation and consciously develop it as a crucial attribute for international activity.

The results presented in the article are a starting point for further detailed analyses, and the directions for further studies are promising. This topic should be analysed from the perspective of management and economics. It is worthwhile to continue research on the influence of entrepreneurial orientation on internationalisation strategies or decision-making processes, especially in the context of dominant logic of causation and effectuation. Within entrepreneurship, we should explore the influence of entrepreneurial orientation, understood as a real recognition of opportunities on foreign markets.

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APPENDIX

Questions on innovations used for the innovation index construct

A10. Which of the activities below have been undertaken by your firm in the last three years? (please tick any number of responses)	A11. What was the scope of introduced innovation from the previous question (tick one option)
☐ introduction of new products (which consumers and users do not know yet) ☐ enhancement or improvement of the quality of the offered products and/or services ☐ introduction of new or substantially improved production methods ☐ finding new sales markets ☐ finding new sources of raw materials or semi-finished goods ☐ introduction of new organisation of economic processes ☐ introduction of new management methods or substantial changes in the organisational structure or strategy ☐ introduction of substantial changes in distribution, promotion, price, packaging ☐ none of the above ☐ If 'none of the above' go to part B	☐ firm-scale innovation (i.e. new in the firm, but functioning in other firms in the region) ☐ region-scale innovation (i.e. new solutions in the region) ☐ country-scale innovation (i.e. new solution in the country) ☐ worldwide innovation (i.e. new solution to the global scale)