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Multicultural migrant firms: Evidence from Italy

Alessandro Arrighetti, Andrea Lasagni, Renata Semenza

A B S T R A C T

Objective: The article aims to show the emergence of a multicultural migrant firm (MMF) model on the market. The empirical analysis of the composition of human capital and economic strategies outlines a new type of migrant firm, which is losing its monocultural character in favour of multicultural heterogeneity. MMFs have reached a large diffusion in migrant entrepreneurship and they play an important role in the processes of integration between actors of different cultures and nationalities. Through three research questions, we investigated how this model differs from the conventional migrant firm one. Firstly, we studied how relevant are family and community ties still. Secondly how much does the propensity for innovation and differentiation of products or services change? And thirdly what is the level of internal diversification that distinguishes MMF from the migrant firm?

Research Design & Methods: We employed a qualitative, interpretative approach to obtain original empirical evidence on the characteristics of MMFs. We based our research methodology on 36 semi-structured in-depth face-to-face interviews with MMFs-owners or partners operating in Italy. Next, we analysed the transcripts from the interviews using a manual approach.

Findings: The research highlights, firstly, how much the diffusion of the firms studied derives precisely from the social and professional ties accumulated over time in the host country; relationships built locally, of a mixed ethnic/nationality nature and not coming exclusively from the pre-existent background, limited to one's geographical origin. In Granovetter's terminology, 'weak ties' gain importance over 'strong ties.' Secondly, the article demonstrates how MMFs are associated with processes of innovation and the identification of market spaces for hybrid products and services. Thirdly, we found that well far from being homogeneous, as the dominant monoethnic model claims, there is a variety of MMFs.

Implications & Recommendations: Because MMFs are highly heterogeneous in terms of economic objectives and values pursued, institutional support has to be as varied and differentiated as the set of target companies. Moreover, policies designed for MMFs must consider adequate consultancy tools (i.e. specific mentoring programmes and projects) regarding managerial practices, strategic decisions, and the planning of workforce training.

Contribution & Value Added: The article contributes to the current debate on the relationship between migration and entrepreneurship highlighting the importance and specificity of MMFs, which is a relevant under-researched segment of migrant entrepreneurship. Our work shows how the boundaries between native and immigrant entrepreneurship are much more blurred than the literature claims.

Article type:	research article
Keywords:	immigrant entrepreneurship; multiculturalism; cosmopolitanism; migration; break-out strategy
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INTRODUCTION

This article is part of the current debate on the nexus between migration and entrepreneurship and it incorporates migration research approaches to entrepreneurship, including recent contributions on the perspective of diversity as an emerging field (Deakins & Scott, 2021; Vershinina *et al.*, 2021).

Usually, in the debate on immigrant entrepreneurship, there is a clear demarcation between firms founded by entrepreneurs born abroad (or of 'ethnic' origin) with their specificities and distinctive characteristics (Sinkovics & Reuber, 2021) and firms founded by 'native' entrepreneurs (*i.e.* belonging to the nationality of the country in which the firm was founded) well differentiated from the former (*e.g.* Bates, 1997; Tsukashima, 1991; Light, 1984; Yuniarto, 2015; Masurel *et al.*, 2002; Malerba & Ferreira, 2020). This interpretative scheme has some advantages on a descriptive level and it is useful for highlighting important aspects of migrant entrepreneurship, but it is less and less accurate on an analytical level. The evolution of the migratory phenomenon and migrant entrepreneurship itself have shown an increasing variety in the business models adopted (Ndofor & Priem, 2011; Waldinger, 2000; Chaganti *et al.*, 2008; Saxenian, 2002; Wadhwa *et al.*, 2008) along with important changes in the configuration of resources that the migrant firm can mobilize. Consequently, some typical elements of the firm founded by immigrants (simplified organizational configurations based on the family and the community of origin, the prevailing 'ethnic' reference markets, low profitability sectors of activity, etc.) can no longer be considered the exclusive or preeminent characteristics of migrant firms (Dabić *et al.*, 2020).

One of the most relevant aspects of the change of migrant firms is precisely the increasingly blurring of a clear, dichotomous distinction between 'foreign' and 'native' firms. Indeed, extensive empirical evidence has shown that many firms controlled by migrant entrepreneurs have lost their monocultural connotation and have diversified internal resources. This new type of firm may be named multicultural migrant firms (MMFs) based on the following criteria: a) the majority of the share capital is held by entrepreneurs born abroad, in non-OECD countries; b) there is a presence of native or non-co-ethnic (coming from different countries) shareholders, managers, and employees.

The article aims to show the emergence of such a new type of firm highlighting its specific economic and strategic traits. We pursued this objective by analyzing the differences that distinguish MMFs from traditional mono-cultural immigrant-owned companies. We focused on three main research questions.

RQ1: Do family and community resources play an equally important role in MMFs as in traditional migrant businesses?

RQ2: Is the propensity of MMFs to innovate and differentiate the product/service supplied on the market similar to that of the traditional migrant company?

RQ3: Do MMFs, like mono-cultural firms, represent a homogeneous model with limited internal diversification or do traits of internal heterogeneity emerge?

Starting from the concept of multicultural organization (Cox, 1991; 1994), the reflection on the role of diversity within companies has received considerable attention in the scientific debate (Shore *et al.*, 2011; Reiche *et al.*, 2018; Earley & Mosakowski, 2000). Nevertheless, despite few relevant exceptions (*i.e.* the formulation of the concept of cosmopolitanism developed by Pecoud, 2004b), the discussion on the implications of cultural heterogeneity within migrant firms has gained scarce relevance in the theoretical debate and empirical analysis.

However, the empirical evidence concerning the diffusion of MMFs provided in the socio-economic literature in more recent years has been particularly significant (Wang & Warn, 2019; Dheer, 2018; Sequeira & Rasheed, 2006; Zolin *et al.*, 2015; Zubair & Brzozowski, 2018; Xu *et al.*, 2019). Mushaben (2006) notes that almost 17% of the Turkish firms in Germany have hired German workers and that 8.7% have non-co-ethnic employees. Leung (2001) shows how Chinese entrepreneurs in France develop forms of collaboration with non-Chinese entrepreneurs while maintaining strong ties with their community. Over time, the majority of ethnic firms tend to repeatedly go beyond the community boundaries using non-ethnic resources to enter the mainstream markets (Pecoud, 2004a). Moreover, regarding Italy, recent studies have highlighted the spread of multicultural experiences in the entrepreneurial field (Arrighetti *et al.*, 2014). Furthermore, the Census conducted by Unioncamere Emilia-Romagna (2019) shows that out of 132 986 foreign-born owner partnerships and joint-stock companies active in Italy in 2019, there are 35 883 companies with a board made up of non-immigrant members, which constitutes a very high percentage considering that migrant companies with native or non-co-ethnic employees or with non-co-ethnic board members are not accounted for. Thus, overall, MMFs

cannot be attributed a role of irrelevance both on an economic and social level. Despite their relevance and diffusion, MMFs have received little attention, especially in understanding the variables underlying their birth and the evolutionary paths undertaken over time. Moreover, because of their structural characteristics, MMFs play an important role in the processes of integration between actors of different cultures and nationalities. This helps to make their study particularly significant.

We employed a qualitative, interpretative approach to obtain original empirical evidence on the characteristics of MMFs. We based our research methodology on 36 semi-structured in-depth face-to-face interviews with MMFs-owners or partners operating in Italy. We analysed the transcripts from the interviews using a manual approach. The field of our study was Italy, a country recording a relatively recent increase in migration flows (similarly to other southern European countries) where a significant percentage of migrants decided to work as self-employed or entrepreneurs (Rinaldi *et al.*, 2023).

The remainder of the article will first try to place MMFs within the literature on migrant entrepreneurship. Secondly, we will present the research methodology and field of investigation. Thirdly, we will attempt to answer the main research questions. Fourthly, in the conclusions, we will summarize the main findings and provide some policy indications.

LITERATURE REVIEW

Originally, scholars associated immigrant entrepreneurship with the theories of disadvantage, according to which migrant workers entering into the labour market of the immigration country are pushed to the margins of the economy (Bonacich, 1973; Jenkins, 1984) and essentially occupy low-skilled job positions (Piore, 1979). On the supply side, the disadvantageous conditions originate from obstacles and barriers, deriving from the characteristics of human capital, poor knowledge of the local language, and difficulty in having professional and educational qualifications formally recognized. All these factors underpinned the widespread discriminatory practices of employers, supported by ethnic, racial, and religious prejudices (taste-based discrimination) or by imperfect information on the labour market (statistical discrimination), which leads to the reiteration of negative stereotypes towards ethnic minorities (Bonacich, 1973; Light, 1979; Tsukashima, 1991). These initial disadvantages can influence the migrant workers' choices of taking up self-employment or entrepreneurial activity as an alternative employment opportunity and pre-condition of any eventual social progress. In this context, the start of an entrepreneurial initiative is based on the identification of a market segment of an ethnic/national nature and on the availability of economic, financial, and informational resources provided mainly, if not exclusively, by the family or the entrepreneur's ethnic community. Traditionally, in migrant enterprises, both the ethnic community and family played a decisive role and represented the fundamental drive of strengthening the entrepreneurial initiative on a financial level, providing information, and making available production factors, such as work. It follows that a central role is played by what Granovetter (1973) called 'strong ties.'

We cannot explain the growing diversification of migrant entrepreneurship in advanced economies, the adoption of complex organizational models and their position in non-niche mainstream markets (Rusinovic, 2008; Aldrich & Waldinger, 1990; Ndofor & Priem, 2011; Ambrosini, 2011; Chaganti *et al.*, 2008; Clark & Drinkwater, 2000; Arrighetti *et al.*, 2012; Saxenian, 2002; Brzozowski *et al.*, 2014; Shinnie *et al.*, 2019) based on these models, (Waldinger *et al.*, 1990; Kloosterman, 2000; Portes *et al.*, 2002; Saxenian, 2002; Zhou, 2014; Rusinovic, 2007; Marra, 2011; Kushnirovich, 2015). Furthermore, extensive break-out strategies and increasing entries into mainstream markets have been empirically proven in numerous studies (Waldinger *et al.*, 1990). They have deep implications both in terms of relations among minority groups and the local economy in which they are based and in terms of social integration (Arrighetti *et al.* 2014). Significantly, the origin of this phenomenon lies in the need to overcome the narrow and often highly competitive boundaries of the 'enclave economy' and exploit new opportunities provided by mainstream markets (Aldrich & Waldinger, 1990; Basu, 2011; Canello, 2016; Wang & Warn, 2019). Migrant firms who cross the enclave market boundaries and enter the key markets need to attract additional investment, expand their management resources, and integrate market information and technological knowledge (Basu & Goswami 1999; Levent *et al.*, 2003; Light *et al.*,

1994), which are resources that are not always available among people in their original national group (Arrighetti *et al.*, 2014). Therefore, the repeated crossing of ethnic boundaries and the simultaneous use of both ethnic and non-ethnic resources (Nee *et al.*, 1994; Pecoud, 2010) lead to the creation of firms made up of entrepreneurs and workers of different nationalities. These elements are at the origin of specific forms of economic organizations that we called multicultural migrant firms (MMFs). Moreover, we may also interpret MMFs as a novel expression of cosmopolitanism, which assumes that 'different cultures coexist and interact with one another without necessarily fully merging and in which some people manage to switch from one cultural milieu to another' (Pecoud, 2004a), with the clarification that a) cosmopolitanism is not restricted to the attitude of the entrepreneur but involves the human resources of the company as a whole and b) cosmopolitanism in itself it is not associated with an intellectual or moral value.

