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How Absorptive Capacity and Organisational Learning Orientation Interact to Enable Innovation Capability? An Empirical Examination

Monika Stelmaszczyk

A B S T R A C T
Objective: The main objective of the article is to examine the effect of organisational learning orientation (OLO) and absorptive capacity (AC) on innovation capability (IC).
Research Design & Methods: The hypotheses were tested on a sample of 239 respondents. Hypotheses were verified by means of structural equation modelling (SEM), using the asymptotically distribution-free method (ADF).
Findings: A change in organisational learning orientation brings about changes in absorptive capacity, which in turn influences business innovation capability. Absorptive capacity is affected mostly by two dimensions of organisational learning orientation: commitment to learning (OLO1) and open-mindedness (OLO3). In turn, absorptive capacity affected by organisational learning orientation has the strongest impact on product innovation (IC1), a lesser impact on process innovation (ICA2), and the weakest impact on managerial innovation (IC3). Moreover, the process of knowledge sharing (KS) mediates the effect of absorptive capacity on each of the dimensions of innovation capability.
Implications & Recommendations: First, this study expands our understanding of the effect of learning orientation on absorptive capacity. Second, it confirms the presence of a statistically significant and positive relationship between absorptive capacity and innovation capability. The third implication concerns the indirect dependencies between absorptive capacity and innovation capability.
Contribution & Value Added: The study identifies and examines mechanisms that support the transformation of external knowledge – already acquired and used by an organisation – into innovations.
Article type: research article
Keywords: absorptive capacity; innovation capability; organisational learning orientation; knowledge sharing; SEM
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INTRODUCTION

In the last three decades, the literature on strategic management has emphasised the importance of knowledge in building and maintaining a competitive advantage (Wang, He, & Mahoney, 2009). In this context, innovation capability – in which knowledge plays a special meaning – is also brought to the forefront. Currently, enterprises increasingly build their innovation capability based on external sources of knowledge (Laursen & Salter, 2006; Newey & Verreynne, 2011). However, key external knowledge is often not easily available (Argote, 2013; Baum, Lööf, & Nabavi, 2019). Moreover, external knowledge enhances the need for the creation of internal knowledge (Nonaka, 1994; Grigoriou, & Rothaermel, 2017). Thus, when we take both sources of knowledge into consideration, absorptive capability becomes the key tool in the process. Absorptive capability involves the ability to acquire and use knowledge available outside of the organisation (Tortoriello, 2015). Absorptive capability is manifested through the organisation's ability to value, assimilate, and apply new knowledge. The ability to value new knowledge is shaped on the basis of existing experience and commitment. The ability to assimilate knowledge depends on the kind of knowledge, characteristics of the organisation or organisational alliances, and technological overlap. On the other hand, the ability to apply knowledge is affected by technological opportunity – the amount of relevant external knowledge – and appropriability, i.e. the ability to protect innovation (Cohen & Levinthal, 1990).

An organisation in possession of a well-developed absorptive capacity can recognise valuable knowledge coming from the outside, assimilate it, and apply it in the development of innovation (Cohen *et. al.*, 1990). Many researchers believe that absorptive capacity plays a key role in the creation and implementation of valuable innovations (Volberda, Foss, & Lyles, 2010; Huang, Rice, & Martin, 2015). According to some researchers, absorptive capacity in the creation of innovation capability of enterprises is continually gaining importance (Peeters, Massini, & Lewin, 2014). However, Wales, Parida, and Patel (2013) show that, in certain circumstances, absorptive capacity can lead to poor performance.

Therefore, studying direct relationships between absorptive capacity and innovations or innovation capability can give an incomplete picture of this dependency (Volberda *et al.*, 2010). Thus, we should investigate the factors that shape the impact of absorptive capacity on innovation capability (Lane, Koka, & Pathak, 2006). However, surprisingly few analyses determine the place and role of strategic orientation in models to test relationships between absorptive capacity and innovation capability, which results in a research gap.

Among various strategic orientations, the organisational learning orientation is extremely important. Its importance lies in the fact that there is a direct relationship between itself and absorptive capacity (Kim, 1998; Lichtenhalter, 2009). However, in strategic management, the most valuable knowledge is the knowledge of cause and effect within a given process. The awareness of this fact allows us to gain a better understanding of the process under scrutiny. Hence, a deeper and more holistic diagnosis of the relationship between the variables requires an examination of cause-and-effect relationships. Therefore, if it turns out that within the same research model organisational learning orientation affects absorptive capacity and, in turn, absorptive capacity affects innovation capability, then these influences can be understood as the effects of the process. Any change to organisational learning orientation – due to its potential impact on absorptive capacity – will

thereby cause a change in absorptive capacity. In turn, any change in absorptive capacity can result in a change in innovation capability. Therefore, we should assume that organisational learning orientation has been the missing link in the study of the cause-and-effect relationship between absorptive capacity and innovation capability.

The purpose of this study is to identify the cause-and-effect relationships that occur among organisational learning orientation, absorptive capacity, and the organisation's innovation capability. The added value of this study is the enrichment of the literature on strategic management with a discussion of the relationship between absorptive capacity and innovation capability, while taking into account organisational learning orientation as the cause of the process.

The hypotheses were tested on a sample of 239 respondents who are employees of one of the largest Polish insulated glass manufacturers. The hypotheses will be verified by means of structural equation modelling (SEM), using the asymptotically distribution-free method (ADF).

We will present the theoretical framework and hypotheses, then describe the research objective (object) and research methods so as to, finally, present the findings of the empirical research, discuss them, and conclude.

LITERATURE REVIEW

Absorptive Capacity

The concept of absorptive capacity was first introduced by Kedia and Bhagat (1988) in the context of research on international technology transfer. However, Cohen and Levinthal (1989) were the first to note that absorptive capacity results from the recognition of the value of knowledge existing in the environment surrounding an organisation, its assimilation and application to achieve given aims. Cohen and Levinthal's study (1989; 1990) is now considered the foundation of the existing research on the subject. In their view, absorptive capacity is "the ability of a business to recognise the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal 1990, p.128).

Lane *et al.* (2006) present an alternative definition of absorptive capacity. They revitalise the concept of absorptive capacity and eliminate possible deviations from its actual meaning. They claim that,

> absorptive capacity is a firm's ability to utilise externally held knowledge through three sequential processes: (1) recognizing and understanding potentially valuable new knowledge outside the enterprises through exploratory learning, (2) assimilating valuable new knowledge through transformative learning, and (3) using assimilated knowledge to create new knowledge and commercial outputs through exploitative learning (Lane *et al.*, 2006, p. 856).

Zahra and George (2002) note that absorptive capacity is also "the set of strategic organisational routines and processes that make it possible for enterprises to acquire, assimilate, transform and exploit knowledge to create dynamic capabilities." The classification of dimensions of absorptive capacity proposed by Zahra and George is widely accepted and adopted by other researchers (for example Wales *et al.*, 2013). Zahra and

George define absorptive capacity with four dimensions: a) the acquisition of general external knowledge, b) assimilation involving the analysis and understanding of the information coming from external sources, c) transformation through which current knowledge is combined with newly acquired and assimilated knowledge, and d) exploitation that allows for an expansion of existing competences or creation of new ones thanks to the use of the already acquired and transformed knowledge (Zahra & George, 2002, pp. 185-203).

These definitions of absorptive capacity clearly focus on external knowledge and information. Therefore, this paper assumes that absorptive capacity is the ability of business to acquire, assimilate, transform, and exploit external knowledge.

Absorptive Capacity in the Context of Organisational Learning Orientation

The postulates proposed by Cohen and Levinthal (1990) indicate that with the growth of investment in research and development (R&D), an organisation increases its ability to acquire and use external knowledge. In turn, this knowledge enhances the growth of an enterprise's innovation. On the other hand, the relationship between R&D and absorptive capacity is accompanied by an implicit belief that external knowledge can be easily assimilated and transformed into organisational innovation. In other words, the main conclusion drawn from this analysis is that while investments in R&D are made with the aim to generate innovation, an important by-product of these actions is the increase in a firm's capabilities to assimilate and exploit externally available information, i.e. the increase in absorptive capacity (Cohen & Levinthal, 1989, p. 592). To this end, Cockburn and Henderson (1998) present the prospect of innovation development based on the absorptive capacity of pharmaceutical enterprises.

The results of subsequent studies generally confirm the existence of a relationship between absorptive capacity and innovation (e.g. Lenox & King, 2004; Penner-Hahn & Shaver, 2005; Mamun, Fazal, & Mohiuddin, 2019). However, the researchers see absorptive capacity primarily in the light of the amount of funds invested in R&D (Lane, Salk, & Lyles, 2001), thereby indicating that the growth of such investments is accompanied by an increasing number of innovations. However, special attention paid to investments in R&D causes other important aspects of the assimilation and use of external business knowledge to disappear in the background (see, for example, Lane *et al.*, 2006). Only a small number of studies highlight mechanisms that allow organisations to identify, assimilate, and use knowledge to enhance innovation, as shown by Volberda *et al.* (2010) who conducted a comprehensive bibliometric analysis of 1213 papers. In their view, there is a need to organise further research on absorptive capacity to fill the observed research gaps. One such research gap concerns a thorough examination of the building blocks that form absorptive capacity and a search for drivers that cause it to grow. Lane *et al.* (2006), Volberda *et al.* (2010) and Tortoriello (2015) claim that, until now, the mechanisms that transform the already acquired and applied external knowledge into innovations have been neither sufficiently recognised nor examined.

However, I suggest that the impact of absorptive capacity on enterprises' innovation capability can be reinforced by strategic orientation. In management sciences – in particular, in strategic management – an orientation of this kind can define the directions of an enterprise's actions (Miles & Arnold, 1991, p. 49) Thus, bearing in mind the relationship between the already possessed knowledge and absorptive capacity (Feng *et al.*, 2014)

and the relationship between absorptive capacity and innovation (Patel *et al.*, 2015), organisational learning orientation can be a guiding force for the impact of absorptive capacity on innovation capability. An organisational learning orientation covers the activities undertaken by the entire organisation in order to generate and apply knowledge to increase competitive advantage (Panayides, 2007). Organisational learning orientation also affects the type of information collected and the way it is evaluated, interpreted, and shared (Gutierrez, Bustinza, & Molina, 2012). The definition of organisational learning orientation used herein is that proposed by Calantone, Cavusgil, and Zhao (2002): the "organisation-wide activity of creating and using knowledge to enhance competitive advantage" (Calantone, Cavusgil, & Zhao, 2002, p. 516).

Organisational learning orientation significantly affects many aspects of an organisation's operations (Jerez-Gómez, Céspedes-Lorente, & Pérez-Valls, 2017; Guinot, Chiva, & Mallén, 2013). It can also affect absorptive capacity. Lichtenhalter (2009) defines exploratory learning as knowledge acquisition and believes that exploratory learning corresponds to the notion of potential absorptive capacity. Meanwhile, exploitative learning includes knowledge assimilation and exploitation, which jointly reflect the concept of realised absorptive capacity. Moreover, Kim (1998) notices dependencies between organisational learning and absorptive capacity. In his view, organisational learning is a function of absorptive capacity. He notes that "absorptive capacity requires learning capability and develops problem-solving skills. Learning capability is the capacity to assimilate knowledge (for imitation), whereas the problem-solving skills represent a capacity to create new knowledge (for innovation)" (Kim, 1998, p. 507). Kim's theoretical considerations were backed by empirical research at Hyundai Motor Enterprise, which established a strategy to develop absorptive capacity by strengthening learning orientation. Therefore, on the basis of previous studies' results, we may assume that organisational learning orientation not only affects absorptive capacity directly but can also affect the logical relationship between this variable and other phenomena. However, little attention is paid to the analysis of the impact of this orientation on absorptive capacity that in turn affects innovation capability. Hence the desire to discover whether this orientation affects absorptive capacity by means of applying innovation capability within the model. The question that arises is as follows: does absorptive capacity need organisational learning orientation in order to create innovation capabilities?

We adopt a view that promotes strategic orientation multidimensionality, represented by other researchers. In these conceptualisations, organisational learning orientation is a multidimensional construct (e.g. Baker & Sinkula, 1999; Wang, 2008; Farkas, 2016). This means that organisational learning can be described using few perspectives. Baker and Sinkula (1999) foreground commitment to learning, shared vision, and open-mindedness. This approach enables a deeper insight into the nature of the phenomenon and the impact of organisational learning orientation on the specified reference point, i.e. absorptive capacity. On the basis of the above arguments, I propose the following hypotheses:

H1a: There is a positive relationship between commitment to learning and absorptive capacity.

H1b: There is a positive relationship between shared vision and absorptive capacity.

H1c: There is a positive relationship between open-mindedness and absorptive capacity.

In organisations involved in learning, managers support learning at every level. They constantly gather pieces of information and analyse them. If there were no such involvement, organisational learning would be on a much lower level (Feng, Zhao, & Su, 2014). The second dimension is associated with the shared vision and objectives of managers and employees. Without a shared vision and objectives, learning motivation will remain at low levels. Employees may not even be aware of what they have to learn (Wang, 2008). Having a shared vision orientates the learning process, while the last dimension, open-mindedness, affects learning intensity (Baker *et al.*, 1999). Thus, open-mindedness is conducive to organisational learning, because it involves the development of new skills and encourages rejecting old and useless knowledge (Sinkula, Baker, & Noordewier, 1997, p. 309). Open-mindedness is a proactive feature, because it is based on the premise that since knowledge is not permanent, every organisation requires continuous development.

Absorptive Capacity and Innovation Capability

The authors of one of the first studies on absorptive capacity highlight a positive linear relationship among absorptive capacity, innovation capabilities, and business innovation performance (Cohen *et al.*, 1990). The results of subsequent studies generally confirm these dependencies (Tsai, 2001a; Zahra *et al.*, 2002; Fosfuri & Tribó, 2008; Tortoriello 2015; Zou, Guo, & Guo, 2017). Moreover, researchers show that innovation capability is an important predictor of success (Godart, Maddux, & Shipilov, 2015). Furthermore, any scholars believe that absorptive capacity is not an end in itself. In their view, this ability mediates, moderates, or otherwise affects key business results (Rothaermel & Alexandre, 2009; Fernhaber & Patel, 2012). Meanwhile, Lewin, Massini, and Peeters (2011) indicate that absorptive capacity was initially viewed solely as a mediating or moderating factor for a variety of phenomena related to innovation or efficiency. Over time, absorptive capacity was seen instead as a moderator, a variable that acts directly on innovation. Therefore, absorptive capacity has long been considered a significant factor in business innovation activity (Cohen *et al.*, 1989, 1990; Cockburn *et al.*, 1998). Despite this, the following question remains a "black box:" what will be the influence of absorptive capacity on innovation capability if we assume that organisational learning orientation is the cause of the existence of absorptive capacity?

Organisations with a well-developed innovation capability demonstrate a willingness to introduce innovations and establish methods for their implementation (Samson & Gloet, 2014, p. 6450; Krawczyk-Sokołowska, Pierścieniak, & Caputa, 2019). Innovation capability is the ability to use a set of interrelated procedures to develop and implement new products and improve the quality of existing products (Wang *et al.*, 2017). In other words, it is a philosophy of continuous improvement that holds a key role in business development (Subramaniam & Youndt, 2005). It is the ability to create and implement new ideas resulting in innovation, whose spread brings benefits to the enterprise (Jain, 2013).

Moreover, based on the concept of innovation by Samson (1991), Tsai, Huang, and Kao (2001b) define innovation capability in terms of product innovation, process innovation, and managerial innovation. We adopt this approach in our study. Much research has been devoted to the influence of absorptive capacity on innovation (or innovation capability). Nevertheless, few empirical studies – if any at all – verify the influence of absorptive capacity on product innovation, process innovation, and managerial innovation (simultaneously taking into account the effect of organisational learning orientation on absorptive capacity).

Scholars argue that absorptive capacity affects product innovation (Zhang, Zhao, & Lyles, 2018; Moilanen, Østbye, & Woll, 2014; Tavani, Sharifi, & Ismail, 2014). Moreover, there exists empirical evidence that absorptive capacity affects process innovations (Ali-asghar, Rose, & Chetty, 2019; Najafi-Tavani *et al.*, 2018). So far, the direct impact of absorptive capacity on innovation management rarely underwent academic scrutiny. Despite such drawbacks, Ali, Kan, and Sarstedt (2016) empirically confirm the existence of a relationship between the variables. Therefore, I propose the following hypotheses:

H2a: There is a positive relationship between absorptive capacity and product innovation.

H2b: There is a positive relationship between absorptive capacity and process innovation.

H2c: There is a positive relationship between absorptive capacity and managerial innovation.

Product innovations must be identified with the implementation of goods or services that are new or significantly improved (Müller-Stewens *et al.*, 2017). Novelty or significant improvement is assessed from the perspective of functionality and the commercial end of a product or service. By contrast, process innovation is the implementation of a new or significantly improved production or delivery method (OECD, 2005; Vuori & Huy, 2016). Process innovations may lower production or supply costs and improve quality. Process innovations provide new or significantly improved products and services. Meanwhile, managerial innovation is the ability through which an enterprise improves its performance. Managerial innovation allows for the introduction of new regulations, systems, or methods of management (Tsai *et al.*, 2001b). In this way, knowledge about the development of managerial functions and mechanisms used by managers to improve managerial efficiency becomes innovation capability.

The Role of Knowledge Sharing as a Mediator

Despite previous studies devoted to the dependencies between absorptive capacity and innovation or innovation capability, surprisingly few studies demonstrate why there is such a regularity. Therefore, a deeper and more holistic understanding of this dependency requires paying attention to additional variables that can shape the relationship between absorptive capacity and innovation capability. Indicating the mediators of such dependencies will foster a better understanding of the studied phenomenon. It will alleviate difficulties in explaining why the phenomenon exists and how it functions. Indeed, mediation is one of the indirect impacts that explains the mechanism or process by which variables interact. Moreover, the role of management and quality sciences is not limited to identifying activities that result in the achievement of objectives. This also involves describing, explaining, and predicting successive states (Sudoł, 2014, p. 18). Hence, with the introduction of mediators into the model, I will attempt to explain the mechanisms underlying the relationship between absorptive capacity reinforced by orientation on organisational learning and specific types of innovation.

Within the scope of these considerations, what deserves special attention is knowledge sharing. Under conditions in which knowledge is identified as the key source of competitive advantage, knowledge sharing becomes a priority (Grant, 1996). Knowledge sharing allows for maximising business capabilities (McEvily, Das, & McCabe, 2000). It is an essential element

in the functioning of any organisation, since it increases the organisation's innovation efficiency (Han, Jo, & Kangi, 2016). Knowledge sharing will be considered a mediator of relationship between absorptive capacity and innovation capacity if the following relationships are confirmed, namely the relationship between absorptive capacity and knowledge sharing and between knowledge sharing and innovation capacity.

The results of previous studies indicate the presence of statistically significant relationships between absorptive capacity and knowledge sharing (Arnold *et al.*, 2010), but also between knowledge sharing and innovation capability (Yeçil, Büyükbeşe, & Koska, 2013; Le & Lei, 2019). Furthermore, there exists empirical evidence concerning the impact of knowledge sharing on product innovation (Maes & Sels, 2014; Lyytinen, Yoo, & Boland, 2016; Markovic & Bagherzadeh, 2018). Researchers argue that there is a relationship between knowledge sharing and process innovation (Shu *et al.*, 2012; Prodan & Murovec, 2009). Moreover, scholars report the existence of impacts of knowledge sharing on management innovation (Buenechea, Kianto, & Sáenz, 2018). Therefore, we may assume that knowledge sharing is a mediator in the relationship between absorptive capacity and innovation capability. The mediation occurs if the effect of the independent variable on the dependent variable is transmitted through a third variable (Cohen *et al.*, 2003, p. 158-161), known as the mediating variable (or mediator). In light of the above, I propose the following hypotheses:

H3a: Knowledge sharing is a mediator in the relationship between absorptive capacity and product innovation.

H3b: Knowledge sharing is a mediator in the relationship between absorptive capacity and product innovation.

H3c: Knowledge sharing is a mediator in the relationship between absorptive capacity and managerial innovation.

Knowledge sharing involves the dissemination of knowledge within a group of employees or the transfer of this resource category between certain individuals, teams, or occupational groups (Probst, Raub, & Romhardt, 2012, p. 146). Probst, Raub, and Romhardt suggest that knowledge sharing can occur at the individual, team, or organisation level. However, they indicate that knowledge is a good that can often be transmitted only through direct exchange between specific people. Davenport and Prusak (1998) also suggest that knowledge is personal. They believe that an organisation can effectively manage its knowledge resources if employees are willing to cooperate. For this reason, our considerations primarily focus on knowledge sharing at the individual level. For individual employees, knowledge sharing means conversations with colleagues that enable them to do something better, faster, or more effectively. By knowledge sharing with others, they also learn how to use their own knowledge in other areas (Cohen *et al.*, 1990). Therefore, individual employee knowledge sharing allows for mutual learning, which may lead to improved results within the organisation (Reinholt & Foss, 2011; Stelmaszczyk, 2016).

Knowledge sharing is a process by which employees mutually exchange knowledge and create new knowledge (Ozer & Vogel, 2015). It consists of knowledge donating and knowledge collecting. Knowledge donating is the willingness of employees to actively communicate with colleagues and share their knowledge. By contrast, knowledge collecting involves active consultations with colleagues in order to learn from them. In other words, knowledge donating means acquiring it from a database or some other source, and then

transferring it to the addressee, while knowledge collecting involves the acceptance of acquired knowledge and the assimilation and use of said knowledge (Cavaliere & Lombardi, 2015). Knowledge donating consists of sharing one's own intellectual capital with others, which from an economic viewpoint means more costs than benefits. On the other hand, knowledge collecting allows one to benefit from the intellectual capital of others. In this situation, the benefits often outweigh the costs.

For the purposes of the present study, I developed a research model, which forms the basis for the presentation of allocation of research hypotheses that require empirical validation (Figure 1).
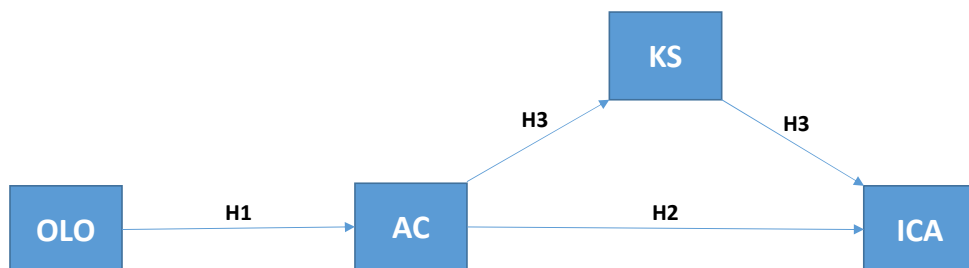
Figure 1. Proposed theoretical model
Source: own elaboration.

MATERIAL AND METHODS

The object of research is the enterprise's registered office in a town in East-Central Poland. This enterprise specialises in the production of high-quality insulating glass and special glass. It is one of the leading manufacturers in this sector in Poland. The enterprise offers a range of products: heat protection panes, laminated panes, soundproof panes, solar panels, decorative panes, and so-called special glass like hardened glass, half-hardened glass, and enamelled glass. This enterprise has a modern machine park supported by cutting-edge technological solutions. Over the period covered by the study, the enterprise had 427 persons in its employment.

In attempting to compete effectively with other enterprises in the market, Effect Glass S.A. wants to raise its ability to create and implement innovations. Effect Glass constantly seeks for ways to introduce new or significantly improved products, production methods, regulations, and management methods. Thus, the enterprise seeks significant and lasting cause-effect relationships between knowledge and the development of innovation. It is for this reason that I selected Effect Glass for the study.

This study was conducted between January and March 2017. The survey questionnaire was used to measure the relationship between absorptive capacity, organisational learning orientation and innovation capability. The study uses a seven-item Likert scale that ranges from (1) "strongly disagree" to "strongly agree" (7). The survey questionnaire was addressed to all employees of the enterprise, i.e. to 427 persons. Responses with missing data or contradictory or incomprehensible answers were eliminated. A total of 239 valid questionnaires were obtained (demographic characteristics of the sample are shown in Table 1).

Table 1. Sample demographics

Category		Frequency	%
Sex	Female	84	35.1
	Male	155	64.9
Age	Under 30	62	25.8
	30-39	108	45.0
	40-49	61	25.4
	50-59	9	3.8
Employment period	1 year or less	69	28.8
	2-3 years	90	37.5
	4-5 years	63	26.3
	6 years or longer	18	7.5

Source: own study.

Dependent Variable

Innovation capability is the ability to create and implement new ideas resulting in innovation whose spread brings benefit to the enterprise (Jain, 2013). In this study, innovation capability is based on the scale developed by Tsai *et al.* (2001b), which measures product innovations (six items), process innovations (five items), and managerial innovations (seven items). The value of Cronbach's α for product innovations is 0.82, for process innovations it is 0.79 and for managerial innovations it is 0.82.

Independent variables

Absorptive capacity is the ability of business to acquire, assimilate, transform, and exploit external knowledge (Zahra *et al.*, 2002). Absorptive capacity was measured using a ten-item scale developed by Pavlou and Sava (2006). Cronbach's value of α for this variable is 0.91.

Organisational learning orientation involves activities undertaken by the entire organisation to create and use knowledge in order to increase competitive advantage (Calantone *et al.*, 2002, p. 516). This study adopted a scale proposed by Sinkula *et al.* (1997) and Baker and Sinkula (1999). The scale has three dimensions: commitment to learning (four items), shared vision (four items), and open-mindedness (four items). The values of Cronbach's α for each of the coefficients are 0.84, 0.82 and 0.77, respectively.

Mediating Variable

Knowledge sharing is a process by which employees mutually exchange knowledge and create new knowledge (Ozer *et al.*, 2015). Knowledge sharing is measured using a 10-item scale developed by Van den Hooff and Van Weenen (2004). The scale consists of two dimensions: knowledge donating (five items) and knowledge collecting (five items). The values of Cronbach's α for knowledge donating and knowledge collecting are 0.90 and 0.92, respectively (see Appendix: List of measurement items).

This survey investigated the issue of causality. I prepared a theoretical model to explain the studied phenomenon and its empirical verification using Structural Equation Modelling (SEM). SEM allows for a multidimensional and multivariate analysis of empirical data. SEM has the unique ability to simultaneously examine multiple variables, especially

in the case when the dependent variable becomes an independent variable in subsequent relationships within the same analysis (Shook *et al.*, 2004).

In order to verify the research hypotheses, I conducted a number of statistical analyses. Basic descriptive statistics, the Kolmogorov-Smirnov test, the Shapiro-Wilk tests, and the analysis of frequency and Cronbach's α reliability coefficients were all calculated with Orange Canvas software. I used EQS software to analyse structural equations.

RESULTS

The analysis initially measured the accuracy of the scales used, using Cronbach's α. The results of the analysis indicate that all of the scales used to build the path-based model have a reliability greater than 0.7. This proves to be a highly satisfactory measurement accuracy of the scales, which results in a very small measurement error of the traits studied. In addition, basic descriptive statistics were calculated, along with the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk (S-W) tests. By using the K-S and S-W tests, analyses were conducted to verify the similarities in the distribution of all measured variables in relation to the theoretical normal distribution. Test results indicate that distributions of variables in this study have a significantly different shape than the theoretical normal distribution. Despite this, a visual assessment of histograms shows that distributions of variables are symmetrical and more similar to a normal distribution than to any other known distribution. Cronbach's α coefficients, basic descriptive statistics and K-S and S-W test results are presented in table 2.

Table 2. Descriptive statistics, Cronbach's alpha reliability coefficient, and measured variables normality distribution tests

Statistics		AC	OLO1	OLO2	OLO3	ICA1	ICA2	ICA3	KSd	KSc
Reliability statistics	Cronbach's alpha	0.91	0.84	0.82	0.77	0.82	0.79	0.82	0.90	0.92
	Number of positions	10.0	4.00	4.00	4.00	6.00	5.00	7.00	5.00	5.00
Descriptive statistics	Average	4.61	4.32	4.21	4.30	4.63	4.65	4.38	5.02	5.09
	Median	4.70	4.50	4.25	4.25	4.50	4.60	4.43	5.00	5.20
	Standard deviation	0.93	1.02	1.02	1.05	0.87	0.92	0.87	1.10	1.09
	Skewness	-0.30	-0.45	0.05	0.04	0.17	-0.07	-0.36	-0.42	-0.71
	Kurtosis	0.52	0.51	0.23	-0.50	-0.63	0.69	0.92	0.37	1.00
	Minimum	1.00	1.00	1.00	2.00	2.83	1.00	1.00	1.00	1.00
	Maximum	6.70	6.75	7.00	7.00	6.83	7.00	6.29	7.00	7.00
Kolmogorov-Smirnov	K-S Statistics	0.06	0.09	0.07	0.06	0.07	0.07	0.10	0.09	0.12
	Validity	0.039	0.000	0.005	0.029	0.005	0.003	0.000	0.000	0.000
Shapiro-Wilk	S-W Statistics	0.990	0.980	0.990	0.990	0.980	0.990	0.980	0.980	0.960
	Validity	0.045	0.001	0.026	0.054	0.009	0.021	0.001	0.001	0.000

Source: own study.

Structural Equation Modelling (SEM)

In order to verify the theoretical model, I conducted an analysis of structural equations using the asymptotically distribution free (ADF) method. The results of the analysis show that the model explaining the influences and relationships between variables fits the empirical data very well. Measurements of the model fit of the data are satisfactory [*CMIN/DF*=3.64, *GFI*=0.95, *CFI*=0.87, *RMSEA*=0.11 (ci=0.08-0.14), *AIC*=114.52, *BIC*=117.13].

The analysis of influence coefficients of the model demonstrated a statistically significant effect of organisational learning orientation (OLO) on the absorptive capacity (AC) of the surveyed enterprise. Absorptive capacity is most strongly affected by commitment to learning (OLO1), less affected by open-mindedness (OLO3), and least affected by shared vision (OLO2). It is demonstrated by the values of standardised coefficients of β regression, which are 0.39, 0.37, and 0.19, respectively. However, the value of the R^2 determination coefficient of 0.67 indicates that the variance in terms of OLO1, OLO2, and OLO3 explains 67% of the variation in the AC measurement (Table 3). Obviously, these dependencies occur with the assumption that the individual dimensions of organisational learning orientation are significantly statistically correlated (correlation coefficient values range from 0.55 to 0.65: Table 4).

Table 3. Estimation results of the path-based model

R^2	Variable	Direction of impact	Variable	B	S.E.	β	C.R.
0.67	AC		OLO1	0.37	0.05	0.39	8.20***
	AC		OLO2	0.17	0.05	0.19	3.20**
	AC		OLO3	0.34	0.06	0.37	6.03***
0.16	KSd		AC	0.45	0.07	0.39	6.80***
0.17	KSc		AC	0.46	0.07	0.41	6.52***
0.47	ICA1		KSc	0.09	0.06	0.11	1.70
	ICA1	<	AC	0.49	0.06	0.53	8.20***
	ICA1		KSd	0.15	0.05	0.18	2.73**
0.44	ICA2		KSc	0.35	0.05	0.39	7.42***
	ICA2		AC	0.37	0.06	0.37	5.73***
	ICA2		KSd	0.04	0.05	0.05	0.77
0.31	ICA3		KSc	0.23	0.05	0.29	4.45***
	ICA3		AC	0.27	0.05	0.31	5.35***
	ICA3		KSd	0.06	0.05	0.07	1.16

$p < 0.001$***, $p < 0.01$**, $p < 0.05$*
Source: own study.

Table 4. Relationships between variables in the path-based model

Relationship between variables		r	C.R.
OLO2	OLO3	0.65	9.53***
OLO1	OLO3	0.55	7.71***
OLO1	OLO2	0.61	9.45***
KSd	KSc	0.69	8.54***
ICA1	ICA3	0.42	6.64***
ICA2	ICA3	0.42	5.57***
ICA1	ICA2	0.44	5.18***

$p < 0.001$***, $p < 0.01$**, $p < 0.05$*
Source: own study.

Next, I observed that there is a statistically significant influence of AC on knowledge donating (KSd) and knowledge collecting (KSc). Indicative of this are the values of the standardised coefficients of β regression that are 0.39 and 0.41, respectively; assuming that both dimensions of knowledge sharing are correlated by an important relationship,

in which r equals 0.69. Moreover, the value of the coefficient of R^2 determination for KSd and KSc is 0.17 and 0.16, respectively. This means that the variability in AC explains 17% of the variation in KSd and 16% of the variation in KSc.

The results of subsequent analyses show the strongest and most statistically significant effect of AC on the level of ICA1 (β=0.53). AC has a lesser effect on ICA2 (β=0.37) and the weakest effect on ICA3 (β=0.31). Obviously, these dependencies occur with the assumption that the individual dimensions of organisational learning orientation are correlated via a statistically significant relationship (correlation coefficient values range from 0.42 to 0.44).

In the next stage of the analysis, I examined the impact of KSd and KSc on business innovation capability (ICA). It turns out that KSd significantly affects only product innovations (ICA1; β = 0.18). In the case of process innovations (ICA2) and managerial innovations (ICA3), I observed no effect. Meanwhile, KSc has the strongest effect on ICA2 and a lesser effect on ICA3. The values of the standardised coefficients of β regression are 0.39 and 0.29, respectively; assuming that the individual dimensions of innovation capability are statistically related (correlation coefficient values range from 0.42 to 0.44). Therefore, the model explains 47% of the variation in ICA1, 44% of the variation in ICA2, and 31% of the variation in ICA3. The results of testing the hypothesised structural equation model are shown in Figure 2.

The Analysis of Mediation Results

In the analysis of the path-based model, mediating effects were obtained. The mediating effect of knowledge sharing (KSd and KSc) was revealed by the influence of AC on individual dimensions of innovation capability (ICA1, ICA2, ICA3). Here, we are dealing with a statistically significant but partial influence of dimensions of knowledge sharing on the relationship between AC and ICA1 (β=0.11; p<0.001), AC and ICA2 (β=0.19 p<0.01), and AC and ICA3 (β=0.15, p<0.01). The presence of KSd and KSc dimensions statistically significantly weakens the influence of AC on ICA1, ICA2, and ICA3. Yet it does not reduce it enough to cause direct effects of the influence of AC on ICA1, ICA2, and ICA3 to be statistically insignificant. This is shown by the significance of the direct effects of AC on ICA1 (β=0.53; p<0.001), on ICA2 (β=37; p<0.001), and on ICA3 (β=0.31; p<0.01). Therefore, AC significantly affects ICA1, ICA2, and ICA3, while the dimensions of knowledge sharing (KSd and KSc) statistically significantly mediate this effect. The correlation between AC and ICA1, ICA2 and ICA3 occurs partly due to the presence of KSd and KSc within the set of variables (Table 5).

Table 5. The mediating effect of knowledge sharing in the relationship between knowledge collecting and innovation capability

Mediating variables	Direct effect	Indirect effect	Type of mediation	Dependent variables
	AC	AC		
KSd, KSc	0.53***	0.11**	Partial mediation	ICA1
	0.31***	0.15**	Partial mediation	ICA3
	0.37***	0.19**	Partial mediation	ICA2

Source: own study.

Summing up, we conclude that the mathematical structure of the model reflects the cause-and-effect influence of variables and dependencies between the variables. The influence of independent variables on dependent variables is very high. This is demonstrated
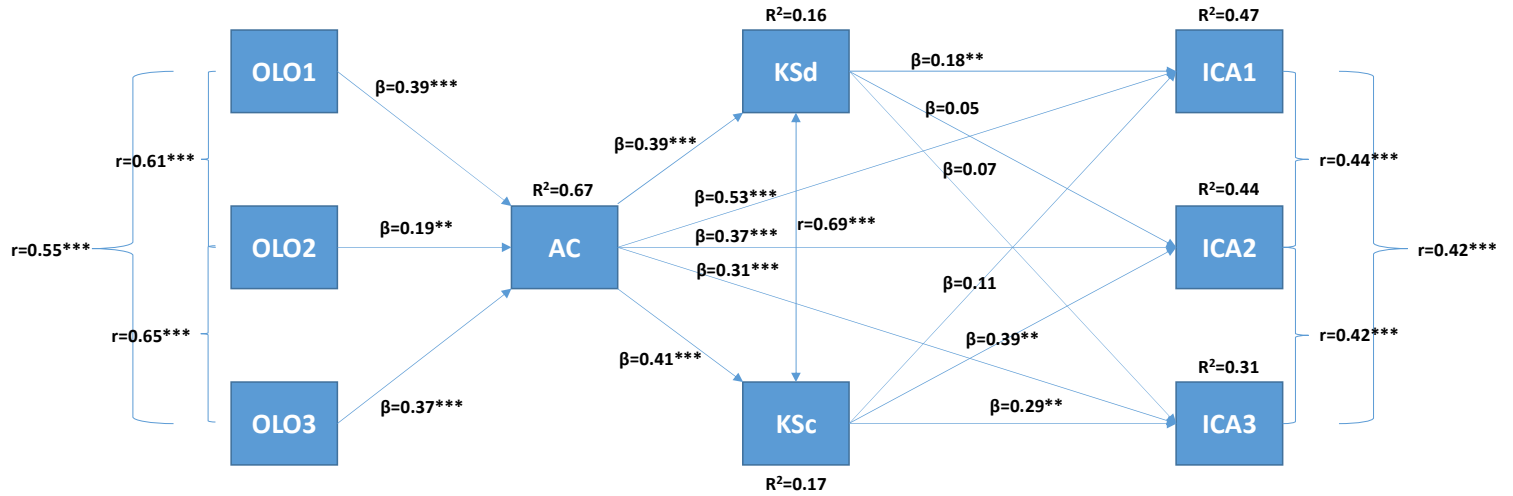
Figure 2. Results of structural equation modelling
Source: own elaboration.

by high values of the R^2 determination coefficients and the standardised coefficients of β regression. Table 6 presents the results of the hypotheses tested in this study.

Table 6. Summary of Hypotheses Testing

Hypotheses	Result
H1a: there is a positive relationship between commitment to learning and absorptive capacity	Supported
H1b: there is a positive relationship between shared vision and absorptive capacity	Supported
H1c: there is a positive relationship between open-mindedness and absorptive capacity	Supported
H2a: there is a positive relationship between absorptive capacity and product innovation	Supported
H2b: there is a positive relationship between absorptive capacity and process innovation	Supported
H2c: there is a positive relationship between absorptive capacity and managerial innovation	Supported
H3a: knowledge sharing is a mediator in the relationship between absorptive capacity and product innovation	Supported
H3b: knowledge sharing is a mediator in the relationship between absorptive capacity and process innovation	Supported
H3c: knowledge sharing is a mediator in the relationship between absorptive capacity and managerial innovation	Supported

Source: own study.

DISCUSSION AND CONCLUSION

Contribution to Theory

The purpose of this study was to identify the cause-and-effect relationships that occur among organisational learning orientation, absorptive capacity, and business innovation capability. The results prove to be interesting, while understanding them may have significant theoretical and practical implications.

There are three issues that this study contributes to the development of the literature on strategic management. First, this study expands our understanding of the effect of organisational learning orientation on absorptive capacity. The results of this analysis indicate that organisational learning orientation strongly impacts the acquisition, assimilation, and exploitation of external knowledge. Previously, little was known about the antecedents of absorptive capacity (Volberda *et al.*, 2010). The present study fills this gap, as it confirms the existence of relationships between organisational learning orientation and absorptive capacity. This means that a strong organisational learning orientation increases absorptive capacity. The results show that an organisation's commitment to learning has the strongest effect on absorptive capacity. Likewise, open-mindedness allows for acquiring useful external knowledge and using it in practice. The weakest factor that is antecedent to absorptive capacity is shared vision. However, bearing in mind the fact that this dimension orientates the learning process, it should not be ignored. In addition, it is strongly and positively correlated with the organisation's other learning orientation dimensions. This highlights the important

role of this variable in the research model. In conclusion, up to 67% of the variation in absorptive capacity is explained by the influence of organisational learning orientation. Therefore, the empirical analysis results confirm the role of organisational learning orientation as the key factor antecedent to absorptive capacity.

The second theoretical implication of this study is the confirmation of the presence of a statistically significant and positive relationship between absorptive capacity and innovation capability. The obtained results confirm the results of earlier studies conducted by Cohen *et al.* (1990), Tsai (2001a), Zahra *et al.* (2002), and Tortoriello (2015). Moreover, Moilanen *et al.* (2014) note the existence of a positive but very weak relationship between absorptive capacity and product innovations. Zhang *et al.* observe a stronger direct impact of one variable on the other (2018). However, the impact of innovative ability on product innovation in our case is also positive but definitely stronger. It is the orientation on organisational learning included in the model that triggered a stronger relationship between absorptive capacity and product innovation. In turn, Najafi-Tavani *et al.* (2018) state that the impact of collaborative innovation networks on process innovation is only relevant when absorptive capacity appears. They studied indirect effects collaborative innovation networks on process innovation and absorptive capacity on process innovation. However, their study allows for a conclusion that there is a significant relationship between absorptive capacity and process innovation. Similarly, Aliasghar *et al.* (2019) indicate a moderately strong relationship between potential absorptive capacity and process innovations. Therefore, our study confirms the occurrence of this relationship: it is clear but a little weaker. In turn, the impact of absorptive capacity on management innovations has so far been rarely analysed. Peeters *et al.* (2014) propose a conceptual research model in which they suggest that absorptive capacity routines can affect the effectiveness of innovation in management innovation management. By contrast, *Ali et al.* (2016) empirically demonstrate that any increase in the individual dimensions of the absorptive capacity results in an increase in the management innovation. The current study also demonstrates a positive relationship between these variables, with the absorptive capacity being treated as a one-dimensional variable.

The added value of the present study lies in the filling of the research gap noted by Lane *et al.* (2006), Volberda *et al.* (2010), and Tortoriello (2015). That is, they all argue that the mechanisms that transform external knowledge into innovations have yet been neither sufficiently recognised nor examined. Therefore, through the inclusion of organisational learning orientation, this study enables a better understanding of the impact of absorptive capacity on the innovation capability. Absorptive capacity needs organisational learning orientation in order to create innovation capability. Absorptive capacity generated by organisational learning orientation has the strongest direct impact on product innovations; it has a lesser effect on process innovations and the weakest effect on managerial innovations. Research shows that a stronger organisational learning orientation increases absorptive capacity. In turn, new knowledge acquired and used thanks to absorptive capacity enhances innovation capability; i.e. an increase in product, process, and managerial innovations. The main conclusion of the analysis is the following: the relationship of organisational learning orientation with absorptive capacity can lead to easier transformations of assimilated external knowledge into innovation.

The third theoretical implication concerns the indirect dependencies between absorptive capacity and innovation capability. It turns out that knowledge sharing – in the form

of knowledge donating and knowledge collecting – significantly mediates in the relationship between these variables. Therefore, what enabled the identification of the mediation is the empirical evidence for the existence of relationships between absorptive capacity and knowledge sharing (Arnold *et al.*, 2010), knowledge sharing and product (Maes *et al.*, 2014; Lyytinen *et al.*, 2016; Markovic *et al.*, 2018), but also process innovation (Shu *et al.*, 2012; Prodan *et al.*, 2009) and managerial innovation (Buenechea *et al.*, 2018). The identification of mediation demonstrates that absorptive capacity impacts each of the mentioned types of innovations through knowledge sharing in the studied enterprise. Thus, an enterprise can improve its innovation capacity both by increasing its absorptive capacity and by improving knowledge sharing. Of course, this is only a partial mediation, since we know that there exist other mediators beside knowledge sharing, which were not included in the study. However, knowledge sharing most strongly affects the relationship between the absorptive capacity and product innovation. This is clearly proven by the strength of the impact of absorptive capacity on product innovation, which significantly decreases after the introduction of a mediator into the model. Moreover, it depends on the intensity of the process of knowledge sharing. Thus, knowledge sharing constitutes an important factor, while the external knowledge acquired is used to develop and implement new products, but also to improve the quality of existing products.

Contribution to Practice

In practice, this study has three main implications. Firstly, it provides top management with ideas on the development of innovation capability. New knowledge obtained from external sources and applied in practice most strongly affects product innovations. Therefore, the expansion of absorptive capacity should be seen as a key factor affecting the development and implementation of new products, but also as the improvement in the quality of existing products. Thus, in the case of product innovation, managers should pay particular attention to the quality and kind of knowledge acquired from external sources. They should also make every effort to ensure that the knowledge acquired is assimilated and put to practical use by the organisation. On the other hand, absorptive capacity is one of many factors that affect process and managerial innovations. This means that only a fraction of the data complies with the implied dependency. The trend is visible, but some deviations may occur.

Secondly, if employees are more willing to share their knowledge with others in the enterprise, it will facilitate the transformation of acquired and assimilated knowledge into innovation capability. The strongest relationship of this type occurs between absorptive capacity and product innovation. Therefore, managers can engage in developing mechanisms for knowledge sharing and encouraging employees to directly exchange knowledge, thus strengthening the impact of absorptive capacity on the capability to create product innovations. In other words, they can allow for a maximisation of capabilities for business product innovation. The results of my analyses show that the process of knowledge sharing within the enterprise can become an important mechanism to facilitate the transformation of external knowledge into product innovations.

Thirdly, in order for an enterprise to be able to benefit from its absorptive capacity, it must be committed to learning and feel an obligation to be open-minded towards new information and new methods of action. The enterprise should also be engaged in a common interpretation of obtained information and in reaching a general consensus as to its meaning. Reagans and McEvily (2003) show that organisation participants can absorb

knowledge with more ease if there is already some common – basic and specialist – knowledge made available to them. Therefore, managers should support learning at all levels: individual, team, and organisational. They should develop new skills and encourage rejecting outdated and impractical knowledge. By strengthening organisational learning orientation, the enterprise will be able to build its absorptive capacity.

Limitations and Future Research

As with all research, any conclusions based on the results obtained should be interpreted with certain limitations in mind. Firstly, in the cause-and-effect research model, I consider linear relationships between variables. The results confirm the existence of a positive linear relationship, e.g. between the three dimensions of organisational learning orientation and absorptive capacity. A reasonable explanation of this fact is that the enterprise must continuously strive to strengthen the organisational learning orientation so that its absorptive capacity can grow. This study highlights the benefits of organisational learning orientation. However, it does not tackle costs. A stronger focus on organisational learning orientation may be likely accompanied by a decrease in absorptive capacity. A similar correlation was observed concerning the impact of absorptive capacity on inter-organisational learning (Schildt, Keil, & Maula, 2012). Therefore, a pattern based on linear relationship can only occur up to a certain level of organisational learning orientation. Beyond that, a decrease in absorptive capacity may be experienced. In light of this fact, future research should examine the hypothesis about the existence of an inverted U-shaped relationship between organisational learning orientation and absorptive capacity.

The second limitation relates to the sample selection, as it was limited to one enterprise. It may be interesting to examine the proposed research model in other enterprises that also specialise in the production of insulating glass. In the future, researchers may also attempt to advance our understanding of the relationship between organisational learning orientation, absorptive capacity, and innovation capability in other business sectors.