In consideration of the hybrid composition of the corporate and government structure, in MMFs, the centrality of the 'strong ties' (Granovetter, 1973) is expected to be less evident than in the traditional migrant firm. Therefore, the first question (RQ1) investigates whether MMFs are associated with the weakening of strong ties (family, parental, and co-ethnic community) and whether this leads to a strengthening of weak ties (extra-family social relationships built with colleagues in school and training, or previous jobs experiences).

In the second research question (RQ2), we asked whether the propensity to innovate and differentiate the supply of goods and services can distinguish the MMFs from traditional migrant firms.

As already underlined, the monocultural migrant enterprise often confines its activity to enclave markets and has a limited propensity to grow (Edwards *et al.*, 2016). Co-ethnic enclave offers migrant entrepreneurs the benefits of cultural proximity, market knowledge, and labour markets of immigrants (Clark *et al.*, 2015). Moreover, the traditional enclave economy offers the advantages of captive markets and protection from competitors outside the community (Wilson & Portes, 1980). However, entry barriers that limit external community entries result in obstacles to the firm's growth: as in perfect competition regimes, the presence of positive profits incentivizes the starting of new ventures (Jones *et al.*, 2000) and an increase in demand translates into an increase in the number of enclave companies operating with minimal profitability, not in the growth of the size of the incumbents. Finally, lower overall community income compresses the possibilities for product differentiation (Li, 1997). The choice to expand, innovate, and diversify one's activities is constrained by the size of the market and the homogeneity of the preference, tastes, and needs of the single-belonging community.

On the other hand, considering the MMFs, it is expected that multiculturalism represents a driver of product/service innovation since it can exploit a combination of know-how, information, and ties and opportunities that the mono-culture company cannot possess. Multicultural migrant firms can broaden the heterogeneity of the strategic paths that traditional migrant firms can adopt, leveraging, as foreseen in the evolutionary models based on the resource-based view (Wernerfelt, 1984; Barney, 1991), on the accumulation of skills and knowledge to compete in the markets (Haq *et al.*, 2023; Bolzani, 2020). In this sense, the paradigm of 'push' and 'pull' dynamics (Bonacich, 1993) acquires renewed attention since the pull factors gain importance in explaining the differentiation of the immigrant firms (Aliaga-Isla & Rialp, 2013; Dheer, 2018), especially in some specific markets and sectors and in contexts, in which high technological and production heterogeneity prevails. The increase in economic opportunities and therefore in 'pull' factors would have its origin in the cultural variety and diversity in nationalities generating, on the one hand, complementarity between the resources used (Lazear, 1999) and, on the other hand, allowing for increasing the variety of products supplied and expanding market opportunities (Nathan & Lee, 2013).

Furthermore, the variety of cultures progressively penetrates economic organizations and other social domains. 'Diversity' is more and more recognized as a lever to increasing the level of creativity and innovation and at the same time, it has a positive effect on workers' productivity and efficiency, thus improving organizational performance. In this sense, MMFs are in an advantageous condition to reap the benefits of the diversity of cultures both in overcoming internal limits and enhancing new opportunities.

However, we cannot exclude (RQ3) that multicultural choice is induced by exogenous contingencies (external to the entrepreneurial group and assumed by the company as constraints and not as

a choice). In other words, value-oriented objectives (cultural variety and national diversity represent value in themselves) could be replaced by goal-oriented objectives (motivated by functional and instrumental purposes) (Engelen, 2001). In fact, the composition of the available workforce or the access to some unique skills of specific ethnic or national groups could push the firm to adopt a multicultural configuration. In this circumstance, cultural diversity is not an advantage but an external conditioning. Therefore, an 'imposed' multiculturalism could increase internal communication difficulties, weigh down management tasks, and enhance coordination costs. Consequently, the efficiency and competitiveness of the firm are closely linked to the ability to reduce the costs of multicultural diversity, instead of researching and promoting it as a resource.

All this leads to the view that MMFs are not a uniform phenomenon from the point of view of the strategies pursued by the entrepreneurial group. Therefore, we investigated a third question (RQ3) that is, if the MMFs give uniform weight to value-oriented and goal-oriented objectives and if, as a consequence, markedly different business models and evolutionary paths can emerge.

RESEARCH METHODOLOGY

Sampling and Data Collection Method

We employed a qualitative, interpretative approach to obtain original empirical evidence on the characteristics of MMFs. As anticipated in the Introduction, we identified MMFs based on the following criteria: a) the majority of the share capital held by entrepreneurs born abroad, in non-OECD countries; b) the presence of native or non-co-ethnic (coming from different countries) shareholders, managers, and employees. A group of researchers in Italy conducted the fieldwork (36 semi-structured in-depth face-to-face interviews) by visiting the operational headquarters or establishments of MMFs. Interviews lasted on average one hour and a half. Researchers and respondents discussed: (a) economic and sociological factors that facilitate the foundation of MMFs; (b) the main economic and sociological factors that discourage the foundation of MMFs; and (c) the main contextual factors that facilitate the foundation of MMFs.[1]

We selected MMFs in several consecutive steps. Firstly, we employed lists of business addresses provided by small business associations and Chambers of Commerce. Secondly, we considered candidates recommended by immigrant community associations. Finally, we adopted procedures of snowball sampling, *i.e.* interviewees providing the personal details of other potential interviewees (Vershinina & Rodionova, 2011). We used the purposive sampling method to collect information for MMFs located in different places and with different foundation stories.

Data Analysis

We opted for a manual approach to qualitative analysis. We transcribed all interview recordings and examined all interview transcripts without using computerised data analysis software. This process 'encourages a slower and more meaningful interaction with the data [and] great freedom in terms of constant comparison, trialling arrangements, viewing perspectives, reflection and ultimately developing interpretative insights' (Maher *et al*., 2018, p. 11).

Following the standard practice (Miles & Huberman, 1994) in coding data, we performed some detailed readings of the raw data (the interview transcripts) and we identified some primary codes (first-order codes) with wording that was close to the language used by the respondents. In other words, as suggested by Miles and Huberman (1994), we used codes to retrieve and organize the parts of the interview transcripts that should be interesting regarding answers to our research questions. Table 1 presents our data structure.

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[1] For additional details, see International Organization for Migration (2020).

Table 1. Data structure

Research Questions	First-order codes
RQ1: Do family and community resources play an equally important role in MMFs as in traditional migrant businesses?	Selecting a partner to add his/her skills [not because he/she is from the same ethnic group]. Selecting a (non-co-ethnic) partner because of a long common job experience. Selecting partners because of having a similar background. Selecting a partner that was a former colleague in a previous native-owned company.
RQ2: Is the propensity of MMFs to innovate and differentiate the product/service supplied on the market similar to that of the traditional migrant company?	Targeting the co-ethnic community is not financially sustainable. Producing while applying innovations that stem from knowledge of foreign markets. Not looking at [possible] customers of the same nationality.
RQ3: Do MMFs, like mono-cultural firms, represent a homogeneous model with limited internal diversification or do traits of internal heterogeneity emerge?	Looking for people of different nationalities is better: the work environment must necessarily be mixed. Cultural diversity is an enrichment, which extends company's economic opportunities. Multiculturalism in the company is good for solving linguistic problems. Multiculturalism is not an intentional strategy but is induced by context variables that are external to the company. The nationality [of partners] does not make any difference. Multiculturalism in the company is not an asset: doing business is doing business.

Source: own study.

Description of the Sample and Respondents

The respondents (namely, MMFs-owners or partners) were originally migrants from the largest communities in Italy: Albania, Romania, and Morocco (see Table A1 in Appendix). However, our sample included also respondents from Pakistan, India, Iran, Iraq, and Maghreb countries, such as Tunisia, Algeria and Egypt. Most respondents were men. The MMFs were mostly located in metropolitan areas (Milan, Turin, Bologna, Florence, and Rome) in Northern and Central Italy. Most MMFs were active in manufacturing industries (mechanical products and food productions), but also in some retail services such as family clothing stores, and restaurants, along with other transportation services (*i.e.* logistics).

There was a small number of MMFs that we should define as 'young' enterprises. Indeed, for more than 50% of MMFs in our sample, the firm age was between 10-15 years. As far as firm size (number of employees) is concerned, only a few MMFs may be considered medium-sized firms, since most of them are micro and small-sized companies (less than 50 employees).

RESULTS AND DISCUSSION

Findings on Family and Community Resources in MMFs (RQ1)

The evidence gathered with our qualitative study indicates that the founders of MMFs are individuals with a high migratory seniority, with relevant work experience, and often with a well-defined professional profile. Without exception, all the foreign-born MMFS founders had lived in Italy for at least five years. Often, they started the firm leveraging long-standing relationships of friendship or professional collaboration.

> We (referring to the non-co-ethnic partner) are partners because we worked together for 13 years. It is normal that if you work together for a long time and the company grows, you say 'I trust you, you trust me, let's carry on' (INTERVIEW-3).

> We asked our circle of friends if anyone would be interested in starting a firm. There were eight of us: four Italian boys, three girls of Eritrean origin, and a girl of Iranian origin. … As for the background, we are quite similar and therefore we enjoyed working together because we have many similarities. The fact that we were friends before has helped us a lot (INTERVIEW-10).

All the excerpts from interviews show that mutual work experience, understanding each other on a human and personal level, and sharing a common goal are the initial components underlying the decision to set up the firm. Entrepreneurs leading MMFs appeared to be well integrated into the host society. Concerning RQ1, the interviews showed that very often the evolution of the MMFs is not a function of the breadth of social networks built by migrant entrepreneurs, nor of the intensity of relations with the community of origin. Indeed, we have clues that it is not the level of the social capital that is decisive for the design of the MMFs and in particular for the identification of the partner-shareholders. Instead, the more important elements are the ones that are less present in the debate on entrepreneurship, namely social networks based on the work experience of the individual and his or her (elective) friendly connections. These mostly remain limited to the context of work and do not explicitly involve either the co-ethnic community even if it does not exclude the family sphere.