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Appendix:

Measurement items

Construct	Items
Absorptive capacity (AC)	1. We are successful in learning new things within our firm. 2. Our firm is effective in developing new knowledge or insights that have the potential to influence our business. 3. Our firm is able to identify and acquire internal (e.g., within the firm) and external (e.g., market) knowledge. 4. Our firm has effective routines to identify, value, and import new information and knowledge. 5. Our firm has adequate routines to analyse the information and knowledge obtained. 6. Our firm has adequate routines to assimilate new information and knowledge. 7. Our firm can successfully integrate our existing knowledge with the new information and knowledge acquired. 8. Our firm is effective in transforming existing information into new knowledge. 9. Our firm can successfully exploit internal and external information and knowledge into concrete applications. 10. Our firm is effective in utilising knowledge in new services.
Commitment to learning (OLO1)	1. Managers basically agree that our firm's ability to learn is the key to our competitive advantage. 2. The basic values of our firm include learning as key to improvement. 3. The sense around here is that employee learning is an investment not an expense. 4. Learning in our firm is seen as a key commodity necessary to guarantee organisational survival.
Shared vision (OLO2)	1. There is commonality of purpose in our firm. 2. There is total agreement on our firm's vision across all levels, functions and divisions. 3. All employees are committed to the goals of our firm. 4. Employees view themselves as partners in charting the direction of the firm.
Open-mindedness (OLO3)	1. We are not afraid to reflect critically on the shared assumptions we have made about the way we do business. 2. Personnel in our firm realise that the very way they perceive the marketplace must be continually questioned. 3. We continually judge the quality of our decisions and activities taken over time. 4. Managers encourage employees to "think outside of the box."
Product innovations (ICA1)	1. Our firm often develops new products and services well accepted by the market. 2. A great majority of our firm's profits are generated by the new products and services developed. 3. The new products or services developed by our firm always arouse imitation from competitors. 4. Our firm can often launch new products or services faster than our competitors. 5. Our firm has better capability in R&D of new products or services than our competitors. 6. Our firm always develops novel skills for transforming old products into new ones for market.

Construct	Items
Process innovations (ICA2)	1. Our firm often tries different operation procedures to hasten the realisation of the firm's goals. 2. Our firm always acquires new skills or equipment to improve the manufacturing operation or service process. 3. Our firm can develop more efficient manufacturing process or operation procedure. 4. Our firm can flexibly provide products and services according to the demands of the customers. 5. The new manufacturing process or operation procedure employed by our firm always arouses imitation from competitors.
Managerial innovations (ICA3)	1. Our firm will change the division of work among different departments according to the needs of market management. 2. Our firm's department heads will adopt new leadership approaches to lead all staff towards task completion. 3. The new staff welfare system adopted by our firm can effectively provide incentives to our staff. 4. The new financial management system adopted by our firm can effectively monitor the actual discrepancy between our performance and our goals. 5. Our firm emphasises innovative and creative capability when recruiting staff. 6. The new staff recruitment system adopted by our firm is efficient and effective. 7. The new performance assessment method adopted by our firm can enable department heads to gain a better picture of how far the staff has achieved the firm goal.
Knowledge donating (KSd)	1. I often share with my colleagues the new working skills that I learn. 2. My colleagues often share with me the new working skills that they learn. 3. I often share with my colleagues the new information I acquire. 4. My colleagues often share with me the new information they acquire. 5. Sharing knowledge with my colleagues is regarded as something normal in my enterprise.
Knowledge collecting (KSc)	1. My colleagues often share with me the working skills they know when I ask them. 2. I often share with my colleagues the working skills I know when they ask me. 3. My colleagues often share with me the information they know when I ask them. 4. I often share with my colleagues the information I know when they ask me. 5. Our firm staff often exchanges knowledge of working skills and information.

Source: own study.

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Sculpting Factors of Entrepreneurship among University Students in Indonesia

Zakky Zamrudi, Farida Yulianti

A B S T R A C T
Objective: The objective of this article is to investigate students as a young generation and their intention to start their own business by analysing the internal and external factors of entrepreneurial intentions in Indonesia.
Research Design & Methods: The research sample included 652 undergraduate students spread across universities on the five largest islands in Indonesia collected using an online survey form sent using email and group chat. The collected data was analysed by using partial least square-structural equation modelling (PLS-SEM) to investigate the proposed hypotheses in the model.
Findings: The results indicated that from the structural model, we confirmed that entrepreneurial self-efficacy shows non-significant results on entrepreneurial intention. However, the most considerable effect of the supporting condition demonstrated better results on entrepreneurial self-efficacy rather than on behavioural control.
Implications & Recommendations: The non-significance effect of entrepreneurial self-efficacy on entrepreneurial intention indicated that having sufficient knowledge regarding entrepreneurship is not enough without the confidence to apply it.
Contribution & Value Added: From the empirical evidence, this research has two implications for educators: it is crucial to improve student creativity and to increase the role of external stakeholders to develop entrepreneurial spirit among the students.

INTRODUCTION

Entrepreneurship has received considerable interest in recent decades, particularly after the rise in development of information systems. The ease of information dissemination and information seeking across platforms created a new stream of business players (Sentanu, Zamrudi, & Praharjo, 2019). Information and technology development is currently able to facilitate communication directly person-to-person by using the available platforms, including handling payment, knowledge sharing, reporting, security services, monitoring, and many more (Zamrudi, Karim, Faridha, Maharani, & Kuraesin, 2019). This not only allows large firms to reach a mass market but also provides access for small businesses. Information analysis is mostly discussed in the academic environment and in entrepreneurial forums (Franke & Lüthje, 2004).

The entrepreneurial atmosphere in Indonesia demonstrated beneficial conditions during recent decades. The newest data from the Ministry of Cooperatives and Small and Medium-Sized Enterprise (SME) of the Republic of Indonesia, demonstrated a satisfactory ratio of SME growth by 14.92% or an increase from 52.76 million units of SMEs in 2010 to 62.92 million units by the end of 2017 (Ministry of Cooperatives and SMEs, 2018; Ministry of Cooperatives and SMEs, 2016). This data also demonstrated that 99.99% of the current SME market shares come from Indonesian citizens. The number indicates that the existing market conditions depend on the national supply and demand rather than the international supply and demand. The average owner of SMEs in Indonesia is mostly at the young-adult age between 14 to 40 years old (Directorate of Cooperatives and SMEs Development, 2016). However, from the young-adult population of the SME owners above, most of them are of the age of 27 years to their mid30s.

In today's competitive conditions, the topics of entrepreneurship are becoming a concern for many stakeholders, including universities. University curricula have focused on nurturing entrepreneurship in various countries, including Indonesia. University graduates in Indonesia are also required to understand the concept of entrepreneurship through formal education prepared in the university curriculum.

Universities are considered as a great environment to develop the potential talent of a student and their entrepreneurial spirit. This role remains undeniable in the strengthening of the entrepreneurial intention of its students (Okręglicka, Havierniková, & Mynarzová, 2013). Many universities have begun offering entrepreneurship departments or at least offering entrepreneurship courses in their curricula in order to promote entrepreneurship culture (Mat, Maat, & Mohd, 2015). The expected results are for the student to be educated with entrepreneurial information so that they can become potential candidates for future entrepreneurial activities. Most advanced countries began including entrepreneurial studies in their curricula decades ago, which commonly arose from European and American countries (Franke & Lüthje, 2004). Many factors could increase the knowledge of entrepreneurship culture among university students, including the internal and external environment, self-efficacy, and self-esteem.

A previous study implied that there is another integrated causal chain between the supporting conditions, entrepreneurial self-efficacy, perceived behaviour control, and entrepreneurial intention. The study conducted by Yurtkoru, Kabadayı Kuşcu, and Doğanay, (2014) indicated that the relational supports mostly reflect the most influential factor in

determining student entrepreneurial intention. The study suggested that a more contextual factor would yield better results. A study between three universities in Vienna, Munich, and MIT found that there was a correlation between external and internal factors in developing student entrepreneurial intention. This study suggested that the exiting variable can be tested to reveal the most influential factor among the proposed variables (Franke & Lüthje, 2004). It is also essential to understand the "reality" vs. "perception" that reflects the experience as perceived by the student.

To understand the concept, one study determined a specific group of data sources and created more specific indicators of the proposed variables for the supporting conditions and entrepreneurial intention (Turker & Selcuk, 2009). There is a possibility to find a second-order variable that is derived from the first order construct. It is essential to include the fundamental nature of entrepreneurship education rather than focusing on a specific context. Universities have to contribute to increasing the entrepreneurial spirit by proposing a particular curriculum related to entrepreneurship (Greblikaite, Sroka, & Gerulaitiene, 2016). Specifically, the findings from Cape Town, Africa showed that there is a significant effect in increasing the student entrepreneurial intention through focusing more on student self-efficacy. However, a larger selection of data sources may give a better understanding of the longitudinal results of entrepreneurial intention studies (Kalitanyi & Bbenkele, 2019).

This study proposed a model to investigate and understand the factors that may sculpt and cultivate the entrepreneurial spirit in higher education students in Indonesia. The study proposed four constructs that consisted of an antecedent and results variable. The antecedent variable consisted of a supporting condition; entrepreneurial self-efficacy; and perceived behavioural control. The results variable in this study was the entrepreneurial intention.

This study was designed to detail the factors that interest the students in Indonesia to start their own business. This research used an empirical approach employing partial least square-structural equation modelling (PLS-SEM) data analysis to explain the interactive model of the proposed constructs. The research contribution of this study consists of two main points. The first is to give a review of the literature of entrepreneurial attractiveness, particularly those studies related to university students. The second is the empirical part, which tries to fill the gap regarding the importance of entrepreneurial education in higher education by comparing the two paths in the proposed model. The results of this study are expected to give meaningful insight to create an appropriate milestone into entrepreneurial-based education at the university level in Indonesia.

LITERATURE REVIEW

Among the factors that determine entrepreneurial self-efficacy, the perceived impact of formal learning has the most significant effect. Formal academic programs can have a positive impact on students' intentions to start entrepreneurship activities. Some scholars have pointed out that entrepreneurship education tends to focus on the technical aspects of entrepreneurship and pays little attention to the knowledge of the potential entrepreneurs, including their ideas, beliefs, and intentions (Zhao, Hills, & Seibert, 2005). Lüthje and Franke (2003) suggested that policymakers and universities need to encourage the programs to step-up their efforts to introduce education, research, and resource planning

for entrepreneurship. The study of Türker and Selçuk (2009) indicated that higher education has a positive impact on entrepreneurship intentions. According to their research, college education had a positive effect on entrepreneurship intentions.

Franke and Lüthje (2004) compared MIT with two German-speaking universities (the Vienna University of Economics and Business Administration and the University of Munich). They found a unique entrepreneurial model in these universities. Compared with the Massachusetts Institute of Technology, the students from the German speaking universities were not as willing to start a business. According to their cross-cultural studies, Moriano, Gorgievski, Laguna, Stephan, and Zarafshani (2012), indicated that educational programs should pay special attention to affecting students' attitudes toward entrepreneurship positively.

According to Henderson and Robertson (2000), education is often criticized for its separation from the real-world, but educators were considered to encourage people to pursue the choice of entrepreneurship as a profession. According to Türker and Selçuk (2009), decisions about career choice for adolescents varied depending on their family and friends. However, they found that a supportive relationship did not significantly affect entrepreneurs' intentions. Relationship support resembles subjective norms because it reflects the recognition of family and friends. Some empirical studies demonstrated that subjective norms are not relevant when interpreting entrepreneurial intention in the Theory of Planned Behaviour (TPB) model; however, they can have an indirect effect on the entrepreneurial intention by affecting the perceived behavioural control (Liñán, 2008; Liñán & Chen, 2009).

The Global Entrepreneurship Report (2012) emphasizes the importance of a supportive cultural and institutional environment for entrepreneurship. According to Davis (2011), many governments seem to encourage entrepreneurship without providing a supportive environment for entrepreneurs. Policy recommendations have led to increased labour flexibility, communication, open markets, increased social entrepreneurship, and the elimination of bureaucracy and red tape (Kelley, Singer, & Herrington 2012). He believes there is need for a culture that encourages hard work and creativity, not politics. Governments that raise economic issues rather than political interests promote entrepreneurship. Research by Türker and Selçuk (2009) suggested that entrepreneurs have a positive impact on corporate intentions, encouraging private, public, and non-governmental organizations to participate in entrepreneurial activities.

This has prompted governments to provide more skills, resources, and support, especially in developing countries, such as Yemen (Zolait, 2014). The possible reason for the rise of perceived behavioural control could be the educational support, relational, or structural support (Karimi, Biemans, Lans, Chizari, & Mulder, 2014). Saeed, Yousafzai, Yani-De-Soriano, and Muffatto (2013), found that the supporting conditions, such as educational, relational, and structural support can foster entrepreneurial self-efficacy. Therefore, hypotheses 1 and 2 were developed as follows:

H1:   The impact of the Supporting condition significantly affects entrepreneurial self-efficacy.

H2:   The impact of the Supporting condition significantly affects the perceived behavioural control.

The intention remains the best indicator of human behaviour (Heuer & Kolvereid, 2014; Krueger & Carsrud, 1993). According to the Theory of Planned Behaviour (TPB)

model, goals are defined by personal standards and social relationships (Ajzen, 2002). Self-efficacy affects individual decisions in terms of physical exercise at work, objective levels, stability, and performance (Baron & Kenny, 1986; Hayes, 2009). Adelekan, Williamson, Atiku, and Ganiyu (2018), performed an empirical analysis between social entrepreneurship education and student attitudes to the development of social institutions in Nigeria. The results demonstrated that there is an essential positive relationship between the self-efficacy of Nigerian entrepreneurs and the college students' desire for social entrepreneurship. Therefore, the high level of self-efficacy of this initiative is related to the intention of college students to create social institutions.

According to a study by Kalitanyi and Bbenkele (2019), their goal was to measure awareness of the role of self-efficacy in improving the entrepreneurship intentions of college students. The study also showed that self-efficacy could influence entrepreneur success. Perceived creativity and learning is a vital prerequisite to be an entrepreneur (Laguía, Moriano, & Gorgievski, 2019). To improve student entrepreneurial intentions will require steps to strengthen factors, such as the business environment, risks, difficulties, and predictability of various outcomes.

The study on the United States does not imply any significant relation between the entrepreneurial self-efficacy on entrepreneurial intention as another aspect is required to understand the feasibility aspect of the businesses (Fuller, Liu, Bajaba, Marler, & Pratt, 2018). Therefore, hypothesis 3 is as follows:

H3: Entrepreneurial self-efficacy positively affects the entrepreneurial intention.

Perceived behavioural control (PBC) is related to the belief that companies can carry out a behaviour under investigation and the belief that people control this behaviour (Ajzen, 2002). PBC is concerned about the validity of the actions that individuals generally take concerning the activities they can judge (Fayolle, Gailly, & Lassas-Clerc, 2006). PBC is similar to Bandura's theory of self-efficacy (1982). This indicates the belief that an individual can accomplish a task (Bandura, Freeman, & Lightsey, 1997). Ajzen (2002), however, argues that the PBC is a broader concept of self-efficacy as it includes control measures.

Self-government is defined as "awareness of those who believe that the most important people should not carry out the problems in question" (Utami, 2017). PBC is considered a social-belief in shaping the individual belief in the ability to perform a specific behaviour in business (Doanh & Bernat, 2019). Engle *et al.* (2010) stated that PBC could successfully predict the entrepreneurial intention among university students in seven countries. A study conducted with engineering students in Austria indicated that there is no significant relationship between PBC and entrepreneurial intention. Therefore, hypothesis 4 was developed as follows:

H4: Perceived behavioural control affects entrepreneurial intention.

Based on the previous research and the literature mentioned above, Figure 1 depicts the proposed conceptual model of our current research.

MATERIAL AND METHODS

This study is an empirical study that used an explanatory approach to explain the proposed model in order to increase the understanding of student intentions regarding entrepreneurship. The factors that influenced the entrepreneurial intentions included the support-

ing condition, entrepreneurial self-efficacy, and perceived behavioural control. The proposed model is shown in Figure 1.
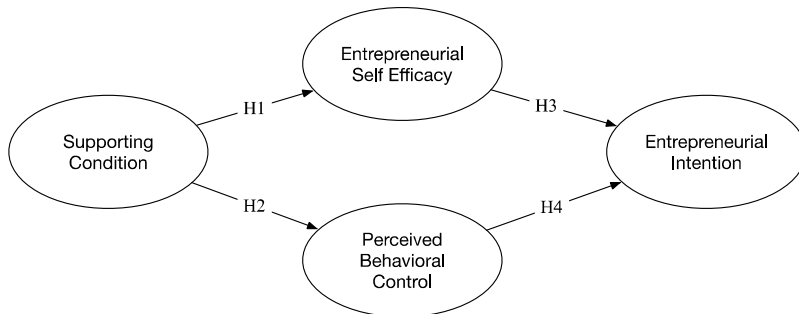
Figure 1. The Proposed Model of Factors Affecting Entrepreneurial Intention
Source: adapted from Kalitanyi and Bbenkele, 2019; Natalia and Rodiah, 2019; Qiao and Huang, 2019; Huang and Zhou, 2018; Venema *et al.*, 2015; Yurtkoru *et al.*, 2014; Esfandiar *et al.*, 2005.

Instrument Development

This research proposed four constructs, namely the supporting condition, entrepreneurial self-efficacy, perceived behavioural control, and entrepreneurial intention. In measuring the proposed constructs, this research built a set of research instruments that consisted of a list of questions. The instrument was measured using seven point semantic differential scales to provide a wide span of choice for two contrasting answers. The supporting condition consisted of three second-order dimensions consisting of educational support, relational support, and structural support. Entrepreneurial self-efficacy was measured using two second-order dimensions consisting of creativity and learning. The developed instrument used in this study can be found in appendix A in the end of this paper.

Sample and Data Collection

The data were collected through a survey conducted in Indonesia in December 2018. The target respondents were higher education students, both in undergraduate and postgraduate programs in Indonesia, from 28 universities from the five biggest islands in Indonesia, including Java, Sumatra, Kalimantan, Sulawesi, and Papua. The question instrument was distributed using an online form questionnaire distributed to the population randomly. Before the primary studies, pilot research was conducted to ensure the wording was clearly understood by the respondents while ensuring the instrument validity and reliability for complete data collection. For the primary data collection, there were a total of 700 students involved in this study from various universities. The online forms were linked to the student groups across social media platforms to increase the ease of survey completion, including WhatsApp groups, Facebook groups, Instagram pages, twitter, etc. Due to incompletion of the form, several data were discarded, resulting in 653 usable responses. The valid data included 250 male students and 403 female students. The age of respondents ranged from 17 to 42 years old, with an average age of 19 years old.

Data Analysis

The proposed construct employed structural equation modelling (SEM) as recommended by previous studies. This has many advantages over other methods (Amaro & Seabra, 2015; Hair, Risher, Sarstedt, & Ringle, 2018; Hair, Ringle, & Sarstedt, 2013; Straub, Boudreau, & Gefen, 2004). SEM provided a comprehensive analytical tool to measure the path analysis and factor analysis while ensuring the validity and reliability for internal consistency. This research employed partial least square-SEM (PLS-SEM) over other methods. Sample size and model specifications for rarely conducted research are often issues with SEM, while PLS can handle the problem smoothly (Hair *et al.*, 2018). The nature of this research was an exploratory analysis where PLS was appropriate to analyse the model and test the hypothesis.

This research used a 500 bootstrapping resample method for exploratory analysis as recommended by prior research in testing the causal chain hypothesis. The results indicated the estimates for loading factors of each item, indicator, and constructs based on the confidence interval level (CI), allowing determination of the factor stability (Hair, Ringle, & Sarstedt, 2011).

RESULTS AND DISCUSSION

The results section in this article will provide proof of the construct validity, reliability, structural model, and a discussion. The reliability and validity of the constructs will show the internal consistency of the current measurement model. In the next description, the measurement model emphasizes the causal chain described using path analysis in PLS-SEM. The discussion section attempts to relate the findings with previous studies associated with this study. The detailed results and discussion section are presented as follows.

Reliability & Validity

Reliability in a survey reflects the stability of the measures it uses. Table 1 displays the results of the reliability analysis assessed by using composite reliability and the Cronbach alpha. In evaluating the reliability our methods involved the composite reliability where the accepted value should exceed 0.70, which needed the Cronbach alpha to interpret the results (Hajli, 2015; Hajli & Lin, 2016). According to Table 1 below, all of the proposed constructs met the cut-off value of the reliability assessment. The cut-off value of the composite reliability must be >0.7, and the Cronbach alpha cut-off value must indicate a number >0.68.

Validity in a survey depicts the item's ability to measure the phenomena. The validity measures used two methods, the convergent validity and discriminant validity. Table 1 shows the convergent validity test provided by the average variance extracted (AVE) results. The AVE cut-off value must be >0.5, which all of the constructs met. The discriminant validity, as shown in Table 2, indicates that all of the constructs met the Fornell-Larcker criterion that the cross-diagonal results should be higher than the off-diagonal results (Hair *et al.*, 2018; Wong, 2013). The construct including Entrepreneurial Intention (EI); Entrepreneurial Self Efficacy (ESE); Goal (GOL); Implementation (IMP); Creativity (CRE); Educational (EDU); Learning (LRN); Perceived Behavioural Control (PBC); Relational (REL); Structural (STR); Supporting Condition (SC).

Based on these results, all the constructs passed the validity and reliability evaluation. These results suggested that the data could then be processed for further analysis.

Table 1. Source of Construct, Reliability, and Validity

Sources	Code	Loading	CR	AVE	Alpha
Educational (Kalitanyi & Bbenkele, 2019; Yurtkoru *et al.*, 2014)	ed1	0.910	0.886	0.922	0.747
	ed2	0.883			
	ed3	0.873			
	ed4	0.788			
Relational (Venema *et al.*, 2015; Yurtkoru *et al.*, 2014)	rel1	0.890	0.805	0.882	0.716
	rel2	0.720			
	rel3	0.915			
Structural (Venema *et al.*, 2015; Yurtkoru *et al.*, 2014)	str1	0.874	0.827	0.743	0.897
	str2	0.894			
	str3	0.817			
Creativity (Esfandiar *et al.*, 2019; Zhao *et al.*, 2005)	cre1	0.846	0.883	0.594	0.910
	cre2	0.837			
	cre3	0.823			
	cre4	0.826			
	cre5	0.713			
	cre6	0.735			
	cre7	0.577			
Learning (Yurtkoru *et al.*, 2014; Zhao *et al.*, 2005)	lrn1	0.697	0.714	0.542	0.824
	lrn2	0.740			
	lrn3	0.831			
	lrn4	0.666			
Perceived Behavioural Control (Natalia & Rodhiah, 2019; Qiao & Huang, 2019; Yurtkoru *et al.*, 2014)	pbc1	0.804	0.875	0.616	0.906
	pbc2	0.824			
	pbc3	0.802			
	pbc4	0.789			
	pbc5	0.786			
	pbc6	0.698			
Goal (Huang & Zhou, 2018; Qiao & Huang, 2019; Yurtkoru *et al.*, 2014)	gol1	0.922	0.814	0.843	0.915
	gol2	0.914			
Implementation (Natalia & Rodhiah, 2019; Qiao & Huang, 2019; Zhao *et al.*, 2005)	imp1	0.890	0.846	0.765	0.907
	imp2	0.884			
	imp3	0.849			

Source: adapted from Kalitanyi and Bbenkele, 2019; Natalia and Rodiah, 2019; Qiao and Huang, 2019; Huang and Zhou, 2018; Venema *et al.*, 2015; Yurtkoru *et al.*, 2014; Esfandiar *et al.*, 2005; detail item in appendix A.

Structural Model

The estimation results of the PLS path analysis are shown in Figure 2. According to the results, the four hypotheses indicated that three of them demonstrated a significant effect, while the other showed a non-significant effect at the 0.05 level. The proposed construct's ability to explain the antecedent variable on the results variable was assessed using the R square and structural path loading. The R square indicated that the supporting

Table 2. Square correlations among the constructs

	EI	ESE	GOL	IMP	CRE	EDU	LRN	PBC	REL	STR	SC
EI	**0.946**										
ESE	0.347	**0.964**									
GOL	0.897	0.376	**0.918**								
IMP	0.746	0.301	0.709	**0.875**							
CRE	0.340	0.694	0.369	0.294	**0.771**						
EDU	0.170	0.431	0.192	0.145	0.464	**0.864**					
LRN	0.257	0.814	0.278	0.226	0.629	0.241	**0.736**				
PBC	0.736	0.469	0.729	0.654	0.448	0.227	0.378	**0.785**			
REL	0.342	0.483	0.385	0.272	0.500	0.443	0.306	0.367	**0.843**		
STR	0.166	0.426	0.231	0.107	0.461	0.613	0.227	0.280	0.579	**0.826**	
SC	0.263	0.534	0.313	0.205	0.568	0.859	0.307	0.343	0.772	0.867	**0.716**

Note: EI – Entrepreneurial Intention; ESE – Entrepreneurial Self Efficacy; GOL – Goal; IMP – Implementation; CRE – Creativity; EDU – Educational; LRN – Learning; PBC – Perceived Behavioural Control; REL – Relational; STR – Structural (STR; SC – Supporting Condition.
Source: own study based on Smart-PLS output, 2019.

condition had a satisfactory result in explaining the entrepreneurial self-efficacy for 28.5%. However, the supporting condition demonstrated enough effect in explaining the perceived behavioural control for 11.7%. The ability of entrepreneurial self-efficacy and perceived behavioural control showed a satisfactory result in explaining the entrepreneurial intention for 54.2%. The following relations explained the relationship among constructs, both in a direct relationship and indirect relationship.

The empirical data testing was conducted through a bootstrapping method to reveal the significant relations among the constructs using t-tests reflected by the critical ratio. The criteria that demonstrated if any hypothesis showed a statistically significant effect is indicated by the critical ratio (CR) value should exceed 1.96, as shown in Figure 2. The bootstrapping method used a 500 resample method with 652 cases per sample. Based on the findings, it is indicated that there is one hypothesis that demonstrated a non-significant result, that is, the effect of entrepreneurial self-efficacy on entrepreneurial intention. Therefore, H1, H2, and H4 were supported, while H3 was not supported.

According to the path coefficient from Figure 2, the effect of the supporting condition on entrepreneurial self-efficacy (0.534) was stronger than that of the perceived behavioural control (0.343). The effect of perceived behavioural control (0.736) was more significant than that on entrepreneurial self-efficacy (0.001). The indirect effect of the supporting condition on entrepreneurial intention through perceived behavioural control (0.252) demonstrated a significant effect, while by entrepreneurial self-efficacy showed a non-significant indirect effect (0.001). This result indicates that the perceived behavioural control was more critical than the entrepreneurial self-efficacy.
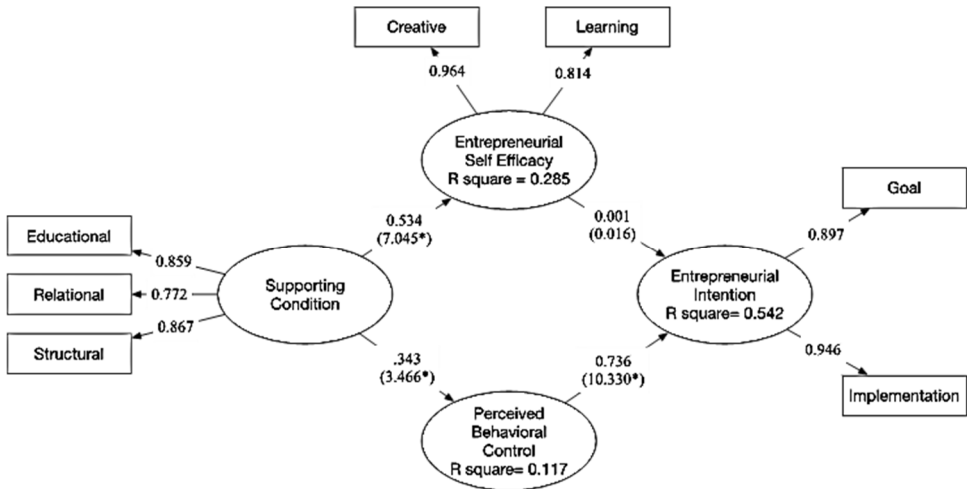
Figure 2. Partial least square (PLS) path model assessment
Source: own study from Smart-PLS Output, 2019.

Table 3. Indirect effect Path Analysis

Indirect	Loading	t-test	Sig.
supp. condition -> Entre. Self. Effic -> Entre. Intention	0.001	0.015	No
supp. condition -> perc. Behav. Control -> Entre. Intention	0.252	3.461	**Yes**

Significant at 0.05.
Source: own study from Smart-PLS Output, 2019.

Discussion

Cultivating entrepreneurship culture has become a predominant topic for increasing the number of independent businesses. This study extends the related factors that form entrepreneurial intentions among university students. The intention to become an entrepreneur does not begin simply because people think that it can be done. To create a powerful intention requires comprehensive cognitive thinking of a feasibility analysis for a business (Fuller *et al.*, 2018).

This study proposes the foundations of cognitive processes of entrepreneurial intention creation through the following factors: the supporting condition of surrounding stakeholders, the entrepreneurial self-efficacy, and the perceived behavioural control.

The results of this study demonstrated that, among the supporting condition factor, the structural support was seen as the primary contributor, followed by the university support and relational support. While the university appeared to be the runner up for the supporting condition, its role is undeniable (Kalitanyi & Bbenkele, 2019). Universities should provide a more involved program, such as an integrated curriculum that combines not only theoretical educational content but also fosters creative thinking (Yurtkoru *et al.*, 2014).

From the analysis above, the supporting conditions were considered as a factor that can increase the entrepreneurial self-efficacy more than perceived behavioural control. A well established and supportive environment could increase an individual's confidence

based on the knowledge and understanding of a particular topic, which, in this study, was entrepreneurship (Parkinson, David, & Rundle-Thiele, 2017). Individuals expect more when they have sufficient knowledge from the surrounding environment to solve future problems. However, the finding also indicated that the supporting condition could also increase the confidence of an individual to start and control a businesses based on individual performance. The existing environment could impress the individual to perceive that they can control the business with the existing support (Turker & Selcuk, 2009).

However, this finding does not support the findings in Istanbul, due to different governmental policies (Yurtkoru *et al.*, 2014). The findings in Istanbul indicated that funding support from the government without a sufficient learning program could result in the business going nowhere. The difference with the Indonesian government policy (under the Ministry of Cooperatives and SMEs), lies with various integrated programs to support the local businesses, including the financing, networking, ease of information sharing, SMEs awards, SMEs exhibitions, SMEs competitions, and many programs that support businesses to promote and sell products across the islands.

Those programs were developed not only to increase the confidence level of existing business owners but also with an intent to invite potential new business owners into the systems. The collaboration across ministries in Indonesia can reliably improve the students eager in developing their entrepreneurial skills, as realized by the competition event and fundraising program initiated by the government. These are mainly under the Ministry of Education and Culture under the Directorate of Higher Education.

A highly confident individual, as mentioned by many researchers, could increase the intention among university students to start their business (Fuller *et al.*, 2018; Kalitanyi & Bbenkele, 2019; Yurtkoru *et al.*, 2014). The confidence level of the student on entrepreneurship was measured using two distinct constructs from the behavioural theories. These are the entrepreneurial self-efficacy, which reflects the individual's expectation on business performance based on their knowledge, and the perceived behavioural control, which is a belief that a business will run based on the individual characters who run it (Parkinson *et al.*, 2017).

Parkinson *et al.* (2017), also mentioned that intentional behaviour is better measured by self-efficacy than by perceived behavioural control. Based on the findings in this study, there was no effect of entrepreneurial self-efficacy on entrepreneurial intention. This demonstrates that a knowledgeable individual does not merely increase their intention to start a business. The wide range of business activities required in initiating a new business is a common issue, and while self-efficacy alone could sufficiently understand the feasibility, a strong personal belief to control and adapt to the future problems is also necessary (Fuller *et al.*, 2018; Karimi *et al.*, 2014).

On the other hand, there are many studies that indicated that the ability to analyse and understand a business is essential in order to increase the confidence level to become entrepreneurs (Doanh & Bernat, 2019; Kalitanyi & Bbenkele, 2019; Laguía *et al.*, 2019). From the results above, we conclude that the level of confidence level, supporting condition, and individual characteristics may differ across the nation and thus resulted in different results of the study. Therefore, the implications and limitations of this study are presented in the conclusion remarks below.

CONCLUSIONS

This study on entrepreneurial intention was conducted to lend more perspective in understanding the intentions of university students in starting their own businesses. Universities are expected to provide further resources for entrepreneurial endeavors by adding entrepreneurship programs in their curricula. In a developing country like Indonesia, creating a small business has become one of the government concerns to support social welfare independently rather than relying on large scale business. Thus, society is expected to be economically independent.

This study found that the supporting condition of the surrounding environment is one of the main points that could increase a student's belief in establishing their own business. The support of the government, educational institution, and other related stakeholders is not sufficient to increase the student's interest in starting their own business, particularly for women. This study proposed that there is a gender-related reason that results in women in developing countries tending to be passive in building their own business. Instead of creating their own business, they tend to rely on a man, who is often considered as the head of the family in developing countries, and is responsible for fulfilling the family necessities.

This study has some implications regarding the results described above. Universities in Indonesia have included entrepreneurial content into their curricula, hoping the students will be not only prepared to enter the job market for large companies but also that they will gain the intent to start their own businesses. As a consequence, the universities must also pay attention not only to the theoretical aspects of business but also create a more supportive environment, cooperating with other stakeholders, including the government and existing local business owners. For governments, the cooperation with an educational institution and local business owners needs to be enhanced to scale up the program effectively. The business owners could also benefit from the universities, gaining help to understand recent data trends and the ways to innovate to maintain their business.

However, this study has certain limitations. First, though the intention is to measure future behaviour, the perception of an individual can change over time, especially after the business trial and even after graduation. Second, there is limited research comparing the entrepreneurial self-efficacy and perceived behavioural control, thus requiring more supportive results for these conclusions. Third, the role of individual characteristics may create different results. Thus, we recommend several recommendations for future research. Future studies need to administer longitudinal research and qualitative research to understand the shifts of behavioural changes among respondents. Researchers should also discuss the role of individual characteristics in entrepreneurial intentions more specifically. Finally, the research could be expanded by comparing the samples across the border by selecting the appropriate criteria with Indonesia to make the results more comparable.

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Appendix A: Items constituting the measuring question instrument

Sources	Code	Constructs
Educational (Kalitanyi & Bbenkele, 2019; Yurtkoru *et al.*, 2014)	ed1	The campus program supports the development of student entrepreneurship
	ed2	Development of entrepreneurial knowledge and abilities by the campus
	ed3	Availability of scientific support on entrepreneurship by the campus
	ed4	Availability of entrepreneurship development laboratories
Relational (Venema *et al.*, 2015; Yurtkoru *et al.*, 2014)	rel1	Support from friends around for entrepreneurship
	rel2	Support from family about entrepreneurship
	rel3	Supporting the environment for entrepreneurship
Structural (Venema *et al.*, 2015; Yurtkoru *et al.*, 2014)	str1	Support from the local government for student entrepreneurship
	str2	Support from the private sector for the development of student entrepreneurship
	str3	Support from entrepreneurial organizations (example: HIPMI) for the development of student entrepreneurship
Creativity (Esfandiar *et al.*, 2019; Zhao *et al.*, 2005)	cre1	Ability to provide solutions
	cre2	The ability to make various alternative solutions
	cre3	Willingness to communicate ideas
	cre4	Often providing solutions ahead of others
	cre5	The ability to translate ideas to colleagues
	cre6	The level of motivation in creating ideas
	cre7	Feelings when thinking about new ideas
Learning (Yurtkoru *et al.*, 2014; Zhao *et al.*, 2005)	lrn1	Ability to manage activities during deadlines
	lrn2	Ability to understand problems
	lrn3	The ability to map the sequence of events (systematic) problems
	lrn4	Memory of an entrepreneurial concept
Perceived Behavioural Control (Natalia & Rodhiah, 2019; Qiao & Huang, 2019; Yurtkoru *et al.*, 2014)	pbc1	Confidence in starting a decent business
	pbc2	The ability to handle business processes in a business
	pbc3	Detailed knowledge of business management in practice
	pbc4	Knowledge in developing small and medium business projects
	pbc5	Feelings about success in the future business field
	pbc6	Feelings about the ease of starting a business and running it
Goal (Huang & Zhou, 2018; Qiao & Huang, 2019; Yurtkoru *et al.*, 2014)	gol1	Desire to become an entrepreneur
	gol2	Totality in designing a business
Implementation (Natalia & Rodhiah, 2019; Qiao & Huang, 2019; Zhao *et al.*, 2005)	imp1	Determination to become an entrepreneur
	imp2	Desire in planning a business
	imp3	The possibility to start a business in the near future

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International Entrepreneurial Orientation: Exploring the Brazilian Context

Ricardo Raats, Patricia Krakauer

A B S T R A C T
Objective: To explore the practises that characterise the International Entrepreneurial Orientation (IEO) of SMEs who endeavour to reach foreign markets from emerging economies.
Research Design & Methods: The multiple case study method analysed data collected through interviews and examined with the support of NVIVO software. Panels provide visualisation of entrepreneurial postures, while a final description supports the explanation of four companies' context.
Findings: The combination of IEO dimensions assumes a distinct synergistic effect in different companies' internationalisation moments. The study suggests that competitive aggressiveness is confused as being part of proactivity in that country context, as the autonomy dimension was not utilised sufficiently by the companies.
Implications & Recommendations: Resources such as networks, licenses, and certifications are competitive advantages that encourage forceful entry despite organisational constraints. Future research can investigate concepts of co-creation to bring new insights into the international development of companies and products.
Contribution & Value Added: To distinguish how entrepreneurial organisations with autonomy constraints succeed by showing competitive aggressiveness as critical determinants to entering new foreign markets with innovative products.

INTRODUCTION

The entrepreneurship and strategy literature indicate that entrepreneurial orientation (EO) improves skills and overall performance in organisations (Rauch, Wiklund, Lumpkin, & Frese, 2009). Assuming that firms show different competences in aggressive environments (Wiklund & Shepherd, 2005), scholars point to investigating SMEs' strategic organisational posture as a central element to outline these firms' profiles in international business (Sapienza, Autio, George, & Zahra, 2006; Knight & Kim, 2009).

In terms of internationalisation theories, there is extant literature that focuses on the entry stage, growth, and survival of companies in foreign markets as an opportunity-seeking behaviour (Coviello, McDougall & Oviatt, 2011; Jones, Coviello & Tang, 2011). Such trajectories, when intensified by entrepreneurial orientation, highlights SMEs internationalisation from both economics and management perspectives (Kuivalainen, Sundqvist, Saarenketo, & McNaughton, 2012; Dai, Maksimov, Gilbert, & Fernhaber, 2014). Different scholars argue that export market exploitation and exploration capabilities refer to the entrepreneur's abilities and resources (Birkinshaw & Gupta, 2013), while others emphasise the more considerable influence of firm's capacities to acquire new overseas market (Lisboa, Skarmeas, & Lages, 2011). When applied to international contexts, the most effective firms operate exploration and exploitation processes in a state of ambidexterity (Covin & Miller, 2014), to investigate strategic decisions regarding their actions of international marketing (Kozlenkova, Samaha, & Palmatier, 2014), allows firms to create specific capabilities and develop competitive advantages across national borders (Kazlauskaitė, Autio, Gelbūda, & Šarapovas, 2015).

Regardless of a comprehensive theory of entrepreneurial internationalisation (Wach, 2015), Brazilian SMEs may offer insights on how EO manifests inside organisations going through market expansion. Their late international expansion (Amal & Freitag Filho, 2010; Da Rocha, Mello, Pacheco, & Farias, 2012), is interesting to study internationalisation processes in organisations from emerging economies (Boso, Oghazi, & Hultman, 2017). In Latin America, the overall business environment remains a challenge; Brazil falls near the bottom of the GEM 2018/2019 Global Report rankings (48 out of 54). Macroeconomic deterrents partially explain why most firms that ventured abroad in the past did so solely by exports (Carneiro & Brenes, 2014). Besides, current international competitors' presence in local markets defies the lack of a global mindset. With this background in mind, few studies investigated practises that characterise the International Entrepreneurial Orientation (IEO) in Brazilian SMEs (Freitas, Martens, Boissin, & Behr, 2012; Martens, Lacerda, Belfort, & Freitas, 2016; Tonial & Rossetto, 2017).

The current study seeks to understand whether IEO supported four companies to identify and capitalise on air sports international markets (Slevin & Terjesen, 2011). The article offers a qualitative approach through a multiple case study to appreciate the firms' entrepreneurial actions after they already achieved international entries (Zahra, Wright, & Abdelgawad, 2014). Operationally, the narrative analysis justifies the use of theoretical sources in addition to a description of cases with the help of qualitative data analysis software (Short, Broberg, Cogliser, & Brigham., 2010). In-depth interviews collected data by questionnaires to assess the owners' view of their firm-specific competitive advantages (Doz, 2011). Content analysis method supported the entrepreneurs' narrative inquiry and

provided the basis for a display to show the differences in entrepreneurial outcomes (Paulus, Woods, Atkins, & Macklin, 2017). In a slightly ambitious way, this study serves to communicate the results and the construct's applicability in recent international business research (Etemad, 2019; Wales, Gupta, Marino, & Shirokova, 2019). The research question is how do International Entrepreneurial Orientation (IEO) gains ground in SMEs exporting from an emergent economy, to verify empirically whether the five dimensions – innovativeness, proactivity, risk-taking, competitive aggressiveness, and autonomy – apply and relate to companies with different levels of internationalisation. Herein follows an explanation of the qualitative methodology employed. The next section describes the theoretical framework consisting of the components developed for researching, followed by the data analysis of interviews. Last, we offer final discussion and conclusion.

LITERATURE REVIEW

Early definitions of IEO resumed the concept as the leveraging of strategies prepared to enter foreign markets (Knight, 2001). According to Knight and Cavusgil (2005), a firm's innovation and proactivity reflect an overall aggressiveness, as it brings about specific capabilities needed for successful internationalisation. A more general argument is that the entrepreneur, firm, and environment are critical elements of the processes of entrepreneurial internationalisation (Jones & Coviello, 2005). Scholars argue that opportunities are the result of firms' strategic adaptation regarding entrepreneurial knowledge and position in international networks (Freeman & Cavusgil, 2007).

On the other hand, the combination of behaviours that aim to value opportunity creation as forms of innovative methods – risky and independent activities to overcome international competitors (Sundqvist, Kyläheiko, Kuivalainen, & Cadogan., 2012) – qualify the concept of IEO as a construct only possible when high levels of innovativeness facilitate technological and marketing capabilities, directly promoting export sales level (Covin & Miller, 2014). More recently, Boso *et al.* (2017) define IEO as processes that firms use to exploit entrepreneurial opportunities to create new products and services abroad. Concept development (Table 1) demonstrates that a large body of previous research used the original EO three-dimension scale of Miller/Covin and Slevin (1989) to measure firm performance (Covin & Wales, 2012). However, as EO is inherently an exploratory orientation (Wiklund & Shepherd, 2011), with a focus on pursuing new opportunities, it makes sense to operationalise IEO as a multidimensional construct with other examples of managerial orientations that enhance competitiveness by risk-taking actions in international contexts (Anderson, Kreiser, Kuratko, Hornsby, & Eshima, 2015).

While the five-dimension scale of Lumpkin and Dess (1996) value similar entrepreneurial qualities, "being entrepreneurial" by the original 3D scale lacks consistency for the most recent conceptualisations, resulting in a different understanding of success in international contexts (Covin & Lumpkin, 2011). Consequently, the aggregation of the dimensions of competitive aggressiveness and autonomy as necessary for the EO construct to exist in dynamic environments (Sundqvist *et al.*, 2012; Boso *et al.*, 2017) opens the conceptualisation of IEO to appreciate different sets of strategic managerial postures (Wach, 2015; Covin & Wales, 2019). With that in mind, this study purposefully foregrounds the IEO construct as a multidimensional setting of five components, able to show entrepreneurial behaviour in organisations, by assuming that dimensions can vary in intensity and configurations, independently

of the context (Miller, 2018; Wales *et al.*, 2019). Therefore, following Wales (2016), the description of the dimensions was adapted to Brazilian companies' context to understand their entrepreneurial mechanism proposed for the investigation (Table 2).

Table 1. Selected definitions of IEO

IEO "reflects the firm's overall pro-activeness and aggressiveness in its pursuit of international markets" (Knight, 2001, p. 159)
IEO reflects "the firm's overall innovativeness and proactiveness in the pursuit of international markets. It is associated with innovativeness, managerial vision and proactive competitive posture" (Knight & Cavusgil, 2005, p. 129)
IEO is "a set of attributes commonly acknowledged as helpful for overcoming obstacles in the internationalisation process" (Jones & Coviello, 2005)
IEO "refers to the behaviour elements of a global orientation and captures top management's propensity for risk-taking, innovativeness, and proactiveness" (Freeman & Cavusgil, 2007, p. 3)
IEO is "a set of behaviours associated with the potential creation of value with an emphasis on outperforming rivals across national borders" (Sundqvist *et al.*, 2012, p. 205)
"IEO is not treated as a construct distinct from EO. Instead, 'international' is simply a context in which the EO phenomenon is explored" (Covin & Miller, 2013, p. 14)
"IEO as the processes that firms use to exploit entrepreneurial opportunities to create new products and services abroad" (Boso *et al.*, 2017, p.6)

Source: own elaboration based on Wach (2015).

Table 2. Dimensions of IEO

Dimensions	Definitions
Proactivity	It is the perspective of leadership capable of anticipating demands in the search for opportunities (Dess & Lumpkin, 2005).
Innovation	It aims to develop new products, services, and processes through experimentation and creativity introduced by the organisation (Leite & Moraes, 2015).
Risk-taking	Organisational tendency to act with caution versus boldness to achieve goals (Martens *et al.*, 2016).
Autonomy	Independent action responsible for the conceptualisation of the business from early expansion until its establishment in international markets, supporting marketing, licensing strategies and final products export (Freitas *et al.*, 2012).
Competitive Aggressiveness	The effort of the organisation in overcoming competitors, overcoming threats, or improving market position (Freitas *et al.*, 2012).

Source: own elaboration based on Wales (2016).

To understand the capacity building of the studied companies, the resource-based view (RBV) served as a theoretical perspective for explaining the internationalisation of SMEs when EO drove strategic initiatives (Knight, 2001). Meanwhile, an innovative small business will not be entrepreneurial if it does not take risks or is not sufficiently proactive towards competitors and environment (Jones & Coviello, 2005), as it will not be able to sustain such advantage without policies and procedures in place to exploit the full competitive potential of its resources and capabilities (Alvarez & Barney, 2017). Moreover, EO may prove insufficient as a resource for competitive advantage unless embedded in the very processes of a firm (Martin & Javalgi, 2016). Teece, Peteraf, and Leih (2016) define capabilities as "the key role of strategic management in adapting, integrating, and reconfiguring internal and external organisational skills, resources, and

functional competencies to match the requirements of a changing environment," so the above theoretical developments suggest building a three-step process of international entrepreneurial orientation (Figure 1).
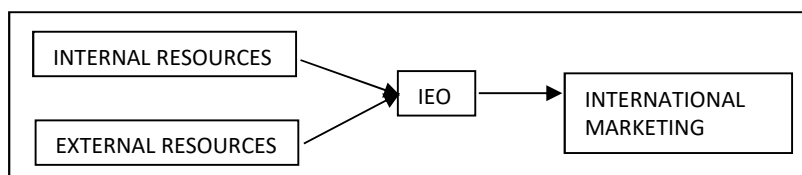
Figure 1. IEO from the Resource-Based View
Source: own elaboration.

Given the above, SMEs can capitalise on international marketing strategies, because their managers' IEO deliberately support processes that focus on the search for information for competitive analysis and resource organisation (Swoboda & Olejnik, 2016). Simultaneously, more than building capacities related to the aspects of product and market advantages, the collection of information is a fundamental element that underlies companies' decision about marketing differentiation strategies, building networks, or leveraging relationships (Alvarez & Barney, 2017). Therefore, the IEO concept serves for the examination of organisational initiatives aimed at new markets and the introduction of new products (Table 3).

Table 3. Organisational Initiatives

Concept	Processes	Practices
IEO	Develop organisational compensation systems for international partners	The formation of distribution channels and commercial sales
	Guarantee investments for prospecting and developing new international businesses	Participation in events and commercial networks
	Create collaborations for identifying new opportunities and sales	Involvement with institutions to promote international business
	Define resource allocation and risks involved in innovations, product tests, and demonstrations	Market intelligence

Source: own elaboration based on Tonial and Rosseto (2014).

In this context, the study considered a series of managerial practises found in Brazilian literature (Table 4) concerning the adaptation to foreign competition in domestic and international markets, managerial capacity to innovate, and centralisation of decisions by the entrepreneur (Amal & Freitag Filho, 2010; Da Rocha *et al*., 2012; Leite & Moraes, 2015; Martens *et al.,* 2016).

As IEO relies on the disciplines of entrepreneurship, international business, and strategic management (Wach, 2015), we first assembled the theoretical definitions of construct dimensions, next appraised the context of the construct, and then listed the managerial practises. Finally, based on Dess and Lumpkin (2005), we applied the semi-structured questionnaire.

Table 4. Elements of managerial practises

Dimensions	Management Elements	
	Categories	Managerial Practices
Proactivity	Monitoring	Monitoring and market research of foreign markets
	Anticipation	Pioneering and tendency of the attack on the foreign markets
	Troubleshooting	Participation and control as troubleshooting and opportunity planning
	Adaptability and flexibility	Availability and access to persons, resources, and equipment necessary to have flexibility skills to meet foreign market needs
Innovation	Products for the external market	The number of new products, the number of line changes to fulfil international demand, and the frequency of changes in products required by foreign markets
	Innovation in processes	Adaptations in administrative, technological, product, and market processes to operate internationally
	Creativity to act internationally	Engagement and tests; external market experiments
	Differentiation by external market	Initiatives of awkward imitation by international competitors
Risk-Taking	General risk	A strong trend to high-risk projects to attend external markets
	Decision risk	Preference of managers to act with autonomy and personal risk assumption to explore external markets
	Financial risk	Risk of financial loss or without the premium
	International Business risk	Actions of large extent to counter business hostility
Autonomy	Team	Leaders with autonomous behaviour that coordinate activities with measures and international monitoring
	Centralisation	Model management; decision and authority delegation
	Accountability	Participation in sectoral, consortia, or independent projects to promote external market prospection actions
	Organisational capacity	Departmental action or business units coordinated by managers with entrepreneurial characteristics
Competitive Aggressiveness	Reaction to competition	Moving in reaction or with aggressive behaviour towards competitors and changes in foreign markets
	Financial competition	Search for positioning to cash flow costs, profitability, patents cost, licensing, and certifications
	International Business competition	Aggressiveness to confront trends of unfavourable changes; imitation, copying, or use of unconventional methods
	Market positioning	International marketing mix for new products, services, distribution, and different markets

Source: own elaboration based on Amal and Freitag Filho (2010), Da Rocha *et al.* (2012), Leite and Moraes (2015), Martens *et al.* (2016).

MATERIAL AND METHODS

To analyse IEO as an element of firms' strategy, the study design relied on the literature review (Flick, 2002) to detail the issue, assess data collection procedures, and examine and introduce information. The mooring matrix shows the steps to confirm the structure (Table 5).

Table 5. Mooring matrix

Research Model	Theoretical Model	Operational Steps	Data Analysis
Identification of databases and journals	Database construction on International Entrepreneurial Orientation	Use of NVIVO program for synthesis and content analysis	1. Thematic analysis; documentary and in-depth interviews; 2. identification of similarities and differences between organisations
Understanding of EO structure in terms of dimensions and categories	Recognition of theories in terms of authors and articles available in the literature	Understanding procedures, formatting, and presenting EO content	
Confirmation of elements considered to be managerial practises	Review of the literature and temporal situation of theories	Codification of relevant dimensions and elements	1. In-depth interviews; 2. Characterisation of companies
Evaluation of the international activities of firms	Exploration of conditions and evaluation of current concepts	Systematisation and evaluation of results	Content and narrative inquiry of interviews
Elaboration of the multi-case study	Understanding of conceptual models	Definition of the matrix presentation	Analysis of the multi-case study

Source: own elaboration based on Flick (2002).

The literature search and selection stage utilised the databases CAPES-Periodicals, EB-SCOhost, Elsevier Science Direct and Proquest libraries, to find direct citations. The corpus arrangement included searching through keywords like "internationalisation," "international entrepreneurship," "entrepreneurial orientation," "entrepreneurship," and searches for articles with titles containing "international entrepreneurial orientation." After locating relevant literature, the use of bibliographic and bibliometric reviews supported the creation of the resulting conference corpus for the study (Rauch *et al*., 2009; Jones *et al.*, 2011; Martens *et al*., 2016). The majority of studies relied on EO constructs that used dependent variables of internationalisation theories and, mostly, quantitative methods. However, for the last 20 years, the field evolved to focus on international entrepreneurship (IE) as a way of examining internationalisation processes (Autio, 2017). Operationally, there still exists a continuing need for measurements to characterise IEO and the different types of resources and capabilities concerning the internationalisation of SMEs from Latin America (Bianchi, Glavas, & Mathews, 2017).

The study follows Miller's (2011) proposition to apply qualitative methodologies to investigate entrepreneurial orientation in specific contexts. For the interpretation of the context of firms, a multiple case study generated several key organisational characteristics to facilitate comparison between the organisations (Doz, 2011). The population of the study consisted of companies' owners of four SMEs that export air sports products. The selected companies are critical cases as they represent almost all the industry in Brazil and

differ in organisational aspects (Vissak, 2010). To address the matter of EO's expressions, the study employed two complementary approaches, the use of a computer-assisted qualitative data analysis software, as recognised by Covin and Wales (2012), and the use of a matrix represented by the firm's scores or profile across various dimensions (Polites, Roberts, & Thatcher, 2012). Once the few informants restricted the possibility to triangulate qualitative data with other methods such as surveys, studies from Brazilian literature supported the development of the theoretical framework with meanings closer to the companies' context (Table 4). These individual informants reported data not on themselves but their organisations (Table 6).

To assert the frequency of words as indicative of the strength of IEO's dimensions in those companies, the use of NVIVO offered comprehensive support for the content analysis and interpretation of the narratives found in multiple documents and in-depth interviews. This strategy followed the two-phased procedure suggested by McKenny, Aguinis, Short, & Anglin (2016) when acknowledging the validity and reliability of the computer-assisted qualitative analysis of entrepreneurial orientation constructs. First, the selected papers were open coded for preliminary content analysis to distinguish the topics. More specifically about the codification phase, the EO dimensions reflected the elements that comprise business practises in the companies; and the concept served for profile construct to help the researcher understand the phenomena under investigation (Bazeley & Jackson, 2013; Paulus *et al.*, 2017). After outlining the dimensions, a list of words supported the interpretation of the entrepreneurs' narratives. The collection of words was favoured by *The Blackwell Encyclopedia of Management: Entrepreneurship*, as proposed by Short *et al.* (2010). Moreover, for final delivery, the software's tools for word frequency analysis – text coding and matrix coding – facilitated the presentation of crossings and interrelations between the data and the narrative offered by the companies' owners (Lage, 2011).

Regarding the questionnaire (Dess & Lumpkin, 2005, p.153), translated questions and the context of the construct followed the consolidation provided by Freitas *et al*. (2012). In this respect, one first interview assessed the commentaries of an independent commercial agent for the same national air sports sector. Overall, the use of protocols in the form of a semi-structured questionnaire – with reports and webpages verifications – conformed to an interactive exercise between the researcher and informants, as the four in-depth interviews provided a useful way to learn about their companies' characteristics (Vissak, 2010). Visits for data collection phase started right after the reception of consent, whereas vis-à-vis interviews occurred at respective company establishments from March to August of 2017. The recording of interviews took about 90 minutes and resulted in unique reports for each company. The entrepreneurs received transcriptions for confirmation and revised the texts from June to October of 2017. The revisions counted with each entrepreneur's voice and knowledge for improving the interpretation and naming of practises, to refine and relate elements to themes. Final reports validated the owner's narrative with the content found in the literature (Paulus *et al.*, 2017).

In terms of EO's measurement, scholars point to fundamental differences like the dimensions that form the core EO construct (Covin & Wales, 2012; Anderson *et al.*, 2015). However, the study addresses the difficulty of determining the structure of a multidimensional construct by theorising different profile constructs to exist at the

same level of dimensions and to represent the influence of each one (Polites *et al*., 2012). Divided into a series of discrete levels, the profiles facilitated the visualisation of various combinations of IEO levels (Table 7). Thus, each observation in the firm's scores measured as the distance from the best profile member in the matrix, evidenced each dimension points about the average of all the data classified under the general profile (McKenny *et al*., 2016).

RESULTS AND DISCUSSION

To accomplish the primary objective and answer the research question, this research assessed the methodological aspects of IEO literature and contextualised the profile frames to discuss the implications found in the results. The studied companies share specific industry characteristics, as they utilise niche strategies in markets worldwide. The following tables demonstrate the characteristics of the companies (Table 6), and the expected IEO posture (Table 7) found in the study. Hence, the profiling of their cross-border operations exhibited common aspects that may have influenced the acquisition of operational attributes required by the company's strategic orientation (Magnani & Zucchella, 2019).

First, to characterise SMEs internationalisation in emerging economies (Kazlauskaitė *et al*., 2015), the companies were grouped in Table 6 according to a series of indicators (Dib, Da Rocha & Silva, 2010; Da Rocha *et al*., 2012). For example, establishment before 1990 (Rotor Harnesses and Trike Icaros) and after 1990 (Sol Paragliders and Tirante A). This differentiation makes sense from a theoretical perspective, but also from the viewpoint of these firms' evolution in international market knowledge and technological expertise. Not only did the younger group take much less time to export but they also developed more products and exported to more countries. The informants often referred to the need of certifications: "equipment produced within strict aeronautical standards" (Trike Icaros); but they express less need for patents: "several people have already copied my products, as I have copied as well, it makes me innovate more" (Rotor Harnesses); "yes, being imitated is good. Even more so in our business today. When we present a paraglider to the market; everything in that paraglider is already tested" (Sol Paragliders).

There are examples of reputation and social capital as drivers of internationalisation (Tang, 2011) like the two companies with higher exports rates. For the Rotor Harnesses owner, "the foreign market helped develop the domestic market. After the Brazilian team won the world championship in Italy, everything changed." For the Sol Paragliders owner, "for the 18th time in a row, we were present at the largest free-flight event in the world at Saint Hilaire, France." There are examples of resource constraints and intermittent innovative actions (Zonta & Amal, 2018). Trike Icaros owner mentioned: "the customers contact us via the website, email, and social group lists; we do not invest in roadshows outside Brazil." Whereas, Tirante A owner explained: "the first time we visited a fair, only two other companies held expositions. The second time, many others appeared. Manufacturers started popping up worldwide, so we stopped visiting fairs.

The classification by the NVIVO coding matrix enabled the examination and exploration of data across and within categories, allowing for comparisons between the collected material and general overview of companies' managerial practises (Table 7).

Table 6. Characteristics of air sport companies

Characteristics	Rotor Harnesses	Trike Icaros	Sol Paragliders	Tirante A
Scope	10 countries	5 countries	56 countries	15 countries
Products	5+ models of harnesses and products for hang gliders	18 combinations of trikes and microlight aircrafts	60+ general products for paragliders	4 electronic products
Established	1983	1986	1991	2009
Marketing	Promotion, aftersales, and sponsorship	Online promotion	Trade fairs, promotions, sponsorships, online shop	Business trips
First Export	15 years after	17 years after	2 years after	1 year after
Entry Mode	Representation, indirect exports	Representation, direct exports	Representation, direct exports	Dealers only, indirect exports
Reason to Participate in International Markets	Innovation, partnerships, certification, and branding	Distribution	Innovation, partnerships, certification, and branding	Distribution
Size	4 persons	5 persons	150+ persons	5 persons
Relevance	85% exports	25% exports	50% exports	15% exports

Source: own elaboration based on Dib *et al.* (2010) and Da Rocha *et al.* (2012).

After word frequency assessment and converting coverage percentages into points, the latter facilitated the understanding of the influence of each of the five dimensions ranged 37-51 points, with an average of 43 points. According to the report, the evolution of elements shows that the dimension of proactivity (51) stands out with the highest number of highlighted elements. The dimensions of Innovation (44), risk assumption (44), and autonomy (41) had several attenuated categories with organisations presenting variation among the elements. Competitive aggressiveness (37) emerges with the least number of attenuated elements. Interestingly, the dimension of autonomy appears with the most significant disparity, which suggests that companies practise it less homogeneously. Similarly, the individual scores of companies ranged 46-68 points, with an average of 54 points. Sol Paragliders (68) presented the highest levels of innovation (16), proactivity (15), autonomy (13), competitive aggressiveness (13), and risk-taking (11). The second company, Trike Icaros (52), emerged as almost equally proactive (14) but more balanced among innovation, autonomy, and risk-taking (10), with less competitive aggressiveness (8). Subsequently, the third company was Tirante A (51), which presented the highest level of risk-taking (16), followed by proactivity (10), innovation (9), autonomy (8), and competitive aggressiveness (8). The company with least intensity in total, Rotor Harnesses (46), appeared as more consistent among the five dimensions: proactivity (12), autonomy (10), innovation (9), competitive aggressiveness (8), and risk-taking (7). In general, the discrepancies between autonomy and competitive aggressiveness seem to explain reasonably well the difference in internationalisation pathways of the SMEs, even though there is inherent innovativeness, risk-taking, and proactiveness in all of the measures of managerial elements.

Table 7. IEO in air sport companies

Dimensions	Management Elements				
	Categories	Rotor Harnesses: 46	Tirante A: 51	Trike Icaros: 52	Sol Paragliders: 68
Proactivity: 51	Adaptability/Flexibility: 14	3	3	4	4
	Anticipation: 13	3	3	4	3
	Troubleshooting: 13	3	2	4	4
	Monitoring: 11	3	2	2	4
Innovation: 44	Products for the external market: 13	3	3	3	4
	Innovation in processes: 11	2	2	3	4
	Creativity to act internationally: 10	2	2	2	4
	Differentiation by external market: 10	2	2	2	4
Risk-Taking: 44	General risk: 15	3	4	4	4
	Decision risk: 12	2	4	3	3
	Financial risk: 9	1	4	2	2
	International Business risk: 8	1	4	1	2
Autonomy: 41	Centralization: 16	4	4	4	4
	Accountability: 12	4	2	4	2
	Organizational capacity: 7	1	1	1	4
	Team: 6	1	1	1	3
Competitive Aggressiviness: 37	International Business competition: 11	2	3	2	4
	Reaction to Competition: 9	2	2	2	3
	Market positioning: 9	2	2	1	4
	Financial Competition: 8	2	1	3	2

1) white cells = categories not mentioned; 2) light grey cells = categories mentioned less frequently; 3) grey cells = categories with low occurrence; 4) dark cells = categories with high occurrence.
Source: own study.

Within a specific and nascent industry context, the perspective of IEO referred to internationalisation as critical to air sports companies based in Brazil, which allows us to identify patterns employed as strategic orientations that stimulate firm-level processes for new entries onto international markets, regardless of firm's size, age, or capabilities. When conceived as a posture-based phenomenon, the concept favours competitive actions of firms to move into new product-market arenas. For example, Tirante A displayed the most evident risk-taking intensity combined with low competitive aggressiveness disposition. Even though Tirante A stopped exporting, the knowledge accumulated in international business helped it to foster their viability in other markets and segments. Noteworthy, in terms generalizability (Wales *et al.*, 2019), the dimension of autonomy offered a less accurate representation of what it means for firms to be entrepreneurially oriented within such a distinct socio-cultural context. The findings evidence that the firms leverage this capacity at lower levels. Results show that the entrepreneurs, in this case, confuse this organisational factor with centralisation and the lack of accountability processes.

Further Discussion

The following is a brief overview of each dimension, along with the category that mostly reflected the practises employed by the companies, accompanied by a short transcription of two most disparate reports.

PROACTIVITY (adaptability and flexibility): expanding a firm's operations assumed as reflections of company adaptability and reinvestment capacities as industry requirements (Żur, 2015).

"Today we understand that the market is segmenting, the new developments you see, one, two… fourteen canopies, plus the prototype, is to serve the same market size as five years ago we were serving with half the number of models" (Sol Paragliders).

"The products have one point in common, which is technology. So, a lot of the technology we created for air sports, we use here today in another segment (fleet control), now we need to adapt to this new customer, create a distribution, grow management, not just the product anymore" (Tirante A).

INNOVATION (products for external markets): treated as the potential for new market entries, it also is a source of learning experience when one considers certifications, participation in international fairs, import/export modes, or foreign personnel cooperation (Kosala, 2015).

"We created more than 40 products since 2000, when we brought Andre (designer) from Switzerland; he already had a vast experience. We started with competition wings that served as prototypes for intermediary levels and further certifications. In two years, we already had a product mix equal to our European competitors" (Sol Paragliders).

"When the [delta-wing] factory started to represent me, we already had novel features but a small line of products. To meet the basic need of safety in parachute opening, I invested in processes, modelling, new equipment, and soon after we also certified the equipment with the help of our German representative. It was a learning process for me at the time, a complicated one" (Rotor Harnesses).

RISK TAKING (general risk): the lack of planning for risk management at various levels of a network, business level or functional level along with the increasing speed of the process of internationalisation (Fudaliński, 2015).

"The risk is greater. Whenever you export and present the product, if you have a problem, it is much more complicated for you to solve. We had a case in Korea that was not cool. We sent the variometre and – due to a mistake in the production here – the 1500 model received the software of the TAV1000. It was a loss to solve the problem and such image crisis" (Tirante A).

"When I was sewing alone, I took many risks without representatives; you are at a disadvantaged situation, because either you have to send another product to the customer or the customer gives up the sale and you lose money. As the business is tailor-made, in the beginning, many pieces were stranded, returned, and such; we encountered first acceptance problems" (Rotor Harnesses).

AUTONOMY (centralisation): structural autonomy as necessary to obtain an employee's creativity (Freitas *et al*., 2012).

"Here, 20% of people are pilots involved with the factory, design, and administration. About the commercial department today we have people dedicated to international

trade, people who speak languages, do all the contacts with the markets, but it depends on the dynamics of the company; before 2004, I did everything with my brother and a few representatives"(Sol Paragliders).

"My daughter is responsible for the commercial area, financial, purchasing, and sales. She is the first contact the client gets, she is the person who orders the budget and checks if the client received the product. If I realise the client has cooled in the negotiation because he is more interested in the technical area, I take part in communication, even though she is a pilot as well. We do not have an international department; it is our representatives who take care of the export" (Trike Icaros).

COMPETITIVE AGGRESSIVENESS (international business competition): as a response to the actions of the competition, firms need enhanced monitoring capabilities (Hughes-Morgan, Kolev, & Mcnamara, 2018).

"There was always something exciting in Germany, which until today makes it difficult to sell through schools. If a school sells specific brands, another school sells the same brands too. I want to pull one of those brands for myself. Therefore, the same way we find in Brazil new entrants sending directly their products via parcel to the consumer's house, this practice only does damage. If everyone gives a three-month warranty, I provide six months to double the warranty time" (Sol Paragliders);

"The competition is for relationships, so the guy who sells Sol already knows the Brazilian product and has no objections to the product. We surfed a little on the wave that already existed! We contacted representatives mainly via Skype and email. We visited these people at schools all around Europe. Then we went to a fair in France to share the booth with Sol, we even exported to South Korea and Iraq" (Tirante A).

Although differentiation has to do with innovations that are difficult to imitate, the analysis shows that the sector follows imitation practises. According to IEO literature, the influence of autonomy on firm performance is complex, as organisational and international marketing approaches can provide insights into when the dimension is a critical driver of firm performance across international contexts. We would propose that the effects of autonomy on companies' outcomes are positively associated with international cultural contexts and international marketing adaptation. Even with significant differences in age, size, or the existence of specialised departments among companies, the possible implications for the IEO construct are that resources such as reputation, different licenses, and certifications are competitive advantages that encourage internationalisation processes as a means of forceful entry and continuous development.

CONCLUSIONS

The main goal of this research was to explore to what extent international entrepreneurial orientation (IEO) appears in internationalisation strategies developed by SMEs exporting from emerging markets. The concept of IEO proved useful for monitoring the environment and forecasting the competitor's actions in international business. The dimensions of IEO conform to evidence that managerial elements enhanced the companies' international experience and reflected in the internal organisation of studied firms. Further research would be valuable for the identification of elements and categories of IEO in other economic sectors. Attention to other approaches that include quantitative data may relate to

a more analytical capacity on a more adequate and updated conceptual basis in later studies. Limitations related to the scales used and data collected in the above discussion are that the study investigated only Brazilian companies from the same industry. A more significant number of participants from different industries in international markets would favour generalisation and theory development. Future research can investigate concepts of co-creation to bring new insights into the international development of companies to distinguish how entrepreneurial organisations with autonomy constraints succeed by showing competitive aggressiveness, as critical determinants to entering new foreign markets with innovative products.

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The Use of Organisational Learning Practices in Start-Ups Growth

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A B S T R A C T
Objective: To explore the use of organisational learning practices in start-up growth by focusing on start-up development stages and the 4I framework of organisational learning.
Research Design & Methods: The qualitative analysis was performed based on seven case studies: Lithuanian technology-based start-ups. The data collected from entrepreneurs working in technology knowledge intensive sector enables examining the practices of organisational learning that emerges in specific life cycle stages of start-ups.
Findings: The research results indicate that Lithuanian technology-based start-ups use behavioural learning the most in their growth stages. Start-ups are more likely to use the error-learning approach than cognitive or action learning practices. Learning practices are accepted intuitively, later interpreted and integrated. However, Lithuanian technology-based start-ups have not yet institutionalised the benefits of organisational learning.
Implications & Recommendations: Organisation learning practices should be applied in start-ups from the very beginning of their growth with the goal to develop a culture of learning.
Contribution & Value Added: This study contributes to the international entrepreneurship literature by examining the start-ups growth stages and the aspects of organisational learning: its methods, dynamic processes and the benefits of its application. Our contribution is a contextual focus of Lithuania, a small economy in transition. The empirical results provide some guidelines to practitioners who reduce gaps in the developmental stage of start-ups, solve challenges, and achieve a quicker settlement of a start-up in global markets by effectively using the knowledge of organisation learning in individual, group, and organisational levels.
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INTRODUCTION

The globalisation of countries, the openness of markets, and the development of technologies made a positive stimulus for new business creation: start-ups. Due to the large number of start-ups and various new management mechanisms, structures and actions emerging from these business activities in markets, research on start-ups, along with the growth and internationalisation of start-ups receive increasing attention especially in the past decade (Blank & Dorf, 2012; Bosch, Olsson, Björk, & Ljungblad, 2013; Chung & Bowie, 2017; Pomerol, 2018; Swanson & Baird, 2003). However, researchers show that more than half of all start-ups fail most often without reaching their fifth year of activity and they do not perform any international activity (Henry, 2017; Swanson & Baird, 2003; Sweetwood, 2018).

Many authors analyse challenges that arise from start-up activities, which sometimes leads to their collapse (Cantamessa, Gatteschi, Perboli, & Rosano, 2018; Mueller, Volery, & von Siemens, 2012; Wang, Edison, Bajwa, Giardino, & Abrahamsson, 2016), while frequent research emphasises the importance of organisational learning for start-up competitiveness, inter-knowledge sharing, and operational efficiency (Brockman, 2013; Chandler & Lyon, 2009; Chen, Lin, & Yen, 2014; Lumpkin & Lichtenstein, 2005; Tam & Gray, 2016). Although there is a high variety of frameworks in organisational learning (OL), previous entrepreneurial research applied 4I OL framework provided by Crossan, Lane, and White (1999). The 4I OL framework includes the environments of an individual, a group, and organisational learning. Organisational learning process among all team members in different start-up development phases and international growth is one of the most important source of innovation (Sekliuckiene, Vaitkiene, & Vainauskiene, 2018). Group knowledge in start-up teams contributes to the success of the start-up, and team engagement in knowledge-acquisition activities has a major impact on high start-up results (Chandler & Lyon, 2009).

However, there is a lack of research that would reveal interactions at every stage of start-up development, when organisational learning practices are used, which may show how organisational learning differs at each stage of the start-up life cycle. Thus, individual, entrepreneur, and organisational learning are important aspects that affect the growth of firms (Koryak, Mole, Lockett, Hayton, Ucbasaran, & Hodgkinson, 2015). Despite the fact that there exist some research issues in this area (Baggen, Lans, Biemans, Kampen, & Mulder, 2016), most scientific works are devoted to the entrepreneurial individual (Cosenz & Noto, 2018), although organisational learning can be viewed from the perspective of the continuous learning process. Thus, in this article, we address the gap in the literature by drawing upon organisational learning and entrepreneurship theories so as to analyse technology-based start-ups' ability to apply organisational learning practices in entrepreneurial business growth.

This article poses the following research question: how do start-ups apply organisational learning practices in entrepreneurial business growth? In order to examine this matter, we performed an in-depth qualitative analysis for the case study on the example of seven technology-based Lithuanian start-ups.

The paper contributes to the existing literature in two ways. Firstly, the research develops the theory of entrepreneurship by showing the importance of organisational learning practices in start-up development. Secondly, the article shows the specific context of Lithuania, a Baltic country in transition, for technology-based start-ups growth.

The text is organised as follows. First, theoretical background is provided. The second section explains the methodology used to explore Lithuanian technology-based start-ups. The third section presents the main results of the empirical study. The final section integrates conclusions of the study and is followed by discussion and future research directions.

LITERATURE REVIEW

Start-Ups Characteristics

Start-up is a small company most often with a high-tech focus (Swanson & Baird, 2003), which proposes a new product or service to the market in conditions of extreme uncertainty (Bosch *et al.*, 2013) while aspiring to grow fast (Wang *et al.*, 2016). Most often, start-ups have limited resources in terms of people and funding (Bosch *et al.*, 2013), which leads them to struggle for existence (Salamzadeh & Kesim, 2015). These entities are mostly formed based on new ideas that increase instability in economy by putting all business under the pressure of innovation and disruption (Pomerol, 2018). Many start-ups are going global by engaging in international activities (Bürgel, Fier, Licht, & Murray, 2004) and making the expansion processes as the core of their interests (Bailetti, 2012).

The main role in recognizing, evaluating, and exploiting the opportunities during the growth of a start-up lies with the entrepreneur (Mueller, Volery, & von Siemens, 2012) whose first steps depends on the entrepreneur's ability to decide how and where to use available resources (Alvarez & Busenitz, 2001). According to Aldrich and Yang (2012), the founder of a start-up performs actions oriented towards a goal according to the logic of a tripartite action: routines, habits, and heuristics. Each entrepreneur has four types of capital that he uses to create a start-up and achieve his or her goals (Karataş-Özkan, 2011): 1) economic capital that represents the amount of financial resources that it has or may have access to; 2) business know-how; 3) social capital that is the entrepreneur's connections gathered by knowing and maintaining partnership with universities, work environments, or other networks; and 4) symbolic capital that combines the three types of capital categories mentioned above with the help of personal qualities such as power and independence. A new business founder must have appropriate resources, such as education, experience, strong relationships, personal savings, and financial contributions from a close environment to start a new venture and turn his capital into start-up capital (Lichtenstein & Brush, 2001).

According to Osnabrugge and Robinson (2000), there are three types of start-ups which have great potential to grow: lifestyle ventures, middle-market and high-potential start-ups. Lifestyle ventures are based on an activity that provides sufficient capital to the founders of the company, but they are not inclined to high growth as this increases potential risk. Companies of this type mostly use internal funding, because their lack of propensity to expand has little chance of attracting funding from external sources (Osnabrugge & Robinson, 2000). Meanwhile, middle-market high-potential start-ups are already considered to be business enterprises prone to rapid growth. Middle-market companies have an annual growth probability of more than 20% and more than 10 million USD revenue over a five-year period. This type of start-ups has the ability to attract external investors, mostly business angels, but also to finance its growth processes by bootstrapping. High-potential firms have a growth rate of over 50% a year, with a five-year projected return of more than 50 million USD, and 50 or more employees in a 5-

10-year period. These are companies able to quickly adapt and change as needed – to take risky decisions – and their growth rates are attractive to both business angels and venture capitalists. Start-up financing method depends on its type (Jones, Macpherson, & Jayawarna, 2014). Thus, the availability of start-ups to certain funding sources directly depends on their stage of development and type of business.

Funding at the start-up seed stage is considered to be the riskiest, because investors do not receive any income; no business or financial plan is available (Paschen, 2017). As a result, most costs associated with start-ups early-development phase are usually financed from the personal resources of entrepreneurs, from their family and friends (MaRS, 2009a), from donation crowdfunding (Paschen, 2017), or bootstrapping resources (overdrafts, credit cards). These investors are the most attractive in the first start-up phase because start-ups do not have to offer a tangible potential reward, and their investment is minimal (Paschen, 2017). In case a start-up fails, investors will suffer lower losses. At the start-up stage, the investment risk is reduced because the start-up product concept stage was achieved. Moreover, since a business plan is already prepared, there are clear financial needs. A start-up at this stage usually attracts investment from business angels, as this stage is the most attractive and they fund the start-up individually or by assembling a group of investors (MaRS, 2009b). Moreover, at this stage, there remains the importance of funds from the close circle of the entrepreneur, because these can form guarantees for borrowing from the bank (Jones *et al.*, 2014). Investment risk at the early stage significantly decreases compared to the first two stages, because the new venture demonstrates business traction. At this stage, business angels and venture capital investments are the main financial sources (MaRS, 2009c). Even if a start-up was funded by banks in the previous stages, early stage intensifies the lending (Jones *et al.*, 2014), money borrowed from banks are used more for everyday start-up operations. At the last stage, investments for further development come from VC funds, institutional investors, and venture leasing companies. At this stage, the risk is reduced due to the already established relationship with customers and suppliers and revenue scaling. However, market competition remains, so minimum start-up risk remains (MaRS, 2009d).

There are three categories of actions that entrepreneurs take in their start-up development: activities, functions, and features (Mueller *et al.*, 2012). Exploration and exploitation of opportunities become very important at each start-up action. Activities are mainly management tasks for exchanging information, analytical and conceptual work, contact support and networking, and constant start-up monitoring. Functions are actions organised according to organisational context. Features include start-up management, marketing, sales, product/service and organisational development, human resources, financial control, and ongoing environmental monitoring. Actions related to possibilities exploration, identification, research, and obliteration are exploration start-up activities. Meanwhile, exploitation encompasses the implementation and execution of opportunities discovered in start-up activities.

Countries encourage the emergence of start-ups by creating various funding (loans and grants) and mentoring programs, or by establishing support mechanisms such as incubators and hatcheries (Jones *et al.*, 2014). The authorities try to raise awareness of the importance of start-ups in society. Salamzadeh and Kesim (2017) distinguish six different support mechanisms that contribute to the development of start-ups at various growth

stages: incubators, accelerators, hatcheries, small business development centres (SBDC), angel investors, and science parks. Accelerators and hatcheries engage in start-up activities through intensive mentoring programs. Moreover, accelerators offer a variety of workshops for start-up learning, incubators train start-ups to work with human resources and advise on legal issues, while hatcheries mainly work with start-up introduction to the market. Incubator and accelerator support mechanisms are named as the most common contributors to start-up activities (Motoyama & Knowlton, 2017).

Start-Up Growth Stages

Although researchers distinguish a different number of start-up development stages, the features are relatively similar in character. Osnabrugge and Robinson's (2000) framework distinguishes four start-up development stages. 1) Seed stage is a stage when only the idea of a potential new venture undergoes elaboration. A new venture creator expects to have a potentially profitable business idea, but it needs to be analysed, developed, and validated. 2) Start-up stage is when a new venture already started, progressing from an already approved idea to work with product development and a marketing campaign. Most often, the new venture at this stage is still small. 3) Early stage is a development phase when the new venture is expanding, the product or service is in production and marketing. In most cases, this phase takes less than five years and may still be unprofitable. 4) Later (expansion) stage is the maturity stage of the company. A venture is established, most likely profitable and with predictable cash flows.

Tech (2014) distinguishes three different stages of start-ups: 1) early, 2) growth, and 3) later. Each stage is described through the organisation, product, market, and funding prisms by presenting young venture activities specific to each stage.

Three stages breakdown are made by Paschen (2017), who distinguishes 1) the pre-start-up stage when the founder of a new venture verifies the ability of his idea to become a real business by dealing with significant client problems. At this stage, main competitors, partners and suppliers are identified by working with the target market. 2) The second stage is the start-up stage when the business idea and the reliability of the business model are already proven. At that stage, the entrepreneur seeks possible improvements to the product prototype and creates a viable business plan. 3) Third stage of start-up is called the growth stage when a start-up becomes productive and profitable. It now conducts market penetration and scaling operations as the product is already approved on the market, so that the start-up has the potential to grow steadily.

According to Salamzadeh and Kesim (2015), a start-up's development may also be divided into three stages. 1) In the first, bootstrapping stage, the entrepreneur seeks to create a profitable venture by initiating various activities to implement his idea. At this stage, the first close environmental investment is obtained, but the risk of uncertainty is high. The bootstrapping stage needs to reveal the biggest advantages of product, team, financial management and customer interest in the product. 2) The seed stage is characterised by a high level of uncertainty, but the main aspects of this stage are the creation of a product prototype, entry into the market, and the search for additional assistance from support mechanisms (incubators, accelerators, investments). This stage also includes start-up evaluation. As a result, this stage is important due to the large number of start-ups failure in finding support mechanisms. However, start-ups that outlast this stage have great opportunities to become

profitable companies. 3) The latest, creation stage, is the stage of product sales, market entry, and first employee recruitment. The company is formed at the end of this stage but still seeks additional sources of funding. Finally, a company becomes mature and profitable and looks for opportunities of development, diversification, and internationalisation.

Organisational Learning and Its Dynamics

Organisational learning promotes cooperation, allocation, and integration processes among team members; it creates innovative environment in the company and increases competitive advantage, should individual employees' practice and share learning at work and should a firm support a learning-conducive workplace in the long run (Chen *et al.*, 2014; Tam & Gray, 2016). Organisational learning helps to expand a business to new arenas by creating new knowledge, building new understandings, and detecting and correcting misalignments (Lumpkin & Lichtenstein, 2005). A start-up must ensure development processes through action and advanced cognitive learning in different size of groups because organisational learning involves whole organisations into the learning processes; although still most of the learning happens at an individual level (Chandler & Lyon, 2009).

Firms that promote and use organisational learning in their activities have an increased likelihood of recognising various market opportunities and adapting them to their business or to the process of establishing other companies (Lumpkin & Lichtenstein, 2005). Three different methods of organisational learning can be used in company activities. According to Osnabrugge and Robinson (2000), there are three types of start-ups which have great potential to grow: lifestyle ventures, middle-market and high-potential start-ups. It is based on the reactions of one's organisation or other organisations to the various company routines, systems, structures, and technologies that occur when there exist inefficient processes or gaps in the market. Cognitive learning explores how individuals' cognitive maps affect the entire organisation's cognitive schema. Cognitive learning specifically focuses on learning processes rather than on behavioural outcomes. If members of an organisation effectively utilise this type of learning, basic data can become a knowledge base generated by the organisation as a whole or by certain organisational competencies that can provide a significant competitive advantage in the market. Action learning helps to achieve the best possible action at a given moment; it analyses the gap between a person's claim that he will perform a certain action and the actual action. If a group of people working in an organisation uses action learning methodology, a community of learning practice is often created that can significantly increase the company's performance in areas such as intercommunication, innovation, and team efficiency.

The debate on firm organisational learning was initiated by Jones and Macpherson (2006) who undertook the development of the 4I model, designed by Crossan *et al.* (1999). The 4I framework is highly applicable in the investigations on SMEs learning, from individual through group to organisational levels of learning (Jones & Macpherson, 2006). The 4I framework of organisational learning by Crossan *et al.* (1999) contains four related processes:

1. Intuiting is one person's intuitive behaviour based on his or own experience, a person's behavioural model.
2. Interpreting is an understanding of actions by individuals. In this process, it is important to understand the verbal and non-verbal communication of an obsessive person.

3. Integrating is the process of generating a common and equally acceptable understanding of people in a group and, at the same time, adjusting coordinated actions. This process is primarily informal but – through dialogue and the integration of joint action – it can be institutionalised to become meaningful.
4. Institutionalising is a process that seeks to ensure the emergence of routine actions in an organisation and creates collective knowledge formalised within an organisation. This is done through clearly defined actions, tasks, and organisational mechanisms.

The 4I organisational framework works when an individual – through previous experience and intuition – finds a business opportunity to explore through individual action models (Dutta & Crossan, 2005). Then, the individual shares own insights with a larger group of people who join the process to interpret and explore the emerging business opportunity so as to create a common business proposition. Later, this common understanding becomes enabled commonly across the organisation through created systems, procedures, and overall strategies.

The Use of Organisational Learning Practices in Start-Up Development Stages

We combined the process of organisational learning with three start-up stages into the development model created by Brockman (2013) to evaluate the evolution of this process during the growth of a start-up (see Figure 1). Start-up development begins with the intuitive process: we first and foremost recognise the opportunity at the individual level. Since in this start-up stage its activity is only being prepared, there is an incubation period, so that everything depends on the entrepreneur's ability to learn at this stage, recognise the potential of the external environment, and exploit it by adapting own internal abilities. Soetanto (2017) summarises this approach by emphasising that the entrepreneur is "learning-by-doing" while analysing erroneous activities, working on problem-solving, and discovering solutions. This is tantamount to entrepreneurial alertness, the ability to detect opportunities, the added value of the product in development, and the ability to adapt and implement it all. As Ghezzi (2019) declares, it is the act of discovery and pursuit of profitable opportunities that builds the start-up in this phase. The engagement in seeking opportunities and advantages. At this start-up phase, action learning is important, which comes from the founder's responses to emerging market relationships and own knowledge and experience.

In the start-up phase, one person's intuition during connections with others (stakeholders, entrepreneurs) becomes an interpretation, and the start-up begins to assume a certain shape. Participation in different communities, networks is important learning source that promote the transfer of skills and existing knowledge within the team members (Soetanto, 2017). Thus, group connections may become a common understanding that arises from the interpretation of a single individual to the overall integrating process of the entire organisation. At this stage, behavioural learning is particularly relevant to action learning, group beliefs, and interpersonal relationships. However, the identification and exploitation of opportunities at this stage are still more informal and have not yet reached the institutionalising process.

In start-up growth phase, including international growth, learning is transferred from an individual to a small group until the entire organisation thinks its processes and structures through. If organisational learning reaches an integrating process in this start-up

phase, learning in growth stage becomes the institutionalising process. Due to common and combined mental model, the process of learning becomes a dynamic activity for the whole start-up. All three learning modes are used here: cognitive, behavioural, and action. Depending on the company's activities and processes, their importance is constantly changing, thus creating an ideal learning environment. When start-ups become connected, learning makes it easier to innovate and divide available capabilities, because information is used in a collective knowledge system.

PRE-START-UP
(Entrepreneurial Alertness)
- Opportunity recognition
- Dauble-Loop action learning
- Individual intuition

START UP
(Absorptive, Strategic learning, Balanced exploration/explotation)
- Opportunity recognition
- Opportunity exploitation
- Behavioral learning, suported by action learning
- Group interpretation and integration

GROWTH
(Heedful Interrelation)
- Opportunity recognition
- Opportunity exploitation
- Cognitive learning, suported by behavioral and action learning
- Institutionalized OL processes and mindful organisational action

Figure 1. Organisational learning in start-up development
Source: own elaboration based on the Brockman model (2013).

Seeking to integrate possible organisational learning solutions that could potentially improve start-up activities, we developed the framework below (see Figure 2).

It can be stated that a purposefully implemented organisational learning process can increase the competitive advantage in market due to the promotion of cooperation and discussion inside a start-up. This helps to ensure different learning and the creation of a collective knowledge-based system. Similarly, the use of organisational learning practices in start-ups ensures continuous market monitoring, learning from other start-up experiences, integrated response to specific situations, and the implementation of a common strategy for the understanding of start-up information and knowledge for each team member.
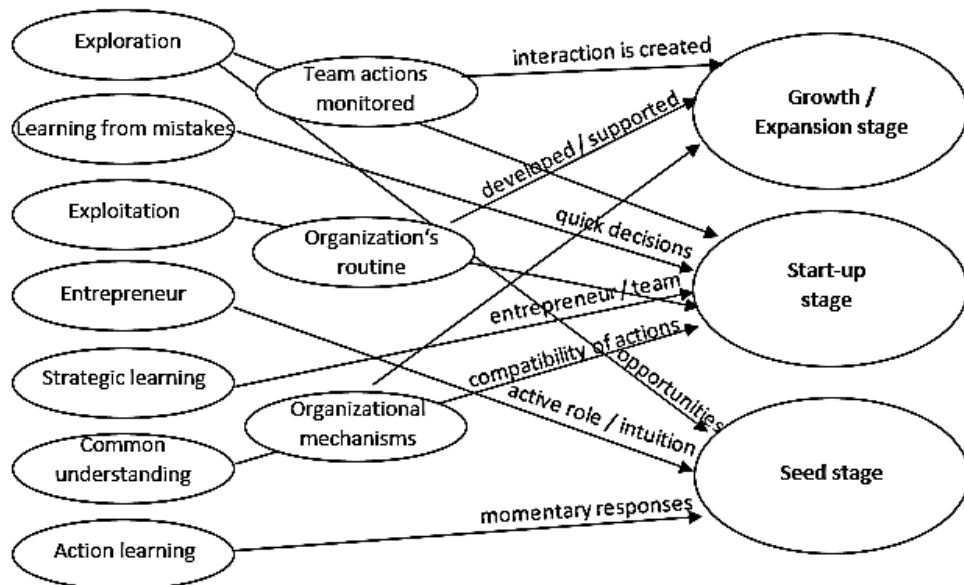
Figure 2. Framework of organisational learning practices in start-up growth
Source: own elaboration.

MATERIAL AND METHODS

Research Design

Research Method

The objective of this study is to define how start-ups apply organisational learning practices in business growth. Based on this perspective, we used a descriptive case study design in this research to describe the phenomenon and real-life context in which this application occurs (Yin, 2003), while gathering data with several different methods: especially observation and interviews (Eisenhardt, 1989). The research is based on a qualitative approach that sought to describe and define the social construction of reality: to understand how a particular theory works in real investigated examples (Eisenhardt & Graebner, 2007) and also to be able to enhance the development of quality measures and find the way to improve quality efforts in the analysed cases (Sofaer, 2002). Findings from the qualitative research stimulate practitioners' interest by allowing them to compare own daily practices with research findings and create new practices in their work (Silverman, 2016).

Qualitative research was conducted with a method of individual in-depth interviews. During these interviews, we analysed pre-defined topics and issues. When needed, these interviews were adapted to the specific context of the organisation under investigation by supplementing the questionnaire with unforeseen elements or changing questions depending on the situation.

All the interviews were conducted face-to-face. Each interview lasted from one to three hours. Audio-recording technology was used during the interviews to collect data and process it to transcripts. All interviews have been fully transcribed.

The data gathered during individual interviews has been processed and systemised according to interview transcripts, later analysed and divided into subcategories connecting the OL method with OL processes: behavioural learning / interpreting, behavioural learning / integrating, cognitive learning / intuiting, cognitive learning / interpreting, cognitive learning / integrating, action learning / interpreting, action learning / integrating. This allowed us to later connect each growth stage with OL methods and processes and provide conclusions based on the connections.

Sampling

The case studies comprised seven Lithuanian start-ups that represent information communications technology (ICT) and technology fields. The firms selected for the research had to meet the following criteria: 1) the firm is categorised as small or medium-sized; 2) the firm's activities should be technology-based; 3) the firm should be founded in Lithuania. Founders of the firms or CEOs were interviewed, which allowed us to gather answers from seven informants. The CEOs an in-depth knowledge of their start-ups' growth and organisational learning practices.

Because of contextual focus, the Lithuanian context was important in this research. According to InvestLithuania (2019) and StartupLithuania (2019):

− Lithuania has a population of young professionals who have 85% proficiency in English, they are third in CEE for Bachelors graduates in science, maths, computing, engineering, manufacturing, and construction, and Lithuania has the third highest share of youth (25-34 years old) in tertiary education in the EU (55.2%). Moreover, Lithuania is first in CEE for university-business collaboration in research and development.

− Lithuania is 11th globally for the ease of doing business; it takes one day to register a business using e-signature; and Lithuania is among the top ten EU countries in digital public services for businesses.

− Lithuania has growth-friendly taxation levels; third lowest corporate profit tax in CEE and 0% tax on profits in Free Economic Zones.

− Lithuania is ranked first globally for fulfilling business needs for ICT in areas like 4G availability (ninth globally), public Wi-Fi speed (first globally), and National Cyber Security Index (first globally).

− Lithuanian government and other institutions provide various support mechanism for start-ups, such as governmental support, pre-accelerators, accelerators, investments, incubators, hubs, sandboxes, and other support programs.

These specific features of Lithuanian start-up ecosystem provide a positive stimulus for technology-based start-ups creation in Lithuania. Table 1 below offers a description of sample start-ups.

The analysed start-ups operate from one to ten years and have teams counting from three to 18 people. The interviews occurred from the end of October 2018 until the be-ginning of December 2018.

Table 1. Description of the case studies

Activity	Industry	Year of foundation/Age of the start-up	Number of founders	Number of employees	Technology
Start-up A	Computer Software	2018 / 1 year	2	5 people	Mobile app / platform
Main activity	A mobile app designed for hair care professionals to easily communicate with their customers: create and save customer data during visits and showcase your work examples to others.				
Start-up B	Telecommunication	2011/ 8 years	3	16 people	Cloud-enabled platform
Main activity	Smart, connected, and on-demand communication experiences in nearly any environment. The goal is to deliver the most natural and pervasive face-to-face communication experience possible.				
Start-up C	Information Technology and Services	2017 / 2 years	2	18 people	ID scanning software
Main activity	Identity verification company, which helps reducing frauds, make business smoother, and make it more profitable. This company provides the possibility to turn smartphones (iOS and Android) or computers into a 24/7 ID scanning terminal and facial recognition system that makes it fast and easy to capture and verify customer identity to meet KYC (Know Your Customer) and other regulations requirements.				
Start-up D	E-Marketing and Advertising	2018 / 1 year	1	5 people	Mobile app / platform
Main activity	A cloud-based platform for building and managing a customer loyalty program powered with analysis and communication tools that do not require any additional integrations for serving a customer. The platform connects all loyalty programs into one network and gives access to it through a single mobile application.				
Start-up E	Electrical/Electronic Manufacturing	2016 / 3 years	1	3 people	Technological invention
Main activity	Focusing on delivering a revolutionary electric drive to the global market. The patented X drive is a Plug & Play solution for making bikes electric.				
Start-up F	E-learning	2013 / 6 years	2	15 people	Platform
Main activity	Company teaches and connects 10-18-year-old students and senior professionals with talents from business solutions programming, game development, and 3D modelling areas.				
Start-up G	Computer Software	2009/ 10 years	4	18 people	Mobile robotics solutions
Main activity	The company provides mobile robotics solutions by developing 3D visual perception and navigation technology for free-ranging vision-guided robotics applications in various industries, including manufacturing, material handling, and healthcare. The company is well regarded for its precise FDA-compliant robotic solution that targets tumours, designed exclusively for an image-guided radiation therapy product by Elekta, a medical device manufacturer listed on NASDAQ OMX NORDIC. The company provides hardware, software, and services to enable self-driving vehicle development, deployment, and fleet operation. The company can convert selected customer vehicle platforms into robotic systems.				