Findings on the Propensity to Innovate and Differentiate Products in MMFs (RQ2)

As discussed above, the empirical analysis confirmed that a strong incentive to consolidate MMFs derives from the exploitation of complementary skills and resources. This element is particularly present when the non-co-ethnic partner or employee has the technical knowledge, administrative skills, access to information on the markets, communication skills (overcoming language barriers but not only) and negotiation styles that the other shareholder (other shareholders) does (do) not possess. The quest to find resource complementarity is a well-known aspect of the development of immigrant-owned businesses. This trait defines the increasing operational complexity attained through activities promoted by foreigners, particularly in contexts that encompass the transition from ethnic markets to mainstream ones (Kloosterman, 2010; Kloosterman *et al.*, 2016) (see RQ2). Our study fully confirmed this orientation for MMFs as well. In all of the cases analysed, the reference market appeared to be exclusively mainstream. This refers to companies operating both in the manufacturing and service sectors. Even if it is not possible to establish a causal hierarchy between the abandonment of the centrality of enclave markets, firm size growth and the adoption of an MMF model, a marked association between these phenomena appears evident.

> We have never been interested in having customers of our own nationality. Indeed, I am happier when Italian customers arrive. We are interested in working well, not in the nationality of customers or collaborators. We have always been with our people, we have grown up with them and we have always lived in a certain way, but I also like to work with other people, other cultures (INTERVIEW-11).

> At the beginning, we thought a lot about this, about binding ourselves to the communities to which we belong. As Syrians there are just a few of us, so eventually the reference community in Turin would have been the Moroccan one. However, it was precisely by studying this community that we realized that it would not financially support our project (INTERVIEW-24).

> The products we use are mostly of Middle Eastern origin, but we are not of Middle Eastern origin, except the Iranian girl. She brought a certain know-how, and she helped us elaborate the recipes, also because her mother knew them well, who always had us over to eat. Monocultural firms lose some of the possibilities given by the broader notions that occur when there are members in the firm, both among shareholders and employees, coming from countries of other cultures, because the differences are 'pluses' and therefore there is a lack of this knowledge, provided precisely by differences. (INTERVIEW-10).

Furthermore, multiculturalism is a lever for innovation and for the identification of market spaces for hybrid products and services that originally combine transcultural skills. The products and services offered are the result of a design intentionally based on the interweaving of different cultures.

The project started with the idea of bringing 'modest fashion' to Italy, a fashion that was suitable not only for Muslim women in particular, but also transversal and that concerned all women interested in maintaining clothing that was not too flashy. We have thought of a 'modest' clothing production that has a very strong tinge of Italian design. Hence the Italian designer and an Italian name. We speak to all women, but we respond to the needs of certain women because mainstream fashion goes in the opposite direction (INTERVIEW-24).

This product [a special refrigerator] that I invented works through photovoltaic systems that can also be used in Africa. I made it as a prototype in our factory. This innovation also stems from the knowledge of the foreign markets in Africa. These ideas can come neither from an Italian who lives here nor from an African who lives there (INTERVIEW-27).

Sometimes the multicultural choice corresponds to the need to complete or integrate the internal skills of the firm with other knowledge of non-co-ethnic collaborators. In this sense, being able to leverage the complementarity of knowledge and experience represents a significant incentive for the creation of firms based on a mix of different nationalities and cultures.

I believe that different mentalities and ways of conceiving of the firm are particularly advantageous for business management. Furthermore, having an Italian employee is particularly advantageous, especially from a linguistic point of view. In fact, this employee, who is of particular help to us, conducts commercial relations with Italians (INTERVIEW-12).

We had the opportunity to connect skills on the Italian market and the Balkan market. I take care of the sale and the administrative part related to contact with the foreign countries where I come from. I think our formula is positive, as it allows for a greater knowledge of markets, countries, the local mentality, the places where you go to collaborate and sell. ... On the other hand, to manage administrative and banking relations, we need someone who knows the country in which the firm is based (INTERVIEW-18).

Findings on Internal Heterogeneity in MMFs (RQ3)

Our findings show that MMFs are heterogeneous not only thanks to their presence in a plurality of industries, the market segments in which they operate, and the size they have acquired, but also in reference to how multiculturalism has been interpreted and the influence it has had on the firm's evolution. A big part of the literature interprets cosmopolitanism and cultural diversity as phenomena essentially exogenous to the firm and deriving from the opening of international markets, the different regulations governing the exchanges, and the need to include in the company individuals from different countries and cultures. For most of the observers, the main challenge that diversity imposes on management concerns the system of rules and values that must be adopted to ensure alignment of behaviours to a common model and to guarantee a communication system that strengthens the organization's internal cohesion (Brett *et al.*, 2011; Glinkowska, 2016). Concluding, cultural diversity has different nuances and accents in individual organizational contexts, but, in essence, we may interpret it as a unitary phenomenon that requires uniform rules of conduct, managerial solutions, and communication tools.

Instead, the idea being advanced here is that multiculturalism may be a source of differentiation among the firms generating different evolutionary trajectories (see RQ3). The main line of differentiation concerns the strategic role attributed to multiculturalism. Not all MMFs give equal importance to cultural diversity in their strategic approach. Some act as the pivotal point that shapes the organization's evolution, leveraging cultural differences as an asset that enhances intangible resources, thereby bolstering the skills and knowledge embedded within the company (*high strategic multiculturalism*). Others view it as an externally imposed trait, accepted as an unavoidable aspect, often embraced passively. In these cases, it does not serve as a competitive asset but rather as an essentially inevitable incidental factor (*low strategic multiculturalism*).

High strategic multiculturalism. Economic and organizational advantages corresponding to high strategic multiculturalism are present at various levels, but in particular, the enhancement of the cultural diversity of human capital appears to be relevant. Especially in reference to transactions on foreign markets, the multicultural choice seems to help to reduce information costs regarding the characteristics and trends of local markets and sectoral dynamics. It also facilitates the absorption of the regulations governing exchanges among countries and appears useful in enhancing knowledge regarding styles of negotiation and methods of personal contact characteristic of a country.

> Before establishing my business, I worked in many countries, from Lebanon to Colombia, and I noticed that being multicultural is a fundamental issue: when you go into a country and you have to relate to local companies, you somehow have to know the territory where you are going to carry out an activity (INTERVIEW-2).

> We did not want people of the same nationality. We have always looked for people of different nationalities because it is better. Having all [employees] of the same nationality 'ruins your job.' To do it right, the work must necessarily be mixed. It is better to have problems with the language but have workers of different nationalities (INTERVIEW-17).

> Our employees are of mixed nationalities. … We actually like to keep some variety. I believe that cultural diversity enriches us, sends a message to our customers and allows us to work well (INTERVIEW-10).

Very often, MMF model is seen as a response to the needs of a global world. Within the firm, it reflects the variety of cultures present in society and, at the same time, it is a tool that facilitates economic (and non-economic) interaction with distant markets. It is an approach which is especially necessary for the small-size firm that must possess sufficiently varied skills to avoid being penalized in exchanges on foreign markets and in the recruitment of its workforce.

> For me, it is necessary to have employees from different cultures, and I am truly pleased to see that other entrepreneurs think the same. Thirty years ago, when I established my company, I saw that the world was already moving towards multi-ethnic firms, which even precede the multi-ethnicity of the population (INTERVIEW-20).

Noteworthy, very frequently, respondents associated the high level of strategic multiculturalism with the view that the diversity of cultures incorporated in the company is positive in itself: a feature that should be emphasised, a factor of organizational cohesion and a significant element of identity. Respondents also recognised multicultural background as an added value that provides a distinctive identity to the organization. Thus, in this case, identity is an ex-post result, at the end of a process, it is not the sum of ex-ante individual identities. In this sense we have an echo of Appadurai's thought on modernity at large (1996). Appadurai reminds us how much cultural diversity is more than the fact of cultural difference. It is a value which recognizes that differences in human societies are parts of systems and relationships, a value through which differences are mutually related and reciprocally supportive. In his interpretation, diversity means the infinite multiplication of differences and a particular organization of differences. Referring to global cultural flows and the concept of 'ethnoscape,' Appadurai explains the way people from different countries and socioeconomic backgrounds mix.

> I have always tried to talk about multiculturalism in the company: a warehouse worker comes from Belarus, a girl comes from Morocco, and now I am introducing a Colombian into the sales marketing division, both for a linguistic purpose and for multiculturalism-related reason. As soon as possible, we will have a Chinese woman, because I work a lot with China and therefore, I want to have someone in the company who knows Chinese language and culture well (INTERVIEW-5).

Low strategic multiculturalism. If in some cases multiculturalism is a primary ingredient of the migrant firm strategy, in others, it has a lesser importance (*low strategic multiculturalism*). Moreover, in these businesses, the variety of nationalities of the shareholders and employees is marked but not intentionally sought. Instead, it derives from factors related to the local labour market and the characteristics

of the labour supply. The firm employs workers of different nationalities, because the labour supply – for the skills required and the willingness to accept specific contractual forms and working conditions – is essentially (or to a significant extent) made up of migrants of different nationalities and to a lesser extent of indigenous workers. The migrant firm becomes multicultural, in essence, because the labour supply for some jobs is in itself multi-ethnic.

Respondents often associated limited strategic multiculturalism with the creation of standardized goods or services that are not subject to the introduction of variants of a cultural derivation. The production is destined for the local market, rarely for exportation. It responds to given technological constraints (mechanics, systems design), consolidated practices (construction), and defined contractual schemes (cleaning services, logistics). In these circumstances, respondents did not perceive the variety of cultures and experiences as an advantage but as an element of initial heterogeneity to be overcome by standardizing individual and group behaviour to the needs of the organization and the corporate hierarchy.

> My branch of activity (mechanics) is particular, because if you come to work for me you have to do what needs to be done, regardless of where you come from. … In my company the division of roles is important. Cultural factors do not come into play (INTERVIEW-1).

In this approach, it is the skills acquired that count, together with the attitude and orientation towards work.

> If my partner had been Italian, it would change things a little. The important thing is to have the same values. You have to find a person who wants to work, who has few issues, who is serious, and I do not care about nationality. Neither nationality nor religion, none of this. I think that when it comes to work one should not look at anything else. You can be Jewish, Chinese, or Muslim. The important thing is that you have a purpose, you just follow it: the rest does not matter (INTERVIEW-7).

An element associated with a low level of strategic multiculturalism is a managerial orientation aimed at containing the diversity of the individual conduct of the employees. Respondents perceived the variety of cultures in these contexts as a source of entropy generating limited organizational advantages: cultural variety determines costs, and misalignments of behaviours that can be reduced to unity only by imposing a uniform and rigid protocol of conduct.

> In the company where I work, there is the woman with a veil, there is the woman without a veil, and they are from the same country. There is the believer, there is the non-believer, there is the Catholic, there is the Muslim, and there is a bit of everyone but what guides us are the regulations. As I say with everyone, inside the company, we are obliged to communicate all together, when we are outside, if we are not friends, you go here, I go there. But inside, we have to communicate and collaborate. You have to respect the internal regulations, because that is our guide (INTERVIEW-8).

Other respondents did not perceive the diversity of cultures and nationalities present in the firms as a distinctive value or an objective to be pursued. In these cases, professionalism in the execution of tasks and the ability to adapt to customers' requests played a central role, putting both one's origin and the cultural diversity context in which the business is conducted in the background.

> For seven years I worked alone. Then I hired a girl who worked with me for 10 years, then I took on the second one. Now there are three of us working, an Albanian and a Moroccan, like me. I have always selected the girls who work with me by looking at what they know how to do and not where they come from. For me, it does not make any difference where people come from. … What I look at is the ability to work and to respect the work that our clients ask us to carry out (INTERVIEW-25).

Concluding and trying to answer RQ3 (the heterogeneity of MMFs), we may state that empirical evidence highlights how multiculturalism is associated with very diversified experiences, organizational models, and business strategies.

Discussion

The few contributions that explored multiculturalism in migrant firms (Nathan and Lee, 2013; Pécoud, 2004a; Arrighetti *et al.*, 2014) do not provide a sufficient basis to measure the extent of the cognitive advances made in the present work. Instead, the collected evidence stimulates discussion on the limits of current knowledge and the main lines of future research on this topic.

In this sense, the first question that remains open concerns the link between the multicultural composition of internal resources and the exploitation of market opportunities. In this regard, we can hypothesise on two directions in which the relationship may develop. The first, which we can call resource-driven, assumes that the presence of resources, which for various reasons have a multicultural configuration, constitutes an incentive to adopt a strategy aimed at exploiting the competitive advantages associated with product innovation and at establishing economic exchange outside ethnic markets. On the other hand, the second direction which we can call opportunities-driven, originates in the perception of the existence of new market opportunities that a monocultural organization is unable to satisfy and that an economic unit that assumes a multicultural configuration would instead be able to do it. In the first case, it is multiculturalism that guides the evolution of the company towards the diversification of markets and products; in the second, on the contrary, it is the variety of demand that induces the change within the company in the direction of multiculturalism. The evidence collected in this research is insufficient to provide a conclusive evaluation, even some clues seem to indicate a particularly relevant role associated with the *resources-driven model*. Therefore, it would be of considerable importance to know more about the factors at the origin of the described processes. In this sense, in the next research, it will not suffice to study whether companies have multicultural teams/staff, but the researchers will have to aim to understand whether this is used as a resource to reach strategic objectives or not.

The second question concerns the contextual factors that impact the development of multicultural experiences. Like conventional migrant firms, MMFs also interact with the social and institutional environment in which they are located, which can influence the evolution of firms over time. Therefore, if an analytical approach that refers to the hypothesis of mixed embeddedness appears to be of great utility, a substantial amount of work needs to occur in this field to comprehend the rules and institutions that can enhance the spread of MMFs. An important line of research in this direction could be the launch of comparative analyses capable of comparing different socio-institutional structures (both locally and nationally) with the propensity of migrant ventures to implement multicultural solutions.

The third question concerns the role of the business sector as a favourable context or an obstacle to the development of multicultural initiatives. At first glance in some sectors, entrepreneurs may experiment a multicultural option overcoming relatively modest difficulties; in others, the spaces are much smaller. In sectors such as mechanics, construction, logistics, systems design, and cleaning services – just to name a few that we examined in our study – it seems to be very difficult to develop an innovative project based on multiculturalism. The product or service provided must meet compliance constraints that reduce the scope for innovation linked to multicultural strategies, even if the possibilities remain open to leveraging multiculturalism to develop transnational exchanges and extend the skills possessed by the managerial team. On the other hand, in other sectors, such as food production, restaurants, fashion and tailoring, and cultural and personal services, the feasible alternatives appear to be wider, and the enhancement of multicultural solutions generates opportunities for product differentiation. The available evidence is not sufficient to reach definitive conclusions on this topic and further investigations would be of great importance.

The fourth issue concerns the evolution of multicultural experiences that originate in the particular configuration of the local labour market, which exogenously imposes on the company the adoption of a multicultural model due to the lack of different alternatives. An important area of future research would be to verify under what conditions 'passive' multiculturalism, induced by constraints external to the company, can evolve towards an 'active' model of multiculturalism, in which the diversity of human capital is a lever for business performance improvement. The methodology adopted in this qualitative study did not allow us to obtain useful elements for understanding the dynamics of the MMFs and

therefore the question remained unanswered. Thus, further studies are advisable. Moreover, in this case, the implications are significant: the possibility of using little-exploited multicultural resources to diversify markets and strengthen collaboration networks (nationally and internationally) appears to be a significant opportunity to support the company's economic and organizational growth.

CONCLUSIONS

The study aimed to show the emergence of a multicultural migrant firm (MMF) model on the market. The spread of MMFs appears to be associated with the diffusion of migrant entrepreneurship which, in the last few years, has become more relevant even in contexts such as Italy, a country with a relatively recent immigration history. More and more frequently, the strategies for overcoming the boundaries of the enclave economy and entry into mainstream markets have imposed significant economic and organizational transformations on immigrant-owned firms.

There are numerous questions concerning the distinctive elements of MMFs. To provide evidence in this under-researched area we developed a comparison between MMFs and conventional migrant firms regarding the resources mobilized and the strategies adopted.

With our first research question, we asked if the development of the MMF model, differently from the conventional migrant enterprise, is associated with the review of the role of the so-called 'strong ties' (such as family and community relationships) in the support to the firm (RQ1). The answer to the question seems to be positive. Even if we find no evidence of the weakening of co-ethnic relations, there is no doubt that the role of social non-co-ethnic ties and the common work experience represent the fundamental levers for the rise of multicultural initiatives. The second research question (RQ2) we examined was whether the propensity to innovate and differentiate the supply of goods and services can distinguish the MMFs from traditional migrant firms. Pending further insights, a marked association emerged between multiculturalism and innovation and the identification of market spaces for hybrid products and services that originally combine transcultural skills. The third theme (RQ3) concerned the unitary nature of MMFs and the presence of drivers that, as in the traditional migrant firm, push towards uniformity in the behaviour of the examined firms. We found that multiculturalism is not a homogeneous phenomenon. The presence of different combinations of multiculturalism as a strategy amplifies (and does not reduce) the variety of adopted solutions.

Policy implications and research limitations. The diffusion and strengthening of the MMFs increase the social integration of immigrants in the host community and open up relevant opportunities and innovations at the economic level. At the same time, the challenge for MMFs is the presence of obstacles (transactional, cultural, linguistic, managerial, etc.) that structurally characterize their business life and represent elements of risk and fragility, especially in the start-up phase. Therefore, appropriate institutional supporting measures are necessary for helping MMFs to cope with these problems. This implies that the obstacles to growth that some firms meet are not the same as others. In addition, the degree of innovation and risk of the entrepreneurial initiative is variable and some experiences, more than others, represent important tools for social inclusion. Consequently, the institutional support model can be as varied and differentiated as the set of target companies. Furthermore, MMFs turn out to be organizational forms of considerable complexity. In this sense, it would be desirable for MMFs to be supported, not so much on a financial level, but by adequate consultancy (*i.e.* specific mentoring programmes and projects) regarding both managerial practices, strategic decisions, and the planning of workforce training. A further policy suggestion is associated with what was previously highlighted concerning the evolutionary dynamics of MMFs. Facilitating the transition from a multiculturalism of human resources induced by exogenous factors to a multiculturalism capable of enhancing the diversity of resources would be important, not only to expand markets and further qualify the products/services offered, but also to strengthen the quality and skills of internal human capital and improve the integration between different cultures.

This study has some limitations. Although we examined MMFs located in similar places, we were not able to exclude the fact that some context-specific issues may significantly affect our findings. Therefore, additional research on MMFs is needed to provide a more extensive perspective on this theme.

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Appendix

Table A.1. List of respondents

Nr	M/F	Origin	Foundation Year	Nr. Employees	Location/Province	Industry/sector
1	M	ALB	2003	9	Parma	Machinery and mechanical production
2	M	ARG	2014	5	Parma	Machinery and mechanical production
3	M	ALB	2017	16	Parma	Food production
4	M	ROM	1970	35	Torino	Machinery and mechanical production
5	M	ALB	2011	2	Reggio E.	Repair of motor vehicles
6	F	BRA	2016	4	Reggio E.	Cleaning activities
7	M	EGY	2005	9	Reggio E.	Specialised construction activities
8	M	TUN	1992	–	Reggio E.	Machinery and mechanical production
9	M	TUR	1998	12	Modena	Warehousing and storage
10	M	IRN	2013	–	Milano	Restaurants
11	M	PAK	2001	100	Brescia	Restaurants
12	M	BGD	2014	10	Brescia	Import/Export
13	M	BFA	2017	14	Bologna	IT services
14	M	EGY	1990	26	Bergamo	Various services
15	M	EGY	2008	230	Bergamo	Warehousing and storage
16	M	MAR	2015	100	Bergamo	Warehousing and storage
17	F	ALB	2015	9	Bergamo	Warehousing and storage
18	M	YUG	2003	3	Padova	Apparel and fashion
19	M	DZA	1990	15	Padova	Machinery and mechanical production
20	M	AFG	2019	–	Bologna	Restaurants
21	M	IND	1995	–	Padova	Machinery and mechanical production
22	M	SEN	2013	28	Palermo	Restaurants
23	M	ROM	2000	89	Torino	Food production
24	F	TUN	2018	–	Torino	Apparel and fashion
25	F	MAR	2002	3	Noceto(PR)	Apparel and fashion
26	F	MLI	2019	–	Roma	Apparel and fashion
27	M	BFA	2010	11	Bologna	Machinery and mechanical production
28	M	ARG	2010	–	Milano	Restaurants
29	M	IRN	1963	–	Milano	Machinery and mechanical production
30	M	IND	2019	–	Firenze	Restaurants
31	M	MAR	2017	–	Modena	Retail
32	M	IRQ	1985	12	Torino	Cultural services
33	M	ALB/MAR	2006	16	Torino	Cultural services
34	M	URY	2014	22	Milano	Restaurants
35	F	MAR	2018	–	Torino	Apparel and fashion
36	M	TUN	2000	10	Torino	Restaurants

Note: legend for International Standards Organization (ISO) three-digit alphabetic codes is AFG= Afghanistan, ALB=Albania, DZA=Algeria; ARG=Argentina, BGD= Bangladesh, BFA= Burkina Faso, BRA=Brazil, EGY= Egypt, Arab Rep, IND=India, IRN= Iran, Islamic Rep., IRQ=Iraq, MLI=Mali, MAR= Morocco, PAK= Pakistan, ROM=Romania, SEN=Senegal, TUN= Tunisia, TUR=Turkey, URY=Uruguay, YUG= Yugoslavia, FR (Serbia/Montenegro).
Source: own elaboration based on field study.

Authors

The contribution share of authors is as follows: Alessandro Arrighetti – 30%,
Andrea Lasagni – 40% and Renata Semenza – 30%.