Source: own elaboration based on the analysed start-ups' websites.

RESULTS AND DISCUSSION

Case study results showed that integrative behavioural learning is the most commonly used method of organisational learning among Lithuanian technology-based start-ups, while the group that employs behavioural learning is the biggest. Therefore, it can be assumed, that Lithuanian technology-based start-ups are more likely to learn from mistakes, because behavioural learning methods can be specified as "learning from mistakes" instead of applying cognitive or action learning practices.

While analysing the dynamic process used in start-ups' organisational learning, it can be observed that the learning methods are most often interpreted, i.e. start-up teams try to understand the verbal and non-verbal communication of the whole organisation when certain actions are performed. Noteworthy, when the actions of colleagues are already interpreted, they are followed by a fairly frequent integration process, according to which we may assume that Lithuanian technology-based start-ups seek to generate a common and collective understanding of all members of the organisation, implement coordinated actions in start-up activities, and approach institutionalised processes in their activities.

In Lithuanian technology-based start-ups the method of behavioural learning is used the most in their growth and international expansion. This method is interpreted and integrated in organisation activities. As is typical for this learning method, start-ups investigate the responses of their team members and their product/service users to a particular company's routine. Start-up A's founder and CEO states that:

> I am using the program myself, I am constantly talking and presenting it to my colleagues, improving together, and the possibilities came from that dialogue. For us, the whole process is constantly dictated by the market. Our wish is to use all the opportunities of the market [its exploitation]. / We talk to our customers, get feedback from them, and according to that feedback fix the app.

The results showed that the start-up teams are learning from their mistakes. This can be seen in Start-up E's example, whose founder reports:

> Before the first Kickstarter in 2013, we didn't even suspect that it would be so complicated to have so many new components created, tested, and launched on the market. We didn't really know that. We learned this from this very difficult situation. We fell, we got up, we learned, and we did it again. And after a little while, we've solved those problems.

This type of learning extends the final product/service result due to the required fixes only after the malfunction has been implemented, as it can be seen in the words of Start-up D's co-founder:

> Every Wednesday we are doing a team meeting, when every manager presents in what position they are in the process of app development. If any idea comes to our minds, we all discuss how to apply it in the best possible way. We often think in one direction but after a week we say, "No, this is really wrong, we should do it differently."

Moreover, the routines that arise from behavioural learning are first used within the group and are later transmitted to another group, hence they become common and collective knowledge for the whole organisation. This circumstance appears in Start-up C's founder's words: "Now, we are working very hard for the sales team to communicate with the IT department. Because sales feedback comes from customers, so salespeople should emphasise what the client wants from the IT department and only then do priorities appear."

After analysing the behavioural learning method in start-up activities, we may assume that Lithuanian technology-based start-ups learn from own mistakes. They analyse the reactions of both their team members and external partners. Then, they adapt that information to the results for improvements of start-up product/service. First by interpreting and checking it in smaller work teams and then integrating it across the whole organisation as organisational learning practice.

Lithuanian technology-based start-ups also use the cognitive learning method in their activities to ensure the presence of learning processes rather than respond to the consequences of team members' behaviour. The use of cognitive learning method in start-up activities is very closely related to start-up founders, because they promote the application of this learning process by intuiting it.

According to Start-up D's founder, start-ups use this method by trying to get particular knowledge in the field from persons who are more experienced and capable of providing the necessary knowledge:

> Our main manager travelled through all the companies connected with the start-up community. He presented our business model, asked for advice, reflected on our mistakes and advantages. He has a few colleagues working with start-ups, so they also asked for advice from surrounding people on how to make our product better. So, he has tried to get the most knowledge and experience, and learn which problems we can face in the future or now. / We started contacting other start-ups by asking how they solved all these problems. After that, we created a big model of work, a working plan, and we started to do sprints with specific tasks which we should achieve in a certain amount of time; we wanted to do them purely, as one hundred percent functional, and so we gradually arrived at the goal. / We communicated with Invest Lithuania, with all the other start-ups, and with others to get the best possible knowledge and adapt our entire model as best as we can.

Learning from other team members, that have the extraordinary skills in the particular field, was another practice used by founders. According to Start-up A's and Start-up F's founders':

> [Engineering] education helped a lot and, of course, experience from previous practices. / It all started with the knowledge we already had. In the same field, in the same sector – in the training sector and in the technology sector – but also because at least a few dozen people have always been around in my circle of friends who did it all the time and where I was able to watch and actively do it myself all the same.

Most commonly, purposefully gained knowledge is interpreted by start-up teams in an attempt to absorb the best and most appropriate solutions proposed for their activity, and later integrate the most appropriate information in their processes. Hence, we may

assume that the cognitive learning method is exploited by start-ups to purposefully transform acquired knowledge into a shared start-up knowledge that improves operational processes and creates competitive advantage.

The institutionalised method of organisational learning is also in use by Lithuanian technology-based start-ups' but less frequently compared to other methods. According to the response of Start-up B's founder, this method is used to follow up on a common team solution with quick actions; to find the best way to improve the product: "Someone has an idea, then we would discuss it together, see it fit or not, and then decide whether to implement it in the system. / We talked and made decisions together, we were a single team. In the form of communication and discussion, ideas were born and implemented."

After the team discussion, as founder of Start-up F states, and after receiving valuable knowledge from outside consultants, according to Start-up A's founder:

> Product development opportunities are inevitable. A simple form is the conversation between the founder and the staff going on every day. And this is about these things. / An accelerator helps with everything. For me it is the first time, everything is new but very interesting. We receive training in different fields: finance, marketing, sales. I haven't heard so much information about my idea yet. People from the side look into our idea, analyse it, and that helps me and the team a lot.

Prior to start-ups' coordinated actions triggered by the action learning method, the information received is first embedded in the start-up team and later, after verification, integrated into the organisation as a whole.

CONCLUSIONS

The study defined start-ups development model, growth stages, and aspects of organisational learning: its methods (behavioural, cognitive, action), dynamic processes (intuiting, interpreting, integrating, and institutionalizing), and the benefits of its application, such as enhancing competitive advantage, constant market monitoring, promoting a common organisational culture, and ensuring inter-knowledge sharing. However, as prior literature emphasises, there are very limited studies that try to understand the outcomes of learning as a social phenomenon (Nogueira, 2019), entrepreneurial learning as part of organisational learning, and what impact they have on start-up survival and development (Krishna, 2018).

The results revealed that Lithuanian start-ups established in various technology sectors acknowledge the benefits of start-up learning. Lithuanian technology-based start-ups use three organisational learning methods: an error-learning approach, learning both from own mistakes and external mistakes, experienced and deliberately assured learning methods, start-up teams learn from their own entrepreneur or from other external individuals who can provide the required knowledge. Then fast needed decisions are made. Learning mentioned in start-up activities is accepted intuitively, later interpreted an integrated. However, Lithuanian technology-based start-ups have not yet institutionalised the benefits of organisational learning. The following managerial implications stem from the results of our research.

Seed stage. This can be overcome with the use of organisational learning behavioural method when the feedback from potential clients has to be discussed together in the team and further product adjustment processes are overcome by correcting the mistakes that

have been made so far in the product. As business knowledge deficiencies raise further challenges at this stage, we advise start-up developers to participate regularly in start-ups ecosystem before beginning the start-up and during the first development phases, which can provide primary knowledge needed for business development; especially when it comes to acquiring certain required information with the use of cognitive learning method. Moreover, it is essential to develop social skills and use social networks, which contributes to the development of the social capital of a start-up (Brockman, 2013).

Start-up stage. This challenge can be softened by monitoring competitors on the market, analysing their product/service, and finding gaps that would be relevant to consumers, thus overcoming the possible practices of action learning method. In order to solve the challenges of organisational management as smoothly as possible, we advise consulting with external partners (cognitive learning) or overcoming the behavioural method of organisational learning by learning from mistakes. According to Tam and Gray (2016), managers of an enterprise should take lead in group learning activities and create a shared learning culture in the workplace.

Growth/expansion stage. It is in such situations that the action learning process is used most often because of a quick reaction and problem solving at a given moment. We recommend that all organisational learning methods at this stage be institutionalised throughout the start-up organisation. Thus, this study suggests that start-up founder/co-founders should align and promote OL with growth stages of start-ups to maximise employee learning effectiveness, which will lead to versatile growth.

Certainly, this research has its limitations. Only start-ups from Lithuanian market were analysed, so the results cannot be applied to start-ups from other markets. This study could be a foundation for future comparison. Moreover, future research may conduct a deeper analysis of the challenges and organisational learning practices of start-ups. Thus, we recommend focusing more on how to solve the challenges through the use of organisational learning benefits. Try to find a closer relationship between the challenges faced by start-ups and organisational learning practices. More extensive researches (e.g. quantitative) can be conducting for covering different sectors. Another direction could be empirical studies that would compare start-ups in countries in transition (e.g. CEE countries), because they lack entrepreneurial business ecosystems and an environment favourable to investments, start-up growth, and effective learning practices.

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Institutional Quality in Central and East European Countries and Its Impact on FDI Inflow

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A B S T R A C T
Objective: To verify the quality of institutional environment and its role in attracting foreign direct investment (FDI). The article attempts to provide a quantitative description of the impact of institutional quality (IQ) on FDI inflow to 17 countries of Central and Eastern Europe (CEECs) in 2007-2017.
Research Design & Methods: Firstly, we reviewed studies dedicated to the relationship between institutional operations and investment attractiveness. Then, we selected 17 CEECs and ranked them for the value of FDI in absolute terms and as a share of GDP. The third stage focused on building an original set of indicators. We used selected categories of Global Competitiveness Index (GCI). Based on rankings, in the fifth stage, we divided 17 CEECs into groups representing similar IQ using hierarchical cluster analysis. The final stage consisted in examining the impact of IQ on the inflow of FDI within a selected group of countries by estimating dynamic panel data models.
Findings: The study demonstrated that CEECs differ with respect to IQ; an aspect that exerts a statistically significant impact on FDI inward stock as % of GDP.
Implications & Recommendations: The study has implications for research and practice. The results may be interesting for policymakers and may have an application value for institutions. An efficient and effective institutional system may importantly contribute to the boosting of investment attractiveness of countries and impact FDI flows.
Contribution & Value Added: The article sheds more light on the discussion about the relevance of IQ as a factor determining FDI inflow. The added value of this article consists in grouping 17 CEECs based on their similarity with respect to IQ and demonstrating that it impacts the size of FDI inflow. We proposed an original set of indicators for these countries that help in identifying their IQ.

INTRODUCTION

Foreign direct investment is viewed as a beneficial and safe form of international capital flows and a way to finance development processes. For that reason, for many decades already, countries around the world become increasingly eager to open up their economies and create conditions to attract FDI understood as an important stimulator of productivity enhancement, technological advancement, and job creation. Determinants of FDI location are associated with conditions favourable for conducting economic activities within a given area. These conditions create the investment climate in individual locations.

There is a long list of location-specific attributes which impact FDI inflow. Independent variables include economic and social stability, taxes, institutions, the size of host market, the cost of labour, the availability and quality of infrastructure, and political risk. We want to focus on the institutional aspects and their role in attracting FDI. We observed that the literature recently becomes increasingly interested in the institutional setting that surrounds FDI, in particular in developing countries, where institutional quality significantly differs from what we can expect of developed countries (Bailey, 2018; Jabri & Brahim, 2015). The dominant view is that countries with better institutional quality can attract more FDI. Poor quality institutions hinder FDI inflow acting like a tax (Buchanan, Le, & Rishi, 2012). The host country's institutional quality "affects profitability, and institutionally strong countries can attract foreign investors by offering high returns" (Sabir, Rafique, & Abbas, 2019, p. 4). In other words, countries with weaker institutions perform poorly, while countries with better institutions tend to perform better (Hayat, 2019).

Our article aims to provide a quantitative description of the impact of institutional quality on FDI inflow into Central and Eastern Europe countries (CEECs) in 2007-2017. Our hypothesis is that institutional quality – measured with a set of selected indicators – impacts the FDI inward stock as % of GDP. This article adds to the existing literature by addressing the following questions: (1) how can institutional quality be measured? (2) is institutional quality, as a determinant of FDI, equally important for CEECs? (3) what is the relevance of institutional quality, compared to other important determinants of investment attractiveness in attracting FDI, such as GDP per capita growth, inflation, employment, or merchandise trade? The analysis was conducted using hierarchical cluster analysis and panel models. Institutional quality along with the broadly understood investment attractiveness and its impact upon the size of FDI inflow into CEECs was previously the subject of our interest (e.g., Dorożyński, Dobrowolska, & Kuna-Marszałek, 2019). Thus, the article can be seen as another attempt to demonstrate the importance of the relationship between the quality of institutions and FDI, this time using different methods of research analysis. The article is structured as follows. Section two contains literature review. Section three provides details on data and methodology, followed by section with results and discussion.

LITERATURE REVIEW

The relationship between the quality of institutional environment and FDI was examined extensively. Its relevance was highlighted quite a long time ago; however, over the last two decades FDI researchers began to attach greater importance (Bailey, 2018; Daniele & Marani, 2006; Bénassy-Quéré, Coupet, & Mayer, 2005). The subjects increasingly attracts

researchers' attention especially in developing and transitioning countries (Jabri & Brahim, 2015; Daude & Stein, 2007).

There are many reasons why the quality of institutions does matter to foreign investors. Firstly, according to the institutional theory, enterprises operate in a complex and unstable environment, which is why their decisions are largely based on the performance of institutions that impact the development of investment environment (Francis, Zheng, & Mukherji, 2009). Policymakers can influence capital structure and investment decisions – thus the cost of capital and company value – by controlling corruption, adopting quality regulations and ensuring the rule of law. Secondly, since policymakers may impact the capital structure of firms, by the same token they may determine the quality of corporate governance at company level (Lemma & Negash, 2013). Finally, and most importantly, the presence of a high-quality institutional setting tends to add more credibility and security to MNEs, which translates into lower investment transaction costs, sunk costs included (Daniele & Marani, 2006).

In other words, (1) good governance helps firms to increase their productivity; (2) poorly performing institutions can raise additional costs as they may act like a tax inflicting cost on FDI investors; and (3) poor institutional quality can further increase uncertainty, leading to firms' higher vulnerability (Buchanan, Le, & Rishi, 2012; Bénassy-Quéré *et al.*, 2005; Daude & Stein, 2007). The key role in deterring FDI play the unpredictability of laws, regulations, and policies, government instability, excessive regulatory burden, and lack of commitment (Daude & Stein, 2007). Investors are unwilling to invest in countries where institutions encourage corruption and nepotism (Mengistu & Adhikary, 2011). On the other hand, there is research (Hausmann & Fernández-Arias, 2000), which openly suggests that countries representing "lower" institutional quality paradoxically lure more foreign capital, because there are investors who prefer doing business in a more complex investment environment, as the cost of entering such markets is lower compared to other economies.

Researchers agree that institutions – be it regional, national, or even supranational – shape the nature of business by providing the framework of opportunities and constraints within which economic activity takes place (Nielsen, Asmussen, & Weatherall, 2017), which implies that the quality of the host country institutions should impact FDI location decisions. Moreover, some try to prove that better quality institutions enhance FDI-induced economic growth – especially in low-income and middle-income countries (Hayat, 2019) – as institutional quality is to modulate the effect of FDI on economic growth in developing countries (Jude & Levieuge, 2015). From the perspective of this group of economies, such conclusion seems worthwhile.

Moreover, what is important is policy flexibility, as it gives politicians more leeway to use investment incentives to attract foreign investors. According to Zheng (2011), foreign investors generally prefer a policy environment with low political risk and consistent policy agenda, but they also like a flexible environment in which the government has the capacity to address their particular needs. In result, institutional differences between countries may be a source of comparative advantages (Levchenko, 2004). Hence, some sectors are more "institution-intensive" than others, which could be a source of more trade or investment flows.

The relationship between institutional quality and FDI inflows is illustrated by many factors, such as political regime (Madani & Nobakht, 2014; Guerin & Manzocchi, 2009),

democratic institutions and political stability (Jensen, 2008; 2003; Brada, Kutan, & Yigit, 2006), corruption (Habib & Zurawicki, 2010; Al-Sadig, 2009), tax policies (Eicher, Helfman, & Lenkoski, 2011; Feld & Heckemeyer, 2008), property rights (Tanaka & Iwasako, 2014; Khan & Samad, 2010), quality of educational system (Miningou & Tapsoba, 2017) or security (Essien, Barikui, Abuba, & Igbara, 2015; Stoian & Vickerman, 2005). Due to the multiplicity of factors that shape the above-mentioned institutional quality, the literature on its impact upon FDI can be divided into three strands (Kurul & Yalta, 2017). The first strand focuses mainly on identifying the effects of a specific institutional dimension, such as the influence of corruption or political regimes on FDI. The second strand analyses the importance of different dimensions of institutional quality. Finally, the third strand explores the effect of a composite institutional indicator, which is constructed by combining different dimensions of institutional variables.

Empirical results are vague, because it is hard to measure institutional factors. The reason may be that various researchers use different measures of institutional quality and look at different types of data – such as investing firms versus aggregate FDI inflows (Walsh & Yu, 2010) – or differently define individual factors of institutional quality. As Ali, Fiess, and MacDonald (2010) rightly observe, measurement problems emerge also when a single factor is used to capture a complex broad phenomenon like institutions. Foreign investors are likely to base their investment decisions on overall institutional quality rather than on a single institutional aspect such as political stability or corruption. By using only one indicator in the analyses, we are most likely to underestimate the role of institutions in determining FDI inflows. Moreover, according to Arel-Bundock (2017) contemporary researchers tend to overemphasise the statistical significance of outcomes of their works and often neglect to assess the explanatory or predictive power of their theories. In other words, we need to be cautious in approaching the results of many studies that assume the powerful impact of institutional quality on FDI inflow. Finally, institutional quality quite often appears as a necessary but insufficient precondition to attract FDI (Masron & Naseem, 2017).

Institutional quality is considered one of the leading factors that attract FDI independently of a country's level of economic development, and empirical results confirm that this level has a positive impact on FDI in all groups of countries. However, some researchers find that institutional quality has a greater impact on FDI in developed countries than in developing countries (Sabir *et. al.*, 2019).

To sum up, there is substantial literature linking the quality of institutions with FDI inflows from the perspective of developed and developing countries, but also economies in transition. A vast majority of research in FDI mainly focuses on the regions of North and South America, Eastern Europe, South-East Asia, and Africa. Little attention in the research on FDI inflows and institutional quality focuses on Central and Eastern European countries (e.g., Dorożyński *et. al*, 2019). Within this gap we focus on the relationship between institutional factors and FDI flows in CEECs.

FDI in Central and Eastern European Countries

Central and Eastern Europe is often perceived by investors as a single entity, even though the countries of the region greatly differ with respect to their ability to attract FDI (Figure 1). Poland, the Czech Republic, and Hungary are the most effective in successfully competing for foreign investors. In 2017, the total value of the FDI inward stock in these three

countries exceeded the value of FDI stock in all the other countries covered by the study taken together (ca. USD 480 bn compared to USD 408 bn).
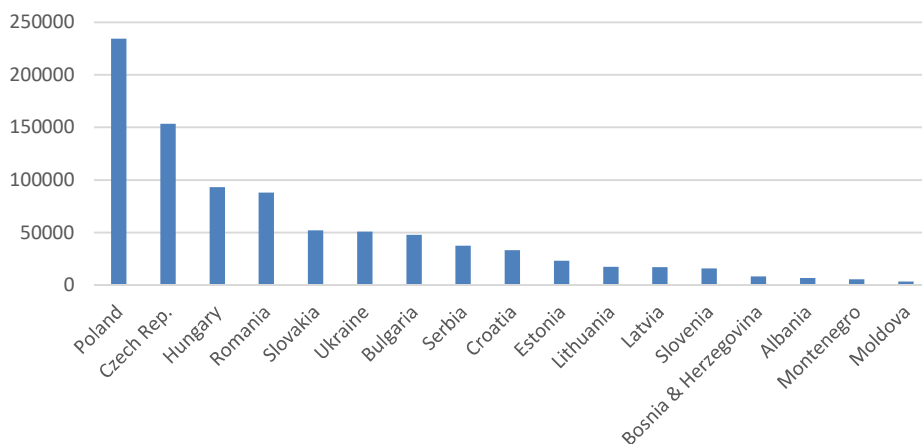
Figure 1. FDI inward stock (as at the end of 2017, in millions of USD)
Source: World Investment Report UNCTAD (2018).

However, the examined values look different when we take into account the FDI inward stock as % of GDP (Figure 2). Then we find out that the undisputed leader is Montenegro (116%). Estonia, Bulgaria, and Serbia manage to attract FDI stock equivalent of ca. 90-80% of their GDP. Poland in this ranking occupies the 14th position among all the 17 CEE countries (44.68%). At the bottom of the ranking is Slovenia with the share of FDI stock in GDP of 32%. It is difficult to find regularities in this ranking that would address e.g. the impact of the size of the country or the impact of its EU membership.
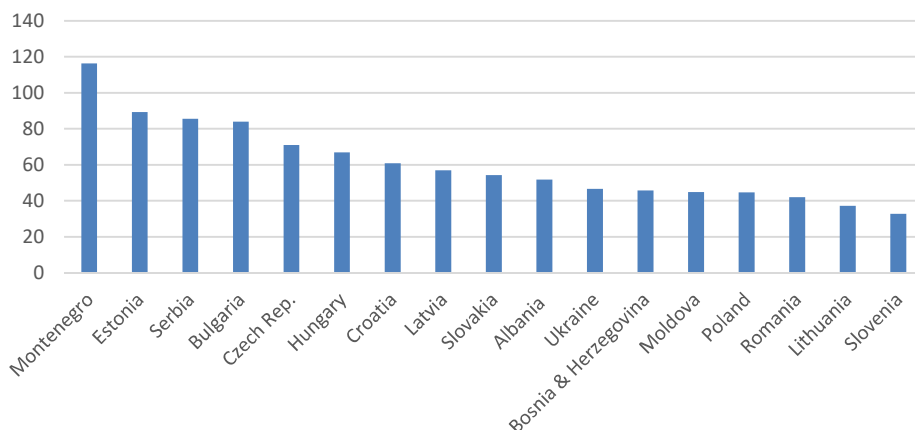
Figure 2. FDI inward stock as % of GDP (as at the end of 2017)
Source: own elaboration based on UNCTADSTAT.

MATERIAL AND METHODS

Institutional Quality Assessment Based on the *Global Competitiveness Index*

The institutional performance of CEECs was assessed based on the *Global Competitiveness Index* (GCI). The index is regularly published by the World Economic Forum since 1979. The GCI started with only one ranking, the Competitiveness Index, prepared under the supervision of Jeffrey Sachs and designed to identify the foundations of medium and long-term rapid economic growth. Then it gradually expanded with new indices. Some of them come from results of surveys conducted among thousands of corporate managers from almost all the countries included in the analysis; 138 countries in the edition 2016-2017 considered in this study.

The GCI presents the results in three main categories – basic requirements, efficiency enhancers, and innovation and sophistication factors – which address twelve policy domains called pillars. Each pillar is built of at least several detailed subcategories and their indices. The final assessment of a given economy is thus a derivative of over 100 different indicators. For our article we selected 23 indices that best describe institutional quality. Most of them come from the first pillar "Institutions" and from its "Part I: Public Institutions,"[1] which includes 16 detailed indices. Nevertheless, we decided that some indices from other pillars relate to institutional quality, although they have been included in other fields, e.g. education, market efficiency, or R&D innovation (Figure 3). Many other authors believe that these inform about the institutional quality of a country, e.g.:

1. **The quality of the educational system** (Miningou & Tapsoba 2017; Alesina & Perotti, 1996): we may expect that a more educated population demands more transparent and dynamic institutions and permits to build them.
2. **The effectiveness of an antimonopoly policy** (Petersen, 2013): the better antitrust regimes protect the market against monopolies or cartels, the more intense competition between different suppliers and the better the institutions perform.
3. **The effect of taxation on incentives to invest and work** (Fatica, 2009; Feld & Heckemeyer, 2008; Bénassy-Quéré, Fontagné, & Lahrèche-Révil, 2003; Moore, 1998): a sound tax system enables the consolidation of a social contract that gives rise to a more demanding relationship between the state and citizens.
4. **The relevance of trade barriers** (Rodrik, Subramanian, & Trebbi, 2004; Rigobon & Rodrik, 2004): international openness creates a more dynamic, sophisticated, and demanding environment, which fuels demand for good institutions, encourages a more competitive environment, and may hinder corruption and nepotism.
5. **Business impact of rules on FDI** (Bruno, 2008): investors usually avoid investing in countries where regulations are unclear and often change and restrict competition. The better and more effective the institutions, the better development opportunities for the market.
6. **Government procurement of advanced technology products** (Lee & Park, 2013): manufacturing of advanced technology products is linked, among other things,

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[1] Besides "Part I" in the pillar "Institutions," there is also "Part II. Private institutions." The latter embraces two categories and five detailed indices that provide the assessment of such notions as corporate ethics and governance standards. We skipped "Part II" in our study and decided to focus on the assessment of public institutions performance.

with intellectual property rights; thus, we may expect that more respect for intellectual property rights (IPR) means better perception of the quality of institutions in a given country.

All of the above-listed indicators help us to assess the institutional system of a given country from the viewpoint of, among other things, the enforcement of property rights, public institutions' interference in the economy, efficiency and transparency in the public sector, the quality of the education system, and labour market efficiency.
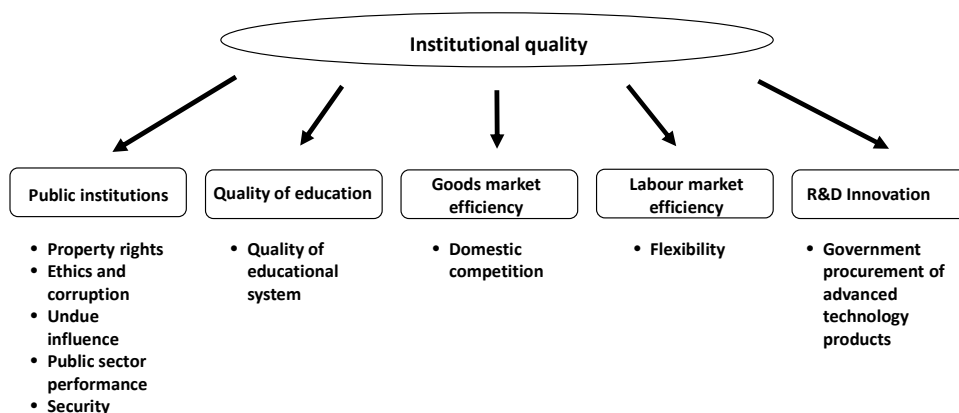
Figure 3. Key subcategories and indices of institutional quality
Source: own elaboration based on the World Economic Forum; GCI (2016-2017).

The 2016-2017 edition of GCI features only six CEECs in the top 50: Estonia occupies the highest, 30th place, followed by the Czech Republic (31), and Lithuania (35) with respective scores of 4.78, 4.72, and 4.60 on a scale from one to seven, with seven being the highest score. In this edition, institutions in the CEE countries score quite differently. When it comes to performance, Estonia is the undisputed leader (first rank among all the surveyed CEECs and 23rd globally), followed by Lithuania (second and 51st respectively), the Czech Republic (third and 54th), and Slovenia (fourth and 58th). Institutions in Bosnia and Herzegovina (15th and 126th), Moldova (16th and 128th), and Ukraine (17th and 129th) are considered the worst performers.

A detailed analysis of 23 individual subcategories of institutional quality further reveals substantial differences among the CEECs. Estonia clearly outperformed other CEECs in almost all the surveyed subcategories with first rank in 21 out of 23 variables. Slovenia, Macedonia, and Latvia scored relatively well to occupy top positions in a number of subcategories, which is indicative of relatively high indicators of institutional quality. The bottom of the ranking is as usually occupied by Ukraine, Slovakia, and Moldova (Table A1 in Appendix).

Institutional Quality in 17 Central and Eastern European Countries in 2007-2017
This part of the study focused on distinguishing 17 CEECs and grouping them based on similarities in institutional quality. To this end we deployed the Hierarchical Cluster Analysis. The method is a tool used to explore and identify natural clusters in sets of data, similar with respect to specific features (James, Witten, Hastie, & Tibshirani, 2014; Lasek, 2002).

The selection of diagnostic variables is crucial for the correctness of results obtained from the study. As we have already mentioned, variables in our case were selected based on the GCI. For this article we selected the most relevant indicators that describe institutional quality. They come from several pillars encompassing a number of indices. For variables selected for further analysis we calculated basic descriptive statistics, which suggest that variation coefficient does not exceed 10% (Table 1) for only three variables; i.e. business costs of terrorism (8.18%), business costs of crime and violence (9.15%), and the relevance of trade barriers (8.39%). However, we should bear in mind that the examined variables are treated as quantitative even though they are measured only at the ordinal level, on a scale from one to seven.

Ward's method was used to obtain a dendrogram illustrating the hierarchical structure of the set of objects assessed for their institutional quality in 2007-2017. A detailed analysis of the dendrogram allowed us to divide the 17 CEECs included in the study into five groups that exhibit strong similarity with respect to institutional quality (Figure 4):

1. Group I: Hungary, Romania, Slovakia, Croatia.
2. Group II: Latvia, Lithuania, Poland, Slovenia, Czech Republic.
3. Group III: Albania, Montenegro.
4. Group IV: Bosnia and Herzegovina, Serbia, Moldova, Ukraine, Bulgaria.
5. Group V: Estonia.

Estonia is an indisputable leader in institutional quality, which is why this country and group V were selected as the reference point for further analyses. Group II brings together runners-up in this ranking, i.e. Latvia, Lithuania, Poland, Slovenia, and the Czech Republic. A slightly worse score, although very close, was achieved by countries in group III, i.e. Albania and Montenegro (Table A2 in Appendix).

The above-presented division seems convincing, although one cannot find unambiguous linkages between countries in each and every case. Groups I and II are made of European Union member states. With the exception of Romania, all the other listed countries represent a similar level of economic development. Except Romania and Croatia, most of them launched economic and systemic transformations at the same time, cooperated with one another, and drew on each other's experiences. All these countries seek markets for their products mainly in Western Europe. For countries from group I Germany remains the main trade partner; only in Croatia Germany ranks second after Italy.

Group II includes countries similar at economic, political, and cultural levels. Their populations and markets are relatively small, with the exception of Poland. In all of the Group II countries foreign capital comes mostly from Western Europe; all of these economies work towards attracting FDI and, in doing so, they compete with each other.

Members of groups III and IV are countries in geographic proximity; only Ukraine and Moldova come from Eastern Europe, while the rest belong to South-Eastern Europe. All of them are the least affluent European countries. Only Bulgaria is an EU member state, with the rest of the countries aspiring to EU membership. On top of that, Montenegro, Serbia, and Bosnia and Herzegovina are linked with historical bonds, as these countries emerged after the breakup of Yugoslavia in the 1990s.

Group V is composed of Estonia, a country clearly different from the rest of countries examined with respect to their economic development. Its economy rests on openness, liberal economic policy, but also on tax and banking system that is enterprise- and investment-friendly. The country is very active in the area of innovation, automation, and digitalisation, in which it is also a leader in the EU.

Table 1. Potential diagnostic variables for institutional quality in CEECs and basic descriptive statistics for the examined general population

Symbol	Variables	aver-age	vari-ance	between groups variance	within groups variance	stand-ard de-viation	variation coeffi-cient (%)
Pillar 1: Institutions/index: Public institutions
X_1	Property rights	3.91	0.44	7.03	0	0.66	16.88
X_2	Intellectual property protection	3.58	0.42	6.66	0	0.65	18.16
X_3	Diversion of public funds	3.15	0.38	6.00	0	0.61	19.37
X_4	Public trust in politicians	2.39	0.23	3.75	0	0.48	20.08
X_5	Irregular payments and bribes	4.07	0.52	8.32	0	0.72	17.69
X_6	Judicial independence	3.38	0.73	11.73	0	0.86	25.44
X_7	Favouritism in decisions of government officials	2.74	0.26	4.09	0	0.51	18.61
X_8	Efficiency of government spending	2.79	0.34	5.44	0	0.58	20.79
X_9	Burden of government regulation	2.99	0.33	5.33	0	0.58	19.40
X_{10}	Efficiency of the legal framework in settling disputes	3.03	0.26	4.07	0	0.50	16.50
X_{11}	Efficiency of the legal framework in challenging regulations	2.95	0.24	3.90	0	0.49	16.61
X_{12}	Transparency of government policymaking	3.95	0.26	4.14	0	0.51	12.91
X_{13}	Business costs of terrorism	5.87	0.28	3.66	0	0.48	8.18
X_{14}	Business costs of crime and violence	5.03	0.21	3.32	0	0.46	9.15
X_{15}	Organised crime	5.03	0.47	7.73	0	0.69	13.72
X_{16}	Reliability of police services	4.13	0.41	6.47	0	0.64	15.50
Pillar 2: Higher education and training/index: Quality of education
X_{17}	Quality of the education system	3.59	0.23	3.66	0	0.48	13.37
Pillar 3: Goods market efficiency/index: Domestic competition
X_{18}	Effectiveness of antimonopoly policy	3.66	0.24	3.81	0	0.48	13.11
X_{19}	Effect of taxation on incentives to invest	3.26	0.31	5.02	0	0.56	17.18
X_{20}	Relevance of trade barriers	4.53	0.14	2.29	0	0.38	8.39
X_{21}	Business impact of rules on FDI	4.34	0.43	6.94	0	0.66	15.21
Pillar 4: Labour market efficiency/index: Flexibility
X_{22}	Effect of taxation on incentives to work	3.08	0.21	3.42	0	0.46	14.94
Pillar 5: R&D Innovation
X_{23}	Government procurement of advanced technology products	3.16	0.13	2.15	0	0.37	11.71

Source: own compilation based on GCI.
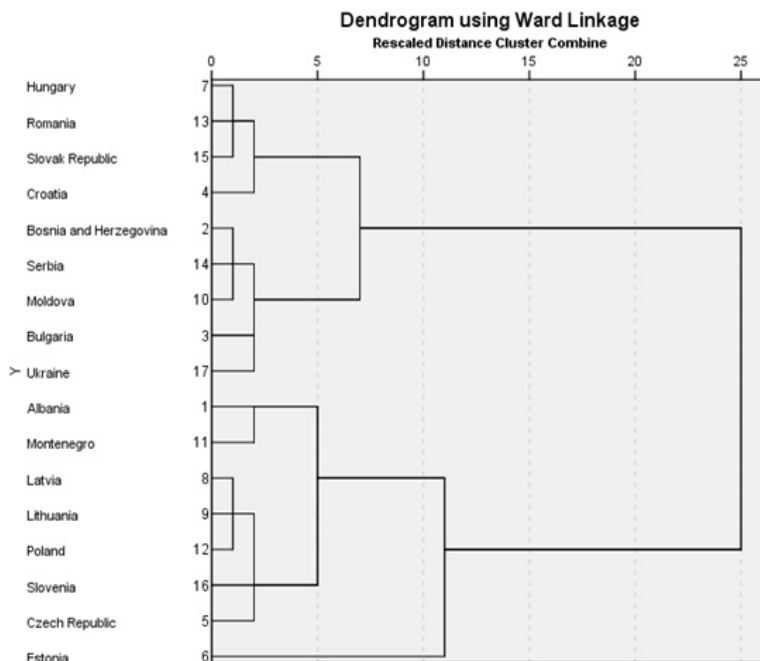
**Figure 4. Dendrogram of average institutional quality for 17 CEECs
for 2007-2017 obtained using Ward's method (Ward's linkage)**
Source: own elaboration.

Panel studies

Collected statistical data are structured in a panel (2007-2017), in which a calendar year is the principal period, while its objects are 15 countries[2] of Central and Eastern Europe. When exploring FDI inflows, attention is paid to their sustainability, because effects achieved in the past are decisive for current performance. Given the dynamic nature of examined occurrences and how they intertwine with panel data, we used dynamic panel data models.

In general form, a dynamic panel data model can be presented as follows:

$$y_{it} = \gamma y_{i,t-1} + \boldsymbol{x}_{it}^T \boldsymbol{\beta} + u_{it} = \gamma y_{i,t-1} + \boldsymbol{x}_{it}^T \boldsymbol{\beta} + \alpha_i + \varepsilon_{it},$$
$$i = 1, \dots, N, \qquad t = 1, \dots, T$$

(1)

where:

ε_{it} - $\sim N(0, \sigma_\varepsilon^2)$ for each i, t;

α_i - group effects; if α_i are random, then $\alpha_i \sim N(0, \sigma_\varepsilon^2)$;

$\mathbf{x}_{it} = [x_{kit}]_{K\times 1}$ - vector of explanatory variables with K coordinates;

$\boldsymbol{\beta}$ - vector of parameters (Kx1) identical for all i and t;

γ - autoregressive coefficient (Maddala, 2006; Dańska-Borsiak, 2011).

The most important estimators proposed for dynamic panel data models presented in the current literature are based on the generalised method of moments (GMM) and in-

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[2] Due to a partial lack of data we removed Serbia and Montenegro from the final analysis.

strumental variable method resulting from it (Baltagi, 2005). This method makes it possible to take account of the heteroscedasticity and autocorrelation of random component, but also to distinguish and use appropriate instrumental variables. GMM is particularly useful to estimate models that contain endogenous or predetermined explanatory variables, and in which the process generating time series is not fully specified (Bond, 2002; Dańska-Borsiak, 2011). We assume that one may use instrumental variables $\boldsymbol{Z}$, which are independent of the random components of the model.

The estimator of the generalised method of moments takes the form of the following equation:

$$\widehat{\boldsymbol{\beta}} = (\boldsymbol{X}^T\boldsymbol{Z}\boldsymbol{W}_N\boldsymbol{Z}^T\boldsymbol{X})^{-1}(\boldsymbol{X}^T\boldsymbol{Z}\boldsymbol{W}_N\boldsymbol{Z}^T\boldsymbol{y}) \qquad (2)$$

in which $\boldsymbol{Z} = (Z_1, Z_2, \dots, Z_N)$ is a properly structured matrix of instruments, while $\boldsymbol{W}_N$ is a matrix of weights.

A model of this class requires specific estimation methods, other than methods used in static models. The most important proposed methods discussed in the literature are based on the generalised method of moments. Within a series of methods proposed to estimate dynamic panel data models the following two play the most prominent role in practice: GMM for the first differences model (FDGMM) and the system estimator GMM (GMM-SYS) as its extension. Each estimator can be discussed as a one- or two-step version. The matrix of instruments $\boldsymbol{Z}$ and the matrix of weights $\boldsymbol{W}_N$ are decisive for the form of the estimator.

When we analyse the correctness of the estimated GMM model, we pay special attention to two tests: the Arellano-Bond autocorrelation test and the Sargan test of over-identifying restrictions.

In the former, differences model (FDGMM), the autocorrelation of the random component ε_{it} is an expected phenomenon.[3] Higher-order autocorrelation would mean that instruments used to estimate the GMM are incorrect. Thus, the test which detects 2nd-order autocorrelation in the model can validate the correctness of moment conditions. Arellano and Bond proposed a 2nd-order autocorrelation test, in which null hypothesis assumes there is no such autocorrelation. Empirical statistics of Arellano-Bond test takes the following form:

$$AR(2) = \frac{\Delta\widehat{\boldsymbol{\varepsilon}}_{-2}^T\Delta\widehat{\boldsymbol{\varepsilon}}_*}{\Delta\widehat{\boldsymbol{\varepsilon}}^{1/2}} \qquad (3)$$

where $\Delta\widehat{\boldsymbol{\varepsilon}}_{-2}$ are second differences of vector $\boldsymbol{\Delta\varepsilon}$, while components of vector $\Delta\widehat{\boldsymbol{\varepsilon}}_*$ are equal to components of $\boldsymbol{\Delta\varepsilon}$ and two fist values are omitted (to enable the multiplication). $AR(2)$ statistics has got a normal distribution $N(0,1)$.

Another important test is the Sargan test applied to examine the correctness of over-identifying restrictions, not used in estimation. In accordance with the null hypothesis, instruments are appropriate and not correlated with random components of the first- differences model. Test construction is based on what was proposed by Sargan (1958) and Hansen (1982). Empirical statistics looks as follows:

$$s = \Delta\widehat{\boldsymbol{\varepsilon}}^T\boldsymbol{Z}[\textstyle\sum_{i=1}^N \boldsymbol{Z}_i^T\Delta\widehat{\boldsymbol{\varepsilon}}\Delta\widehat{\boldsymbol{\varepsilon}}^T\boldsymbol{Z}_i]^{-1}\boldsymbol{Z}^T\Delta\widehat{\boldsymbol{\varepsilon}} \qquad (4)$$

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[3] If ε_{it} are independent, their first differences exhibit first-order correlation (see Dańska-Borsiak, 2011 for more details).

Statistics s with χ^2 distribution and q degrees of freedom, where q means the number of columns in matrix $\boldsymbol{Z}$ decreased by the number of estimated parameters.

Finally, the model takes the following form:

$$FDI_{it} = \beta_0 + \gamma FDI_{i,t-1} + \beta_1 GDP_{it} + \beta_2 GCF_{it} + \beta_3 I_{it} + \beta_4 NRR_{it} +$$
$$+\beta_5 MT_{it} + \beta_6 E_{it} + \beta_7 MUE_{it} + \beta_8 EUR_{it} + \beta_9 D1_{it} + \beta_{10} D2_{it} + \qquad (5)$$
$$+\beta_{11} D3_{it} + \beta_{12} D4_{it} + \varepsilon_{it}$$

As an explained variable (FDI_{it}) we took the value of FDI inward stock as % of GDP for country i in period t. Based on the overview of empirical studies conducted for panel studies, a number of variables have been selected that determine FDI inflow (Bénassy-Quéré *et. al*, 2005; Tun, Azman-Saini, & Law, 2012). However, despite the plenitude of analyses devoted to individual variables what remains certain is that FDI inflow is the function of demand (market size) estimated by an entrepreneur and the assessment of investment risk (stability of business environment), i.e. it is guided by general investment decision-making rules formulated by Keynes (Lautier & Moreau, 2012).

Table 2. Explanatory variables: Definitions and sources of data

No.	Symbol	Definition	Source
1.	GDP_{it}	GDP per capita growth (% of GDP) for country i in period t;	World Bank national accounts data and OECD National Accounts data files.
2.	GCF_{it}	gross capital formation (% of GDP) for country i in period t;	World Bank national accounts data and OECD National Accounts data files.
3.	I_{it}	inflation, consumer process (annual %) for country i in period t;	International Monetary Fund, International Financial Statistics, and data files.
4.	NRR_{it}	total natural resources rents (% of GDP) for country i in period t;	Estimates based on sources and methods described in *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium* (World Bank, 2011).
5.	MT_{it}	merchandise trade (% of GDP) for country i in period t;	World Trade Organization and World Bank GDP estimates.
6.	E_{it}	employment to population ratio 15+ for country i in period t;	International Labour Organization and the ILOSTAT database.
7.	MUE_{it}	EU membership for country i in period t;	EU Commission.
8.	EUR_{it}	Eurozone membership for country i in period t;	EU Commission.

Source: own study.

The model also included variables reflecting the affiliation with one of the five groups of countries –distinguished earlier based on the dendrogram – that exhibit similar institutional quality. Since there was only Estonia in group V, a country whose institutional quality is viewed as the highest among CEECs covered by the study, it became the reference point for comparison of other, earlier distinguished groups:

$D1_{it}$ – group 1 consisting of countries representing a similar level of institutional quality, distinguished based on the dendrogram (Hungary, Romania, Slovakia, Croatia) for country i in period t;

$D2_{it}$ – group 2 including countries representing a similar level of institutional quality, distinguished based on the dendrogram (Latvia, Lithuania, Poland, Slovenia, the Czech Republic) for country i in period t;

$D3_{it}$ – group 3 consisting of countries representing a similar level of institutional quality, distinguished based on the dendrogram (Albania, Montenegro) for country i in period t;

$D4_{it}$ – group 4 including countries representing a similar level of institutional quality, distinguished based on the dendrogram (Bosnia and Herzegovina, Serbia, Moldova, Ukraine, Bulgaria) for country i in period t.

RESULTS AND DISCUSSION

Due to higher statistical value measured with the Arellano test, we presented estimates obtained using the GMM-SYS method (Table 3). The table contains absolute values of t-statistic, while the last but one line shows AR(2), empirical values of the Arellano-Bond statistic that validates the second-order autocorrelation of the random component in the first differences model, in which the null hypothesis reads: there is no second-order autocorrelation.

Table 3. Results of the estimation of parameters in dynamic panel data models

Explanatory variables and selected characteristics	Parameter estimation	z	p
Constant	30.951	7.045	0.0001
$FDI_{i,t-1}$	0.440	6.203	0.0001
$D1_{it}$	-12.246	-4.918	0.0001
$D2_{it}$	-21.299	-6.361	0.0001
$D3_{it}$	-12.180	-3.464	0.0004
$D4_{it}$	-4,355	-1,780	0.0751
MUE_{it}	13.337	5.610	0.0001
Test AR(2) [*p*-value]	-1.87638	x	[0.061]
N	150	x	x

p – probability value (p$\in$ [0,1]).
Source: own study.

Results of the Arellano-Bond autocorrelation test suggest there are no grounds for the rejection of the null hypothesis, which means there is no second-order autocorrelation. The assessment of autoregression coefficient is statistically significant and positive. FDI inward stock as % of GDP of the previous year implies increases in FDI inward stock as % of GDP. The obtained results come as a surprise. They do not confirm the impact of most explanatory variables on FDI inward stock as % of GDP. However, the model confirmed that the EU membership is positively and statistically significantly correlated with FDI inward stock as % of GDP. Institutional quality turned out to be a statistically significant variable in countries covered by the study. Coefficients estimated for variables indicating affiliation to a specific group of countries demonstrate that FDI inward stock as % of GDP in all distinguished groups is lower than in Estonia.

The results obtained in our study are in accordance with the literature addressing empirical FDI incentives, which stresses the importance of institutions for FDI inflow (Dorożyński *et al.*, 2019; Buchanan *et al.*, 2012; Daude & Stein, 2007; Bénassy-Quéré *et al.*, 2005). This article reveals that institutional quality tends to be an important stimulus in attracting FDI inflows in the CEE countries.

The results obtained from this study are useful for policymakers. Our findings allow us to formulate policy implications that stress the role of institutional quality, as an important determinant in attracting FDI inflows. The CEECs are highly dependent on FDI inflows and

foreign capital. Without FDI inflows, economic development can be hindered. In other words, the authorities at different levels (local, regional, national) should improve the quality of institutions to attract and retain companies with foreign capital. Otherwise, foreign investors might be less interested in investing in Central Eastern Europe.