Alessandro Arrighetti

Full Professor of Industrial Organization at the Department of Economics and Business of the University of Parma. His research interests include industrial concentration, vertical integration, dynamics of the industrial structure, firm size and growth, and migrant entrepreneurship.
Correspondence to: Prof. dr. Alessandro Arrighetti, University of Parma, Via J.F. Kennedy 6 43100 Parma (PR), Italy, e-mail: alessandro.arrighetti@unipr.it
ORCID http://orcid.org/0000-0002-9951-5658

Andrea Lasagni

Associate Professor of Applied Economics at the Department of Economics and Business of the University of Parma. His research interests include institutions and productivity, firm size and growth, and migrant entrepreneurship.
Correspondence to: Prof. dr. Andrea Lasagni, Via J.F. Kennedy 6 43100 Parma (PR), Italy, e-mail: andrea.lasagni@unipr.it
ORCID http://orcid.org/0000-0001-5718-673X

Renata Semenza

Associate Professor of Economic Sociology (Social and Political Sciences) Education, University of Milan (Italy). Her re-search interests include economic and labour sociology from an international comparative perspective, in particular, the transformation of employment models and the forms of flexibility of employment relationships.
Correspondence to: Prof. Dr Renata Semenza, University of Milan, Via Conservatorio, 7 20122 Milano (MI), Italy, e-mail: renata.semenza@unimi.it
ORCID http://orcid.org/0000-0001-6392-9624

The mediating role of competitive and collaborative orientations in boosting entrepreneurial orientation's impact on firm performance

Rafał Kusa

A B S T R A C T
Objective: This study aims to assess the role of the relationships between organizations in shaping entrepreneurial performance. In particular, I tested the mediating role of inter-organizational cooperation and competition in the relationship between entrepreneurial orientation and firm performance.
Research Design & Methods: This quantitative study used structural equation modelling (SEM) to test hypotheses reflecting relationships among variables. I present the relationships in the research model. The research sample consisted of 117 one- and two-star hotels operating across Poland.
Findings: The most original finding refers to the mediating role of relationships among organizations. In particular, the study unveiled the mediating role of both competitive and collaborative orientation in the relationship between entrepreneurial orientation (EO) and firm performance. In both cases mediation was partial. Thus, collaborative behaviours may be as important as competitive ones in transforming entrepreneurial approach into performance. Additionally, the findings confirm the positive impact of EO on competitive and collaborative orientation, as well as the positive impact of these three factors on firm performance.
Implications & Recommendations: This study indicates that both entrepreneurs and researchers should consider inter-organizational relationships as a factor that can enhance entrepreneurial efforts. Thus, these relationships can play an important role in managerial practice and they can be a subject of research focused on organizational entrepreneurship. Regarding theory development, I recommend further studies on collaborative behaviours in pursuing and exploiting entrepreneurial opportunities; specifically, future studies can test presented relationships in other contexts (other industries, countries, and organization types). Moreover, I recommend the inclusion of other variables which can affect the tested relationships as they can help to explain the contingencies related to the tested model. Finally, further testing and improvement of used constructs (especially those reflecting cooperation and competition) are recommended.
Contribution & Value Added: This study's findings contribute to the literature on entrepreneurship and inter-organizational relationships. Specifically, this study explains the role of two opposite postures, namely, cooperation and competition, in the context of entrepreneurial orientations. With its findings, the study augments our understanding of entrepreneurial posture and sheds new light on the operationalization of entrepreneurial orientation, which highlights the role of competing behaviours and omits collaborative actions.

INTRODUCTION

Along with the increasing role of entrepreneurial activity in the economy (Ribeiro-Soriano, 2017), entrepreneurship theory has been continuously developing. Scholars identify entrepreneurship as pursuing opportunities (Stevenson & Jarillo, 1990). Opportunities are the situations that enable gaining profit (Casson, 1982). In changing market environment, where threats often appear along with opportunities, the abilities to seek and exploit opportunities are pillars of firm strategy (*i.e.* entrepreneurial strategy; Drucker, 1985; Dyduch, 2019) and strategic entrepreneurship (Hitt *et al*., 2001). One of the most commonly accepted conceptualizations of entrepreneurship at the organizational level is the entrepreneurial orientation (EO; Covin & Wales, 2019; Wales *et al*., 2020). Entrepreneurial orientation is a multidimensional construct that includes risk-taking, proactiveness, and innovativeness (Covin & Slevin, 1989). In other concepts, autonomy and competitive aggressiveness also constitute dimensions of EO (Lumpkin & Dess, 1996).

Similarly to the development of entrepreneurship practice and theory, we can observe the increasing role of relationships among organizations. These relationships can include both rivalry (Markin *et al*., 2017) and collaboration (Dwyer *et al*., 1987), as well as simultaneous competing and cooperating (which is labelled as 'coopetition;' Brandenburger & Nalebuff, 1996). Competitive relations are important characteristics of a market and they force entrepreneurs to develop different strategies (Suder *et al*., 2022) that can help them to develop their businesses in competitive, and sometimes hostile, environments (Covin & Slevin, 1989). Collaborative relations can involve numerous actors, resulting in the development of networks. All these situations are the subject of intense research; there is reliable evidence showing that they can affect the firm performance (*e.g.* Baker *et al*., 2016).

Previous studies have also explored the role of relationships between organizations in the entrepreneurial context. In this vein, scholars perceive competing as a manifestation of entrepreneurial posture, and, as mentioned above, some propose competitive aggressiveness as a dimension of EO (Lumpkin & Dess, 1996). However, collaborative relationships are also the subject of entrepreneurial studies (*e.g.* Rocha & Miles, 2009) and there are premises to consider inter-organizational collaboration as a dimension of EO (Kusa, 2017). This approach results in the concept of collaborative entrepreneurship which highlights the ability of a company to collaborate outside the organization (Ribeiro-Soriano & Urbano, 2009). The studies focused on small business management also investigate the role of cooperation and networking and provide evidence that they can be profitable for companies (*e.g.* Kusa *et al*., 2023). We may observe a similar positive outcome in studies focused on innovation (Alexiev *et al*., 2016) which is a dimension of EO.

However, the relationships between organizations in the context of entrepreneurial activity are still underexplored. For example, despite massive evidence that competitive and collaborative behaviours can coexist, we have limited knowledge about their interactions and the mechanism leading to the outcome of these interactions in an entrepreneurial context. This study addressed this research gap and aimed to explain the role of relationships among organizations in shaping entrepreneurial performance. In particular, the study examined the mediating role of inter-organizational cooperation and competition in the relationship between EO and firm performance.

To achieve its aim, this study used a research model that reflects direct and mediated relationships among EO, competing, collaborating, and firm performance. The study employed structural equation modelling (SEM) to test the model and hypotheses about these relationships. I tested the model and the hypotheses with a sample consisting of 117 one- and two-star hotels operating throughout Poland. This study intended to contribute to the literature on entrepreneurship and inter-organizational relationships. Specifically, this study strived to augment our understanding of mechanisms of organizational entrepreneurship by explaining the role of two opposite postures, namely, cooperation and competition, in shaping entrepreneurial performance. Furthermore, the study joined the process of improving the operationalization of organizational entrepreneurship by testing the model which includes EO, external cooperation, and inter-organizational competition. Finally, this study aimed to contribute to the literature on tourism management, as it examined the mediating relationships between

the target variables in this industry (as proposed by Czernek-Marszałek, 2019) and focused on a less studied segment of the industry, namely, low-category hotels (as recommended by Perdomo-Verdecia *et al.*, 2022); these arguments justify the sample choice.

The structure of the remainder of the article is as follows. Firstly, I will propose research hypotheses and a theoretical model based on the literature review. Secondly, I will describe the research methodology. Thirdly, I will present our results and confront them with the findings of previous studies. Finally, I will conclude with the contributions and limitations of the study as well as recommendations for future research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

As stated in the Introduction, one of the most common conceptualizations of entrepreneurship is EO. This study focused on the three-dimensional EO construct which includes risk-taking, proactiveness, and innovativeness. The impact of EO on firm performance is a subject of numerous studies in the fields of entrepreneurship and organizational strategy. However, this impact is not clear. Although most studies report a positive impact (*e.g.* Rauch *et al.*, 2009; Kraus *et al.*, 2012), others report a lack of such impact (*e.g.* Renko *et al.*, 2009), and there are also cases of negative impact (*e.g.* D'Souza & Fan, 2022). Moreover, this relationship can be non-linear (Tang *et al.*, 2008; Wales *et al.*, 2013). This ambiguity suggests that this relationship can be affected by other factors, both internal (*e.g.* hotel category; Hernández-Perlines, 2016) and external (*e.g.* market characteristics; Rosenbusch *et al.*, 2013; Wójcik-Karpacz *et al.*, 2019). In studies focused on the hospitality industry, scholars also consider EO as a factor positively affecting hotel performance (*e.g.* Tajeddini *et al.*, 2020; Singal & Batra, 2021). Based on the above, I submitted a hypothesis about the positive impact of EO on firm performance, but after that, I proposed additional hypotheses related to selected factors that can affect this relationship. Thus, I put forward the following hypothesis which was an axle of our theoretical model:

H1: Entrepreneurial orientation positively affects firm performance.

Entrepreneurial orientation reflects a posture towards a firm environment. This posture can affect different behaviours of entrepreneurs. Regarding an entrepreneur's attitude towards other enterprises, we can distinguish two opposite positions: competitive and collaborative. In the entrepreneurship theory, the former dominates (Markin *et al.*, 2017); scholars perceive competing as a manifestation of entrepreneurship (Lumpkin & Dess, 1996). As a result, some EO operationalisations include 'competitive aggressiveness' defined as 'a firm's propensity to directly and intensely challenge its competitors to achieve entry' (Lumpkin & Dess, 1996, p. 148). Consequently, an entrepreneurial firm is expected to take diverse actions to outperform its market rivals (Giachetti, 2016), including direct confrontation (Lumpkin & Dees, 1996). Compared to risk-taking, innovativeness, and proactiveness, competitive aggressiveness less commonly constitutes a dimension of EO in empirical studies (Covin & Lumpkin, 2011); this encouraged me to interpret competitive orientation as a factor separated from EO. However, I propose that it is influenced by EO.

Entrepreneurial posture (expressed by the pursuit of opportunities) can lead to inter-organizational cooperation; specifically, entrepreneurs can cooperate to pursue an opportunity. Entrepreneurs can cooperate at the early stages of the entrepreneurial process, which results in starting their business in partnership (Ruef, 2010). However, they collaborate also at later stages within networks, supply chains, or clusters (Blomqvist & Levy, 2006). Cooperation enables overcoming resource limitations (Nason & Wiklund, 2018), which can prevent firms from pursuing opportunities. This refers also to knowledge resources that are necessary to recognize and capture an opportunity; sharing information and knowledge facilitates generating new ideas, innovation, and finally value creation (Gupta & Govindarajan, 2000). Thus, creating cooperative relationships aimed at pursuing opportunities can be interpreted as a manifestation of entrepreneurship (Franco & Haase, 2013; Kusa, 2017). This is similar to creating a new firm, which is an entrepreneurial act (Gartner, 1989). Previous studies showed that inter-organizational cooperation positively correlates with EO (Kusa *et al.*, 2019) and entrepreneurial

firms are able to form collaborative relationships (Ribeiro-Soriano & Urbano, 2009) and business networks (Abbas *et al.*, 2019). Thus, I hypothesised:

H2: Entrepreneurial orientation positively affects collaborative orientation.