CONCLUSIONS

The main goal of the article was to assess the impact of institutional quality on the inflow of foreign direct investment in countries of Central and Eastern Europe. The conducted analyses have led us to the following conclusions:

1. Most researchers agree that institutional quality is one of the main determinants of FDI inflow.
2. Central and Eastern Europe is currently one of the most attractive areas to invest. Taking account of the amount of inflowing capital, the EU Member States, in particular Visegrad Group countries, are leaders in the region.
3. Measuring institutional quality remains problematic to many researchers as there is no coherent measure. This is why we tried to develop our own measure built from 23 partial variables from the GCI. In the group of countries covered by the study, Estonia is an undisputed leader when it comes to the quality of institutions.
4. Simultaneously, it turned out that the examined countries can be divided into groups representing similar institutional quality. Using the hierarchic cluster analysis, we selected five such groups. Countries that belong to these five groups exhibit some identical features, e.g. geographic proximity, the level of economic development, or EU membership.
5. Using dynamic panel data models, we examined the impact of institutional quality upon FDI inflow. It turned out that membership in a particular group of countries similar to one another in institutional quality strongly impacts their investment attractiveness.

Although this study provides important theoretical contributions and useful implications for policy makers in the examined countries, we realise that it has limitations. Firstly, the study exclusively covers countries from Central and Eastern Europe, i.e. a group of countries sharing specific historical experiences and bound with geographic proximity. Hence, it is hard to compare the obtained results with surveys conducted in other countries or regions, including emerging economies such as China or India, which rather abundantly feature in the literature on economics and international management. This is also why possibilities to generalize the obtained results are rather limited. Secondly, we used statistical data until only 2017, as the GCI 2017/2018 edition significantly changed the methodology used to estimate the indicator and data published for periods after 2017 became non-comparable to earlier data. The same can be said about data pre-dating 2007. Thus, the possibility to conduct analogous panel studies based on this database but covering a longer time horizon is not feasible in practice. Thirdly, using the GCI coefficient means we deal with a closed set of comparable explanatory (independent) variables.

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Appendix

Table A1. Partial ranking of institutional quality for 17 CEECs

Symbol	Variables	Countries																
		AL	BA	BG	HR	CZ	EE	HU	LV	LT	MD	ME	PL	RO	XS	SK	SI	UA
Pillar 1: Institutions/index: Public institutions																		
X_1	Property rights	15	16	12	11	5	1	9	2	4	14	6	8	10	13	7	3	17
X_2	Intellectual property protection	15	17	13	9	3	1	4	5	7	12	11	8	10	14	6	2	16
X_3	Diversion of public funds	9	7	14	8	13	1	12	5	6	17	2	3	11	10	15	4	16
X_4	Public trust in politicians	5	13	9	10	15	1	14	6	4	11	2	7	17	12	16	3	8
X_5	Irregular payments and bribes	12	14	10	9	8	1	6	5	4	16	7	3	11	13	15	2	17
X_6	Judicial independence	15	11	13	10	2	1	6	5	7	17	8	3	9	14	12	4	16
X_7	Favouritism in decisions of government officials	5	9	11	8	10	1	14	7	4	16	2	3	15	13	17	6	12
X_8	Efficiency of government spending	4	16	8	11	3	1	12	5	7	9	2	6	13	15	14	10	17
X_9	Burden of government regulation	2	11	5	16	13	1	15	4	6	9	3	12	8	17	14	7	10
X_{10}	Efficiency of the legal framework in settling disputes	5	12	11	16	6	1	7	9	3	14	2	4	10	13	17	8	15
X_{11}	Efficiency of the legal framework in challenging regulations	4	11	9	14	5	1	12	7	3	15	2	8	10	13	17	6	16
X_{12}	Transparency of government policymaking	7	17	15	11	9	1	14	4	3	5	8	13	16	10	6	2	12
X_{13}	Business costs of terrorism	14	9	17	3	4	2	6	8	7	11	10	12	13	15	5	1	16
X_{14}	Business costs of crime and violence	14	13	17	5	4	2	6	3	7	11	8	10	12	15	9	1	16
X_{15}	Organised crime	14	13	17	7	4	1	8	2	5	12	9	6	10	15	11	3	16
X_{16}	Reliability of police services	9	8	15	3	12	1	4	5	7	16	6	10	11	13	14	2	17
Pillar 2: Higher education and training/index: Quality of education																		
X_{17}	Quality of the education system	4	9	12	11	2	1	14	8	6	16	5	10	15	13	17	3	7
Pillar 3: Goods market efficiency/index: Domestic competition																		
X_{18}	Effectiveness of antimonopoly policy	13	14	12	11	3	1	7	6	8	16	10	4	9	17	5	2	15
X_{19}	Effect of taxation on incentives to invest	10	12	3	17	5	1	9	4	6	8	2	7	15	13	11	14	16
X_{20}	Relevance of trade barriers	12	14	16	7	2	1	6	4	9	13	8	10	11	15	3	5	17
X_{21}	Business impact of rules on FDI	7	14	13	16	3	1	4	6	10	11	5	9	8	12	2	15	17
Pillar 4: Labour market efficiency/index: Flexibility																		
X_{22}	Effect of taxation on incentives to work	4	12	3	16	6	1	7	5	10	9	2	8	14	11	15	17	13
Pillar 5: R&D Innovation																		
X_{23}	Government procurement of advanced technology products	3	16	5	15	4	1	12	9	7	17	2	6	11	13	14	10	8

AL – Albania, BA – Bosnia and Herzegovina, BG – Bulgaria, HR – Croatia, CZ - Czech Republic, EE – Estonia, HU – Hungary, LV – Latvia, LT – Lithuania, MD – Moldova, ME – Montenegro, PL – Poland, RO – Romania, XS – Serbia, SK – Slovakia, SI – Slovenia, UA – Ukraine.
Source: own elaboration based on GCI.

Table A2. Institutional quality ranking for five groups of countries

Symbol	Variables	Countries				
		Group I	Group II	Group III	Group IV	Group V
	Pillar 1: Institutions/index: Public institutions					
X_1	Property rights	3	2	4	5	1
X_2	Intellectual property protection	3	2	4	5	1
X_3	Diversion of public funds	4	3	2	5	1
X_4	Public trust in politicians	5	3	2	4	1
X_5	Irregular payments and bribes	4	2	3	5	1
X_6	Judicial independence	3	2	4	5	1
X_7	Favouritism in decisions of government officials	5	3	2	4	1
X_8	Efficiency of government spending	4	3	2	5	1
X_9	Burden of government regulation	5	3	2	4	1
X_{10}	Efficiency of the legal framework in settling disputes	4	3	2	5	1
X_{11}	Efficiency of the legal framework in challenging regulations	5	3	2	4	1
X_{12}	Transparency of government policymaking	5	4	3	2	1
X_{13}	Business costs of terrorism	3	2	4	5	1
X_{14}	Business costs of crime and violence	3	2	4	5	1
X_{15}	Organised crime	3	2	4	5	1
X_{16}	Reliability of police services	4	2	3	5	1
	Pillar 2: Higher education and training/index: Quality of education					
X_{17}	Quality of the educational system	5	3	2	4	1
	Pillar 3: Goods market efficiency/index: Domestic competition					
X_{18}	Effectiveness of antimonopoly policy	3	2	4	5	1
X_{19}	Effect of taxation on incentives to invest	5	3	2	4	1
X_{20}	Relevance of trade barriers	2	3	4	5	1
X_{21}	Business impact of rules on FDI	3	4	2	5	1
	Pillar 4: Labour market efficiency/index: Flexibility					
X_{22}	Effect of taxation on incentives to work	5	4	2	3	1
	Pillar 5: R&D Innovation					
X_{23}	Government procurement of advanced technology products	4	3	2	5	1

group I: Hungary, Romania, Slovakia, Croatia; group II: Latvia, Lithuania, Poland, Slovenia, Czech Republic; group III: Albania, Montenegro, group IV: Bosnia and Herzegovina, Serbia, Moldova, Ukraine, Bulgaria; group V: Estonia.
Source: own elaboration based on GCI.

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Tax Evasion, Tax Morale, and Trade Regulations: Company-Level Evidence from Poland

Dagmara Nikulin

A B S T R A C T
Objective: To investigate the determinants of the phenomenon of evading taxes among polish entrepreneurs. In particular, I examine such factors as tax administration satisfaction, tax morale, tax burden, and the influence of trade regulations.
Research Design & Methods: A survey study conducted in 2017 in Poland among 454 enterprises. I used the zero-inflated negative binomial modelling technique to examine the impact of factors on the probability and extent of tax evasion. I also checked the robustness of the obtained results.
Findings: I report low tax morale of company managers, low level of satisfaction of tax administration, and tightness of trade regulations as important factors that impact the probability of tax evasion. Moreover, tax morale plays an important role in explaining the extent of underreporting income. I report no significant impact of tax burden on the probability to evade taxes and the magnitude of evasion.
Implications & Recommendations: Tax burden should not be considered as predominant in explaining tax evasion inclinations. More social aspects, like the perceived quality of governance, the level of trade regulations, and tax morale, become increasingly important in affecting tax evasion attitudes.
Contribution & Value Added: I offer empirical evidence on the determinants of tax evasion. To that end, I utilise a new econometric approach and own primary data.

INTRODUCTION

Reducing tax evasion level is a complex matter as several approaches combating the shadow side of the economy may be applied. The related literature proposes plenty theoretical and empirical considerations on the causes and policy measures regarding tax evasion (for a review, see Buehn & Schneider, 2012). The most prevalent policy measures mainly cover higher penalties and an increase in the frequency of audits. As the traditional model proposed by Allingham and Sandmo (1972) asserts, the decision on evading taxes depends on the calculation between profits from tax evasion, on the one hand, and the risk of detection on the other hand. Today, the traditional model suffers criticism because of its simplicity and other dimensions like institutions, individual characteristics, morale, ethics, culture, and social stigma, which should be included when explaining tax evasion (Abdixhiku, Krasniqi, Pugh, & Hashi, 2017). As Torgler and Schneider argue, it is really important to investigate not only objective factors of tax evasion like tax burden, rate of public expenditure, or regulation density but also subjective factors like the perceptions, attitudes, and motivations reflected in tax morale or (perceived) institutional quality (Torgler & Schneider, 2009).

Some postulate that – apart from simple tax rate reduction – policy-makers should seek an alternative policy that may be more successful in fighting tax evasion problems (Enste, 2010). Many studies try to investigate the possible causes of taxpayers' behaviour to describe tax evasion determinants and formulate policy implications. Apart from tax burden (Abdixhiku *et al.*, 2017; Joulfaian, 2009; Nur-Tegin, 2008), many others causes for the development of tax evasion appear in the literature, like tax morale (Alm, 2012; Alm & Torgler, 2006; Cummings, Martinez-Vazquez, McKee, & Torgler, 2009), the quality of governance (Hanousek & Palda, 2004; Torgler & Schneider, 2007), and the tightness of regulations (Enste, 2010; Schneider, 2014).

However, despite the existing evidence on determinants of tax evasion, there still is space for further research, especially for those who analyse the social dimension of this phenomenon (Abdixhiku *et al*., 2017). A review of tax evasion theories by Slemrod (2007) suggests that – despite deterrence being a powerful factor in evasion decisions – there is still a need for further research on tax evasion determinants. In this study, I aim to test contemporary hypotheses on the causes of tax evasion behaviour. To do this, I use the results from a survey conducted among Polish entrepreneurs in 2017, which covered 454 effective interviews. I use the zero-inflated negative binomial modelling technique to examine not only the determinants of the decision to evade taxes but also to find factors that increase the probability of evading. I contribute to the existing literature by providing – to the best of our knowledge – the first empirical evidence on tax evasion determinants in Poland based on microdata. A good reference point is the research of Abdixhiku *et al.* (2017) who examine the determinants of tax evasion in 26 transition countries, including Poland. The study is based on firm-level company data derived from WB/EBRD Business Environment and Enterprise Performance Survey (BEEPS) for 2002 and 2005, covering 12,692 firms. The joint results obtained for all 26 transition countries indicate the possible reasons for tax evasion behaviour: tax burden, low trust in the government and the judicial system, high perceptions of corruption, and high compliance costs. Moreover, the results of my study may

be useful for other countries – especially from Central and Eastern Europe – in creating policy measures to tackle this phenomenon.

This article begins with a discussion on the driving forces of the shadow economy and tax evasion based on the existing literature. I focus on the influence of tax morale, institutional quality, tax burden, and state regulations on tax evasion behaviour. Section 3 includes a description of the data and methodology applied. In section 4, I present the estimations of our results and provide relevant discussion. Section 5 concludes the study.

LITERATURE REVIEW

Shadow Economy and Tax Evasion: Driving Forces

There are many factors that affect the probability to evade taxes. The literature offers plenty of research both on tax evasion and tax compliance determinants. In general, two main groups of reasons may be distinguished. The first approach, based on the rational choice model, includes an economic assumption that the decision on evading taxes depends on the individual perceptions between gains and the risk of detection and punishment (Allingham & Sandmo, 1972). This popular approach asserts that the probability of detection and punishment may influence tax evasion behaviour. Among other economic factors, the burden of taxation is the most quoted determinant of tax compliance. However, the empirical evidence on the influence of tax rate on tax evasion is rather inconclusive (Bernasconi, Corazzini, & Seri, 2014). Even studies based on the same data show different results, depending on the selected set of variables; compare the research based on Business Environment and Enterprise Performance Survey (BEEPS) from Nur-Tegin (2008) and Joulfaian (2009).

Another area of study is related to the correlation between the quality of institutions and the size of shadow economies, therefore also tax evasion inclination. Torgler and Schneider (2007) conduct a cross-country analysis based on panel study and find that institutional quality is a significant factor that impacts the size of the shadow economy. Hanousek and Palda (2004) analyse citizen perceptions of the quality of government services as the determinant of tax evasion. Based on the survey conducted in the Czech and Slovak Republics, Hungary, and Poland, they find strong evidence on the correlation between tax avoidance and the quality of government services. Barone and Mocetti (2011) use individual Italian data to claim a positive relationship between the efficiency of spending public money and the attitude towards paying taxes.

Apart from institutional quality and governance, the level of liberalisation measured by the tightness of regulations may play a role in explaining attitudes towards tax evasion (Enste, 2010; Schneider, 2014). If existing regulations are tighter, including the trade regulations, then there is a greater possibility of underreporting to circumvent stricter rules.

Another strand of literature exceeds the traditional deterrence model and takes into account non-economic factors like cultural values, tax morale, social and ethical norms to explain tax evasion (Cummings *et al.*, 2009). A comprehensive review of current studies on tax evasion that focuses on behavioural aspects is presented by Pickhardt and Prinz (2014). Wenzel (2004) argues for a significant difference between the impact of personal norms (individual morale of taxpayers) and social norms (morale attributed to other taxpayers) on tax compliance. While the relationship between personal norms and

tax compliance is positive and strong, the influence of social norms depends on the level of group identification. Based on the self-categorisation theory, Wenzel finds that social norms influence taxpayers' behaviour only if group identification is strong. Otherwise, social norms play no role in tax compliance (Wenzel, 2004). A cross-country study conducted by Bobek, Roberts, and Sweeney (2007) reveals that – among the most influential factors – personal moral norms and norms attributed to people close to them play an important role in creating taxpayers' behaviour. Results presented by Ferrer-i-Carbonell and Gërxhani (2016) indicate that tax evasion in Central and Eastern Europe countries is also negatively associated with individuals' life satisfaction. The study conducted by McGee and Benk (2011) reveals that tax evasion behaviour is related to government oppressiveness and corruption. The stronger the perceived unfairness of the system, the higher the inclination to evade taxes. Moreover, in another study, Mcgee and Benk (2019) find that tax evasion is smaller if tax rates are low, and people feel that they receive good value for their taxes. Turning towards socio-demographic determinants, the survey conducted by James, Mcgee, Benk, and Budak (2019) among English students and university members shows that young, non-married, and less-educated men are less opposed to evading taxes if they have such chance.

Besides studies that analyse the influence of social norms on tax evasion, another vein of research explains the correlation between tax morale impact and the size of the shadow economy (among others, Alm, Martinez-Vazque, & Torgler, 2006; Alm & Torgler, 2006; Torgler, 2005; Torgler & Schneider, 2009). Indeed, tax morale may be defined as intrinsic motivation to pay taxes (Torgler & Schneider, 2007) or as "a belief in contributing to society by paying taxes" (Torgler & Schneider, 2009, p. 230). Interestingly, Buehn and Schneider (2012) claim that tax morale is influenced by several factors like deterrence and the quality of state institutions. Doerrenberg and Peichl (2013) link tax morale to the progressivity of taxes and argue that progressive taxes have a positive impact on tax morale. Russo (2013) claims the positive relationship between tax morale, social capital, political participation, and immigration but a negative relationship between tax morale, the dissatisfaction with public services, and the level of unemployment. Similarly, Alm and Gomez (2008) find an important role of social capital in creating tax morale in Spain. Tax morale rises along with the perception of benefits in the form of public goods and services. The majority of the literature shows a negative correlation between personal ethical attitudes and tax evasion behaviour (see, among others, Kaplan, Newberry, & Reckers, 1997; Kogler, Batrancea, Nichita, Pantya, Belianin, & Kirchler, 2013; van Dijke & Verboon, 2010).

Based on the above-presented literature review, I develop the following hypotheses in this article:

H1: There is a negative relationship between tax morale presented by entrepreneurs and the inclination to evade taxes.

H2: The tightness of regulation, including trade regulation, boosts the probability of tax evasion.

H3: The overall satisfaction related to the quality of governance, measured by satisfaction with tax administration, will enhance tax compliance.

MATERIAL AND METHODS

Sample and Questionnaire

To test tax evasion hypotheses indicated in the previous section, I use quantitative data derived from a survey study conducted among Polish companies in April 2017. The questionnaire is proposed by Putniņš and Sauka (2015) who have been conducting business survey studies related to the shadow economy in the Baltic countries since 2010. My survey consists of 23 questions related to external influences, government policy, the amount of informal business, company performance, attitudes towards informal economy, and barriers to running a business. The survey sample covers 454 companies in Poland and is representative of Polish enterprises. For the purpose of representativeness, a random stratified sample is used with the following strata: region (voivodeship), industry, and employment size. The survey study was conducted by a data-collecting company and provides phone interviews with top managers or company owners in Poland. A description of the sample is presented in the Appendix, part A.

In reference to the aim of this article, I intend to gauge the probability of being engaged in the shadow economy, in particular to evade taxes. I use a direct approach to measure tax evasion in Poland based on a company survey. Given the data availability and the conventions used in the literature, I define tax evasion variable as the extent of the underreporting of business income. Keeping in mind the sensitive nature of the surveyed topic and the possible reluctance of respondents to giving truthful answers, I applied an indirect way of asking. Proposed and applied by Putniņš and Sauka (2015) and discussed in Gërxhani (2007), this indirect approach is particularly is based on questions to company managers but in reference to their opinion about firms in their industry instead of their own company. Past evidence on tax evasion claims that perceived tax evasion in the reference group is correlated with self-reported tax behaviour (Webley, Cole, & Eidjar, 2001), so this indirect indication may be used instead of the respondent's own answer (Gërxhani, 2007). Due to the difficulties related to the direct way of asking, I measured how company owners and managers perceive the scale of income underreporting in firms in their industry. Then, I used the assessed extent of income underreporting in the industry as a proxy for tax evasion prevalence in the interviewed company. In the remaining part of the article, the term tax evasion refers to this assumption. A detailed question wording is presented in Appendix B.

Table 1 presents the descriptive statistics of the variables used. As reported, the extent of underreporting of business income among Polish entrepreneurs is considerable. However, 30% of respondents declare no underreporting of income by firms in their industry, the remaining 70% of them claim some extent of tax evasion, among them over 50% state that the degree of underreporting is greater than 10%. In order to avoid the distortion of the results, I replace the extreme values by certain percentiles. In particular, the values below the 1st and above the 99th percentile are replaced by the values at 1st and 99th percentiles, accordingly.

To seek out the determinants of tax evasion, I considered a set of determinants, which correspond to the hypotheses indicated in the previous section. In particular, I employed the explanatory variables related to tax morale hypothesis (justified_to_cheat), regulation hypothesis (obstacle_trade), and governance quality hypothesis (tax_administration_sat). A detailed description of these variables is presented in

Appendix B. Moreover, aware of the rich body of potential factors that influence the inclination to evade taxes, I included control variables in our regressions, like the perceived tax burden (obstacle tax_rates) and the company size (no_employees).

Table 1. Descriptive statistics of dependent and explanatory variables

Variable name	N	Mean	Sd	Max	Min
underreport_income	454	14.51101	13.75563	0	80
justified_to_cheat	454	2.367841	0.6604074	1	4
obstacle_trade	454	2.251101	1.2354	0	4
tax_administration_sat	454	2.810573	0.7885903	1	5
obstacle_tax_rates	454	3.070485	0.7687961	0	4
no_employees	454	1.539648	0.7044268	1	7

Source: own elaboration based on company survey study.

Modelling Method

As I aimed to investigate the relationship between tax evasion and possible determinants, I employed the econometric modelling technique in the empirical part. The selected estimation method depended on the description of the dependent variable. Keeping in mind that a significant part of observations of the dependent variable equals zero – 30% of respondents claims no underreporting of income in the firms in their industry – I used zero inflated negative binomial regression, which is proper for attributes of this variable. The zero-inflated negative binomial regression was used for count data with excessive zeros and consists of two parts: the first one is the count model (negative binomial model) and the second one is binary outcome model predicting the excessive zeros. In our case, I reported two parts of the model: the first one describes the influence of selected determinants on the extent of tax evasion (count model), while the second part reports which factors impact the probability to evade taxes (logit model). In the second part (logit model) I analysed factors which enhance the probability of being zero (no tax evasion). Utilisation of this model has an additional advantage: it allowed me to analyse not only the determinants that enhance the inclination to tax evasion but also to indicate the factors that impact the attitudes of current tax evaders.

RESULTS AND DISCUSSION

The Results

The results of regression estimation are reported in Table 2. I present the results separately for the negative binomial count model (upper part of Table 2) and the zero-inflated model (lower part). I used the same regressors in both models.

Firstly, I interpret the second part of the model by predicting whether a company underreports business income or not. In other words, I assess the probability that the dependent variable equals zero, what in our case means no tax evasion. I can see that the propensity of companies to underreport is greater if the tax morale of company owner/manager is lower. If the respondents are more inclined to justify cheating on taxes, the probability of underreporting of business income is greater. In other words, the probability of no underreporting is lower. As the variable *justified_to_cheat* – that reflects the

company managers' attitudes towards tax evasion – is statistically significant, we can confirm the assumption on the positive influence of attitude factors on tax compliance.

Table 2. Estimations results: the impact of tax evasion determinants

Dependent variable	degree of underreporting business income (in %)		
	(1)	(2)	(3)
Negative binomial count model			
justified_to_cheat	0.119*	0.110*	0.109*
	[0.064]	[0.061]	[0.061]
obstacle_trade	0.003	0.005	0.005
	[0.032]	[0.032]	[0.032]
tax_administration_sat	0.005	0.006	0.006
	[0.053]	[0.052]	[0.052]
obstacle_tax_rates	-0.010	-0.010	–
	[0.045]	[0.045]	–
no_employees	0.033	–	–
	[0.047]	–	–
Zero inflated model			
justified_to_cheat	-0.805***	-0.760***	-0.764***
	[0.199]	[0.193]	[0.193]
obstacle_trade	-0.197**	-0.208**	-0.210**
	[0.099]	[0.098]	[0.098]
tax_administration_sat	0.289**	0.289**	0.288**
	[0.142]	[0.142]	[0.142]
obstacle_tax_rates	-0.063	-0.067	–
	[0.139]	[0.140]	–
no_employees	-0.186	–	–
	[0.184]	–	–
ll	-1413.83	-1414.76	-1414.91
N	454.00	454.00	454.00
N_zero	138.00	138.00	138.00

Notes: Zero-inflated negative binomial regression with robust standard errors; standard errors in parentheses; sector dummies included but not reported; variable description as in Appendix B; * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Source: own elaboration based on company survey study.

These results agree with previous evidence (Kaplan, Newberry, & Reckers, 1997; Kogler *et al.*, 2013; van Dijke & Verboon, 2010). Moreover, I see that the propensity of companies to underreport their income is higher if the managers perceive trade regulations as a very severe obstacle. If trade regulations are tighter, then the company has a greater incentive to underreport a part of their income. In this way, I confirm the assumption proposed by Enste (2010) and Schneider (2014). Going further, I find that the phenomenon of tax evasion is less prevalent in companies in which managers indicate a high level of satisfaction with the quality of tax administration. In this way, I support the hypothesis about the positive impact of institutional quality on tax compliance. Similar outcomes are presented in the study from Hanousek and Palda (2004) and Torgler and Schneider (2007). Interestingly, my results reveal that the decision to evade taxes does not depend on tax burden. There is no statistically significant impact of the perceived obstacle in the form of tax rates on

the probability to underreport income. Similarly, I find no relationship between the inclination to tax evasion and the size of the enterprise.

Secondly, based on the results from the negative binomial count model (the upper part of Table 2) I can assess which determinants impact the extent of underreporting of business income for those who already evade taxes. In other words, I can examine whether the same factors that determine the decision to evade or not are still significant if we consider only those enterprises which underreport a part of their income. In short, the indication is that only the tax morale of company managers may influence the extent of underreporting income. If the tax morale of company managers is lower, then, other things being equal, the degree of tax evasion is higher. Interestingly, another possible factor does not contribute to the scope of underreported income.

Sensitivity Analysis

To check the reliability of my results, I ran several additional regression as a robustness check. Table 3 present the results of the sensitivity analysis.

Table 3. Odds ratios of determinants of tax evasion

Dependent variable	The degree of underreporting business income (intervals)		
	(1)	(2)	(3)
justified_to_cheat	2.418***	2.418***	2.499***
	[0.508]	[0.606]	[0.535]
obstacle_trade	1.238*	1.238*	1.165
	[0.110]	[0.130]	[0.0987]
tax_administration_sat	0.761*	0.761*	0.744*
	[0.0978]	[0.1000]	[0.0946]
obstacle_tax_rates	1.030	1.030	1.032
	[0.122]	[0.173]	[0.123]
no_employees	1.317	1.317	1.192
	[0.225]	[0.247]	[0.191]
sector dummies	yes	yes	no
N	454	454	454
Wald chi^2	54.89	117.88	50.12
Prob>chi^2	0.00	0.00	0.00
Pseudo R^2	0.0679	0.0679	0.0598

Notes: ordered logistic regression; standard errors in parentheses; specifications (1) and (2) with robust standard errors, specification (3) with robust cluster errors clustered at province level (NUTS 2); sector dummies not reported; variables' categories as in Appendix B; *p ≤ 0.10, **p≤ 0.05, ***p ≤.01.
Source: own elaboration based on the company survey study.

I utilized an ordered logistic regression with robust standard errors, as my outcome variable was recoded into the intervals: 1 for no underreporting at all, 2 for underreporting between 1-10% of business income, 3 for 11-30%, 4 for 31-50%, 5 for 51-75%, 6 for 76-100%, accordingly. The results presented in Table 3 confirm my baseline findings: the propensity for greater tax evasion rises along with lower tax morale, lower satisfaction with tax administration, and greater obstacles related to trade regulations. Again, I find no support for the notion that greater involvement in tax evasion stems from a higher tax burden.

DISCUSSION

Based on the above presented results, I can verify the hypotheses presented in Section 2. Regarding hypothesis H1 related to the impact of tax morale on tax behaviour, I find that moral aspects play an important role both in the decision to evade taxes and on the extent of this evasion. Therefore, I can fully confirm hypothesis H1. This reading follows the literature, which holds that the moral attitudes of taxpayers determine their behaviour towards tax evasion (Torgler & Schneider, 2009). Furthermore, I test the assumption about the impact of trade regulations on the inclination to evade taxes. In this case, my results reveal that tight trade regulations may enhance the inclination to evade taxes, but these are not significant enough to explain the level of this evasion. Hence, trade regulations do not determine the extent of income underreporting. As I predominantly sought to test whether the tightness of regulation determines the probability of tax evasion, I can now fully confirm hypothesis H2. Therefore, I contribute to the existing evidence provided by Schneider (2014). Finally, I examine the relationship between perceived institutional quality and inclination to cheat on taxes. Again, I find that the satisfaction with tax administration may influence the inclination to tax evasion, not the extent of this phenomenon. Therefore, I can confirm hypothesis 3, which asserts that the overall satisfaction related to the quality of governance enhances tax compliance. This finding agrees with the previous evidence presented in the literature (Hanousek & Palda, 2004; Torgler & Schneider, 2007). Based on a similar survey conducted in Baltic states in 2014, Putniņš and Sauka's study (2015) finds several shadow economy determinants against this background, such as tolerance towards tax evasion, satisfaction with state revenue services, the government's tax policy, business legislation, and the government's support for entrepreneurs. My study contributes to these findings by providing evidence from Poland.

CONCLUSIONS

The literature agrees that the phenomenon of tax evasion is extremely important and requires further exploration, as it results in reduced revenues to state budgets, unfair competition, and a disrupted system of public funds redistribution. As the problem of hidden economy concerns all countries, the explanation of the reasons for tax evasion and shadow economy activities gains in importance. In this article, I consider the determinants of tax evasion, including tax morale, trade regulation, and related institutional quality. To do this, I employed a company-level survey conducted among Polish entrepreneurs. I used the perceived degree of underreporting of business income in industry firms as the indication of tax evasion measures. Among the explanatory variables, I included determinants that reflect our three hypotheses, which evaluate the relationship between tax evasion and tax morale presented by entrepreneurs, the tightness of trade regulations, and the overall satisfaction with tax administration. As a control variable, I added the perceived severity of tax burden and company size.

Our results show that the higher the subjective permission to avoid taxes (tax morale), the higher the underreporting inclination. Other factors that increase the probability to evade taxes include the tightness of perceived trade regulations and a low level

of satisfaction with the quality of tax administrations. With regards to the above-mentioned determinants, the influence on tax evasion is of the expected sign and confirms previous evidence from the literature. Furthermore, I report no significant impact of tax burden, often postulated in the literature. Interestingly, I exceed measures that seek to describe the probability of tax evasion and provide evidence on the factors that impact the extent of this phenomenon. In particular, I find that for those who already evade taxes, tax morale may affect the extent of the underreporting.

The main contribution of this article is twofold. Firstly, I provide empirical evidence on tax evasion determinants based on the company-level survey, which fills the existing gap on tax evasion and shadow economy studies, especially in Poland. My findings show a good consideration of the possible causes of tax evasion. Secondly, I address methodological issues raised by tax evasion determinants analysis by adopting the zero-inflated negative binomial model, which allows for the determination of factors that influence not only tax evasion inclination but also the extent of this evasion. This brings important contributions from both the scientific and political perspective.

Despite the significant contribution, this article shows several limitations. As the analysed phenomenon is of very sensitive nature, my results may be distorted because of untruthful answers. Moreover, in most of the questions asked in the survey, an indirect way of asking was applied. However, I based my approach on the method available in the literature, so some readers may understand tax evasion measure as a perceived extent of underreporting. Finally, in view of the relatively small sample of Polish enterprises, my research should be considered as preliminary. Moreover, I aim to initiate further research on tax evasion in Poland, in particular on its sources and possible relevant solutions. My findings can contribute to the debate on the tax evasion phenomenon in Poland and other European countries.

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Appendix A: Description of the sample

Table A1. The number of companies according to employment level

Employment level	No. of companies in the sample	Share in the total sample (%)	Enterprises by size class in Poland (2017)* (%)
0-9	438	96.48	96.5
10-49	15	3.3	2.59
50-249	1	0.22	0.74

*Based on Statistics Poland (2018) data; share in the total number of non-financial enterprises.
Source: own elaboration based on company survey study.

Table A2. The number of companies according to economic sector

Sector	No. of companies in the sample
Manufacturing	85
Wholesale	35
Retail	57
Services	228
Construction	49

Source: own elaboration based on the company survey.

Table A3. The number of companies per region

Region (voivodship)	No. of companies in the sample
Lower Silesia	38
Kujawy-Pomerania	31
Lublin	19
Lubuskie	13
Lodz	34
Malopolska	41
Mazovia	79
Opole	14
Podkarpacie	18
Podlasie	2
Pomerania	16
Silesia	50
Swietokrzyskie	12
Warmia-Masuria	15
Wielkopolska	47
West Pomerania	25

Source: own elaboration based on the company survey.

Appendix B: Questionnaire form (selected questions used on the model)

Question	Answers options	Variable name	Variable type/Linking with the hypothesis
Please estimate the degree of underreporting business income (in %) by firms in your industry in 2016.	Exact number	underreport_income_2016	Dependent variable
Companies in your industry would think it is always justified to cheat on tax if they have the chance.	1: strongly disagree, 2: disagree, 3: neither agree nor disagree, 4: agree 5: strongly agree	justified_to_cheat	H1 (tax morale)
As I list some factors that can affect the current operations of a business, please tell me if you think that each factor is No Obstacle, a Minor Obstacle, a Moderate Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment; factor in trade and customs regulation.	0: no obstacle; 1: minor, 2: moderate, 3: major, 4: very severe obstacle	obstacle_trade	H2 (regulations)
Please evaluate your satisfaction with the performance of the state revenue service with regards to tax administration.	1: very unsatisfied, 2: Unsatisfied, 3: Neither satisfied nor unsatisfied, 4: Satisfied, 5: very satisfied	tax_administration_sat	H3: (governance quality)
As I list some factors that can affect the current operations of a business, please tell me if you think that each factor is No Obstacle, a Minor Obstacle, a Moderate Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment; factor in tax rates.	0: no obstacle; 1: minor, 2: moderate, 3: major, 4: very severe obstacle	obstacle_tax_rates	Control variable
Approximately how many employees are currently employed in your company (full-time equivalent, including you)?	1: 1-5 employees; 2: 6-10 employees; 3: 11-20 employees; 4: 21-40 employees; 5: 41-60 employees; 6: 61-100 employees; 7: 101-150 employees	no_employees	Control variable
What is the main activity (i.e. sector) that your company is engaged in?	1: manufacturing; 2: wholesale, 3: retail, 4: services, 5: construction, 6: other	sector	Control variable

Source: own elaboration based on company survey study.

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Trade Policy and Export Diversification in Nigeria in the years 1970-2017: A Sectoral Analysis

Philip Ifeakachukwu Nwosa, Oluwadamilola Tosin Fasina

A B S T R A C T
Objective: This study examines the impact of trade policy on export diversification of economic sectors in Nigeria over the period of 1970 to 2017.
Research Design & Methods: The study utilises Autoregressive Distributed Lag (ARDL) technique and the Herfindal formula to compute the export diversification index.
Findings: The results of the study show that trade policy has a significant impact on export diversification of the oil sector, while the impact of trade policy on export diversification of the remaining sectors of the economy is insignificant.
Implications & Recommendations: The Nigerian export base is still highly skewed towards oil export at the expense of other sectors. Thus, with exception to the oil sector, trade policy has not enhanced export diversification of other sectors of the Nigerian economy. Thus, the study recommends that the government de-emphasises dependency on oil and discoveries of new oil wells, such as those discovered in the Southwest and Northern regions of Nigeria.
Contribution & Value Added: This study contributes to the literature by showing that trade policy has diverse influence on export diversification in various sectors of the economy. Hence, the use of trade policy recommendations from aggregate analysis should be discontinued while sector specific policies should be adopted.
Article type: research article
Keywords: trade liberalization; trade openness; export diversification; bound cointegration; Nigeria
JEL codes: F10, F13, O20, O24
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INTRODUCTION

Prior to the attainment of independence in 1960, the Nigerian economy was characterised by sectoral concentration of commodity export (dominated by agricultural export), while with the discovery of oil in exportable quantity, the country's export became dominated by oil which accounts for over 80% of total export from 1970 to 2017. Sectoral concentration on commodity export is associated with high sensitivity to sector-specific shocks, high terms of trade volatility, and high volatility of export revenue/foreign exchange earnings (Gylfason, 2001; Dawe, 1996; Bleaney & Greenaway, 2001). Particularly for countries like Nigeria – where natural resources account for a large share of exports – sectoral concentration of commodity exports resulted in many macroeconomic challenges such as economic instability, increased civil unrest and the Dutch disease that affects the competitiveness of the manufacturing sector due to the appreciation of domestic exchange rate (Corden & Neary, 1982; Corden, 1984; Mehlum, Moene, & Toruik, 2006; Ross, 2006).

In spite of the socio-economic challenges confronting sectoral concentration of export, the political emphasis on export diversification in Nigeria seems to fluctuate inversely with the trend in international commodity prices. For instance, periods of decline or collapse in international oil prices - such as the decline of oil price from 39.5 US dollars per barrel (dpb) in early 1980 to 11.57 US dpb in mid-1986 - witnessed strong agitation for export diversification that lead to the implementation of various trade policies like as trade liberalization, trade openness, exchange rate deregulation; among others, under the Structural Adjustment Program (SAP) of 1986. The rebound of crude oil in the late 1980s brought about the demise of agitations for the diversification of the Nigerian export base. Similarly, the recent intense resurgence of the need to diversify the economy is a fall-out of the decline in oil price from 105.79 US dpb in mid-2014 to 30.32 US dpb in early 2016. The decline in crude oil prices was accompanied by numerous economic challenges such as lower foreign exchange reserve, exchange rate depreciation, and a rising budget deficit.

The decline in crude oil prices was accompanied by numerous economic challenges such as lower foreign exchange reserve, exchange rate depreciation, and a rising budget deficit.

This inconsistency in the drive for export diversification shows the lack of political will and determination in the Nigerian government to diversify the economy, which resulted in the continuous lopsidedness in the export base or export structure of the Nigerian economy. Undoubtedly, the lack of economic diversification contributed immensely to the 2016-2017 economic recession, which was attributed mainly to the decline in international crude oil price. The recession was accompanied by rising unemployment and poverty rates that calumniated in the declined standard of living of the citizenry. Successive government established several trade policies and entered into various bilateral, multilateral, and regional trade agreements, such as – Trade and Investment Framework Agreement (TIFA) between the USA and Nigeria, Bilateral Investment Treaties (BITs) with many countries of the world, Economic Community of West African States (ECOWAS) trade liberalization scheme (ETLS), and common external tariff (CET) with ECOWAS among others. Moreover, the Nigerian economy is a member of, among other organisation, the World Trade Organization (WTO), Global System of Trade Preference developing countries (GSTP), and African Growth and Opportunity Act (AGOA). The above policies and trade agreements were

to increase trade transactions between Nigeria and its global trading partners, de-emphasise Nigerian dependence on oil with its perennial challenges, and expand Nigerian export base/structure through export diversification. These trade policies and agreements seem not to have yielded satisfactory outcomes as the country's export is still largely dominated by oil export as shown in Figure 1.
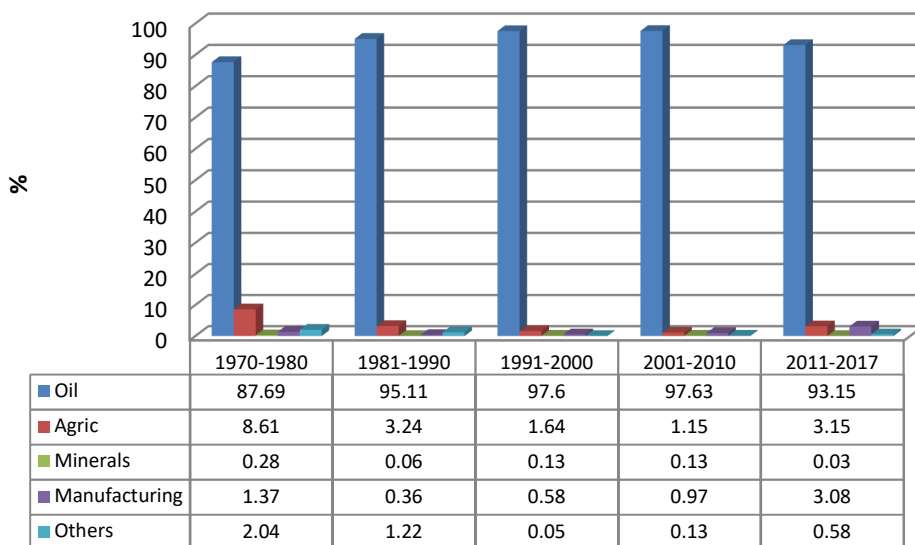
	1970-1980	1981-1990	1991-2000	2001-2010	2011-2017
■ Oil	87.69	95.11	97.6	97.63	93.15
■ Agric	8.61	3.24	1.64	1.15	3.15
■ Minerals	0.28	0.06	0.13	0.13	0.03
■ Manufacturing	1.37	0.36	0.58	0.97	3.08
■ Others	2.04	1.22	0.05	0.13	0.58

**Figure 1. The percentage of the average share of sectoral export
to total export in Nigeria in the years 1970-2017**
Source: own computation. Data from Central Bank of Nigeria (CBN)
Statistical Bulletin, 2018 Edition.

Figure 1 shows that despite the huge employment and other economic potentials of the agricultural and the manufacturing sectors, their share of export was less than 10% and 4% respectively. Moreover, despite the huge mineral endowments possessed by the economy, the share of total export by the mineral sector is less than 1% over the last four decades. The inconsequential export share of these sectors – agriculture, minerals, manufacturing, and others suggests that the Nigerian economy is far from attaining the export diversification objective and addressing the many economic challenges it is facing.

While acknowledging the facts that export diversification is not new in Nigerian trade policy profile, the absence of any meaningful increase in the export share of various non-oil sectors to total export calls for the need to examine the extent to which trade policy influenced export diversification in various sectors of the economy. The need for export diversification arises because oil resources are finite, and experience shows that both the price of and demand for oil fluctuated disproportionately with severe consequences on the macro-economy over the past years. This study is important because: (1) an increase in export diversification can increase productivity, given that exporters are more productive than non-exporters (Melitz, 2003) and (2) export diversification can reduce exposure to external shocks, reduce macroeconomic volatility, and increase economic growth

(Agosin, Alvarez, & Bravo-Ortega, 2012). Moreover, (3) given that natural resources are not evenly distributed across the economy, export diversification would enable the government to focus on other sectors/regions of the Nigerian economy which would reduce communal unrest. In this regard, Lederman and Malony (2003) note that the negative effect of natural resources abundance disappears once the country controls for export concentration on a single commodity. Finally, the expected growth in productivity resulting from export diversification would greatly contribute in reducing the rising poverty, reducing the escalating rate of unemployment, cushion the excessive volatility of foreign exchange rate through the supply of foreign exchange of diversified sectors, increase the foreign revenue base of the government, and set the country on the path of even and sustained growth across all sectors of the Nigerian economy.

Although articles abound on the issue of export diversification in Nigeria, most are newspaper texts that lack empirical analysis which limits their policy inferences. Moreover, the few local empirical works on this issue (see Olaleye, Edun, & Taiwo, 2013; Odularu, 2009) focus on the link between export diversification and economic growth in Nigeria, while Nwosa and Ajibola (2018) focus on the link between monetary policy and export diversification in Nigeria. The paucity of in-depth empirical understanding of the link between trade policy and export diversification from sectoral perspective makes the study not only original but also novel and worthy of investigation. Furthermore, this article contributes to the literature by showing the extent to which trade policy influenced export diversification in various sectors of the economy. The outcome of this study will show if trade policy recommendations from an aggregate study should be discontinued, while sector specific policies should be adopted to influence the export diversification of sectors. Thus, the objective of this study is to examine the relationship between trade policy and sectoral export diversification in Nigeria. In achieving this objective, the study used the Herfindal formula to compute the export diversification index and the Auto-Regressive Distributed Lag (ARDL) technique to analyse the data. In addition to the introduction, section two covers the literature review, while section three discusses the materials and methods used in the study. Section four discusses the results of the study, while section five presents the conclusion.

LITERATURE REVIEW

Prior to World War II, international trade theorists (Smith, 1776; Ricardo, 1817; Samuelson, 1971; Jones, 1971; Heckscher-Ohlin, 1991) stressed the importance of comparative advantage and encouraged specialisation in the production and exportation of commodities in which countries – particularly developing ones – possess such a comparative advantage. However, after the World War II, Prebisch (1950) and Singer (1950) noted that the specialisation on primary commodities make developing countries export-dependent on raw materials and agricultural products, and import-dependent on consumer and manufacturing products from the developed countries, hence the need for export diversification. Moreover, the Rybczynski (1955) theorem postulates that increases in the supply of a factor of production – while other factors remained – fixed causes the output of a good to increase by intensively using the accumulating factor and the output of other goods to decrease in absolute amount, provided that the goods and factor prices remain unchanged.

From a conceptual perspective, Ofa, Spence, Mevel, and Karingi (2012) and Krugman (1980) view export diversification as an increase in export which results from exporting new products and the discovery of new export markets – known as extensive export margin – or the exportation of older or more current products, known as intensive export margin (Armington, 1969). In this context, Amurgo-Pacheco and Pierola (2008) emphasise the geographic dimension of export diversification through the extensive export margin. According to Amurgo-Pacheco and Pierola (2008), export diversification involves the export of new products to existing markets, old products to new markets, and new products to new markets. However, Hummels and Klenow (2005) note that neither the intensive margin hypothesis nor extensive margin hypothesis fully explains the patterns of international trade in developing countries nor does it provide an empirical framework for dividing export diversification into intensive and extensive margins. Hummels and Klenow (2005) emphasise that improved economic development increases consumer preference for varieties of consumables, thereby providing an incentive for export diversification in the extensive margin. Furthermore, Hummels and Klenow (2005) show that countries export a higher volume of goods (intensive margin), a higher variety of goods (extensive margin), or a higher quality goods (Ofa *et al.*, 2012).

Apart from the above, Dogruel and Tekce (2011) note that export diversification can occur horizontally or vertically. Horizontal export diversification is simply an increase in the number of exported products that happens in the same sector. Samen (2010) and Herzer and Nowak-Lehnmann (2006) note that the addition of new products to existing export baskets in the same sector helps to mitigate adverse economic risks. On the other hand, a shift in a country's exports from primary products to secondary or tertiary sectors describes vertical export diversification.

Giri, Quayyum, and Yin (2019) analyse the determinants of export diversification across countries with respect to empirical literature. Their study employs Bayesian Model Averaging (BMA) to observe that human capital accumulation and reduction in trade barriers are key factors influencing export diversification. Moreover, the study observes that the improvement in institutional quality and financial sector development are important determinants of export diversification. Osakwe, Santos-Paulino, and Dogan (2018) examine the relationship among trade dependence, trade liberalization and export diversification in 144 developing countries in 1970-2010. Their study employs both parametric and non-parametric tests. The non-parametric estimates show that developing countries more open to international trade tend to have more diversified export structure compared to countries less open to international trade. With respect to Sub-Saharan Africa (SSA) countries, the study observes that countries more open to trade have less diversified export structures. Parametric estimates provide further support that trade liberalisation contributes to export diversification in developing countries. Nwosa and Ajibola (2018) examine the extent to which monetary policy influenced export diversification in Nigeria in 1962-2014. By employing the ordinary least squares techniques, their regression estimate shows that monetary policy had insignificant influence on export diversification in Nigeria.

Liu and Zhang (2015) examine the effect of diversification of export product on the choice of exchange-rate regimes in 1974-2010. The study covers 72 developing countries and employs the pooled regression estimation technique. The result of the study shows that diversification of export products had a positive but insignificant effect on the choice

of fixed exchange-rate regimes. Furthermore, the study reveals that when the diversification of export product is decomposed into extensive and intensive margins, the higher level of export product diversification at the extensive margin has a positive and significant effect on exchange-rate regime choices, while the intensive margin has a negative but insignificant impact on the choice of exchange rate regime. Shabana and Zafar (2016) examine the determinants of export diversification for a group of selected ASEAN (Association of South East Asian Nations) and SAARC (South Asian Association for regional Cooperation) member countries in 1986-2012. The study focuses on country factors such as financial sector development, competitiveness, institutional framework, domestic investment, and foreign direct investment. The study employs panel fully modified ordinary least squares co-integration technique and its result shows that the financial sector development, competitiveness, institutional framework, domestic investment, and foreign direct investment are significant determinants of export diversification for the ASEAN and SAARC regions. The study recommends the need for more export diversification policies particularly in their area of specialization, which is vital for economic development. The study also stresses the need for the regions to improve their international competitiveness while upgrading the environment to attract both domestic and foreign investment.

Hvidt (2013) examines past records and future trends of economic diversification in six Gulf Cooperation Council (GCC) countries. By employing a comparative approach, the study observes that past efforts on diversification yielded modest results. Using content analysis in evaluating future diversification trends based on current economic developmental plans, the study observes that the current development plans of the GCC countries generally indicate economic diversification as a means to securing the stability and sustainability of income levels in the future. Olaleye *et al.* (2013) examine the causal nexus between export diversification and economic growth in Nigeria in 1970-2012. The study proxies export diversification by the export shares of oil, manufacturing and agricultural sectors in total exports, while economic growth by per capita income. The result of the causality estimate indicates a uni directional causation from economic growth to agriculture and oil exports with no causality between economic growth and manufacturing export.

Dogruel and Tekce (2011) examine the relationship between trade liberalization and export diversification in selected MENA (Middle East North Africa) countries in 1992-2008. The study covers eight MENA countries (Algeria, Egypt, Jordan, Kuwait, Morocco, Oman, Saudi Arabia and Tunisia) and utilizes the panel data regression estimate. The result of the study shows a dual effect of trade liberalisation on export diversification amongst the sampled countries. On the one hand, multilateral liberalisation in the World Trade Organization (WTO) and the wide-based regional trade agreement GAFTA (Grain and Feed Trade Association) enhanced the effort of these countries towards export diversification, while Association Agreements with the EU (European Union) and the membership to the GCC (Gulf Cooperation Council) lead to the specialisation on the exportation of certain products rather than export diversification. Martincus and Gomez (2009) examine the relationship between trade policy and export diversification in Colombia. The study examines what Colombia stands to gain from Free Trade Agreement (FTA) with the United States of America. By adopting the dynamic random effects Poisson estimation technique, the study observes that reduction in tariffs aid exports diversification from Colombia USA. However, the study stresses that the increase in exports resulting from the reduction in tariffs can

only be sustained and improved in the long run with the provision of physical infrastructure, improvement in institutional infrastructure linked to trade facilitation, enhanced logistic conditions, and improvement in human capital endowments.

Odularu (2009) examines export diversification as a promotion strategy for intra-ECOWAS trade expansion. The results of the study show that the potential of ECOWAS in exploiting economies of scale and enhancing competition is limited by low export diversification, poor infrastructure, and high trading costs among its members. The study stresses the need for a more favourable environment in the ECOWAS region for overall trade and the need for members to demonstrate a strong commitment to a programme of broad-based trade reform to reverse the sub-region's marginalisation in world trade and investment. The study also calls upon International organisations such as the World Trade Organisation (WTO) and the International Monetary Fund (IMF) to assist ECOWAS members in the implementation of development-oriented trade policies, the strengthening of their surveillance, and technical assistance in managing shocks that arise from trade liberalisation and regional integration.

Osakwe (2007) examines the impact of foreign aid and resources on export diversification in Africa. The study utilizes unbalanced panel data for 31 African countries in 1985-2002. The System GMM (Generalized Method of Moments) technique was employed and the results of the study show that foreign aid, resource endowments, and the quality of infrastructure are significant determinants of export diversification in Africa. The study also observes that institutional factors are important, although they are not robust in influencing export diversification in Africa. Finally, the study observes that the geographical location of a country was insignificant in determining export diversification in Africa. Consequently, the study recommends that investment in infrastructure development is important in the region in order to reduce transaction costs and make the region more competitive in the global markets of manufactured goods. Sorsa (1999) examines the relationship among real exchange rate, export diversification, and trade protection in Algeria. Employing an Ordinary Least Square (OLS) technique, the study shows that a decrease in trade protection results in real exchange rate depreciation, which is expected to increase the competitiveness and incentives to invest in the non-oil sector of the economy.

The reviewed literatures clearly show evidences that there exists a dearth of knowledge on the relationship between trade policy and export diversification in Nigeria. Moreover, none of the above positions in the literature examines the link between trade policy and export diversification from a sectoral perspective, thereby justifying the need for this study. Consequently, this study adds to existing literature by examining the relationship between trade policy and export diversification in Nigeria in 1970-2017.

MATERIAL AND METHODS

Measurement of Variables

There are different measures of export diversifications, such as the normalized-Hirschmann index, the Herfindahl index, and the overall difference index (Shabana & Zafar, 2016; Pertersson, 2005; Pineres & Ferrantino, 1997).

The Normalized-Hirschmann Index

The normalized-Hirschmann index is with the below formula:

$$H_{jt} = \frac{\sqrt{\sum_{i=1}^{n} \left(\frac{x_{it}}{X_{jt}}\right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}} \tag{1}$$

where:

x_{it} - is the value of exports of industry "i" located in country "*j*";

X_{jt} **-** is the total exports of country "j" in a given period t.

The number of industries is shows by *n*. The index H_{jt} indicates values $0 \leq H_{jt} \leq 1$. The index value of one denotes low or no presence of export diversification while the index value close to zero denotes high value of export diversification (Shabana & Zafar, 2016; Ofa *et al.*, 2012; Al-Marhubi, 2000).

The Herfindahl Index

The Herfindahl index is calculated as follows:

$$Z_{jt} = \sum \left(\frac{E_{jit}}{\sum E_{jit}}\right)^2 \tag{2}$$

In which E_{jit} is the exports of the country in the "*i*" product (sector) in the given period t, while $\sum E_{jit}$ is the total export of the country in the period t. Moreover, the index Z_{jt} indicates values $0 \leq Z_{jt} \leq 1$. The index value of one indicates full degree of export concentration (or specialisation), while the index value of zero indicates a high level of export diversification (Petersson, 2005).

The Overall Difference Index

The overall difference index measures export diversification as the total deviation of the country's share of the world's overall exports. It is calculated as follows (Al-Marhubi, 2000):

$$S_{jt} = \frac{\sum |h_{ijt}| - |h_{it}|}{2} \tag{3}$$

where:

h_{ijt} - is the share of industry "*i*" in total exports of country;

h_{it} - is the share of industry in world exports in a given period.

Moreover, the index S_{jt} indicates values $0 \leq S_{jt} \leq 1$. The index value of one indicates complete concentration and the index value of zero complete diversification (Shabana & Zafar, 2016; Al-Marhubi, 2000).

From the above measures, this study employs the Herfindal index to calculate export diversification in Nigeria. The Herfindal index is useful when export diversification is apparent by the changes in export composition within sectors. Moreover, it includes both the intensive and extensive edge of diversification (Shabana & Zafar, 2016; Matthee & Naude, 2007; Bebczuk & Berrettoni, 2006).

With respect to other variables, trade policy is measured by trade liberalisation and trade openness. Trade liberalisation is proxied with a dummy variable. Zero (0) represent the period of no trade liberalisation (1970-1985), while one (1) indicates the period of trade liberalisation (1986-2017). Trade openness is measured by import plus export as a ratio of real gross domestic product. Trade liberalisation and trade openness are expected to promote export diversification through an increase in export opportunities of these sectors (Agosin *et al.*, 2012; Melitz, 2003). Financial development is measured by the ratio of credit to the private sector to real gross domestic product. The expected impact of financial development on export diversification is ambiguous. On the one hand, financial development reduces liquidity constraints by enhancing the level of investment by exporters who can facilitate export diversification (Manova, 2008; Chaney, 2007). On the other hand, financial development may retard export diversification because investors do not want to take risk on untried ventures, and they may decide to concentrate their financial resources on existing activities in the economy that has a comparative advantage. Foreign direct investment is expected to increase export diversification if concentrated on the non-oil sector of the economy. Government expenditure is expected to increase export diversification through infrastructural development that would enhance investment level, while exchange rate volatility may inhibit export diversification as it discourages investment.

Sources of Data

Data on sectors' export in oil, agriculture, minerals, manufacturing and others based on Central Bank of Nigeria's (CBN) classification, trade openness (*opnx*), financial development (*fd*), foreign direct investment (*fdi*), government expenditure (*gov*), and exchange rate were also sourced from the CBN's Statistical bulletin, 2018 edition. Exchange rate volatility was computed using E-GARCH volatility model. The E-GARCH model was judged by studies as superior to other models of volatility (see Berument, Metin-Ozcan, & Neyapti, 2001; Kontonikas, 2004) due to its ability to capture asymmetric effects and the non-imposition of non-negative constrain on parameters (Jamil, Streissler, & Kunst, 2012). The study covered the period from 1970 to 2017.

Model Specification

To examine the relationship between trade policy and export diversification in Nigeria, this study utilized a modified model by Agosin *et al*. (2012) on the determinants of export diversification:

$$\text{DIV} = f(\text{TP,FD,FDI,GOV,EXV}) \tag{4}$$

where:

DIV - is export diversification;

TP - is trade policy proxy by trade liberalisation (*TLIB*) policy and trade openness (*OPNX*);

FD - is financial development;

FDI - is foreign direct investment;

GOV - is government expenditure;

EXV - is exchange rate volatility.

The econometric form of equation (1) is as follows:

$$\text{div}_t = \beta_0 + \beta_1 \text{tlib}_t + \beta_2 \text{opnx}_t + \beta_3 \text{fd}_t + \beta_4 \text{fdi}_t + \beta_5 \text{gov} + \beta_6 \text{exv}_t + \mu \tag{5}$$

Equation (2) can be express in a dynamic form as:

$$\text{div}_t = \delta_0 + \sum_{i=0}^{p} \delta_1 \text{div}_{t-i} + \sum_{i=0}^{q} \delta_2 \text{tlib}_{t-i} + \sum_{i=0}^{q} \delta \text{opnx}_{t-i} + \sum_{i=0}^{q} \delta_4 \text{fd}_{t-i} + \\ + \sum_{i=0}^{q} \delta_5 \text{fdi}_{t-i} + \sum_{i=0}^{q} \delta_6 \Delta\text{gov}_{t-i} + \sum_{i=0}^{q} \delta_7 \Delta\text{exv}_{t-i} + \psi\text{ecm}_{t-1} + \varepsilon_t \qquad (6)$$

From equation (3) δ_1, δ_2, δ_3, δ_4, δ_5, δ_6, and δ_7 are the coefficients of the model, while ψ is the speed of adjustment.

Research Hypothesis

H1: Trade policy has a positive and significant impact on export diversification across sectors in Nigeria.

RESULTS AND DISCUSSION

This study begins data analysis by examining the stationarity properties of variables by using the Augmented Dickey Fuller (ADF) test. The results of the stationarity tests presented in Table 1 show that the Herfindal export diversification index for agriculture, mining, oil, and other sectors were integrated of order zero; that is, the variables were I(0) series. Meanwhile, the Herfindal export diversification index for manufacturing and the remaining variables (tlib, opnx, lfdi, fd, lgov, and extv) were integrated of order one; that is, the variables were I(1) series.

Table 1. Unit root test

Augmented Dickey-Fuller (ADF) Test			
Variables	**Level**	**After Differencing**	**Status**
Agric	-21.5296*	-	I(0)
Man	-0.5900	-3.4969*	I(1)
Min	-148.0950*	-	I(0)
Oil	-4.4075*	-	I(0)
others	-3.5950*	-	I(0)
Tlib	-1.3592	-6.6333*	I(1)
Opnx	-2.0558	-8.2254*	I(1)
Lfdi	-0.7129	-9.2879*	I(1)
Fd	-2.4706	-6.2995*	I(1)
Lgov	-1.5842	-7.4851*	I(1)
Extv	-2.3244	-21.0351*	I(1)

Source: own computation with E-views 9. Note: *=1% critical value.

Following the mix in the result of the unit root tests presented in Table 1 above, this study conduct the co-integration test with the Auto-Regressive Distributed Lag Bound Co-Integration test. Pesaran, Shin, and Smith (2001) provide two asymptotic critical values (lower and upper) bounds for testing the existence of co-integration when the regressors are purely I(0) or I(1). A lower value assumes the regressors are purely I(0), while an upper value assumes the regressors are purely I(1). If the F-statistic falls outside the critical values, then a conclusive statement can be made regarding the nature of co-integration among the variables in the ARDL model, without a priori information on the order of integration of independent variables. For instance, if the F-statistic is higher than the upper

critical value, then the null hypothesis of no co-integration is rejected, suggesting the existence of co-integration among the variables. Conversely, if the F-statistic is lower than the lower critical value, then the null hypothesis of no co-integration cannot be rejected, suggesting the absence of co-integration among the variables. However, if the F-statistic falls between the upper and lower critical values, then the result is inconclusive.

In the co-integration result presented in Table 2 the values of the F-statistics for all the models were greater than the upper bound critical values at both 1% and 5%, which suggest the existence of co-integration among the variables in models.

Table 2. The ARDL bound co-integration test

Estimated Model	F-Statistics	
Agricultural Sector	12.6985	
Manufacturing Sector	7.9145	
Mining Sector	13.4239	
Oil Sector	15.5124	
Others	7.5869	
Critical Values	**Lower Bound**	**Upper Bound**
1%	3.15	4.43
5%	2.45	3.61

Source: own study.

The regression estimates from the auto-regression distributed lag technique for the six sectors is presented in Table 3 above. The models focused on the extent to which trade policy influenced export diversification in each sector of the Nigerian economy. From the estimate, we observed that trade policy proxied by trade liberalisation has a negative but significant influence on the agricultural export, while both measures of trade policy - trade liberalisation and trade openness – have a positive and significant influence on the oil export. The negative effect of trade liberalisation on export diversification of the agricultural export implies that the various trade liberalisation policies initiated and implemented by the government did not favour diversification of the sector. However, the positive and significant influence of trade liberalisation on export diversification of the oil sector clearly shows the increase in oil export as reflected by the percentage share of oil export in total export (see Figure 1 above). Moreover, the estimate shows that trade policy proxied by trade openness has a positive and significant influence on the mining sector, but the magnitude of this impact is zero, which implies that trade policy did not meaningfully enhance export diversification in the mining sector. Finally, trade policy has an insignificant effect on export diversification index of other sectors. The implication of the above results is that trade policy differently affects export diversification of sectors, which indicates that trade policy directed at export diversification should be sector specific rather than a one for all or identical policy for all sectors.

The error correction term (ecm-term) from the short run ARDL estimate is expected to be negatively signed and statistically significant. A highly significant ecm-term proves the existence of a stable long-run relationship (Banerjee & Newman, 1993). From the estimate, the coefficients of the error correction terms in the estimated models were correctly signed and statistically significant. The coefficient estimates of the error cor-

rection terms of -0.834 (agric), -0.247 (man), -1.832 (min), -0.374 (oil), and -1.302 (others) imply that the models correct their short-run disequilibrium by 0.834%, 0.247%, 1.832%, 0.374%, and 1.302% speed of adjustment, respectively, in order to return to the long-run equilibrium. Furthermore, the negative sign of the error correction term indicates a backward movement towards equilibrium.

Table 3. The regression estimate

Independent Variable	Estimated Models				
	Agric	**Man**	**Min**	**Oil**	**Others**
tlib	-0.0046 (-2.323)**	-0.0001 (-0.520)	0.0000 (0.568)	0.3721 (2.898)**	-0.0003 (-2.064)
opnx	-0.0001 (-1.889)	0.0001 (1.584)	0.0000 (4.068)*	0.011 (2.680)**	-0.0000 (-0.402)
lfdi	0.0033 (2.530)**	-0.0000 (-0.058)	-0.0000 (-1.132)	-0.024 (-0.586)	-0.0001 (-0.966)
fd	-0.0000 (-0.211)	0.0000 (1.201)	0.0000 (1.713)	-0.017 (-2.090)	-0.0000 (-0.468)
lgov	-0.0035 (-2.346)**	0.0000 (0.116)	0.0000 (0.091)	-0.0530 (-0.899)	0.0001 (1.299)
extv	-0.0000 (-3.083)**	0.0000 (0.283)	0.0000 (10.229)*	-0.0000 (-0.164)	-0.0000 (-1.720)
ecm-term	-0.8340 (-5.456)*	-0.2466 (-3.009)*	-1.8315 (-9.506)*	-0.3743 (-3.481)*	-1.3015 (-5.788)*

Source: own study.

The above allows us to deduce that trade policy proxied by trade liberalisation and trade openness did not influence export diversification in the various sectors of the Nigerian economy. Moreover, it is evident from the regression estimate that Nigerian export is still greatly dominated by oil export. We may also attribute the insignificant impact of trade policy to the lack of political will in the government to diversify the economy, given the dominance of the oil sector. Moreover, the results of the study indicate the absence of vital infrastructural facilities, such as good roads, a stable power supply, stable political and economic atmosphere, and policy consistency, which are essential in enhancing productive activities in the non-oil sector of the economy.

CONCLUSIONS

This study examined the impact of trade policy on export diversification of the various sectors of the Nigerian economy in 1970-2017. The study utilised the Herfindal formula to compute the export diversification index while the results from the auto-regressive distributed lag estimate showed that trade policy had a significant impact on the oil sector, while trade policy had an insignificant impact on other sectors of the Nigerian economy. The implication of this is that Nigerian export is still highly centred on oil export, while the influence of trade policy on the diversification of other export sectors remains insignificant. Hence, this study offers the following recommendations: (1) There is a need for the government to make the already established free trade zone more operational, such as

the Calabar and Lagos free trade zones. This could be done by providing the necessary business enhancing facilities, such as a stable power supply, good roads, and the adequate security of lives and properties. All the above will boost the activities of the manufacturing, wholesale and retail trade, and service sectors. (2) There is a need for the government to de-emphasise the dependency on oil and discoveries of new oil wells, such as those discovered in the South-western and Northern regions of Nigeria. The continuous emphasis on oil will incessantly lessen the government's drive to achieve export diversification of other sectors of the economy. Moreover, (3) there is a need for the government to vigorously support the growth of Small and Medium Enterprise (SMEs) in the non-oil sectors through its agencies, such as the Bank of Industry (BOI) and the Nigerian Export-Import Bank (NEXIM). The growth of SMEs in these sectors along with the granting of export subsidies will further enhance the diversification of export in non-oil sectors.

The research was limited by the non-availability of such data as tariffs on imported goods across sectors or the volume of trade between Nigerian and her trading patterns in each sector. This limitation constrained information on the influence of trade policy on export diversification across sectors.

This study suggests that future research should scrutinise the relationship between trade policy and export diversification by using panel or cross-sectional data. Moreover, future studies should consider the impact of other macroeconomic policies, such as monetary, exchange rate, and fiscal policies on export diversification in Nigeria or across Sub-Saharan African (SSA) countries.

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The contribution share of authors is equal and amounted to 50% each of them.

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The Behaviours of the Ukrainian Lending Rate, Deposit Rate, and Intermediation Premium

Chu V. Nguyen, Oksana Honcharenko

A B S T R A C T

Objective: The objective of this article is to investigate the behaviours of the Ukrainian lending rate, deposit rate, and intermediation premium from January 2000 to January 2019, or the post-1999 era.

Research Design & Methods: The Perron's (1997) endogenous unit root test, the Threshold Autoregressive model, and the Threshold Autoregressive Vector Error-Correction model are utilized to investigate the short-run dynamic and the long-run relationship between the commercial banks' lending and deposit rates to evaluate the intermediating function of the Ukrainian lending institution.

Findings: The intermediation premium followed a stationary trend process with a structural break in July 2004. The Ukrainian banks react symmetrically to expansionary monetary policy and contractionary policy or economic shocks that pushed the intermediation premium out of its long-run path. Finally, the Granger-causality from the Ukrainian commercial banks' lending to the deposit rates is unidirectional, indicating the exogeneity of their lending rate from their deposit rate. This exogeneity hinders monetary policy, investment, and economic growth and, hence, social progress.

Implications & Recommendations: The policy-makers should introduce programs to remove exogeneity from the banking sector. Policy prority should focus on rectifying pervasive corruption, which is one of the major causes for the operation of the shadow banking industry leading to the exogeneity in the economy.

Contribution & Value Added: As far as it may be ascertained, there is no similar study; therefore, the methodology and findings of this investigation will close this gap in the literature and significantly contribute to the knowledge and literature.

Article type:	research article
Keywords:	commercial banks; lending rate; deposit rate; intermediation premium; exogeneity; Granger causality; Ukraine
JEL codes:	E40, E43, E52, E60

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INTRODUCTION

Historically, theorists such as Schumpeter (1912), Patrick (1966), and McKinnon (1973) articulated that financial intermediation is a critical facilitator for investment and economic growth. By determining the spread between the lending rate and the cost of funds or the intermediation premium, commercial banks play a crucial role in the intermediation process. As argued by Nguyen (2015, p. 2), "In addition to creating interest income to financial intermediaries, the intermediation premium affects the economy's savings, investment and consumption levels and hence the effectiveness of the Central Banks' counter-cyclical monetary policies. Naturally, changes in consumption or investment would change employment, inflation and gross domestic product, which may affect economic development, and social progress."

It is not simple and automatic to channel funds from economic units with surpluses to economic units in need of funds to finance their profitable investment opportunities, even in advanced market economies that operate in transparent environment. This intermediation process depends on such factors as culture, financial and banking regulations, monetary policy, domestic and international political and economic conditions.

Ukraine was the second largest economy in the former USSR, producing four times the GDP of the distant third largest economy of Kazakhstan (CIA's World Factbook, 2019). The Ukrainian economy provided significant quantities of agricultural products such as meat, milk, grain, and vegetables, as opposed to manufactured goods. Ukrainian manufacturing segments consisted of heavy industrial equipment, such as large diameter pipes and vertical drilling apparatuses, while raw materials were supplied to industrial and mining sites of other republics in the former USSR. Unfortunately, since its independence on 24th of August, 1991, Ukraine has experienced severe political and economic turmoil. Currently, the Ukraine's oligarch-dominated economy is supported by significant inflows of remittances.

Based on the country's perceived corruption index score, the Heritage Foundation (2019) placed Ukraine 126th/182th in the 2019 country ranking. The Heritage Foundation further reports that the enforcement of contracts in Ukraine is time-consuming and costly. Furthermore, the judiciary is susceptible to political pressure, corruption, and bribery in most sectors of the economy. Consequently, public confidence in the legal system has waned. In this regard, Neutze and Karatnycky (2017, p. 11) articulate that "We concluded that only significant reduction in the levels of corruption will enable Ukraine to provide the sort of investment climate that would generate large and consistent flows of foreign capital, and prepare the country for its stated ambition of drawing closer to the European Union."

The Ukrainian economy in general, and the banking sector in particular, inherited problems from the collapse of the USSR. Therefore, market economic concepts – such as "competition", "cost", "credit", "deposit", "Investment", and "intermediaries" – were not utilized or given much attention.

Given the aforementioned political and economic turmoil, and the importance of the intermediating function of commercial banks, the objective of this article is to evaluate the behaviours of the Ukrainian lending rate, deposit rate, and intermediation premium from January 2000 to January 2019.

Methodologically, first part of our analysis searches for endogenous variables that account for the possible structural break in the long time series data, so as to avoid the possible misspecification of statistical models. Based on these results, we specify and estimate a Threshold Autoregressive (TAR) model and a Threshold Autoregressive Vector Error-Correction (TAR-VEC) model to scientifically and quantitatively investigate the behaviours of the Ukrainian lending rate, deposit rate, and intermediation premium. As far as we know, there is no such study. Therefore, the methodology and the findings of this investigation will close this gap in research and significantly contributes to the literature.

The following section provides a short review of literature and a brief characterization of the Ukrainian economy and the banking sector. Then comes a description of methodological issues and the specification of the model for investigation. The next section discusses the empirical results. The article ends with concluding remarks.

LITERATURE REVIEW

Previous Studies

From the economic theory perspective, Nguyen (2015, p. 2) argues that market forces are fairly predictable when it comes to how they react to very high and low spreads. In most cases, the market will adjust back to equilibrium spread behaviour in response to either very high or very low spreads. The three major hypotheses commonly used to explain the market equilibrium behaviour are bank concentration, the consumer characteristics, and the consumer reaction. According to several researchers, banks in concentrated or oligopoly markets are quick to raise lending rates when the central bank increases its discounts rates, and then slowly reduce the rates charge to borrowers in response to the drops in the central banks' discount rates (Hannan & Berger, 1991; Neumark & Sharpe, 1992). The consumer characteristics hypothesis views consumers as unsophisticated borrowers so lending institutions adjust rates to widen the spread and increase their profitability since borrower seem less sensitive to rate changes because of possible higher search and switching costs (Calem & Mester, 1995; Hutchison, 1995; Rosen, 2002).

The consumer reaction hypothesis which is proposed by Payne and Water (2008, p. 1357) states that the customer reaction hypothesis suggests that banks are more sensitive to customers reactions if they operate in highly competitive environments, and fear strong negative reactions from customers to lending rate increases. This hypothesis supports the asymmetric adjustment of interest rates in a severe upward manner, which may create an adverse selection problem where higher interest rates attract riskier borrowers into the lending market (Stiglitz & Weiss, 1981). Banks tend to respond cautiously in these situations by not quickly increasing lending rates, but may opt to ration credit in an attempt to minimize the default rates of riskier borrowers.

The foundation for hypothesizing the asymmetric adjustment process between the banks' lending rate and the cost of funds that lending institutions pay their depositors may be attributable to the seemingly opposite effect of the lending market and the counter-cyclical monetary policy over different phases of business cycles. More specifically, during the expansionary phases of business cycles, the stimulus of the counter-cyclical monetary policy would increase the money supply, leading to the lowering of banks' cost of funds,

while the information from that state of the economy would precipitate the lending institutions to resist adjusting their spread between the lending rate and their cost of funds downward. This is based on the expected increase in the risky profiles of loan applicants. Consequently, the basis would increase or widen. By the same logic, we may argue that the spread between commercial banks' lending rates and their cost of funds would decrease or narrow during the contractionary phases of business cycles, while the cost of funds is increasing due to tight monetary policy (Nguyen, 2015).

Even though the interest rate asymmetry is relatively new topic, its literature is quite rich. Examples in the literature on emerging and advanced economies include, Dueker (2000) and Tkacz (2001), who report on the asymmetries in the US prime lending rate in the past. Thompson (2006) indicates asymmetries in the spread between US prime lending and deposit rate. Sarno and Thornton (2003) find asymmetries in the US Treasury securities. Scholnick (1999) shows asymmetries in mortgage rates in New Zealand and Canada. Hofmann and Mizen (2004) report on the asymmetric behaviour of retail rates in the UK.

Moreover, Lim (2001) applies the multivariate asymmetric error-correction model to Australian monthly data from the 1990:01-2000:04 sample period and reports that – in response to positive and negative shocks – interest rate adjustments are asymmetric in the short run but not in the long run. Lim (2001) further posits that banks adjust their loan and deposit rates in response to a change in the bank-bill rate. They reported a faster rate during periods of monetary easing (negative changes) than during periods of monetary tightening (positive changes).

Several other studies find an asymmetric co-integration between bank lending and deposit rates. For instance, Nguyen, Pointer, and Smith (2008) report similar asymmetries in Mexican lending and deposit rates. Nguyen and Islam (2010) find asymmetries in Thai banks' lending and deposit rates. Nguyen and Henney (2013) indicate asymmetries in the US housing mortgage market. Chang and Su (2010) reveal nonlinear co-integration between lending and deposit rates in ten Eastern European countries.

More recently, Karagiannis, Panagopoulos, and Vlamis (2010) find symmetry in the adjustment of Greek retail rates in response to changes in the central bank's rate. In contrast, they found a negative asymmetry for Slovenia in the adjustment of loan and deposit rates in response to changes in the money market rate. As for Bulgaria, they report the negative asymmetry hypothesis in the adjustment of the rate of loans in response to changes in both the central bank and money market rates. Nguyen (2019a) finds that lending rates responded asymmetrically to changes in the Central Bank's policy related rates in the US, Chile, Jamaica, and Mexico, while the adjustments in Bolivia, Colombia, Costa Rica, and Honduras are symmetrical. As for transition economies, Nguyen (2019b) reports that – after being pushed out of their long-run paths by economic shocks or counter-cyclical monetary policy – the lending rates in the US, China, Hungary, Ukraine, and Vietnam adjusted asymmetrically, while the adjustment in Romania is symmetric.

Ukrainian Banking Sector

Today, Ukraine is unable to fulfil its internal financial obligations to regular Ukrainian citizens and service external debts without loans from the International Monetary Fund, the World Bank, other international financial institutions, and countries.

The main problem is the "shadow" economy, which causes significant losses in the government's tax revenues. The tell-tale sign of Ukrainian economic problems is that aggregate consumption is twice as much as the reported income. Moreover, the prices of big-ticket commodities like real estate and automobiles are understated in the markets to avoid taxes. This situation arose due to high taxation on wages and corruption. The taxation problem grew in 2019, when the government levied an 18% personal income tax, a 1.5% military tax, and a 22% corporate tax. Given these relatively high total tax rates and pervasive corruption aiding underground business activities to avoid taxes, a significant volume of the Ukrainian business transactions occur underground. Supposedly, the national budget also suffered from theft by various "programs." For example, exporters fabricated documents to receive refunds for portions of export taxes, which is a program introduced by the government to promote exports.

The Ukrainian banking industry first began its efforts at independent operations in 1988. By 1990, three of the five sectoral banks (Agroprombank, Promstroibank, and the Social Investment Bank) transformed into joint stock companies as Bank Ukraine, Prominvest, and Ukrsotsbank. By the time Ukraine declared its independence, the state owned banks accounted for most of the commercial banking business. During this same period, less than one hundred newly formed independent banks represented a much lower percentage of the country's banking industry (Sochan, 1998).

Sochan (1998) indicated that after the dissolution of the Soviet Union, the Ukrainian banking system formed as a natural entity to fill the void left after the State Bank of USSR no longer had authority in the country to perform banking transactions. State banks formally established under the soviet national banking systemwere liquidated, and the National Bank of Ukraine was formed as the central bank with a two tier system. Under this system the National Bank of Ukraine was the central banks and all newly formed banks would be responsible for performing the commercial banking transactions.

Since 2000, the development of the banking system of Ukraine is being restructured because of decreasing profitability, poor bank operations, and the consolidation of capital. One of the main indicators that characterizes the situation in the banking system of Ukraine is high base rate. This causes high levels of tax rate, which in turn leads to a rise in the interest rates on banks' loans to enterprises and the general population.

Given the aforementioned problems with the banking sector, and the Ukrainian "shadow" economy, this study investigates the behaviours of the Ukrainian lending rate, deposit rate, and intermediation by formulating and testing the following five research hypotheses:

H1:   The Ukrainian intermediation premium is stationary with symmetric adjustments.

H2:   The Ukrainian lending rate Granger causes the deposit rate in the short run.

H3:   The Ukrainian deposit rate Granger causes the lending rate in the short run.

H4:   The Ukrainian lending rate Granger causes the deposit rate in the long run.

H5:   The Ukrainian deposit rate Granger causes the lending rate in the long run.

To test hypothesis 1, a Threshold Autoregressive model is specified and estimated, while a Threshold Autoregressive Vector Error-Correction model is formulated, estimated and the calculated test statistics are used to test hypotheses 2-5. Additionally, Nguyen and Kravchuk (2019, p. 195) articulated that economic shocks are common in most economies

in the age of globalization. And, these shocks are expected to change relationships among long time series data, known as their affect structural breaks. Therefore, economic models should account for structural breaks to avoid possible misspecification of model. This study uses Perron's (1997) endogenous unit root tests to endogenously search for structural break in the data and if a break exists, a dummy variable would be introduced into the model specification processes to properly specify the models.

MATERIAL AND METHODS

Structural Break

To endogenously search for the possibility of any structural break in the commercial banks' lending rate-deposit rate spread, this study utilized Perron's (1997) endogenous unit root test function with the intercept, slope, and the trend dummy to test the hypothesis that the spread has a unit root.

$$SP_t = \mu + \theta DU + \sigma t + \gamma DT + \delta D(T_b) + \beta SP_{t-1} + \sum_{i=1}^{k} \psi_i \Delta SP_{t-i} + \nu_t \qquad (1)$$

In which SP_t is the spread between the commercial banks' lending rate LR_t and the deposit rate, DR_t, or the intermediation premium; $DU = 1$ $(t > T_b)$ is a post-break constant dummy variable; t is a linear time trend; $DT = 1$ $(t > T_b)$ is a post-break slope dummy variable; DT $(T_b) = 1$ $(t = T_b +1)$ is the break dummy variable; and ν_t is a white-noise error term. The null hypothesis of a unit root is stated as $\beta = 1$. The break date, T_b, is selected based on the minimum t-statistic for testing $\beta = 1$ (Perron, 1997).

Threshold Autoregressive Model

To specify the model for the empirical analysis, this study first follows Thompson (2006) to regress the spread, SP_t, on a constant, a linear trend, and an intercept dummy to formally examine the Ukrainian commercial banks' lending rates, the deposit rates, and their spread. The intercept dummy was assigned the value of zero prior to the structural break point and the value of one at the structural break point and thereafter.

$$SP_t = \phi_0 + \phi_1 \text{Trend}_t - \phi_2 \text{Dummy}_t + \varepsilon_t \qquad (2)$$

In which SP_t is the Ukrainian lending-deposit rate spread, ϕ_g, g = 0, 1, and 2 are coefficients to be estimated. The saved residuals from the above estimated model, denoted by $\hat{\varepsilon}_t$, are then used to estimate the following TAR model:

$$\Delta \hat{\varepsilon}_t = I_t \rho_1 \hat{\varepsilon}_{t-1} + (1 - I_t) \rho_2 \hat{\varepsilon}_{t-1} + \sum \alpha_i \Delta \hat{\varepsilon}_{t-p} + \hat{u}_t \qquad (3)$$

In which $\hat{u}_t \sim i.i.d.(0, \sigma^2)$, Δ denotes the first difference of the variable, and the lagged values of $\Delta \hat{\varepsilon}_t$ are meant to yield uncorrelated residuals. As defined by Enders and Granger (1998), the Heaviside indicator function for the TAR specification is given as:

$$I_t = \begin{cases} 1 & if\ \hat{\varepsilon}_t \geq \tau \\ 0 & if\ \hat{\varepsilon}_t < \tau \end{cases} \qquad (4)$$

Nguyen (2015, p. 7) indicates that, "The threshold value, τ, is endogenously determined using Chan's (1993) procedure, which obtains τ by minimizing the sum of squared residuals after sorting the estimated residuals in ascending order and eliminating the largest and smallest 15% of values. The elimination of the largest and the smallest values assures the $\hat{\varepsilon}_t$ series crosses through the threshold in the sample period."

Nguyen (2015, p. 7) further argues, the specification of this threshold autoregressive (TAR) model permits a degree of autoregressive decay to depend on the state of the commercial bank lending rate-deposit rate spread, i.e. the 'deepness' of cycles. As Nguyen (2015, p. 7) posits, the estimated TAR model empirically shows if the commercial bank lending rate-deposit rate spread tends to revert to the long-run position faster when the spread is above or below the threshold. Therefore, the TAR model reveals whether troughs or peaks persist more when shocks or counter-cyclical monetary policy actions push the commercial banks' lending rate-deposit rate spread out of its long-run equilibrium path. In this model, the null hypothesis that the commercial bank lending rate-deposit rate spread contains a unit root can be expressed as $\rho_1 = \rho_2 = 0$, while the hypothesis that the spread is stationary with symmetric adjustments can be stated as $\rho_1 = \rho_2$."

Threshold Autoregressive Vector Error-Correction Model

If the results of the tests on the above TAR model are positive, this study uses the following Threshold Autoregressive Vector Error-Correction model, specified by Equation (4), (5), and (6), to further investigate the asymmetric dynamic behaviour of the Ukrainian lending rate (LR_t) and deposit rate (DR_t). By adding the ΔLR_{t-1} and ΔDR_{t-1} to Equation (5) and (6) to introduce short-run dynamics into the model, the resulting estimation can be used to study the nature of the Granger causality between the Ukrainian lending rates and deposit rates, short-run and long-term adjustments when the short-run dynamic adjustments are introduced. The statistical nature of the Granger causality will help to empirically evaluate whether and how the lending rates and the deposit rate respond to changes in the intermediation premium precipitated by counter-cyclical monetary policy or economic shocks.

$$\Delta LR_t = \alpha_0 + I_t\rho_1\hat{\varepsilon}_{t-1} + (1 - I_t)\rho_2\hat{\varepsilon}_{t-1} + \sum_{i=1}^{n} \alpha_i\Delta LR_{t-i} + \sum_{i=1}^{n} \gamma_i\Delta LD_{t-i} + \hat{u}_{1,t} \qquad (5)$$

$$\Delta LD_t = \alpha_0 + I_t\tilde{\rho}_1\hat{\varepsilon}_{t-1} + (1 - I_t)\tilde{\rho}_2\hat{\varepsilon}_{t-1} + \sum_{i=1}^{n} \tilde{\alpha}_i\Delta LR_{t-i} + \sum_{i=1}^{n} \tilde{\gamma}_i\Delta LD_{t-i} + \hat{u}_{2,t} \qquad (6)$$

In which $\hat{u}_{i,t} \sim i.i.d.(0, \sigma^2)$, i = 1, 2 and I_t is set in accordance with Equation (4).

Moreover, as indicated by Thompson (2006), the above-specified TAR-VEC model differs from the convention error-correction models by allowing asymmetric adjustments toward the long-run equilibrium. Furthermore, the asymmetric error correctional model replaces the single symmetric error correction term with two error correction terms. Thus, besides estimating the long-run equilibrium relationship and asymmetric adjustment, the model allows for tests of short-run effects (dynamics) between changes in lending rate and deposit rate. In turn, the tests reveal the nature of the Granger causality.

Data and Descriptive Statistics

This study uses the monthly Ukrainian commercial banks' lending rates and deposit rates from January 2000 to January 2019 (2000:01-2019:01) when the data is available. These two time-series data were collected from the database maintained by the International Monetary Fund (IMF.) The IMF is one of the most reputable international financial institutions with its residential experts stationed in membered countries. Moreover, the IMF staff from Washington conduct annual consultations with membered countries. The quality of the economic and financial data provided by membered countries is one of the issues addressed in Article IV of the Annual Consultation Report, approved by the IMF's Board of Directors. Therefore, data extracted from an IMF's database is of high quality and hence very reliable. The commercial banks' lending rate, the deposit rate, and their spread are

denoted by LR_t, DR_t, and SP_t, respectively. Figure 1 displays the behaviour of the commercial bank lending rate, the deposit rate and their spread over the sample period.

As illustrated in Figure 1, the Ukrainian lending rate and deposit rate generally tracked each other fairly well and were closer to each other, resulting in a stable lending-deposit rate spread. Over the sample period, the lending rate and deposit rate oscillate around steep downward trends until the middle of 2004 and then around slightly downward trends until the end of the sample period.
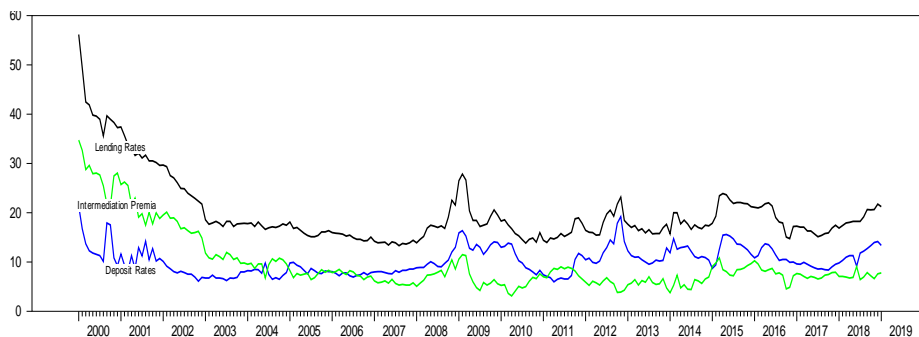

Figure 1. Ukrainian Lending Rates, Deposit Rates, and Intermediation Premia
Source: own calculation based on the monthly data extracted from the International Financial Statistics of the International Monetary Fund.

Moreover, descriptive statistical analysis reveals that the mean Ukrainian lending rate during the sample period was 19.96%, and ranged from 13.31% to 56.19%, with a standard deviation of 6.86%. The mean deposit rate was 10.28%, and ranged from 6.00% to 21.41%, with a standard deviation of 2.75%. Furthermore, the mean lending-deposit rate spread over the sample period was 9.68%, and ranged from 3.12% to 34.78%, with a standard deviation of 6.03%. The correlation between the Ukrainian lending rate and the deposit rate is 48.31%, which is very low. Numerically, for a given level of the lending rate, a monetary policy action or an economic shock causing the deposit rate to decrease would increase the lending-deposit rate spread. The opposite is true if the deposit rate were to change in the opposite direction. The low correlation between these two rates strongly suggests that one of the two rates is exogenous from or does not Granger cause the other rate, which may be discerned by the results of testing hypotheses 2-5.

RESULTS AND DISCUSSION

Results of Perron's Test for Structural Break

The estimation results of Perron's (1997) endogenous unit root tests are summarized in Table 1. The post-break intercept dummy variable, *DU,* is negative; the post-break slope dummy variable *DT*, is positive and they are both significant at the 1% level. The time trend is negative and is significant at the 1% level. The empirical results of these tests suggest that the Ukrainian commercial bank lending-deposit rate spread followed a stationary trend process with a break date on July 2004, which may be attributed to the

intervention in the foreign exchange market and monetary policy stimulations by the Central Bank from the beginning of 2004.

Table 1. Perron's Endogenous Unit Root Test, Ukrainian Data, January 2000 – January 2019

$SP_t = 7.38267 - 5.54140DU - 0.10157t + 0.10195DT + 1.66496D(T_b) + 0.72782SP_{t-1} + v_t$		
(5.3619*) (-5.0390*) (-4.7510*) (4.7598*) (1.6650***) (16.6428*)		
No. of augmented lags: k= 0	Break Date: July 2004	t(α = 1) = -6.2238*

Notes: Critical values for t-statistics in parentheses: Critical values based n = 100 sample for the break-date (Perron, 1997).* and *** indicate significance at the 1% and the 10% levels
Source: own calculation.

Results of the Cointegration Test with Asymmetric Adjustment

The estimation results of Equation (2) are reported in Table 2.

Table 2. Estimation Results, Eq. (2), Ukrainian Monthly Data, January 2000 – January 2019

$SP_t = 18.46461 - 0.01479Trend_t - 9.32802Dummy_t + \varepsilon_t$		
(35.1820*) (-2.6757*) (-10.9067*)		
$ln\ L$ = -624.2207 $\bar{R}^2 = 0.6201$	DW statistic[a] = 0.1445	$F_{(2,226)}$ =187.0673*

Notes: *indicates significance at the 1% level. As articulated by Enders and Siklos (2001, p. 166), in this type of model specification, ε_t may be contemporaneously correlated
Source: own calculation.

Given the estimation results of Equation (2), the estimation results of the TAR model are summarized in Table 3. An analysis of the overall estimation results indicates that the estimation results are devoid of serial correlation and have good predicting power, as evidenced by the Ljung-Box statistics and the overall *F*-statistics, respectively. The calculated statistic $\phi_\mu = 8.7532$ indicates that the null hypothesis of no co-integration, $\rho_1 = \rho_2 = 0$, should be rejected at the 1% significant level, confirming that the Ukrainian commercial banks' intermediation premium is stationary.

Table 3. Unit Root and Tests of Asymmetry, Monthly Data, January 2000 – January 2019

ρ_1	ρ_2	τ	$H_0: \rho_1 = \rho_2 = 0$	$H_0: \rho_1 = \rho_2$	aic	sic
-0.1849*	-0.0994**	0.7422	$\phi_\mu = 8.7532^*$	F = 1.5054	0.6235	0.6990
$Q_{LB\ (12)}$ = 12.0450(0.4421)			$ln\ L$ = -387.8672	$F_{(4,222)}$= 5.6965*	D.W. = 1.9832	

Notes: The null hypothesis of a unit root, $H_0: \rho_1 = \rho_2 = 0$, uses the critical values from Enders and Siklos (2001, p. 170, Table 1 for four lagged changes and n = 100). *and **indicate the 1% and the 5% levels of significance. The null hypothesis of symmetry, $H_0: \rho_1 = \rho_2$, uses the standard F distribution. τ is the threshold value determined via the Chan (1993) method. $Q_{LB\ (12)}$ denotes the Ljung-Box Q-statistic with 12 lags
Source: own calculation.

The estimation results further reveal that both ρ_1 and ρ_2 are statistically significant at the 1% level. In fact, the point estimates suggest that the commercial bank lending rate-deposit rate spread tends to decay at the rate of $|\rho_1| = 0.18486$ for $\hat{\varepsilon}_{t-1}$ above the threshold, τ = 0.7422 and at the rate of $|\rho_2| = 0.09939$ for $\hat{\varepsilon}_{t-1}$ below the threshold. Numerically,

the adjustments of the intermediation premium seem to be asymmetric; however, based on the estimated $F = 1.5054$, the null hypothesis of symmetry, $\rho_{1=} \rho_2$, could not be rejected at any conventional significance level, indicating that adjustments around the threshold value of the commercial banks' intermediation premium are symmetric.

Results of the Threshold Autoregressive Vector Error-Correction Model

The estimation results of the Threshold Autoregressive Vector Error-Correction model are reported in Table 4. In the summary of the estimation results, the partial F_{ij} represents the calculated partial *F-statistics,* with the p-value in parentheses, testing the null hypothesis that all coefficients *ij* are equal to zero. *indicates the 1% significant level of the *t-statistics*. $Q_{LB\ (12)}$ is the Ljung-Box statistics and its significance is in parentheses, testing for the first 12 of the residual autocorrelations to be jointly equal zero. *lnL* is the log likelihood. The overall *F-statistic,* with the p-value in parentheses, tests the overall fitness of the model. The retained estimated coefficients $\alpha_i, \gamma_i, \ \tilde{\alpha}_i, and\ \tilde{\gamma}_i$ are based on the 5% level of significance of the calculated *t-statistics*.

An analysis of the overall empirical results indicates that the estimated Equations (5) and (6) are devoid of serial correlation and have good predicting power as evidenced by the Ljung-Box statistics and the overall *F-statistics*, respectively. As to the short-run dynamic adjustment, the calculated partial *F-statistics* in Equations (5) and (6) indicate unidirectional Granger-causality from the Ukrainian lending rate to deposit rate.