H3: Entrepreneurial orientation positively affects competitive orientation.

Noteworthy, entrepreneurs can simultaneously collaborate and compete with other companies (including their direct competitors; Bouncken *et al.*, 2015). This behaviour is called 'coopetition' (Brandenburger & Nalebuff, 1996) and it somehow manifests flexibility (regarding relationships towards other entities) which is a required characteristic in changing environments and can also be perceived as an entrepreneurial trait (Kusa *et al.*, 2022). Thus, coopetition can be considered in an entrepreneurial context (Soppe *et al.*, 2014; Bouncken *et al.*, 2015; Galkina & Lundgren-Henriksson, 2017; Kusa, 2020). Coopetition is also visible in the hospitality industry (Kallmuenzer *et al.*, 2021). However, since coopetition is a complex phenomenon (Bengtsson & Kock, 2000; Raza-Ullah *et al.*, 2018), it deserves a separate study and I did not include it in mine.

Inter-organizational collaboration is commonly perceived as a facilitator in increasing firm performance. This proposition was developed under resource-based theory. Accordingly, cooperation enables firms, especially small ones, to cope with resource limitations (Welbourne & Pardo, 2009; Staniewski *et al.*, 2016; Li *et al.*, 2021), which is especially valuable during a crisis (Duda *et al.*, 2024); this also refers to small and medium-sized tourism and hospitality enterprises (Pham *et al.*, 2021; Tajeddini *et al.*, 2023). Moreover, cooperation enables firms to reduce the operational costs of the business (Banchuen *et al.*, 2017) and benefit from the investment- and cost-sharing mechanisms (Crick & Crick, 2020). Inter-firm collaboration positively affects creativity, continuous improvement (Fawcett *et al.*, 2008), and innovativeness (Alexiev *et al.*, 2016). Finally, collaboration enhances firm performance (Yue-Ming, 2005). This was also confirmed in entrepreneurship studies. For example, inter-organizational cooperation accompanied by EO dimensions can lead to firm performance (Kusa *et al.*, 2022). Consequently, firms get involved in various types of cooperation with different partners at different levels (Child *et al.*, 2005; Della Peruta *et al.*, 2018; Li *et al.*, 2021). In the tourism context, it is expected to generate 'domino effect' which can be beneficiary for all businesses in the destination (Czernek-Marszałek, 2020a). Owing to this, scholars consider cooperation one of the firm strategies (Nielsen, 1986; Faulkner, 1995) and a foundation for a company's business model (Crick & Crick, 2020). Thus, I hypothesised:

H4: Collaborative orientation positively affects firm performance.

A competitive approach towards other market actors is one of the pillars of an organizational strategy aimed at enhancing competitive advantage (Porter, 1985). For example, in the hospitality industry, competition from neighbouring hotels triggers additional online efforts (Xu *et al.*, 2022). Numerous studies indicate the relationship between competitive behaviours and firm performance (*e.g.* Ajamieh *et al.*, 2016; Schulze *et al.*, 2022), in particular, improving operating performance (Hughes-Morgan *et al.*, 2018), financial performance (Vlas *et al.*, 2022), market position (Lumpkin & Dess, 1996), profitability, and market share (Giachetti, 2016). Consequently, firms develop their competitive methods to increase performance (Powers & Hahn, 2002). This can be enhanced by some negative consequences of social embeddedness, such as limiting the innovativeness of cooperative activities or lowering adaptive abilities, which are observable in the tourism context (Czernek-Marszałek, 2020b). However, the impact of competitive actions can vary depending on firm size. It is stronger in small firms compared to large ones (Weinzimmer *et al.*, 2023). Furthermore, at the embryonic stage of a firm, competitive aggressiveness does not affect firm performance (Hughes & Morgan, 2007). The relationship between competitive aggressiveness and performance can be non-linear (*e.g.* inverted U-shaped; see Andrevski & Ferrier, 2019). Finally, the impact of the competitive approach can be affected by other factors. For example, when accompanied by innovativeness, a competitive approach can lead to firm performance in SMEs (Kusa *et al.*, 2022). Previous research shows that a competitive approach to human resource and IT strategies increases hotel performance (Tavitiyaman *et al.*, 2011). Based on the above, I hypothesised:

H5: Competitive orientation positively affects firm performance.

Taking into account associations of collaborating and competing with both EO and performance (they impact performance, but at the same time, they are affected by EO), I propose that they can play a mediating role in the relationship between EO and performance. Some premises of such role was previously reported; for example, the competitive tactics mediate pioneering orientation and new product performance (García-Villaverde *et al.*, 2017). Additionally, relational capital mediates the impact of green innovation strategic orientation on competitive advantage in the hospitality industry (Dang & Wang, 2022). Thus, I hypothesised:

H6: Collaborative orientation mediates the impact of entrepreneurial orientation on firm performance.

H7: Competitive orientation mediates the impact of entrepreneurial orientation on firm performance.

As stated in the Introduction, organizations can compete and collaborate simultaneously. This encouraged me to propose a theoretical model which includes both collaboration and competition, as well as EO and performance. Figure 1 illustrates the model below.
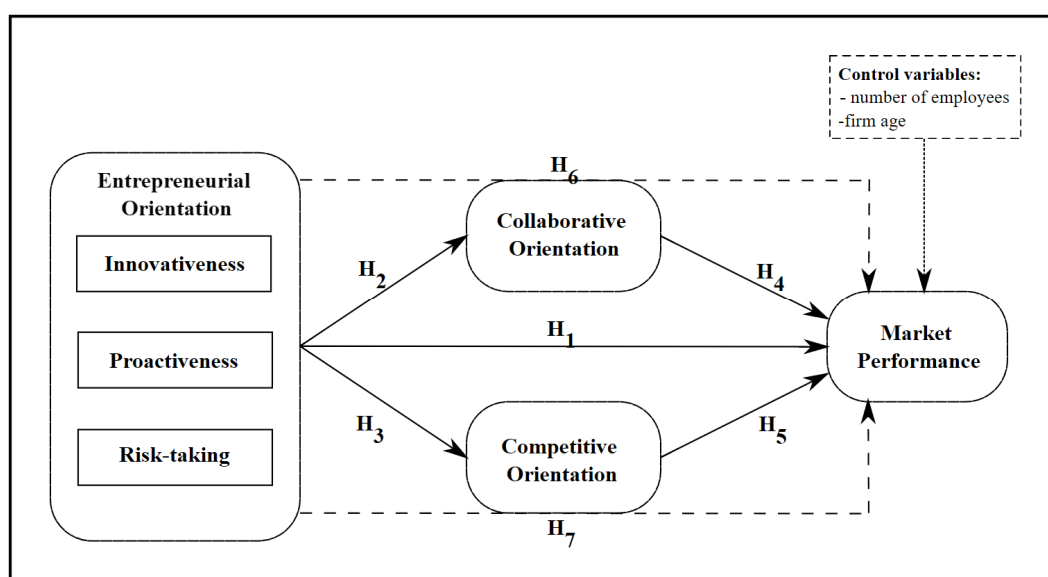
Figure 1. Theoretical model
Source: own elaboration.

RESEARCH METHODOLOGY

Sample and Data Collection

I tested the proposed hypotheses and the theoretical model with one- and two-star hotels operating in Poland. I compiled the list based on the Central List of Hotel Facilities provided by the Ministry of Sport and Tourism of the Republic of Poland (2021); according to the List, there were 680 such entities (November 10, 2021). Representatives of one hundred and seventeen hotels provided their responses to the questionnaire in the November – December 2021 period and they constituted the research sample in my analysis.

Among surveyed entities, 20.8% were one-star and 79.2% – two-star hotels. In total, 57.4% provide 20-50 beds, 20.8% – 51-100 beds, and 21.8% – more than 100 beds. Only 23.7% of surveyed entrepreneurs managed more than one hotel and 16.9% of surveyed hotels were associated with a hotel chain. The majority of hotels in the sample were micro (51.5%) and small (44.6%) enterprises. Only 3.9% were medium ones. Moreover, 7.0% have operated for less than six years, 18.8% between 6-10 years, 31.6% between 11-20, 30.7% between 21-30 years, and 11.9% – over 30 years.

Variables

In this study, firm performance (PERF) was the dependent variable. Other variables were entrepreneurial orientation (EO), external collaborative orientation (COL), and external competitive orientation (COM). In this study, I considered the latter two factors as both independent and dependent variables, as they are associated in different ways with other factors. Entrepreneurial orientation was an independent variable. Entrepreneurial orientation was considered a second-order construct. It includes three constructs, namely, innovativeness, proactiveness, and risk-taking. Table 5 presents the assessment of the EO construct. All variables were indices and consisted of three or four items. Table 1 shows the results of the reliability and validity assessment of each construct. All constructs were based on previous entrepreneurship studies, in particular, performance, EO, and its dimensions were based on the works of Hughes and Morgan (2007) and Kusa *et al.* (2021), and collaborative and competing orientations were based on the study by Kusa, Suder, Baumane-Vītoliņa (2022). In total, the questionnaire comprised 20 questions related to our variables. I present them in Appendix 1. Each question was assessed on a seven-degree scale, where 1 stands for 'fully disagree' and 7 stands for 'fully agree.'

Moreover, I considered firm age and size as control variables. However, the relevant analysis indicated that they did not significantly affect the relationships examined in the research model. Following the recommendation of Bernerth and Aguinis (2016), they were not included in the final analysis.

Method

Due to the research model (Figure 1), which reflects the impact of EO on COL, COM, and PERF, as well as the mediating effect of COL and COM on the impact of EO on PERF, it was appropriate to use a statistical method that allows for the assessment of causal relationships including the evaluation of predictive capabilities. Structural equation modelling based on the partial least squares method (PLS-SEM) provides such possibilities. Scholars commonly use this method of data analysis in many disciplines concerned with causal relationships for latent variables (Hair *et al.*, 2022). In particular, PLS-SEM allows for verifying the significance of both direct and indirect (mediated) relationships (Nitzl *et al.*, 2016; Sarstedt *et al.*, 2017; Suder *et al.*, 2023). I conducted the analysis using SmartPLS software version 4.0.8.7.

I conducted the analysis in three stages. In the first stage, I evaluated the measurement model with a particular focus on verifying the correctness of individual constructs (variables). In the second stage, I built a structural model. Owing to the bootstrapping technique, I could verify the significance of path coefficients (both direct and indirect). In the final stage of the analysis, I estimated the type and strength of the mediating effects for the proposed mediators.