Table 4. Asymmetric Error Correction Model, Monthly Data, January 2000 – January 2019

Eq. (5)	**Independent Variables** $Overall\ F_{(8,210)} = 4.9014(0.0066);\ lnL= -335.2402;\ Q_{(12)} = 4.9920(0.9582);\ \overline{R}^2=0.0603$			
ΔLR_t	$\alpha_3 =\alpha_5 =\alpha_6 =\alpha_9 = 0$	$\gamma_1 = \gamma_2 = 0$	ρ_1	ρ_2
	Partial F_{11} = 4.5432(0. 0015)	*Partial F_{12} = 0.6090(0. 5487)*	-0.0556	0.0070
Eq. (6)	**Independent Variables** $Overall\ F_{(6,208)} = 5.8047(0.0000);\ lnL= -319.8473;\ Q_{(12)}= 18.9220(0.0904);\ \overline{R}^2=0.1187$			
ΔDR_t	$\tilde{\alpha}_6 = \tilde{\alpha}_{13} = 0$	$\tilde{\gamma}_1 = \tilde{\gamma}_2 = 0$	$\tilde{\rho}_1$	$\tilde{\rho}_2$
	Partial F_{21} = 9.7516(0.0000)	*Partial F_{22} = 2.2674(0.1061)*	0.2325*	-0.0004

Notes: Partial F-statistics for lagged values of changes in the lending rate and deposit rate, respectively, are reported under the specified null hypotheses. $Q_{(12)}$ is the Ljung-Box Q-statistic to test for serial correlation up to 12 lags. *indicate the 1% level of significance; other levels of significance are in the parentheses
Source: own calculation.

In addition to revealing the short-run dynamic Granger-causality, the asymmetric error correction model also allows the investigation of the long-run adjustments of the lending rate. Inconsistent with the empirical results of the TAR model, the estimation of Equation (5) indicated that $|\rho_1| > |\rho_2|$ when the short-run factors were incorporated in to the model. However, both ρ_1 and ρ_2 are insignificant at any conventional level. With regard to the long-run behaviour of the deposit rate, the estimation results for Equation (6) also show that $|\tilde{\rho}_1| > |\tilde{\rho}_2|$, after controlling for short-run factors; however, $\tilde{\rho}_1$ is significant at the 1% level, but $\tilde{\rho}_2$ is statistically insignificant even at the 10% level.

DISCUSSION

This investigation used monthly time-series data maintained by the International Monetary Fund over the January 2000 through January 2019 period where the data is available to study how Ukrainian commercial banks set changes in deposit rate that might be precipitated by changes in Central Bank's counter-cyclical monetary policy measures or economic shocks. Descriptive statistics indicated that commercial banks' lending rate, deposit rate, and intermediation premium were very high compared to reported figures for other transitional economies (Nguyen, 2015; Nguyen, Phan, & Williams, 2017; Nguyen, 2018; Nguyen, 2019b). As Figure 1 indicates, over the sample period, the lending rate and deposit rate oscillated around steep downward trends until the middle of 2004 and then around slightly downward trends until the end of the sample period.

Perron's endogenous unit root tests confirmed that the Ukrainian commercial banks' lending-deposit rate spread followed a stationary trend process with a break date of July 2004, which may be attributed to the stimulating monetary policy in the first six months of 2004. More specifically, in their efforts to increase economic growth, the Ukrainian Central Bank intervened into the foreign exchange market. Along with an animation of privatization processes, the Central Bank tried to increase the foreign currency reserves by purchasing international currencies in the interbank market. As a result, during the first nine months of the year, the monetary base grew by 38.2%, compared to 24.3% in the same period in 2003. During this period, the money supply rose by 37.1%, while the corresponding figure for the same period in 2003 was 33.3% (National Bank of Ukraine, 2005).

As to the nature of the relationship between the commercial banks' lending rate and deposit rate, the estimation results for Equation (3) suggested that the null hypothesis of symmetry, $\rho_1 = \rho_2$, could not be rejected at any conventional level of significance. Failure to reject this null hypothesis indicates that adjustments around the threshold value of the commercial banks' intermediation premium are symmetric, which also means failure to reject hypothesis 1. This finding suggests that the Ukrainian lending institutions would respond to the expansionary policy measures or economic shocks in the same fashion as they do with regard to contractionary monetary policy measures.

With regard to time lags in term of months of adjustments, the empirical results for Equations (5) and (6) coincidentally revealed that the longest time lags for α_i is nine months and γ_i is two months; while those for $\tilde{\alpha}_i, and\ \tilde{\gamma}_i$ are thirteen and two months, respectively. Moreover, the partial F-statistics, in Table 4, F_{11} and F_{21} are significant while F_{12} and F_{22} are not significant. Behaviourally, the insignificance of F_{12} indicates that the *null hypothesis H 3* should be rejected, i.e. the Ukrainian deposit rate does not Granger cause the lending rate in the short run. However, the significance if F_{21} suggests that the *null hypothesis H 2* cannot be rejected, i.e. the Ukrainian lending rate does Granger cause the deposit rate in the short run.

These aforementioned hypothesis testing results revealed the unidirectional Granger *causality* from lending rate to deposit rate over the sample period. These findings suggested that changes in the lending rate affected the deposit rate, but the deposit rate was exogenous from the lending rate. These empirical results also suggested that Ukrainian-lending institutions look at their lending rates in the past nine months ($\alpha_i = 9$), but not deposit rates to set their current lending rate. Moreover, as indicated by $\tilde{\alpha}_i = 13$, after a change in the

lending rate pushing the intermediation premium out of its long-run path, the Ukrainian lending institutions took up to 13 months to adjust the deposit rate to the new equilibrium.

Furthermore, the estimation results for Equation (5) – revealing the insignificances of the estimates of ρ_1 and ρ_2 – suggested that the adjustments of the intermediation premium and, hence, the relationship between the lending rate and deposit rate are completed in the short run. More importantly, the insignificance of the estimated coefficient ρ_2 of Equation (5) indicates that the *null hypothesis H 5* should be rejected, i.e. the Ukrainian deposit rate does not Granger cause the lending rate in the long run.

However, the estimation results of Equation (6) revealed that the estimated $\tilde{\rho}_1$ is statistical significance at the 1% level while the estimated $\tilde{\rho}_2$ is insignificant at any conventional level of significance. The finding that the estimated $\tilde{\rho}_1$ is statistically significant indicates that the *null hypothesis H 4* cannot be rejected, i.e. the Ukrainian lending rate Granger causes the deposit rate in the long run.

The uses of the estimation results of the Threshold Autoregressive Vector Error-Correction model to test hypotheses 2-5 above strongly indicates that the *unidirectional Granger causality* from lending rate to deposit rate or the lending rate is exogenous from the deposit rate in the Ukrainian financial markets, which in turn explains the aforementioned low correlation between these two rates in both the short and long run. Moreover, the estimation results of the Threshold Autoregressive Vector Error-Correction model suggested that – when introducing the short-run dynamics to the model above the threshold – the adjustments of the intermediation premium persisted longer; but when the dynamics were below the threshold, the adjustment is completed in the short run.

The high tax rate coupled with pervasive corruption pushed a significant portion of the economy underground, which operates mostly on cash basis to avoid taxes, which leads to losses of tax revenue for the government. In turn, this not only marginalises the intermediating function of the commercial banks but also hinders the flow of foreign direct investments, as foreign companies cannot operate underground.

CONCLUSIONS

Financial intermediation or channelling funds from economic units with surpluses to economic units that need funds for profitable investments was well documented by our study as a critical facilitator for investment and economic growth. Commercial banks play a crucial role in determining the spread between the lending rate and the cost of funds or the intermediation premium. In addition to creating interest income for financial intermediaries, the spread affects the economy's savings, investments, and consumption levels. Changes in consumption or investment influence unemployment, inflation, and gross domestic product, which would improve economic development and social progress.

The research has many implications for Ukrainian economic policies. First, the test results suggest that the intermediation premium follows a stationary trend process with a structural break in July 2004, which may be attributed to the Ukrainian Central Bank's intervention to foreign exchange market in the first six months of that year.

Second, the estimation results of the TAR model revealed that the Ukrainian banks reacted in the same fashion to expansionary monetary policy as they did to contractionary policy or economic shocks that pushed the intermediation premium out of its long-run

path. Moreover, when introducing short-run dynamics to the model, the estimation results indicated that the adjustments of the lending rate are symmetric and completed in the short run when the intermediation is either above or below the threshold.

Furthermore, the calculated partial F-statistics from the estimation of the Threshold Autoregressive Vector Error-Correction Model, reported in Table 4, revealed a unidirectional Granger-causality from the Ukrainian commercial banks' lending to the deposit rates or the exogeneity of their lending rate from their deposit rate. This exogeneity explained the low correlation of 48.31% between Ukrainian lending rate and deposit rate, which strongly indicated that lending institutions in Ukraine did not perform their intermediating responsibility effectively. This exogeneity also hinders the counter-cyclical monetary policy, investment and economic growth and, hence, social progress.

Naturally, the policy recommendation from this empirical finding is that policy-makers should seek to remove this exogeneity in the lending and deposit setting behaviour in the banking sector. Clearly, the priority of the policy should be to rectify the pervasive corruption in the economy. Unfortunately, this recommendation is much easier said than done in emerging and transitional economies, especially in Ukraine.

This empirical investigation used macro-economic data, which is a limitation, as lending and deposit rate-setting behaviours of financial intermediaries may also depend on the characteristics of the depositors, temperaments of the management of these financial institutions, borrowers, and geographical areas of the economy. Thus, a micro-based, firm-level analysis using surveyed data of Ukrainian lending and deposit rates would be a useful complement to this study.

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A Typology of Small Business Growth Modelling:
A Critical Literature Review

Krzysztof Wach

A B S T R A C T
Objective: The objective of the article is to explore how corporate growth in business studies is explained and to present the typology of growth models of small businesses.
Research Design & Methods: This conceptual article relies on literature review and desk research. The article elaborates on available literature via a critical literature review methodology.
Findings: A detailed literature query, conducted for the purposes of this article, identified eight approaches to modelling corporate growth (growth of small businesses). Those are stochastic approach, stages models, evolutionary approach, resource-based view, learning approach, managerial approach, econophysical approach, and sustainable models.
Implications & Recommendations: The literature query and the process of logical reasoning based on the collected material allows to outline several directions of further research. Firstly, future studies should conduct a detailed bibliometric analysis with a map of connections that will allow a classification of research areas. Secondly, scholars should prepare a more integrated approach towards the growth of small businesses, which will include more factors rooted in the entrepreneurship theory.
Contribution & Value Added: The article structures scientific knowledge on the typology of modelling corporate growth in business studies. This article paid special attention to modelling of corporate growth of small and medium-sized enterprises, which in the case of firms of this size class run differently than in the case of large companies and international corporations, for which various models are mainly created.

INTRODUCTION

What we must emphasize is that there does not yet exist a holistic theory of entrepreneurship that would take into account all essential variables and be recognized by the *communis opinio doctorum*. Within the last decade, discussions on the need for a full theory of entrepreneurship that would take into account both the achievements of economics and management, not to mention the integration of various trends that appear in both mentioned disciplines, have become more frequent. As economist Gruszecki (2004, p. 43) emphasizes, the primacy of economics – a particular *ius prima notis* – in entrepreneurship theory is justified, since economics is an older science than organizational theory or management; moreover, it is difficult to imagine economic theory with firms, though – as Gruszecki himself concludes – the concept of the firm in economics is defective. Reflecting on the primacy of individual economic disciplines in the theory of entrepreneurship, Gruszecki (2004, p. 46) concludes that it may be that management is the foundation upon which a full theory of entrepreneurship could be built, while it must be emphasized that he simultaneously perceives certain drawbacks in the management approach.

Within the last five decades, numerous models of the growth of small and medium-sized enterprises (SMEs) have been elaborated. A very general classification of the models of growth of SMEs is proposed by Hill and McGowan (1999, p. 6), who divide them into two categories – conventional and alternative. Conventional models include those based on traditional theories and methods proper to given scientific disciplines (economics, management, sociology, psychology), while alternative models are those based on qualitative studies, which have currently dominated studies in entrepreneurship, and call this phenomenon the qualitative paradigm (Hill & McGowan, 1999, p. 9).

The current article presents the idea of small business growth modelling and ask the following exploratory research questions:

RQ1: How is the small business growth explained in the business studies literature?

RQ2: How can these approaches explaining the corporate growth be named and classified?

The objective of the article is to explore how corporate growth in business studies is explained and to present the typology of growth models of firms. This conceptual article relies on the literature review and desk research. The article elaborates on available literature via a critical literature review methodology.

The article is divided into four basic sections. The introduction, aiming at explaining the research topic and research questions, is followed by the methodology section, which discusses the applied research methods. The core section of the article is a critical literature review of various models of corporate growth, which results in a kind of theory development – a new typology of small business growth modelling. The articles finishes with conclusions and implications.

MATERIAL AND METHODS

Babbie (2012) postulates that smooth and efficient conducting of scientific research requires a procedure according to pre-determined steps in order to obtain the most valuable

cognitive effects of the research process. The nature of the research is multidimensional, it realises exploratory, descriptive, analytical, and predictive purposes (Collis & Hussey, 2009). As it is a conceptual article so the literature review must be applied. The methodology literature offers various types of literature reviews. Paré, Trudel, Jaana and Kitsiou (2015) distinguish seven basic types of literature review such as (i) a narrative review, (ii) a descriptive review, (iii) a scoping review, (iv) a systematic review, (v) an umbrella review, (vi) a realist review, or (vii) a critical review (Table 1).

Table 1. Characteristics of Literature Review Types

Review type	Overarching goal	Search strategy	Appraisal of included studies	Analysis and synthesis	Key references
Narrative review	Aims to summarize or synthesize what has been written on a particular topic but does not seek generalization or cumulative knowledge from what is reviewed.	Selective in nature. Authors usually select studies that support their own view.	No formal quality or risk of bias assessment of included primary studies is required.	Narrative using thematic analysis, chronological order, conceptual frameworks, content analysis or other classification criteria.	(Cronin *et al.*, 2008; Green *et al.*, 2006; Levy & Ellis, 2006; Webster & Watson, 2002)
Descriptive or mapping review	Seeks to identify interpretable patterns and gaps in the literature with respect to pre-existing propositions, theories, methodologies or findings.	Aims to identify a representative number of works on a particular topic. May or may not include comprehensive searching.	No formal quality or risk of bias assessment of included primary studies is required.	Quantitative or qualitative using descriptive statistics (e.g., frequencies), and content analysis methods.	(King & He, 2005; Paré *et al.*, 2015; Petersen *et al.*, 2015)
Scoping review	Aims to provide an initial indication of potential size and scope of the extant research literature. May be conducted to identify nature and extent of research evidence, including ongoing research, with a view to determine the value of undertaking a full systematic review.	Comprehensive search using an iterative process that is guided by a requirement to identify all relevant literature (published and unpublished) suitable for answering the central research question regardless of study design. Uses explicit inclusion and exclusion criteria.	No formal quality or risk of bias assessment of included primary studies is required.	Uses analytic frameworks or thematic construction in order to present a narrative account of existing literature, as well as numerical analysis of the extent, nature and distribution of the studies included in the review.	(Arksey & O'Malley, 2005; Daudt *et al.*, 2013; Levac *et al.*, 2010).

Review type	Overarching goal	Search strategy	Appraisal of included studies	Analysis and synthesis	Key references
Systematic review	Aims to aggregate, critically appraise, and synthesize in a single source all empirical evidence that meet a set of pre-specified eligibility criteria in order to answer in depth a clearly formulated research question to support evidence-based decision-making.	Exhaustive literature search of multiple sources and databases using highly sensitive and structured strategies to identify all available studies (published and unpublished) within resource limits that are eligible for inclusion. Uses a priori inclusion and exclusion criteria.	Two different quality assessments must be addressed in systematic reviews: (a) risk of bias in included studies, and (b) quality of evidence by outcome of interest. Both assessments require the use of validated instruments (e.g., Cochrane criteria and GRADE system).	Two different types of analyses and syntheses methods can be used: 1. Meta-analysis (statistical pooling of study results), and 2. qualitative/ narrative: use of vote counting, content analysis, frameworks, classification schemes, and/or tabulations.	(Borenstein *et al.*, 2009; Higgins & Green, 2008; Liberati *et al.*, 2009)
Umbrella review	Tertiary type of evidence synthesis. Aims to compare and contrast findings from multiple systematic reviews in priority areas, at a variety of different levels, including different types of interventions for the same condition or alternatively, same interventions for different conditions, outcomes, problems, or populations and adverse effects.	Exhaustive literature search to identify all available systematic reviews (published and unpublished) within resource limits that are eligible for inclusion. No search for primary studies. Uses a priori inclusion and exclusion criteria.	Two different quality assessments must be addressed: (a) methodological quality assessment of the included systematic reviews, and (b) quality of evidence in included reviews. Both assessments require use of validated instruments.	Many umbrella reviews will simply extract data from the underlying systematic reviews and summarize them in tables or figures. However, in some cases they may include indirect comparisons based on formal statistical analyses, especially if there is no evidence on direct comparisons.	(Becker & Oxman, 2008; Shea *et al.*, 2009; Smith *et al.*, 2011)
Realist review	Theory-driven interpretative review. Aims to inform, enhance, extend, or supplement conventional systematic reviews by including evidence from both quantitative and qualitative studies of complex interventions applied in diverse contexts to inform policy decision-making.	Can be systematic and comprehensive based on "a priori" criteria or iterative and purposive, aiming to provide a holistic interpretation of a phenomenon through theoretical saturation.	Quality or risk of bias assessment must be addressed using different instruments and/or frameworks for quantitative and qualitative studies. Questions about "quality" and "bias" are very different in the context of qualitative research.	Qualitative evidence synthesis. Can be aggregative or interpretive. Requires transparency. Can use content analysis, conceptual frameworks, as well as interpretive and mixed methods approaches.	(Pawson, 2006; Pawson *et al.*, 2005; Whitlock *et al.*, 2008)

Review type	Overarching goal	Search strategy	Appraisal of included studies	Analysis and synthesis	Key references
Critical review	Aims to provide a critical evaluation and interpretive analysis of existing literature on a particular topic of interest to reveal strengths, weaknesses, contradictions, controversies, inconsistencies, and/or other important issues with respect to theories, hypotheses, research methods or results.	Seeks to identify a representative number of articles that make the sample illustrative of the larger group of works in the field of study. May or may not include comprehensive searching.	No formal quality or risk of bias assessment of included primary studies is required.	Can apply a variety of analysis methods that can be grouped as either positivist (e.g., content analysis and frequencies) or interpretivist (e.g., meta-ethnography, critical interpretive synthesis) according to the authors' epistemological positions.	(Kirkevold, 1997; Paré *et al.*, 2015)

Source: Paré, Trudel, Jaana, and Kitsiou (2015, p. 187).

The thorough literature study was prepared in order to conceptualise and operationalise the research problem. Therefore, the main research method was literature review and its constructive critics. A critical literature review provides a critical evaluation and interpretive analysis of existing literature on a particular topic (Baumeister & Leary, 1997; Kirkevold, 1997). It provides a reflective discussion and a critical evaluation aiming to reveal strengths, weaknesses, contradictions, controversies, inconsistencies, and/or other important issues with respect to theories, hypotheses, research methods or results. The reasons to choose this literature review types are as follows (Saunders & Lewis, 2012, p. 32):

– A critical literature review identifies and includes the most relevant and significant research, but it doesn't include all research that is possibly relevant to a given topic.
– A critical literature review discusses and evaluates a given topic, but not summarises and describes this research.
– A critical literature review identifies the recognised authors, researchers and/or experts in a given topic.
– A critical Literature review contextualises and justifies research questions for a given topic and then considers and discusses research that supports or opposes the research idea.

The article elaborates on available major historical and recent literature. I used the following eight databases of academic literature: (i) EBSCOhost, (ii) Emerald, (iii) JSTOR, (iv) ScienceDirect, (v) Scopus, (vi) Springer Link, (vii) Web of Science, (viii) Willey Online Library. I searched through secondary literature with a combination of screening terms "growth" or "development" and one of the possible ones described in the article: "small business," "small and medium-sized enterprises," "firms," "company," or "business." This article uses a qualitative design of research based on cause-effect analysis, along with predictive synthesis, modelling, induction, and description of the critical literature review.

LITERATURE REVIEW AND THEORY DEVELOPMENT

Identifying Theoretical Conventions of Corporate Growth

O'Farrell and Hitchens (1988, pp. 1365-1383) divide the theories of growth of small and medium-sized firms into four groups, distinguishing:

− static balance models based on industrial economics,
− stochastic models,
− models based on theories of strategic management,
− SME life-cycle models (phase models).

Orser, Hogarth-Scott, and Riding (2000, pp. 43-44) conduct a systemization, distinguishing four approaches to analysing the growth of small firms. They list:

− biological models (economics and management),
− decision-making models (management),
− behavioural models of the figure of the entrepreneur (grounded in social psychology),
− the integrative approach (economics/management or interdisciplinary studies).

Dobbs and Hamilton (2007, p. 279) distinguish six main approaches to the analysis of the growth of small and medium-sized firms, namely:

− stochastic approach,
− descriptive approach,
− evolutionary approach,
− resource-based approach,
− learning approach,
− deterministic approach.

On the other hand, Pümpin and Wunderlin (2005, p. 41) systemize the models of a firm's growth into five groups, distinguishing the following types:

− metamorphic models,
− crisis models,
− market growth models,
− structural change models,
− behavioural change models.

The metamorphic models they distinguish correspond to Dobbs and Hamilton's descriptive models, while Dobbs and Hamilton (2007) would most likely consider crisis models a certain subgroup of the latter.

An own analysis of the literature from the perspective of modelling the growth of firms, especially small and medium-sized enterprises, shows that most popular approaches include the stochastic, stages, evolutionary, resource-based, learning, managerial, econophysical and sustainable conventions (Table 2). Of course, the proposed systemization is not exhaustive, as it is not possible to classify all alternative models here. Moreover, some models make use of a variety of approaches and can be classified in various different ways.

Table 2. Main Conventions in Viewing the Small Business Growth

Convention	Representatives	Characterization
Stochastic approach (econometrics approach)	Gibrat (1931) Mowery (1948)	A firm's growth depends on many factors, none of which is dominant. They cannot be distinguished, we can only statistically describe what was influential at a given time.
Deterministic approach (mathematical economics approach)	Steffens, Davidsson, and Fitzsimmons (2009)	Growth is the function of a permanent cluster of the influence of various internal and external factors. These "postulated" models are to complexly explain relations in the growth process.
Stages models (corporate life cycle, CLC)	Steinmetz (1969) Greiner (1972) Churchill & Lewis (1983)	The firm grows in accordance with a life-cycle typical of live organisms and social organisms, going through individual phases of growth.
Evolutionary approach	Alchian (1950) Jovanovic (1982) Aldrich (1999)	The application of Darwin's theory of natural selection to entrepreneurial reality through expressing growth as the function of the firm's adaptation to its competition and environment.
Resource-based view	Penrose (1959) Wernerfelt (1984) Hamel & Prahalad (1990)	A firm's growth depends on the configuration of internal resources and competence of the entrepreneur.
Learning approach	Senge (1990) Deakings & Freel (1998) Phelps, Adams, and Bessant (2007)	The continuous attainment of knowledge and learning process is the condition of a firm's growth.
Managerial approach	O'Farreell and Hitchens (1988) Drucker (1954) Ansoff (1965) Porter (1980) Mintzberg (1994)	The growth of small and medium-sized firms is analysed according to concepts proper to management. The organizational structure and decisional process is most often analysed. Comparisons are often made between SMEs and LEs.
Econophysical approach	Aislabie (1992) Axtell (2001)	The description and modelling of the growth of firms with the help of mathematico-physical models and physicalistic analogies on the basis of principles adapted from the laws of nature.
Sustainable models	Smith (2011)	The growth of the firm must be sustainable in three dimensions: economic, ecological, and environmental.

Source: own study.

The Stochastic Approach

The stochastic approach (econometrics convention) of describing the growth of firm (also called the statistical or cross-sectional convention), based mainly on economic theories of the firm, uses analogies of growth to the stochastic process. This convention emphasizes that the growth of a firm depends on many factors, none of which is dominant.[1] No coher-

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[1] This convention has its source in Gibrat's law of proportional effect, published in 1931 (in the French language), according to which the index of a firm's growth does not depend on its initial size, but on many factors, mainly on management quality. The growing controversies surrounding this law have led to a series of empirical studies testing its correctness. These studies confirmed such a dependency for large firms, but discovered at the same time that this law has no bearing for micro- and small businesses (Lotti, Santarelli, & Vivarelli, 1999, p. 361).

ent theory explaining the growth of a firm has been created on the basis of one determining factor, but rather many complementary theories concentrated on particular factors of growth. The plurality and variety of influences, especially their mutual correlations, do not allow for the distinction of a single factor that influences the growth of a firm. It is possible, however, to determine the dependencies of dependent and independent variable determining the growth of a firm at a given time, which is why this convention is used mainly as a statistical instrument. The explanation of a firm's growth in the cross-sectional view is based on the identification of a growth determinant (Storey, 1994, p. 123).

In this context, Harris and Robinson (2001) attempt to explain the growth of a firm somewhat differently, as the effect of a cluster of factors treated together as positive or negative determinants of growth. The stochastic convention is frequently used in empirical studies in the field of managerial science. For example, Olson, van Bever, and Verry (2008, p. 55), on the basis of studies conducted on 500 firms, distinguish 42 growth determinants divided into three main groups of determining factors for the firm: strategic, organizational, and external factors.

Another example of the stochastic approach is the dichotomous distinction of factors that inhibit or stimulate growth. For example, Harris and Robinson (2001) distinguish negative and positive factors, while Tether (1997, pp. 509-533) names barriers and success factors.

A critique of the statistical description can be found in Penrose (1959, p. 7), who asserted that a full theory of a firm's growth should be adequate for all economic agents, not only for individual ones. Keasey and Watson (1993, p. 113) indicated that firms in a regressive phase not only have the ability to, but are often characterized by the same determining parameters as firms in progressive phases, which they believe is a signal to be cautious with regard to the results of studies based on stochastic conventions. Similarly, Brüderl and Preisendörfer (2000, p. 51) criticize models that create a list of the determining factors of a firm's growth, emphasizing that such an approach cannot be considered theoretical, but rather particularistic. However, despite critique of this convention, it is widely used according to the postulates of the empirical school, and we can even risk stating that the majority of articles in the field of entrepreneurial theory published in journals on the ISI Master Journal List are based precisely on statistical analysis.

The Deterministic Approach

The deterministic approach (mathematical economics convention) stands in opposition to the stochastic convention. It perceives growth as a cluster of events, phenomena, or actions in close correlation with certain conditions, which is evident from the semantic understanding of determinism. More specifically, thus, growth is understood here as (Dobbs & Hamilton, 2007, p. 299):

> "a stable set of explanatory variables, relating to the people, the firm, and its industry environment, that can explain a major proportion of the observed variation in business growth rates"

This is, in essence, a postulated model, since no one has as yet been able to create such a model, as many authors emphasize. Efforts undertaken to create deterministic models end, in effect, in the creation of subsequent idiosyncratic models.

In the literature, there are numerous models rooted in this approach. It is worth citing one of the most recent attempts at creating an integrated "growth-profitability" model of

the growth of small firms proposed by Steffens, Davidson, and Fitzsimmons (2009, pp. 125-148). Their model combines the approach of the positional school with that of the resource-based school on the basis of entrepreneurial theory. In combining these three approaches, the authors aspire to create what they call a dynamic integrated model (Figure 1). This model encompasses five entry elements and two exit elements. Among the dependent variables are profitability (6), which they propose measuring by way of ROA and growth (7), understood here in terms of qualitative change (an increase in turnover). The focal point of the model is the age of the firm (1), which describes the size and property of a small firm according to its traditional understanding in entrepreneurial theory. Aside from the mentioned variable, the model also includes a third level which encompasses four variables describing the firm and its approach. These are: resources stocks (2), the capability to use them (4), as well as flexibility (3), which is a quality of small, young firms, and influences the ability to discover market opportunities (5). In the opinion of these authors, these five elements are, in the case of SMEs, the main elements which lead to the firm growth and profitability sought by entrepreneurs.
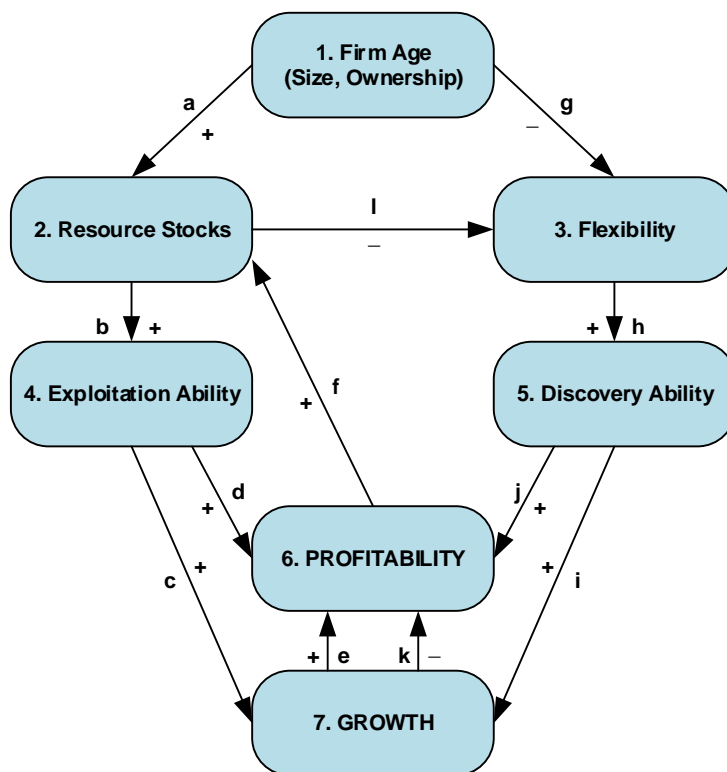

Figure 1. A Deterministic Model of "Growth-Profitability" for Small Businesses
Source: Steffens, Davidson, and Fitzsimmons (2009, p. 128).

This proposal makes use of many elements of entrepreneurial theory, which puts this model one step ahead in the construction of an integrated model of the growth of SMEs.

On the other hand, this model may be critiqued for inadequately taking into account entrepreneurial factors (entrepreneur's entrepreneurial approach, entrepreneurial orientation, internal entrepreneurship, innovativeness), as the model only takes into account entrepreneurial attention. The measurement of effects with the help of hard financial variables (profitability, increase in turnover) is objective, in truth, but leads to a loss of the nature of entrepreneurship. A firm's increase may be measured with the help of a greater number of measures, while growth (increase or growth *sensu stricto* simultaneously) is a more adequate measure in the case of small firms. Deterministic models are generally critiqued rather sharply in the literature; they are not recognized *communis opinio doctorum*; however, without such attempts there would be no scientific progress.

The Stages Models

The phase convention (also called the descriptive or stages convention, organizational life cycle OLC, corporate life cycle CLC, business life cycle BLC), based on firms' life-cycle, makes use of an analogy between firms and natural systems, which develop in stages.[2] In the discussed convention, attention is concentrated on explaining the way in which firms adapt and what their approach is to growth in subsequent phases of the growth cycle, without attempting to explain the factors causing the growth of the firm. The main means of analysis here is description, which is why this convention is also known as the descriptive convention. The biological modelling of firm growth goes back to the 19th century, as Penrose (1952, pp. 804-819) emphasizes in her studies on this issue even before the publication of her well-known book. Though similar analogies in economics can already be seen in the work of Alfred Marshall, they were marginalized, and it was only Kenneth E. Boulding who succeeded in introducing a new quality with theory of firms' life-cycles (Penrose, 1952, p. 805).

In the literature, there are numerous models rooted in this approach. One of the most popular model in the management literature, prepared by Jackson and Morgan (1982) proposes three stages of growth such as (i), (ii) and (iii). In the entrepreneurship literature, Churchil and Lewis (1983), based on their empirical investigations on the sample of 83 small and medium-sized businesses, distinguished five stages of growth (Figure 2), namely (i) existence, (ii) survival, (iii) success – and two sub-stages such as success-disengagement and success-growth, (iv) take-off, (v) resource maturity.

McMahon (1998, pp. 20-35) emphasizes that precisely phase models are widely used and dominant in the literature concerning SMEs, though he extensively cites their critique. The greatest accusation directed at this convention is their empirical verifiability in various sectors, as the phases of the life-cycle vary in different industries, which can be found in the works of Michel E. Porter. The second accusation raised in secondary literature is its biological analogousness, rather than faithful reflection of economic reality, since it is based on a theoretical model. Nonetheless, this convention has its advocates, as it is the dominant approach in modelling the growth of SMEs. The convention is also widely discussed in Polish secondary literature and widely known.

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[2] An extensive overview of phase models can be found in Phelps, Adams, and Bessant (2007, pp. 1-30) as well as in Bessant, Phelps, and Adams (2005).
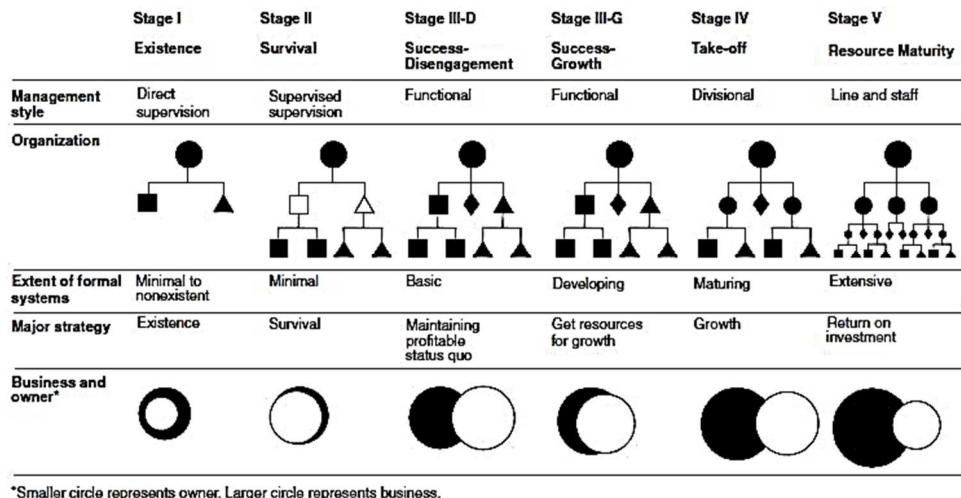
Figure 2. The Characteristics of Small Business at Each Stage of Development
Source: Churchil and Lewis (1983).

The Evolutionary Approach

According to Dobbs and Halilton (2007, p. 298) the **idiosyncratic trend** is based on the evolutionary model of growth. The growth of a given firm depends on many endogenous and exogenous factors. A firm's growth is the product of the unique configuration of its resources, external forces, and capable management. Idiosyncratic approaches are, according to the authors mentioned, the essence of theories of the growth of small and medium-sized firms, since there is no universal growth sequence indicated (as in the phase convention). The growth of SMEs depends on their resources, usually very limited, but above all on the entrepreneur and on his/her strategic ability to identify growth opportunities in interstices left by large firms (Penrose 1959, p. 225; Dobbs & Halilton 2007, p. 298). Three conventions appear within the framework of this trend: (i) the evolutionary, (ii) resource-based, and (iii) learning conventions.

The evolutionary convention,[3] next to the phase convention, constitutes the second subgroup of biological conventions (Penrose 1952, p. 809).[4] This approach is based on Charles Darwin's theory of evolution, which he formed, *nota bene*, inspired by Malthus' economic theory of population.[5] The mechanism and course of biological evolution is based on five principles, and two of these are of special significance for the evolutionary theory

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[3] Penrose (1952, p. 807) suggests that analogies from other fields and academic disciplines, if they are of explanatory value, can be used mutatis mutandis in the economic sciences, though she is skeptical about them and undermines their economic groundedness. Caution is warranted, though, on the other hand, there are many issues in economics that cannot be quantified, which is why only analogies remain. Economics more and more courageously adopt from management so-called soft methods, which the growth of such sub-disciplines as evolutionary economics, bio-economics, behavioral economics, and neuro-economics attests to. For more on the subject of using neuro-economics in entrepreneurship, see Singh and Ronch (2011, pp. 94-103).

[4] A discussion of the analogy of evolution in economic theories can also be found in Foss (1994, pp. 1115-1136).

[5] What is essential here is the main thesis that the population grows faster than the food supply.

of growth – fitness and survival of the fittest.[6] Fitness is expressed in the fact that certain traits are more desirable in the competition for resources in the environment, which is why certain traits make it easier for some subjects to compete in a given environment, than others. Natural selection is expressed in the fact that better adapted, or fitter, subjects have a better chance of survival and of producing offspring than worse adapted subject. If – as the theory asserts – only fitter subjects survive, this means that individual subjects aspire to adapt to the highest degree possible, which is made possible by the attainment of the best traits, which is why subjects seek the best traits in others, so that in the case of inheritance the young subject would be better adapted to the given environment (Sieja & Wach, 2019). Already in the mid-20th century, Alchian emphasized the significance of adaptation for the growth of firms in accordance with the theory of natural selection. In his opinion, adaptation can appear in two forms: as imitation, and by way of trial-and-error (Alchian, 1950, p. 218). Imitation boils down to the implementation of solutions used by successful firms, while trial-and-error consists in continually implementing new solutions, which may result in either success or failure.[7] In one of his publications that elicited critique from the academic environment, Jovanovic (1982, p. 649) introduced the so-called theory of "noisy" selection, which asserts that effective firms grow and survive, while ineffective firms weaken and fall. Firms differ in terms of size, though not due to fixity of capital, but rather to the fact that they discover that they are more effective than others.

Since the 1980s, the evolutionary approach has grown in significance (Nooteboom 2007, pp. 31-55). Conducting an overview of the views of adversaries and adherents of this conception, Hodgson (2002, pp. 259-281) comes to the interesting conclusions that after a decade, some antagonists because advocates, and in reviewing the conceptualization of this convention he noted that it has changed from being an analogy to an ontology. Hodgson and Knudsen (2006, p. 6) believe that precisely the evolutionary convention may give an answer to the question of why some firms "live" longer and grow more intensely than others.

Grebel, Pyka, and Hanusch (2003, pp. 493-514) based their model of the growth of small and medium-sized firms (see Figure 3) on the Darwinian theory of evolution. As was already mentioned, the basis of the theory of evolution is a base population and the individuals that compose it, which should be identified in entrepreneurial theory with the endowed actors that are entrepreneurial spirit, human capital expressed in their knowledge and abilities, and venture capital. Individual actors possess a certain characteristic set of traits (a phenotype in Darwinian terms), which for modelling purposes can be mathematically written as:

$$a_i^1 = \left\{ w_i , \{es_i^1, hc_i^1, vc_i^1\} \right\} \tag{1}$$

where:

a_i^1 - actor i in time t, $\in \{1, \dots n\}$;

es_i^1 - entrepreneurial spirit describing the tendency to become an independent leader;

hc_i^1 - human capital representing the level of knowledge and abilities of the actor;

vc_i^1 - venture capital and/or the actor's financial potential;

w_i - the actor's new knowledge based on innovations (taking the value of 0 or 1).

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[6] About other applications of the theory of evolution in the business studies please read in Sieja and Wach (2019). This article contains a detailed discussion of the theory of natural selection.

[7] Alchian's (1953, pp. 600-603) answer to the critique of his theory by Penrose (1952, pp. 804-819) is rather interesting. Both polemical articles were published, as well the comments of other scientists commenting on their debate.

To survive, the actors seek in others those endowments that they themselves lack, and do this mainly by way of social networks. In this way, they seek the resources and competence they lack in the understanding of Penrose's theory. In accordance with Ronald Coase's conception, some of them are proper to these actors, while they must seek out others on the market. On the basis of entrepreneurial theory, the described mechanisms take place in the conceptualization phase of starting a business.

The adaptation process runs its course in the form of permutations of those actors who are not yet engaged in business practice on the basis of randomly-selected *k* actors with the goal of their evaluation in terms of usefulness for the growth of a potential firm. The effect of this adaptation is a potential firm, which can be written mathematically as a triple additive set of traits of actors *k* composing the firm:

$$pf_q^t = \begin{pmatrix} \sum_{i=1}^{k} es_{i\in k_q^t}^t \\ \sum_{i=1}^{k} hc_{i\in k_q^t}^t \\ \sum_{i=1}^{k} vc_{i\in k_q^t}^t \end{pmatrix} \rightarrow PF^t = \left\{ pf_q^t \left(= ce_q^t \right) \right\}_{q \in \{1, \cdots, m\}} \tag{2}$$

where:

pf_q^t - potential firm based on an additive set of traits of actors *k*;
PF_q^t - potential firms at time *t*;
ce_q^1 - overall "endowment" of all actors identified with pf_q^t;
q - specific potential $q \in \{1, \dots m\}$.

Aside from autogenic factors connected with the actors, it is indispensable to take into account allogenic factors, which influence the behaviour of both the actors and potential firms. This is the reason why the authors of the model introduced the variable ψ^1 into it, which they called the founding threshold. It expresses the influence of the mezzo- and macro-environment, which is negatively correlated with the growth index of sales in sector ω^1. Thus, the growth index of sales in the sector decreases the level of profitability, which, in turn, is negatively correlated with the rate of return ru^1. Hence, there is a positive correlation here with the exit rate d*t* in time *t* (Grebel, Pyka, & Hanusch, 2003, p. 504). This can be written mathematically as follows:

$$\psi^t = \psi \left(\frac{dw}{dt}, d^t, ru^t, t \right) \tag{3}$$

If the potential firm pf_q^t, entire endowment of all actors ce_q^1 crosses the founding threshold ψ^1, the actors decide to found a firm. In this way, the potential firm pf_q^t transforms into an actual firm f_q^t. At the same time, ce_q^1 transforms from potential to actual ce_j^1, and the firm founded in this way is their set, which can be written mathematically as:

$$F_{nowe}^t = \left\{ pf_q^t \colon \sum_{q_j}^{q_k} pf_q^t > \psi^t \right\}_{pf_q^t \in PF^t} \tag{4}$$

On this basis we can mathematically determine all firms founded in time *t* with a formula (7). The actors who were not engaged in founding the firm, along with their resources, remain free and may be subject to evolution in the future. On the other hand, formula (8) expresses the complete endowment of a firm *j's*. The actors engaged are no longer available on the market, which decreases the probability that other actors will find potential partners.

$$F^t = \left\{f_j^t\right\}_{j \in \{1,\dots,x^t\}} \Leftrightarrow \bigcup_0^T F_{nowe}^t \tag{5}$$

$$f_j^t = ce_j^t = ce\left(\sum_{i=1}^k es_i^t, \sum_{i=1}^k hc_i^t, \sum_{i=1}^k vc_i^t\right)_{j \in \{1,\dots,x^t\}, \ i \in a} \tag{6}$$

On the other hand, the number of firms x^t present in the sector increases by the number of newly-founded firms F_{nowe}^t in relation to the period t_{-1}, which can be mathematically written as:

$$x^t = x^{t-1} + |F_{nowe}^t| \tag{7}$$

The survival of firm f_j^t on the market or the threat of its downfall, i.e. exit, depends on its set of endowments and aggregated composition of its abilities that determine its competitiveness. The relation between human capital and venture capital determines the permanent costs. Individual variable costs decrease in time in connection with the learning curve and simultaneously gain efficiency. The survival or fall of a firm is therefore the combination of the individual supply curve and profitability of the firm, which in this case fulfils the function of adaptation in accordance with the theory of evolution. This can be expressed mathematically as:

$$p_{jt} = y_{jt} - \eta x_{jt} + \frac{h_{jt}}{n-1}\sum_l p_{l,t-1}; \qquad j, l \in \{1,\dots,n\}_t \tag{8}$$

Evaluating the model (see Figure 3), we can say that it is a rather successful attempt at reconstructing evolution in modelling the growth of small and medium-sized firms. The model is well-thought out; the empirical data collected during qualitative studies (stochastic convention) is solidly quantified here through its standardization and endowment with quasi-permanent traits. Of course, a defect of the model is its limitation to only a few factors, while the reality of a firm's growth should be examined multi-laterally. This is just a model, however, and is simplified as every model is. The advantage of this model is its empirical verifiability as conducted by its authors.

On the basis of this convention, we can accept the axiom that an increase in the firm's measureable resources directly refers to quantitative statics based on the replication and reproduction[8] of both allogenic (exogenous) entry factors, and autogenic (endogenous) resources of the firm, and in this sense lacks qualitative dynamics. The quantitative growth process (quantitative gain) does not lead to long-term improvements in productivity. The qualitative growth process (qualitative gain) is necessary here, as it is based on transformation and structural metamorphosis, which do lead to long-term improvements in productivity, and in effect to the growth and increase of the firm.

The Resource-Based View

The resource-based view created by Penrose (1959) explains growth in terms of the proper configuration of resources and capacities. This view reached its apex in strategic management in the 1980s and 1990s. The newest literature transformed the initial understanding of the configuration in the direction of the endowment of the firm with resources and capacities.

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[8] Here, replication and reproduction are terms borrowed from the natural sciences and should be understood as such.
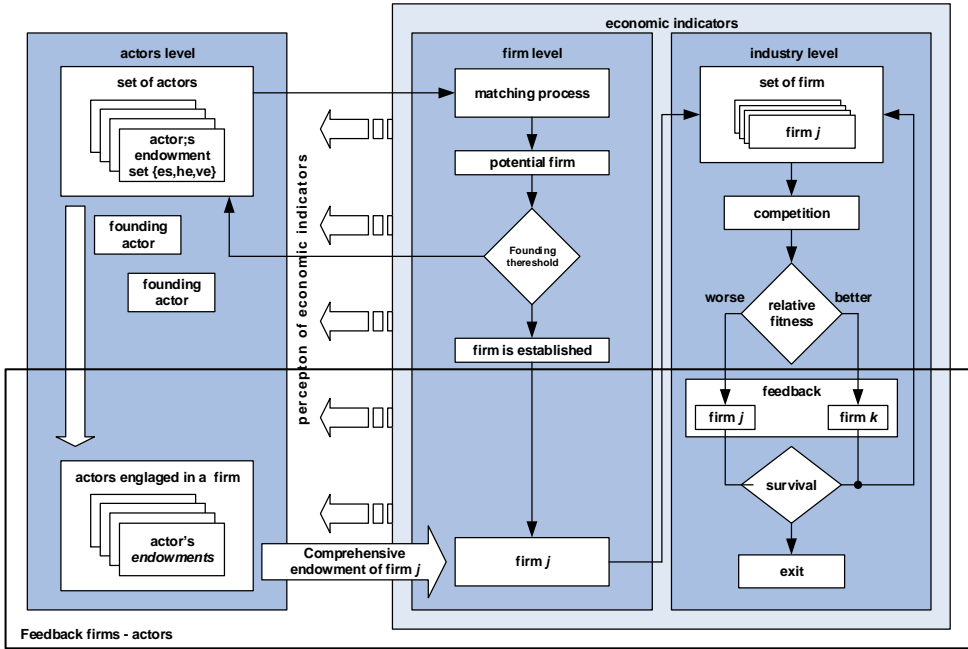
Figure 3. Evolutionary Model of the Growth of Small and Medium-Sized Firms
Source: Grebel, Pyka, and Hanusch (2003, p. 506).

In the literature, the analysis of the growth of small and medium-sized firms from the resource-based perspective is conducted mainly on the basis of Penrose's initial assumptions, who dedicated a chapter of her well-known book to the growth of SMEs (Penrose, 1959, pp. 215-228).[9] The two main resource factors of the growth of small firms she distinguished are above-average entrepreneurial skills and the entrepreneur's financial capital. She perceived the competitive advantage of small firms in their discovery of the already-mentioned "interstices" in the economy (Penrose 1959, pp. 222-223).

Various typologies of the resources of firms appear in secondary literature. An interesting typology was created by Johnson, Schooles, and Whittington (2009, p. 61), who distinguish material and immaterial resources. Material resources encompass physical, financial, human, and intellectual resources. Immaterial resources, on the other hand, are immeasurable and include information, reputations, and knowledge. On the basis of resource-based theory, they distinguished two levels of these resources – threshold resources (allowing the firm to function) and unique resources (helping the firm to achieve a competitive advantage in the market).

Barney (1997, pp. 143-144; 1991, pp. 99-120) distinguishes four categories of resources: financial capital, physical capital, human capital, organizational capital. He em-

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[9] This refers to *Chapter X. The Position of Large and Small Firms in a Growing Economy*.

phasizes the role of rare strategic resources, which guarantee the firm a lasting competitive advantage. His conception was initially applied mainly to large firms; however, it was developed by other authors and adapted to the needs of SMEs.

Interesting studies in this area were conducted by Ong, Ismail, and Goh (2010, p. 387), on the basis of which they confirmed the hypothesis that the two basic strategic resources of small and medium-sized firms from the perspective of resource-based theory are entrepreneurship and happiness. In studies on the growth and development of small and medium-sized firms, two types of resources are generally distinguished – financial and human (Wasilczuk, 2000), though it should be added that in recent times this approach has begun to evolve.

The Learning Approach

Learning models are by nature interdisciplinary, though the managerial science approach is the most visible here. The concept of learning organizations is widely discussed in secondary literature (Wyer, Mason, & Theodorakopoulus, 2000, pp. 239-259). The entrepreneur is forced to react to the actions of the competition, client needs, and signals from the partners he/she cooperates with. Changes in his/her behaviour result from the entrepreneurial learning process, also called experimental learning. Deakins and Freel (1998, p. 147) perceive a reference to Schumpeter's thought here, due to the dynamics of the influence of forces that force small firms to adapt and be innovative.

In the literature, there are numerous models rooted in this approach. Recently, an interesting view on the growth of small and medium-sized firms through knowledge and learning was proposed by Phelps, Adams, and Bessant (2007, pp. 1-30). They based their conception on states, setting them in contrast to stages. The growth of small firms consists in moving from the state of ignorance through awareness, familiarity, and implementation. Strategy, a formal system, financing, human resource management, operational efficiency improvements, and entering markets are all factors of growth. The basis of the growth process for firms is the absorption of knowledge and making proper use of it (Figure 4).

The learning process also occurs through the functioning of formal and informal networks, including within the framework of the firm's support system. For example, firms functioning within the entrepreneurial incubator can learn from one another. The learning process allows them to reach a higher level of growth, to achieve a higher level of quality. The ability to learn is especially essential in the age of economies based on knowledge. On the one hand, the learning process is natural in small firms, seeing as though they are in direct contact with their clients and are able to quickly read signals from the market, which, giving them greater flexibility, guarantees them a privileged position in regards to large firms. On the other hand, due to their limited resources, the learning process depends mainly on the attitude of the entrepreneur-owner, there are no teams here which could implement and shape the learning process.

The Managerial-Strategic Approach

The managerial convention (also called the strategic or managerial-strategic convention) is based on the theory of organization and management, and in its more in-depth form on strategic management. The growth of small and medium-sized firms is most often explained with the help of the same methods and tools that the managerial sciences
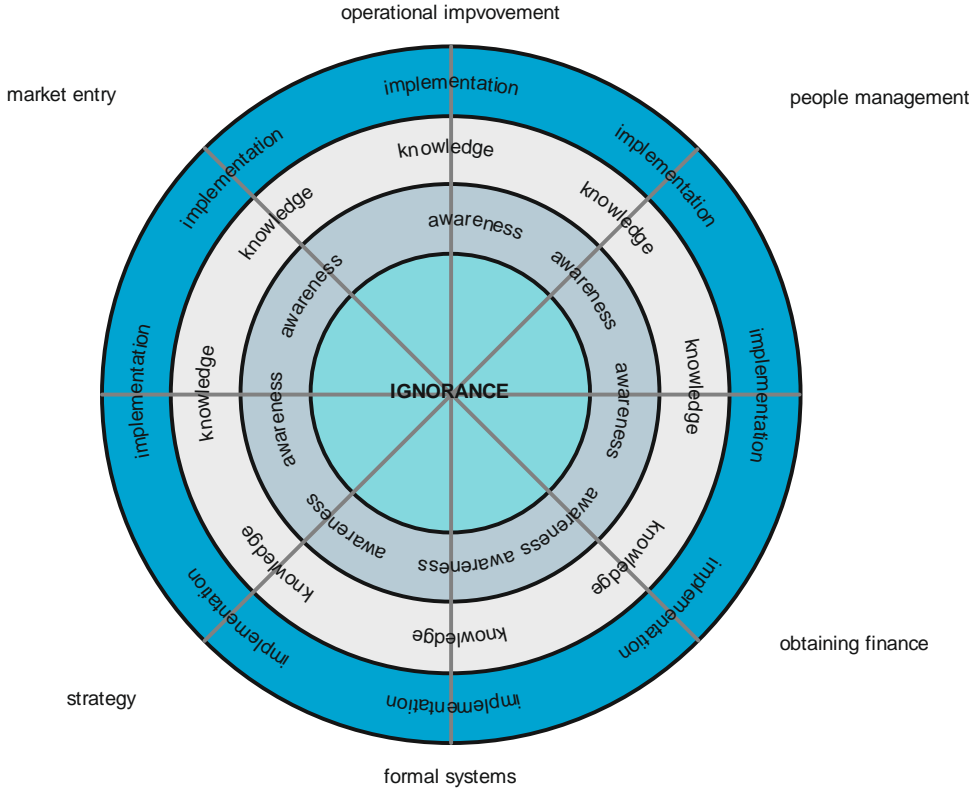
Figure 4. Model of Small Business Growth through Learning
Source: Phelps, Adams, and Bessant (2007, p. 13).

elaborated for large organizations. Frequently, these include comparative analyses between small and medium-sized firms and large firms. The studies conducted within the framework of this convention are multi-lateral, as they concern almost all aspects of managing a firm. In regards to small and medium-sized firms, a decisional approach is the most common, according to which the growth of a small firm depends on the efficiency and effectiveness of the decisional process. The second group encompasses the structural approach, according to which the growth of a firm causes changes in its organizational structure. For example, Churchill and Lewis (1983, pp. 30-50) studied the changes of structure and strategy of small and medium-sized enterprises, and their model combined the structural and phase approaches.

The Econophysical Approach

Econophysical convention[10] uses physical models to describe and model economic phenomena, their exact mathematical reflection is used in finance (as well as economics), while in

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[10] Econophysics is a field of science that studies phenomena appearing in complex economic configurations and in financial markets with the help of tools and concepts used in physics.

management (and economics) physicalistic analogies are mainly used. Chaos theory, complexity theory, catastrophe theory, non-linear dynamics systems theory, the theory of self-organized criticality, and the theory of self-organization of dissipative structure are all econophysical theories developed in the economic sciences (Grobman, 2005, pp. 351-384).

Australian economist Aislabie (1992, pp. 307-314; 1984, pp. 129-142) successfully conceptualizes the growth model for small firms based on catastrophe theory,[11] and his conception from the 1990's, based on Zeeman's model of canine aggression, is the most popular growth model for small firms within the framework of econophysical convention. It would be worthwhile to introduce the basic problems in catastrophe theory before discussing this model to better understand the proposed conception.

Elementary[12] catastrophe theories determine the dependence of traits of the set of critical points K of the potential function $V(x; c)$ on the control parameters c. This never-dense set K, called the catastrophe set, takes the following mathematical form:

$$K = \{(x; c): \nabla_x V(x; c) = 0\} \tag{9}$$

where:

$$x = (x_1, \ldots, x_n);$$
$$c = (c_1, \ldots, c_k);$$

∇_x **-** vector of partial derivatives calculated in relation to the x variables.

Thom (2014), specifying his conception on the basis of mathematical modelling, distinguished five types of catastrophes (fold, cusp, swallowtail, butterfly, and wigwam). Here, a catastrophe is understood as the sudden movement of the studied configuration into a new state and lacks pejorative connotations.[13] Since the configuration aspires to minimize potential energy, the points minimizing this energy constitute the surface of the catastrophe (one of two areas in catastrophe theory). Thus, the set of singularities Σ, which can be called a behavioural graph in economic terms, is a subset of the catastrophe set, of such variables x and control parameters c, for which the value of both derivatives of the potential function equal 0. Mathematically, it takes the form:

$$\Sigma = \{(x; c) \in K: V_x''(x; c) = 0\} \tag{10}$$

Bifurcation set B encompasses all control parameters c, which along with the proper x generate catastrophe. The set is obtained by projecting set Σ onto the area of control parameters (the second area in catastrophe theory). Mathematically, it is written thusly:

$$B = \{c: \vee_x(x; c) \in \Sigma\} \tag{11}$$

Catastrophe theory analytically explains sudden changes in a system's behaviour that came about as a result of minor changes in the factors determining the balance of states that a given system can achieve (Scapens, Ryan, & Fletcher, 1981, p. 2). Thus, it can serve to model the growth of a firm caused by sudden change.

Aislabie (1992) accepted that the series of singularities in modelling the growth of small firms (Figure 4) is the function of assets and turnover, which in turn translates into profitability at the control level. The level of assets is determined in his view in a bi-polar manner

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[11] Catastrophe theory was created by French mathematician René Thom, though a great contribution to this theory was later made by Christopher Zeeman.

[12] The term "elementary catastrophe theories" in secondary literature refers to mathematical modelling.

[13] The number of catastrophes present is finite and cannot be over 5, since after that moment it becomes infinite and is no longer a manifestation of incontinuity.

as "asset poor" and "asset-rich". Both assets and turnover are, according to catastrophe theory, conflicting factors. These factors are presented on the control level, while the firm's behaviour (attack and flight) are presented on the y-axis. Three types of behaviour are possible here – bimodality, hysteresis, and divergence. Bimodality means that with the appearance of the curve (one of the five types of catastrophes), the path of growth either moves in the direction of growth, or regress, since the system can take two values between two coordinates of the catastrophe set. Hysteresis appears when changes in the entry conditions influence the firm's growth leading to its downfall. Divergence, on the other hand, means that the paths of growth can be initiated by slightly different entry conditions, though in effect they may lead to two completely different effects: the first growth path may end up at the bottom, the second at the top of the plane (Aislabie, 1992, p. 209). Catastrophe theory presents the entire path of the object as continuous change that is interrupted by sudden qualitative changes. It combines the two apparently contradictory phenomena of "evolutionariness" and "revolutionariness" into one coherent conceptual system (Jakimowicz, 2010). The postulate of Cameron (1986, p. 545) that effective organizations must possess simultaneously contradictory, or even exclude, attributes can be seen here. Though Aislabie's conception is interesting, its defect is the fact that it is only analogically physicalistic. A mathematical elaboration of catastrophe theory still remains a millennial problem, though mathematician, physicists, and financiers do note progress in this area.
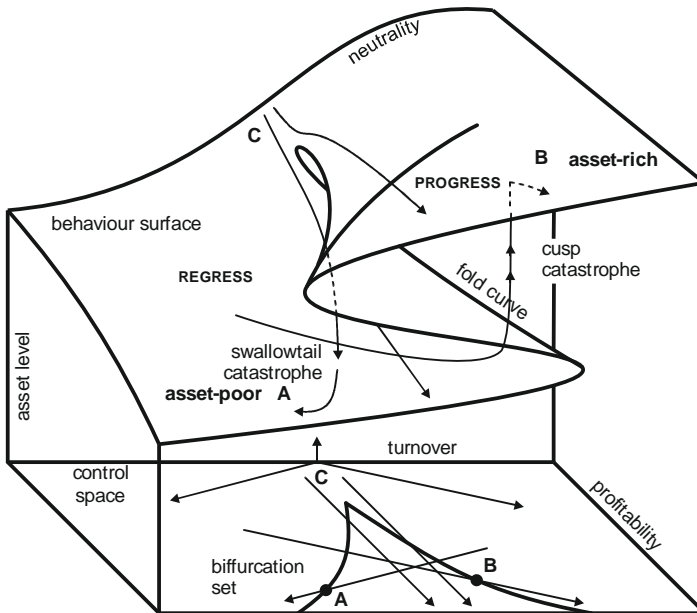

**Figure 4. A Model of the Growth of Small and Medium-Sized Firms
from the Perspective of Catastrophe Theory**
Source: Aislabie (1992, p. 310) – with my own modifications, Aislabie's graphic model is supplemented
with information taken from Zeeman's initial theory on the basis of Thom (2014, p. 84).

The Sustainable Models

Within the last decade especially, the question of the economy's influence on the natural environment has been undertaken, as economic growth – a result of firm growth, among other things – may cause essential degradation and a lessening of the quality of the natural environment. In this context, we may speak of a firm's sustainable or unsustainable growth. It is accepted that a firm's sustainable growth requires the reconciliation of three pillars – economic, ecological, and social (Smith, 2011, p. 6). Sustainable growth is not only conducive to increasing managerial effectiveness, but also to protecting the environment and an increase in social welfare, since its basic assumption is that the economy is a sub-system of the biosphere. As Smith and Sharicz (2011, pp. 73-74) emphasize, the concept of sustainable growth is based on *triple bottom line* (TBL) assumptions, which cause the entire firm in its economic activities to take on a biological attitude of survival, eliminating all negative consequences of its activities for social and economic systems. In contrast, growth which only takes into account the economic dimension is unsustainable growth.
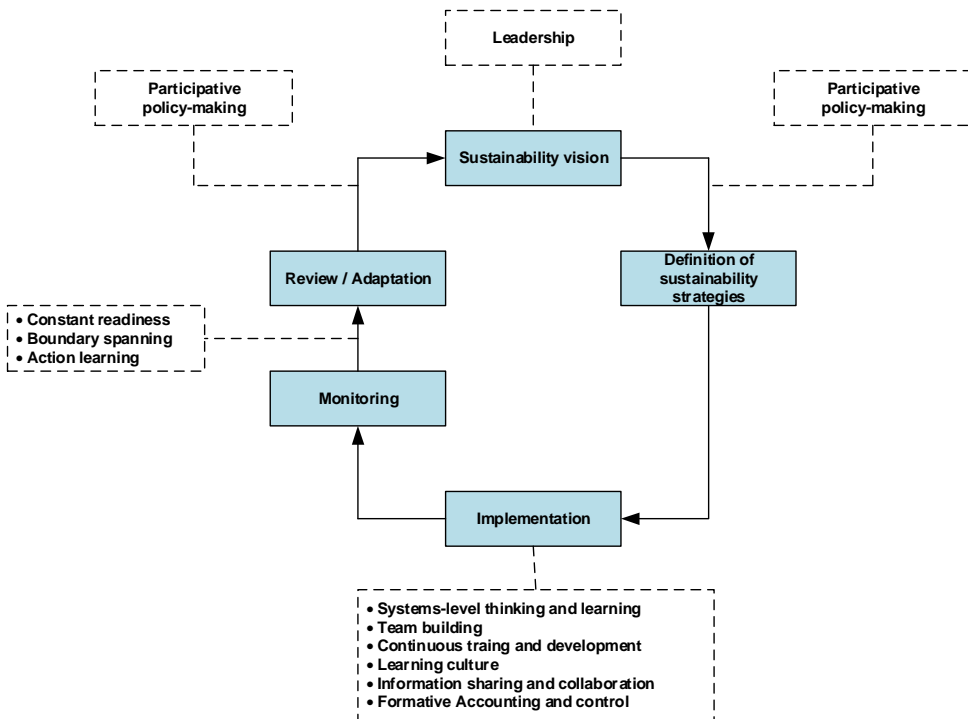

Figure 5. Sustainability Performance Measurement from an Entrepreneurial Perspective
Source: Jamali (2006, p. 817).

In the literature, there are numerous models rooted in this approach. For example, Jamali (2006) proposes a rather interesting system of measurement constructed from the perspective of entrepreneurial theory and practice. The system he proposes, called *sustainability performance measurement* (SPM), is a complex measurement instrument that

makes use of the integration of three groups of indicators – economic, ecological, and social, which corresponds to the needs of the entrepreneurial perspective, especially when it comes to the social aspect. He also makes a combined evaluation at three stages of growth projection, namely planning (including a vision, which is key in entrepreneurship), implementation, and overview. During the last stage, adaptation according to the processual view of management may occur (Figure 5).

CONCLUSIONS

Firms (micro, small, and medium, as well as large) do not grow only of themselves, they function in the market and even in the wider social system, which John Stuart Mill already emphasized in the economic thought,[14] while in organizational thought the conception of the dependence of the firm on its environment was popularized by Kenneth E. Boulding.[15]

This article paid special attention to modelling of corporate growth of small and medium-sized enterprises, which in the case of firms of this size class run differently than in the case of large companies and international corporations, for which various models are mainly created. A detailed literature query, conducted for the purposes of this article, identified eight approaches to modelling corporate growth (growth of small businesses). Those are (i) stochastic approach, (ii) stages models, (iii) evolutionary approach, (iv) resource-based view, (v) learning approach, (vi) managerial approach, (vii) econophysical approach, and (viii) sustainable models.

Like any scientific article, this article is not free from research limitations. The results are exploratory, descriptive and can be considered the basis for further steps. Therefore, the next research stage should consider a much broader spectrum in the subject approach. The overview in this article answered three exploratory questions at a general level. Thus, the next research stage should account for the specific results in the literature.

The literature query and the process of logical reasoning based on the collected material allows to outline several directions of further research. Firstly, future studies should conduct a detailed bibliometric analysis with a map of connections that will allow a classification of research areas. Secondly, scholars should prepare a more integrated approach towards the growth of small businesses, which will include more factors rooted in the entrepreneurship theory.

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[14] John Stuart Mill (1806-1873) believed that economic activity should be analysed within the wider context of the entirety of human social activity.

[15] Kenneth E. Boulding (1910-1993) popularized the assumptions of Ludwig von Bertalanfy's general systems theory in organizational theory and management. The systemic approach emphasized that a firm is a system open to its environment, and its endurance depends on the firm shaping the proper relation with its environment.

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Technologies, Opportunities and Challenges of the Industrial Revolution 4.0: Theoretical Considerations

Jan Rymarczyk

A B S T R A C T
Objective: The aim of this article is to identify the impact of the Industrial Revolution 4.0 (IR 4.0) on the production processes of goods and services, their ground-breaking changes, and their potential economic, social, and political consequences.
Research Design & Methods: The article was based on available literature and online sources. The discussion of the reviewed sources leads to the formulation of three research propositions.
Findings: The technical progress that occurs in modern societies is divided into 4 phases called industrial revolutions. It is assumed that the current phase, i.e. the IR 4.0, began in 2000. It is characterized by the industrial implementation of breakthrough inventions such as the Internet of Things, artificial intelligence, advanced robots, autonomous vehicles, cloud computing, big data, augmented/simulated reality, 3D printing, blockchain, nanomaterials, and digital twins.
Implications & Recommendations: The sooner the inventions and technological phenomena of the fourth industrial revolution will be implemented by particular economies, the sooner the economic effects of this revolution will emerge in the global economy.
Contribution & Value Added: The application of breakthrough inventions will cause revolutionary changes in the process of goods production and services, which are synthetically called an intelligent factory and an intelligent supply chain. In addition to the undoubted benefits of – primarily – technical, organizational, and economic nature, many believe that the IR 4.0 will bring threats in the form of rising unemployment, social stratification, threats to cyber security, violations of privacy, ethics, and social norms, a threat of wars based on new inventions and a growing division of the world into rich and poor countries.
Article type: Conceptual article
Keywords: industrial revolution 4.0; breakthrough technologies; intelligent factory; intelligent supply chain; blockchain; digitization; digitalization
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INTRODUCTION

The most important and immanent factor in the development of civilization is technical and technological progress (Upadhyay, 2019). Over the centuries, technological progress determined economic, social, political, and cultural changes that influenced it as well, i.e. they could have favored it or inhibit. In periods when these factors converged, inventions emerged that created breakthroughs in material production processes (Benazzouz, 2018). Modern history distinguishes four such partially interpenetrating and – at the same time – progressive phases called technological revolutions, from the point of view of the level of technological development and technology. They cover a period of slightly over 250 years, which attests to the huge acceleration in the development of science and the implementation of its achievements in production processes (Młody, 2018). Revolutionary changes in this sphere began in the second half of the eighteenth century and were associated with the invention of the steam engine along with its widespread use in transport, metal, and textile industries. Coal and oil have become the main sources of energy for the production of steam. The emergence of a new energy source – electricity – meant a transition to the second industrial revolution in 1870-1914. Electric light, internal combustion engine, and phonograph were inventions representative of this period. A revolutionary change in the organization of factory production was the introduction of an automated production line and assembly line work that enabled mass production, initially in the automobile industry (Wyciślak, 2017). A transition to the third industrial revolution in the 1980s was determined by digital technology, i.e. increasingly common digitization going far beyond the sphere of industry (Petrillo, De Felice, Cioffi, & Zomparelli, 2018; Prisecaru, 2016). Digital information and communication technologies, the Internet, computers, mobile phones, automation, and robotization found application in many areas of production and social activities. They also form the elementary conditions for the industrial revolution 4.0, whose beginning is conventionally situated in the year 2000. However, unlike the previous revolutions, 4.0 is characterized by much more perfect, wider, deeper, and more complex and systemic applications of mentioned inventions along with the emergence of new breakthroughs. Their combination causes the disappearance of differences between the physical, digital (cyber-physical systems, CPS) and biological (Schwab, 2016a, p. 3) spheres, whose effects predicted by some in the perspective of the next 20 years. In the long run, however, these predictions are close to science fiction, such as the thesis about the elimination of people by super-intelligent robots.

The aim of this article is to identify the impact of the Industrial Revolution 4.0 on the production processes of goods and services, their ground-breaking changes, and their potential economic, social, and political consequences. The article argues that they will be inevitable, because they result from logical civilizational development, determined by challenges related to globalisation processes, and will have both positive and negative consequences, with the predominance of the former.

This short introduction is followed by a brief description of the applied research methodology along with literature review and theory development organized in three interrelated parts related to the conceptualization of the industrial revolution, namely i) technologies as stimulating factors, ii) positive effects and benefits, iii) threats. The article ends with conclusions.

MATERIAL AND METHODS

The article is based on available literature and online sources. This is a theory development article, which relies on literature review and desk research.

This conceptual article derives research propositions from literature review and desk research of current business press papers, professional reports, company web pages and blogs, because this subject is relatively new in the theory of economics and international business. We searched through secondary literature with a combination of two screening terms "industrial revolution" and one of the features describe in this article. Many research articles published so far on blockchain originate from computer science. Nevertheless, the focus of this article was business, management, economics. What must be stressed is the fact that many of these sources present similar perspectives, but only this article cites only the most relevant ones.

To conclude, this article should be considered as a conceptual paper, in which literature review and desk research lead to the development of theoretical propositions. As for the scientific approach, this article uses a qualitative design of research, the method of indirect observation, cause-effect analysis, and predictive synthesis, modelling, induction, and description.

LITERATURE REVIEW AND THEORY DEVELOPMENT

Factors That Stimulate and Constitute the Industrial Revolution 4.0

The contemporary world economy is shaped by two fundamental phenomena, i.e. globalisation and regionalism. These two megatrends cause fundamental changes not only in the economic but also in the social, political, and cultural sphere (Rymarczyk, 2012, pp. 27-41). Along with their progress, the complexity, turbulence, and unpredictability of economic processes increases, so that competition intensifies and new forms appear, such as coopetition, i.e. combining cooperation with competition to obtain a better position on the market. The company's success depends on meeting the challenges dictated by the markets. Companies rely on the ability to produce and provide customers with high-quality products and services in the shortest possible time, tailored to their individual preferences, taking into account the pressure to reduce costs and prices, resource limitations, and environmental protection requirements. This situation requires revolutionary changes in the production process that ensure high innovation, flexibility, efficiency, transparency, close vertical and horizontal integration of activities, and the shortening of the cycle of creating and commercializing effects (Rymarczyk, 2012, p. 44).

The new production paradigm that meets the above criteria, currently *in statu nascendi*, is called the industrial revolution 4.0. The term is used interchangeably with the term industry 4.0. It can be defined as a comprehensive transformation of the value creation chain, which involves the use of digital production technology via the application of the Internet of Things, artificial intelligence, advanced robots, autonomous vehicles, cloud computing, large data sets, augmented/simulated reality, 3D printing, nanomaterials, distributed databases, and twin technology for artificial intelligence products (see Figure 1).

The Internet of Things (IoT) consists in connecting to the internet of people, objects, products, processes, and systems in the form of a virtual network that enables mutual

communication in real time (Gubbi, Buyya, Marusic, & Palaniswami, 2013, pp. 1645-1660). This supports the collection, processing, and transmission of information to optimize the management of the environment, which can mean factories, houses, vehicles, and devices that monitor and control the course of supply, production, transport, and distribution.
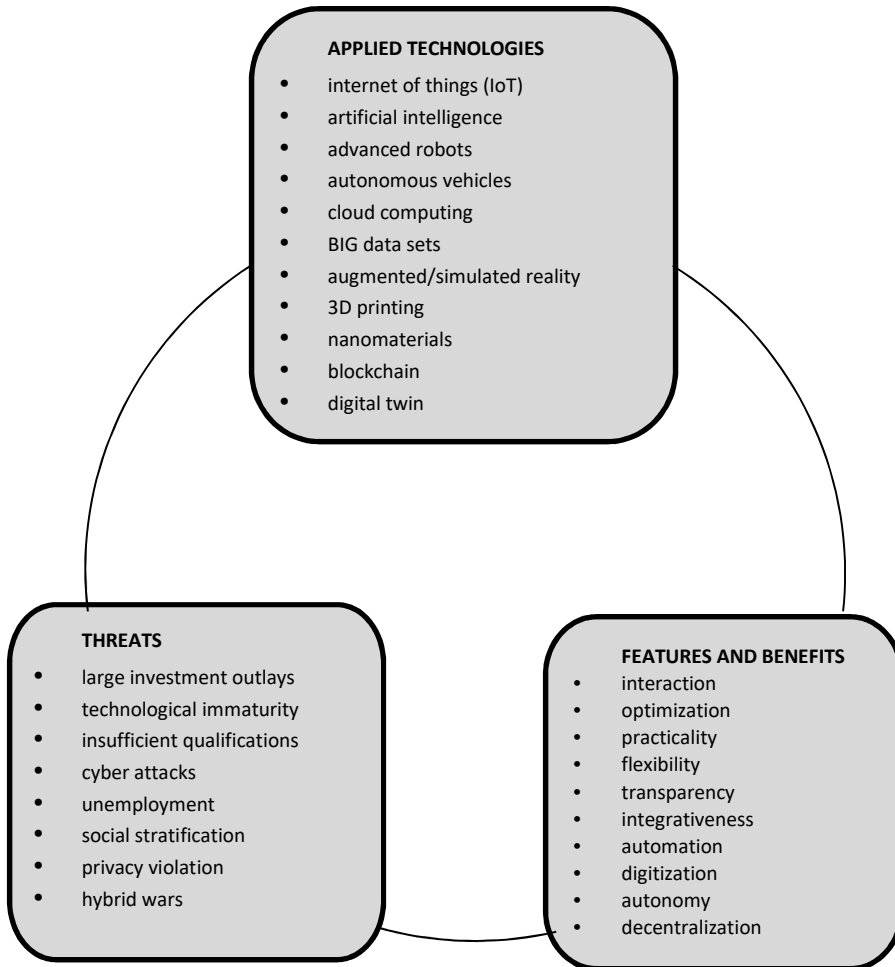
APPLIED TECHNOLOGIES
- internet of things (IoT)
- artificial intelligence
- advanced robots
- autonomous vehicles
- cloud computing
- BIG data sets
- augmented/simulated reality
- 3D printing
- nanomaterials
- blockchain
- digital twin

THREATS
- large investment outlays
- technological immaturity
- insufficient qualifications
- cyber attacks
- unemployment
- social stratification
- privacy violation
- hybrid wars

FEATURES AND BENEFITS
- interaction
- optimization
- practicality
- flexibility
- transparency
- integrativeness
- automation
- digitization
- autonomy
- decentralization

Figure 1. Industrial revolution 4.0 and its threats, benefits, and technologies
Source: own elaboration.

Artificial intelligence, also called machine intelligence, means the ability of devices to perceive the environment and autonomously take actions to maximize their chance of success (Shabbir & Anwer, 2015, pp. 1-9; Warwick, 2012, pp. 31-32, 88-89). Complex algorithms can:

− acquire knowledge and analyze it,
− recognize speech and people,
− recognize letters and images,

- translate texts,
- learn to make decisions,
- monitor, report, and solve technical problems in production,
- assess the creditworthiness of bank customers,
- plan advertising campaigns,
- create songs and works of art etc.

Artificial intelligence can be applied in all stages of value creation and supply chain, radically changing the business model. It is believed that intensive work on its development may in 20 years lead to reaching the human level and, in a more distant perspective, even to its surpassing.

Advanced robots are cyber-physical devices that operate based on computer algorithms partially or completely autonomously. They combine artificial intelligence with physical elements (Freeman, 2018; WEF, 2017). Advanced robots have the ability to communicate with people or other robots and correct their activities based on information downloaded from the cloud. They can operate in an unorganized, uncertain, and dangerous environment, change production parameters without need for full reprogramming, and cooperate with people in a safe way. They can be used in virtually all areas of human activity and – above all – they will be the basis for the functioning of an intelligent factory.

Autonomous vehicles (AVs) are a variation of cyber-physical devices that have the feature of mobility. They are used in internal transport within companies, for movement between warehouse and production facilities, in production and distribution. In the future, they will be widely used in public and intercity transport. They will ensure that loads arrive at their destination precisely, safely, and on time (Bonnefon, Shariff & Rahwan, 2016). The risk of breakdowns and accidents caused by driver errors and fatigue will be reduced. Traffic will become smoother, traffic jams will lose frequency, fuel and electricity consumption will drop, transportation will cease to be one of the factors that contribute most to air pollution and climate change, not to mention its costs will decrease. The mobility of people, including the disabled, will increase and the living conditions in cities will also improve as a result of deglomeration stimulated by the ease of transportation, its accessibility, and cheapness. Moreover, cars, drones, air taxis, and automated boats will be widely used in industry, agriculture, environmental protection, medicine, and services.

Cloud technology is the effect of computing services, servers, databases, networks, software, data storage, and analysis via the Internet (Erl, Mahmood, & Puttini, 2013, pp. 26-50). There are four basic categories of cloud services, namely the provision of:

- infrastructure (servers, networks, operating systems, virtual machines),
- platforms, i.e. environments for developing, testing, downloading, and managing applications,
- serverless information processing,
- software.

Clouds can be public when services are provided by external providers (e.g. Microsoft Azure), private when cloud resources are used by one company, and hybrid when they combine public and private cloud.

The use of cloud technology eliminates the need to incur capital expenditure for the purchase of hardware and software, which reduces labour consumption associated with

the performance of Information and Communication Technology (ICT) management activities, provides quick access to desired amounts of ICT resources, and secures its use.

Big Data are sets of data that are too large or too complex to be processed with traditional software applications (Pauleen & Wang, 2016). The amount of information around the world is unimaginably large and constantly growing. The problem resides in finding, collecting, analysing, sharing, transferring, and protecting relevant data, i.e. managing data. Large data sets are characterized by:

– volume, i.e. the amount generated and produced,
– diversity (text, e-mail, video, audio documents, and their combination),
– variability, i.e. the rate of inflow,
– complexity, i.e. the range of their types,
– veracity, i.e. their credibility.

Information from the analysis of large data sets can be used in production management to increase efficiency, reduce costs, shorten production cycles, reduce losses, determine and prevent the causes of failures, and to increase product innovation. In banking, data sets enable risk minimization, elimination of fraud, and complete an up-to-date knowledge of clients' financial standing. In commerce, Big Data can improve transaction management and facilitate customer relationships. In education, it will promote the development of the education system and curricula. In healthcare, Big Data will improve patient service and counting efficiency. Moreover, it will improve the functioning of the public services sector.

Augmented reality is a system that in real time connects the real world – usually in the form of an image – with a virtual, computer-generated world. The effect appears due to the overlap of these two images, which enriches human experience, although it can also be used to simplify/mask certain elements of reality (Jung & Dieck, 2017). The augmented reality can be obtained with such mobile devices as smartphones and tablets, glasses, helmets and braces, special devices (head-up displays; HUD), contact lenses, and – in the future – also virtual retinal displays (laser images in the human eye). The most popular use of augmented reality is for video games, but the technology has a more serious application in such fields as industrial design and construction, medicine, commerce, navigation, and education. In medicine, augmented reality will allow doctors virtual access to the structure and functions of human internal organs; in commerce, it will support clients in choosing products by multimedia projection in various contexts; in navigation, it will provide better orientation about the location of an object, especially in conditions of limited visibility; in education, it will create interactive training models.

3D printing involves the production of three-dimensional products from a digital file (Ramya & Vanapallis, 2016, pp. 398-408). The products come to being due to the application of successive layers of material until the desired effect is obtained in the form of the final product. The materials can be thermoplastics, ceramics, metal powders, composites, glass, or food products. Traditional production first requires the preparation of moulds or dies, which is expensive and labour intensive. 3D printing eliminates this stage, significantly shortening the production cycle and reducing its costs. Based on digital design, products with very complex shapes can be produced, consisting of but a single part, whereas traditional production usually requires the assembly and welding of many elements. This ensures greater strength and durability of 3D-printed products, their more

accurate reproduction, more flexible design, and material savings. 3D technology is used in prototyping for such works as the production of machine parts, cars, aircrafts, drugs, implants, clothing, footwear, weapons, and for copying works of art or replenishing missing parts. Due to its low price, ease of use, and low transport costs, 3D print will have a special application in the customization of products, i.e. even their individual production, according to consumer preferences near their location.

Nanomaterials are objects or artefacts of very small dimensions measured in nanometres. One nanometre is about one millionth of a millimetre. For comparison, human hair is a million times thicker (Pitkethly, 2004, pp. 20-29). Nanometric particles are found in nature and are created from various products, such as silicon, silver, carbon, titanium, gold, and crystals. They can be used in industry to produce products of low weight, volume, and with extremely high strength and resistance of external influences (e.g. car, aircraft, and other vehicle casings), self-healing materials, i.e. repairing without human intervention, and self-cleaning, i.e. having the ability to remove dirt and bacteria from a surface. In construction, nanomaterials will be added to cement and other building materials to strengthen them. Due to their small size, large electric conductivity, and electromagnetic impulse capacities, they will be extremely useful in electronics. In medicine, nanopharmaceuticals can precisely target specific parts of the human body and destroy cancer cells without damaging others. Nanomaterials also increase the effectiveness of many cosmetics. Moreover, they will find wide application in environmental protection due to their high chemical reactivity. For example, scientists developed with nanomaterials a substance that absorbs carbon from the air and turns it into a useful product.

However, studies show that nanomaterials can be harmful to human health due to their high toxicity. Therefore, their widespread use must take into account this threat and take precautionary measures.

Blockchain is defined as an open distributed book, in which transactions between two parties are recorded in a direct, effective, permanent, and verifiable manner (see Nowiński & Kozma, 2017). The transactions can also be started automatically on the basis of a special program (smart contracts; Iaansati & Lakhani, 2017, pp. 118-127; Dhillon, Metcalf, & Hooper, 2018, pp. 233-234). There are five basic features of blockchain:

- distributed database. Participating parties have access to a fully decentralized database that records digital transactions. They cannot control them, but they can verify without an intermediary;
- peer-to-peer transmission. Communication takes place directly between peer nodes (links) without a central node, while each node stores and forwards information to all other nodes;
- transparency with pseudonymisation. Each system participant has an insight into all transactions contained in it and has a unique address of more than 30 characters that identifies it. Transactions happen between these addresses;
- irreversibility of records. Once the transaction data has been entered into the system, the record cannot be changed, because it is associated with the preceding one via a string. Each subsequent node contains a shortcut of the previous one;
- computational logic. Digital records in the system mean that transactions can be subject to computational logic and be programmed, i.e. participants can create algorithms and rules that allow automatic transactions between nodes.

Blockchain will find wide application primarily in the operations of financial market institutions, such as banks, investment funds and stock exchanges (Nowiński & Kozma, 2017). Besides the financial sphere, practically all industries along with non-profit institutions, governmental organizations, and local governments will be able to use a system that will ensure transaction security, reduce the risk of mistakes, counterfeits, and hacking attacks, not to mention significantly reduce costs by eliminating intermediaries and shortening implementation time.

Blockchain is now used to create cryptocurrencies, of which bitcoin is the most popular. However, in the future, it will probably be the norm to conduct most transactions with blockchain currency, especially the more complex and intelligent transactions.

Digital twin technology involves creating a digital copy of a physical object or process with real-time data to optimize it (Ghobakhloo, 2018; Sieja & Wach, 2019). This technology mainly uses the IoT, artificial intelligence, and software analysis to create digital simulation models that change along with their physical counterparts. The digital twin is used to monitor, diagnose, forecast, and improve the functioning of devices or the life cycle of products. The basic features of digital twin technology are:

- communication between the physical component and the digital equivalent. Sensors located on a website integrate and transmit information to the digital twin,
- homogenization, i.e. the transmission of information in the same digital form,
- ordinary and autonomous reprogrammability. Physical objects can be reprogrammed by a person through an intervention in the digital twin or without it, based on artificial intelligence,
- digital tracks. Digital technologies leave traces of an object's activity that people can use to remove defects or improve the object,
- modularity. The modular construction of machines and their virtual image allows for quick, automatic, or autonomous module replacement and, thus, their repair, improvement, or programming.

Digital twin technology is most widely used in processing, car, aircraft, space, and renewable energy generation industries. In healthcare, the technology can have a revolutionary character, because a virtual patient can be better diagnosed and, thus, better treated.

Positive Effects of the Industrial Revolution 4.0

The industrial revolution 4.0 is a phenomenon whose effects are ultimately difficult to predict. Its principal devices (inventions) are usually *in statu nascendi*, while their wide industrial application may occur over the next several years, if in the so-called meantime there will be no catastrophic phenomena that would prevent its development. We should moreover assume that new, previously unknown inventions may appear that will change our perceptions about the shape of future production and services. An imaginable and achievable holistic effect is an intelligent factory and an intelligent supply chain. The factory of the future is defined as a flexible system that self-improves performance in a wider network, regulates itself, and learns in new conditions, in real time or close to real time, and autonomously launches entire production processes (Burke, Mussomeli, & Laaper, 2017, pp. 5-8). Intelligent factory is characterized by:

- the interaction of the physical and digital world,

- optimization, i.e. minimization of material, energy, and human work consumption,
- proactivity, i.e. the ability to anticipate and undertake activities that anticipate problems created by employees and systems,
- flexibility, i.e. adaptation to changes in the production process autonomously or with little intervention from people,
- transparency, i.e. visualization of data on production processes in real time, thus enabling their monitoring and control.

On the other hand, an intelligent supply chain means far-reaching, horizontal, and vertical integration of processes of ordering storage, production, distribution, and customer relations. These will be digital, automatic, largely autonomous, decentralized, and personified, i.e. determined by the individual tastes and needs of customers.

A detailed enumeration of the benefits of these innovative solutions in the production and consumption process includes (Gregor, Medvecky, Matuszek, & Stefanik, 2009, pp. 124-126):

- better organization and management of the supply chain,
- better planning and monitoring of production processes,
- savings in raw materials, materials, energy, and human labour,
- elimination of downtime and production bottlenecks,
- transparency of manufacturing processes at all stages,
- real-time information availability at all company organizational levels and in all units regardless of location,
- optimization of the number of devices and the use of production space,
- savings in transportation and improvement of logistics,
- shortening and improving the design process, eliminating the creation of prototypes,
- the ability to control processes manufactured from any place in the world,
- the possibility of implementing predictive and prescriptive maintenance strategies,
- the minimization of total production costs,
- the possibility of quasi-closed loop production due to new recycling techniques,
- higher quality, durability, and functionality of products due to the use of new materials and technologies,
- the ability to produce intelligent products,
- the implementation of new, more effective production and consumption models (sharing economy),
- the acceleration of R&D and innovation processes by creating innovative ecosystems based on global digital platforms and open innovation strategies,
- the production of personalized products according to customer preferences,
- reduction in the risk of 'missed' products,
- flexible response to changes in market demand,
- interaction with customers throughout the entire product development cycle,
- an increase in productivity and efficiency leading to an abundance of supply of goods and services,
- an increase in company competitiveness,
- positive impact on the environment,
- an increase in the attractiveness of jobs and activities performed,

- an extension of the average age of life and improving people's health,
- raising the level of education and training,
- better way of meeting human needs,
- an increase in the well-being of society,
- more free time.

As visible in the above list, although industrial revolution 4.0 occurs in the sphere of production of goods and services, it will still bring many positive effects in the social and cultural sphere. It will not only change what and how we create but also ourselves and our relations with the environment.

Threats Related to the Industrial Revolution 4.0

In economics, every benefit comes with a cost, in other words "there is no free lunch." Industrial revolution 4.0 also entails costs, uncertainties, and threats. In the sphere of manufacturing (Schwab, 2016b, pp. 2-8) these include:

- still low level of maturity of the required technologies and their slow development,
- large investment outlays related to the implementation of new machines, devices, and software,
- insufficient qualifications of employees,
- traditionalism and conservatism of top management approach,
- lack of standards, norms, and possibilities of device certification,
- unclear legal situation regarding the use of external information,
- insufficient security of company data networks (threatened by cyber-attacks and industrial espionage),
- uncertainty of achieving the assumed economic effects,
- problems in achieving the appropriate level of vertical and horizontal integration of a unit into the supply chain,
- a threat of redundancy in IT departments of companies,
- shortening the life cycle of products, reducing the benefits of longer life.

In the social sphere, the most serious threats are:

- employment related. Automation and advanced robotics will certainly cause a decrease in demand for unskilled workers employed in assembly and construction works (Lorenz, Rüßmann, Strack, Lueth, & Bolle, 2018, p. 8). Even employees with medium qualifications cannot feel safe. Many jobs in commerce, finance, insurance, administration, accounting, health care, law offices, and call centres will be closed because devices with artificial intelligence will replace people. On the other hand, people with higher education like engineers, economists, and lawyers – should they lack the knowledge and skills necessary to work in a radically changed environment – will either have to acquire them or will lose their jobs. However, demand will simultaneously increase for IT specialists, programmers, machine designers, software and hardware designers, supply chain designers, planners, energy and resource management managers, robot operators, engineers, technicians, physicists, and mathematicians with specialties related to the functioning, monitoring control, and management of devices and production. They all will be expected to have a combination of technical and non-technical skills, learning abilities and critical thinking in order to easily adapt to the challenges of a complex environment;

− labour market segmentation will widen the pay gap between high and low skilled workers, which may cause social unrest. Therefore, there is an urgent need for changes in school curricula and for the state and universities to prefer the development of fields of study that offer the best employment opportunities for students. Scholars estimate that 65% of current primary school students will work in professions that do not yet exist (EC, 2018, p. 9). Generally, owners of intellectual and physical capital of the highest qualifications, top management and shareholders will benefit from industrial revolution 4.0. Income polarization of societies will deepen;

− privacy violation. Industrial revolution 4.0 devices (the Internet of Things, cameras, mobile electronic devices, artificial intelligence) will allow the collection of comprehensive information about people: their location, behaviour, material situation, preferences, abilities, views, education. This information will be required in the personification of products, recruitment of appropriate employees, and security considerations. However, it is easy to cross the boundaries of law in this area, which would lead to violations of dignity and secrecy of persons;

− breach of ethics and social norms in result of genetic manipulation. Scholars presume that this may lead to the selection of a group of people with intellectual and physical qualities exceeding those of all others who cannot afford to finance such experiments; the observed decline of confidence in governments, politicians, businessmen, and the elites in general may deepen as a result of the implementation of industrial revolution 4.0, which may bypass the interests of lower social strata. The history of the Luddite movement – associated with the first industrial revolution – may repeat in a new form in the realities of industrial revolution 4.0.

In the political sphere, the most dangerous seem to be the following threats:

− cyber security. Hacker attacks may be motivated not only by want of financial gain but also political disruption, leading to international conflicts. Many believe that Russian hackers interfered with the election of President Donald Trump in the USA, the revolt of 'yellow vests' in France, and the Brexit vote in the UK. Terrorists can also conduct attacks via industrial revolution 4.0 devices;

− hybrid wars, i.e. combining traditional guerrilla with terrorist and cybernetic operations. Such a war is currently waged by the Russians in Ukraine;

− production of new types of weapons with the use of artificial intelligence, robots, biological engineering, or nanomaterials and the threat of their use in international conflicts;

− a deepening division of the world into rich countries, which will become even richer as a result of the introduction of industrial revolution 4.0, and poor countries, which will be unable to afford the transformation. It is believed that Germany and the USA are currently the most advanced on the road to industrial revolution 4.0. If we assume that one of its consequences will be lower export of jobs from rich to poor countries, i.e. insourcing instead of outsourcing, then the situation among poor countries will deteriorate even further. This will destabilize their political and social situation, create international tensions, and increase migration pressures.

Currently, the above list probably does not exhaust the benefits and threats related to revolutionary changes in the manufacturing process. The list is largely speculative and based on the logic of induction. It will be verified in practice, that is, the shape and course of innovative processes and their effects in the future.

CONCLUSIONS

Predicting what will happen in the future and how will it affect the whole of human existence is not only difficult but also fraught with the possibility of partial or complete failure of forecasts. This is proven by the practice of forecasting, sometimes using very sophisticated methods on the border of many fields of science. Will this be the case when assessing future opportunities and threats that will result from the implementation of devices of industrial revolution 4.0? A competent answer to this question will only be possible *post factum*. Scholars predict that this can happen within the next 10 to 20 years, although it is not certain, because unpredictable catastrophic events may occur that will stop the development of or even annihilate civilization. However, if such bleak scenario does not occur, then the logic of current development indicates a progress of technique and technology that is not only inevitable but also enormously accelerating – it is exponential. The past 20 years have probably seen as many inventions as in the previous 20 centuries. The industrial revolution 4.0 not only uses earlier achievements of science and technology but also creatively develops them by adding new elements, radically changing the way goods and services are produced, with a huge impact on social, cultural, and political spheres of societies. These assumptions are not only speculative but also are based on observations of industrial changes that are already taking place. The aforementioned devices of the industrial revolution 4.0 are already implemented to various degrees in many enterprises, especially in highly developed countries. However, while the expected technical-organizational and economic effects do not arouse much controversy, what is subject to very different assessment are social, cultural, and political issues. These mainly focus on the impact on the labour market and cyber security. Some specialists believe that a social and political Armageddon awaits us as a result of an unprecedented increase in unemployment and polarization of societies. In turn, others believe that new employment opportunities will emerge, while new vocational education will enable job seekers to adapt to the market situation, which means that the effects of industrial revolution 4.0 on the labour market will be neutral or even positive.

We should also consider that the future reality will be shaped not only by revolutionary innovations in industry but also demographic trends, the situation in the natural environment, geopolitics, and new paradigms of social and cultural behaviours. The future and current generations will depend on how we prepare for these challenges ahead of time, and how will we be able to reduce incoming threats.

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