RESULTS AND DISCUSSION

Evaluation of Measurement Model

To assess the correctness of measuring constructs (variables) using the proposed indicators, a measurement model should be evaluated for its reliability and validity (Klarner *et al.*, 2013). Tables 1 and 2 present the evaluation results.

To verify the reliability and validity of the constructs, I used Cronbach's alpha and composite reliability; Table 1 shows their values. According to Kock and Lynn (2012), the threshold of acceptability for these measures is 0.7. For four of the six constructs, the values of these measures were above the aforementioned threshold, which indicates that the indicators were adequate for building the constructs. For two variables, namely, proactiveness and risk-taking, Cronbach's alphas were slightly below 0.7. However, according to Hair *et al.* (2011), the acceptable level for Cronbach's alpha is 0.6. Thus, I also considered these two constructs to be internally consistent, especially since their values of composite reliability (which is a measure similar to Cronbach's alpha; Netemeyer *et al.*, 2003), were much higher than the recommended threshold of acceptability.

Table 1 also shows the outer loadings of each latent variable and the corresponding average variance extracted (AVE). According to the PLS-SEM methodology, the expected value for loadings is 0.7

while the acceptable value is 0.5 (Hair *et al.*, 2022). Only one outer loading for the proactiveness construct (PR_1) was slightly lower than the threshold of 0.7, which allowed for considering all indicators as significant. The AVE values for all constructs were higher than 0.5, which confirmed that all considered variables were relevant (Fornell & Larcker, 1981; Kock & Lynn, 2012).

Table 1. The results of the assessment of constructs and measurement model

Construct	Item	Outer loadings	Collinearity statistics (VIF)	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)
Innovativeness	IN_1	0.784	1.435	0.783	0.874	0.698
	IN_2	0.853	1.904			
	IN_3	0.867	1.798			
Proactiveness	PR_1	0.645	1.431	0.66	0.809	0.589
	PR_2	0.844	1.726			
	PR_3	0.798	1.257			
Risk-taking	RT_1	0.745	1.325	0.683	0.821	0.606
	RT_2	0.748	1.361			
	RT_3	0.839	1.301			
Collaborative orientation	COL_1	0.754	1.704	0.826	0.885	0.658
	COL_2	0.885	2.475			
	COL_3	0.834	2.357			
	COL_4	0.766	1.844			
Competitive orientation	COM_1	0.857	1.554	0.745	0.854	0.661
	COM_2	0.785	1.497			
	COM _3	0.795	1.422			
Market performance	PERF_1	0.827	2.257	0.848	0.897	0.685
	PERF_2	0.863	2.521			
	PERF_3	0.824	2.622			
	PERF_4	0.796	2.386			

Source: own elaboration.

To confirm the absence of collinearity of indicators within each construct, I used the variance inflation factor (VIF). According to Diamantopoulos and Siguaw (2006), the problem of collinearity of indicators does not occur if the VIF values are below 3.30. Data presented in Table 1 shows that all items met this criterion.

An important element in verifying the validity of the model is the assessment of the discriminant (differential) validity of the constructs (Iacobucci, 2010; Kock, 2020). I checked the validity based on the Fornell-Larcker criterion and used the heterotrait-monotrait (HTMT) coefficient. According to Fornell and Larcker (1981) and Kock (2015), discriminant validity requires that the square roots of AVE is greater than its correlations with the other constructs in the model. In contrast, according to Henseler *et al*. (2015), latent variables meet the condition of differential validity if values of HTMT coefficients are below 0.85. Results of the discriminant validity presented in Table 2 show that all examined constructs had differential validity.

I used the standardized root mean squared of residuals (SRMR) as a criterion for fitting the model to the data (Henseler *et al*., 2015). According to Iacobucci (2010) and Kock (2020), the value of SRMR should be below 0.1. Regarding my model, the SRMR was 0.093, which was an acceptable value and confirmed that the model fit the data at a good level.

In my model, I considered EO a second-order construct. Therefore, I followed the recommendations of Diamantopoulos and Winklhofer (2001) and Rasoolimanesh (2022) and determined the collinearity statistics for the outer and inner models. Moreover, I calculated the outer weights for each EO dimension and verified their significance. Table 3 shows the results of this analysis.

The results presented in Table 3 confirm that the EO as a second-order construct is proper in terms of its validity. In particular, for both the outer and inner models, the collinearity statistic had a value

below the recommended threshold (*i.e.* 3.30). Furthermore, the outer weights for each construct were statistically significant (p < 0.05) (Ramayah *et al.*, 2018).

Table 2. Assessment of discriminant validity of the constructs of the Fornell-Larcker and Henseler (HTMT) criterion

Constructs	Fornell-Larcker criterion						Henseler (HTMT) criterion				
	IN	PR	RT	COL	COM	PERF	IN	PR	RT	COL	COM
IN	**0.835**										
PR	0.571	**0.767**					0.754				
RT	0.31	0.276	**0.779**				0.386	0.366			
COL	0.518	0.528	0.362	**0.811**			0.639	0.686	0.463		
COM	0.288	0.418	0.372	0.449	**0.813**		0.361	0.539	0.507	0.564	
PERF	0.314	0.465	0.312	0.472	0.407	**0.828**	0.378	0.594	0.397	0.56	0.498

Note: elements in bold on diagonal show square roots of AVE.
Source: own elaboration.

Table 3. Assessment of measurement model of second-order construct

Second-order construct	Construct	Outer weights	p-value	VIF for outer model	VIF for inner model
Entrepreneurial orientation	Innovativeness	0.411	0.000	1.542	1.176
	Proactiveness	0.506	0.000	1.508	
	Risk-taking	0.372	0.000	1.125	

Source: own elaboration.

The above-presented results of the evaluation of the measurement model and construct validity confirmed that the adopted research model was appropriate for the data used in the study.

Testing Hypotheses With Structural Model

The bootstrapping procedure with 5000 iterations enabled me to verify the statistical significance of the estimated path coefficients (I used a two-sided test with an assumed limiting test probability of 0.05). For each endogenous variable, I calculated the coefficient of determination (R^2); following Cohen (1988) and Kock (2014), a value of this measure above 20% indicates that the model is predictively useful. Moreover, I determined an effect size coefficient (f^2) for each direct relationship; it for allows assessing the role of individual exogenous variables in explaining the variance of the endogenous variable (Cohen, 1988). In particular, I considered the effect size large for $f^2 > 0.35$, medium for $f^2 > 0.15$, and small for an effect size above 0.02.

Figure 2 and Tables 4 and 5 provide the results of the analysis for the structural model. Specifically, Figure 2 presents the path coefficients for each relationship (both direct and indirect) with an indication of their significance. Furthermore, Figure 2 presents the coefficients of determination for each endogenous variable. Table 4 provides complete results for direct relationships analysis and Table 5 provides a summary of results for indirect relationships.

All path coefficients had a positive value, which indicates the presence of a positive influence in the investigated relationships. Moreover, all β-coefficients were statistically significant. In particular, the obtained results indicate that EO was a significant determinant of the PERF, COL, and COM in the examined sample. Thus, hypotheses H1, H2, and H3 were confirmed. In the proposed model, EO had the strongest direct effect on COL ($\beta_2 = 0.615$, p < 0.05) with a large effect size ($f^2 = 0.607$). Based on the R^2 value, EO explains 37.8% of the COL variance. Moreover, EO is also a significant trigger for entrepreneurs' willingness to compete (for COM $\beta_3 = 0.468$, p < 0.05) with a medium effect size ($f^2 = 0.237$). The variability of the COM was nearly 22% explained by EO. The value of the path coefficient for the EO-PERF relationship ($\beta_1 = 0.248$, p < 0.05) indicates that more entrepreneurial behaviour (higher level of EO) leads to higher market performance (PERF). However, the effect size was relatively low ($f^2 = 0.051$). The results of this part of the examination are in line with previous studies indicating the role of EO in shaping firm performance (*e.g.* Rauch *et al.*, 2009; Kraus *et al.*, 2012). These results

confirm also previous propositions regarding the impact of EO on both collaboration (*e.g.* Ribeiro-Soriano & Urbano, 2009; Franco & Haase, 2013) and competition (*e.g.* Lumpkin & Dess, 1996) on the level of inter-organizational relationships.
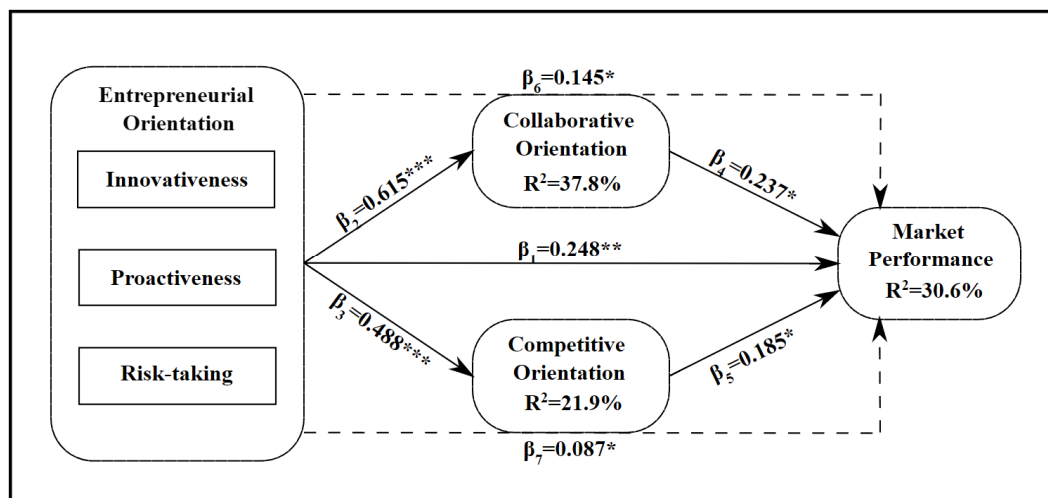
Figure 2. Structural model
Notes: *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05.
Source: own elaboration based on survey results.

Table 4. Results for direct effect evaluation

Hypothesis	Path	Original sample (O)	Bootstrapping				f^2	Hypothesis testing
			Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P value		
H1	EO→PERF	0.248	0.257	0.089	2.806	0.005	0.051	Confirmed
H2	EO→COL	0.615	0.615	0.055	11.087	0.000	0.607	Confirmed
H3	EO→COM	0.468	0.469	0.071	6.571	0.000	0.281	Confirmed
H4	COL→PERF	0.237	0.23	0.106	2.241	0.025	0.048	Confirmed
H5	COM→PERF	0.185	0.182	0.084	2.211	0.027	0.036	Confirmed

Source: own elaboration.

The results indicate that firm performance is significantly influenced not only by EO but also cooperation and competition. Accordingly, hypotheses H4 and H5 were confirmed. Although COL had a greater impact on PERF than COM (β_4 = 0.237, p < 0.05 and β_5 = 0.185, p < 0.05, respectively), for both variables, the effect size was obtained at a low level. The three variables, namely EO, COL and COM, jointly explain slightly more than 30% of the variance of PERF. These results confirm previous observations regarding the positive impact of both collaboration (*e.g.* Yue-Ming, 2005; Welbourne & Pardo, 2009; Kusa *et al.*, 2022) and competitive orientation (*e.g.* Powers & Hahn, 2002; Hughes-Morgan *et al.*, 2018; Kusa *et al.*, 2022) on firm performance. Noteworthy, the results confirm the relevance of tested relationships in the hospitality industry, which corresponds with studies on EO (*e.g.* Hernández-Perlines, 2016; Tajeddini *et al.*, 2020; Singal & Batra, 2021) and inter-organizational relationships in this industry (*e.g.* Kallmuenzer *et al.*, 2021; Pham *et al.*, 2021; Tajeddini *et al.*, 2023). As hotels are an important element of each destination, their collaborative behaviours can affect other local players. They can enhance the 'domino effects' observed at the local level (Czernek-Marszałek, 2020a). The results can help explain the role of competition in improving performance (as shown by Xu *et al.*, 2022). In the case of hotels, this mechanism can be complex and associated with entrepreneurial behaviours.

Evaluation of Indirect and Mediating Effects

In addition to direct relationships, this study examined indirect relationships, which enabled me to assess the mediating effect of collaborative and competitive orientation on the relationship between EO and

market performance (Nitzl *et al.*, 2016; Hair *et al.*, 2022). The mediating effect occurs if the significance of the coefficient for the indirect relationship is confirmed (Zhao *et al.*, 2010). In such cases, it is additionally possible to check the type (full or partial) of mediation (MacKinnon *et al.*, 2007). To determine the type of mediation and compare mediation strength (if there are several mediators), I used the VAF (Variance Accounted For) measure (Hair *et al.*, 2017), which is defined as follows: VAF = (a×b)/(a×b+c')×100%, in which a×b reflects the indirect effect and c' reflects the direct effect. VAF takes values between 0 and 100%; the higher value it takes, the greater role of the mediator in the relation (above 80% – full mediation, between 20% and 80% – partial mediation, below 20% – no mediation effect; Helm *et al.*, 2010). The results of the mediation effect evaluation are presented in Table 5.

Table 5. Results for mediating effect evaluation

Hypothe-sis	Path	Original sample (O)	Bootstrapping				VAF	Hypothesis testing
			Sample mean (M)	Standard devi-ation (STDEV)	T statistics (|O/STDEV|)	P value		
H6	EO→COL→PERF	0.145	0.142	0.07	2.081	0.037	36.4%	Confirmed (partial mediation)
H7	EO→COM→PERF	0.087	0.085	0.042	2.079	0.038	25.5%	Confirmed (partial mediation)

Source: own elaboration.

The results presented in Table 5 indicate that both COL and COM are mediators for the EO-PERF relationship. The path coefficients for both mediated relationships were statistically significant, in particular β_6 = 0.145 (p < 0.05) for COL and β_7 = 0.087 (p < 0.05) for COM. As the direct relationship (EO-PERF) was also statistically significant, this mediation was partial. Additionally, VAF values confirm the mediating effect; VAF fell within the range of 20-80% for both mediators. Thus, hypotheses H6 and H7 were confirmed. Furthermore, the comparison of the VAF values for COL and COM indicates that the mediating strength of cooperation is greater than that of competition. This finding is contrary to a general understanding that competition is more entrepreneurial than cooperation (*e.g.* Lumpkin & Dess, 1996; Markin *et al.*, 2017). However, this also shows that the role of both behaviours can be complex (as indicated previously by García-Villaverde *et al.*, 2017 and Dang & Wang, 2022). This is also somehow in line with studies that suggest that entrepreneurial studies can benefit from the inclusion perspective of coopetition (Soppe *et al.*, 2014; Bouncken *et al.*, 2015; Galkina & Lundgren-Henriksson, 2017; Kusa, 2020). Similarly, the findings correspond with previous studies on tourism management (Czernek-Marszałek, 2019), indicating the mediating role of cooperation in low-category hotels. Finally, this finding confirms that the impact of EO on firm performance can be indirect and can be affected by other factors (in this case, mediated by the type of relationship with other entities). With this finding, the study joins a research stream that focuses on the determinants of this relationship and intends to clarify the ambiguity regarding the relationship between EO and performance (*e.g.* Rosenbusch *et al.*, 2013; Hernández-Perlines, 2016; Wójcik-Karpacz *et al.*, 2019).

CONCLUSIONS

The study aimed to determine the relationship between EO, collaboration, competition, and firm performance, with a special focus on the mediating role of inter-organizational cooperation and competition in the relationship between EO and firm performance. The most original finding unveiled the mediating role of both competitive and collaborative orientation in the relationship between EO and firm performance. In both cases, mediation was partial. This allows me to posit that collaborative behaviours can be as important as cooperative ones in transforming entrepreneurial approach into performance, which sheds new light on our understanding of entrepreneurial behaviours and suggests revising these operationalisations of EO that highlight the role of competing behaviours and omit collaborative actions. Furthermore, the findings confirm the positive impact of EO on competitive orientation and collaborative orientation, as well as the positive impact of these three factors (EO, COM, and COL)

on firm performance. With these findings, the study contributes to the literature on entrepreneurship and inter-organizational relationships. Furthermore, the study adds value to the tourism management literature by explaining the relationships examined in low-category hotels.

This study offers implications for both researchers and practitioners and suggests considering inter-organizational relationships as a factor that can enhance entrepreneurial efforts. Thus, inter-organizational relationships can play an important role in managerial practice and be a subject of research focused on organizational entrepreneurship. The results indicate that hoteliers should improve both collaborative and competitive abilities along with their entrepreneurial skills and use them concurrently to maximize their gains.

However, when applying the presented results, several limitations should be considered. I obtained the results based on the examination of a homogeneous sample (small one- and two-star hotels operating in one country). Therefore, in the case of other companies, the results may differ from those presented in this study. Moreover, it is necessary to take into account the applied operationalization of the tested phenomena, especially collaborating and competing; the use of other operationalisations, which would expose other aspects of these phenomena, can lead to differing results. Finally, there may be more relationships than just the unveiled ones (for example, moderating roles of collaborating or competing; the size of the sample surveyed in this study allowed for testing only selected hypotheses. The above limitations indicate directions for further research exploring the role of inter-organizational relationships in entrepreneurial activities. In particular, I recommend conducting similar research in other contexts (*e.g.* in terms of industry, location, organization type). In the tourism context, studies focused on hotels of other categories (including accommodations that are not classified) or family-owned hotels can be relevant to get a full picture of the role of entrepreneurial, collaborative, and competitive orientations in the hospitality sector. The inclusion of other variables that can affect the tested relationships is also recommended as they can help to explain the contingencies related to the tested model. Finally, I recommend further testing and improvement of the constructs used (especially those reflecting cooperation and competition). Such research would make it possible to confirm the relationships indicated in this study, which could provide a basis for formulating new proposals in the field of inter-organizational relationships and entrepreneurship theory.

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Appendix A: Constructs' items

Innovativeness
    Our organization seeks out new ways to do things.
    We actively introduce improvements and innovations in our organization.
    Innovation is the source of our success.
Proactiveness
    We analyze our external environment.
    We strive to identify future trends.
    We initiate actions to which other organizations respond.
Risk taking
    When we see an attractive opportunity, we follow it regardless of the accompanying risk.
    The term 'risk taker' is considered a positive attribute for people in our business.
    Relative to our competitors, we pursue high-risk opportunities oftener.
Collaborative orientation
    We are more collaborative than our competitors.
    We take advantage of collaboration when we launch new products on the market.
    We take advantage of collaboration when we introduce new processes.
    We perceive collaboration as facilitator of our development.
Competitive orientation
    In general, our organization takes a bold or aggressive approach when competing.
    We try to undo and out-maneuver the competition as best as we can.
    We are more competitive than our competitors.
Market Performance
    Relative to competing products, our products are more successful in terms of sales.
    Relative to competing products, those of our business achieve and maintain a higher market share.
    Relative to our competitors, our income is greater.
    Relative to our competitors, our profit is greater.

Author

Rafał Kusa

Assistant Professor at the AGH University of Krakow, Faculty of Management; PhD in Eco-nomics and Man-agement (2007, Krakow University of Economics, Krakow, Poland). His research interests include strategic management, organizational entrepreneurship, social entrepreneurship, non-profit or-ganizations, digitali-zation, and tourist management.
Correspondence to: Dr Rafał Kusa, Akademia Górniczo-Hutnicza, Wydział Zarządzania, ul. Gramatyka 10, 30-067 Krakow, Poland, e-mail: rkusa@agh.edu.pl
ORCID ⓘ http://orcid.org/0000-0002-9819-897X

Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relation-ships that could be construed as a potential conflict of interest.

Social media and constructing the digital identity of organizations: A bibliometric analysis

Wojciech Czakon, Monika Jedynak, Aneta Kuźniarska, Karolina Mania

A B S T R A C T

Objective: The study aimed to map the stock of knowledge on organizational identity in a digital environment.

Research Design & Methods: We systematically reviewed the literature to map the current research landscape and identify gaps that need to be addressed to better understand how organizational identity is constructed in a digital environment. We used a bibliometric visual analysis to provide a comprehensive overview of the field. We ran a co-occurrence of words analysis to identify central and peripheral themes.

Findings: Organizational identity and digital organizational identity seem to be topics detached from mainstream research. Most of the literature has adopted the individual level of analysis and left other levels of analysis unattended, including the organizational level in particular. We see this gap as a major theoretical and empirical vacuum in the existing literature.

Implications & Recommendations: We identified a research gap regarding the lack of research on the construction of organizational identity in the digital environment at various levels of analysis. We also found that scholars did not devote attention to the micro level of analysis, i.e. individual interactions such as posts, tweets, etc. although it may be instrumental to the construction of an organization's digital identity.

Contribution & Value Added: The article contributes to research on organizational identity shaped in the digital world, especially from the perspective of social media. We show gaps in existing approaches and levels of analysis.

INTRODUCTION

Firms' behaviour and conduct closely intertwine with constructs that capture the collective, distinctive, and enduring features of a given organization (Albert *et al.*, 1985). Organizational identity plays an important role as it is key to elucidating the interactions between the organization and its environment (He & Brown, 2013). The lens of interaction helped scholars develop a stakeholders perspective (Scott, Lane, 2000) in order to better understand how various constituencies construct identity and what are the ramifications of organizational identity for organizational actors (Ravasi & Canato, 2013).

In our study, we followed the fundamental assumption of the social constructionist perspective, which regards organizational identity as emerging from interactions defining the organization's essence (He & Brown, 2013). By doing so, we aimed to address the role of digitalized ways of interacting and the resulting digital impact on organizational identity. Indeed, organizational identity unfolds over time along with the processes of its construction (Alvesson & Empson, 2008). Therefore, focusing on the processes that lead to organizational identity rather than their outcome alone is useful (Ravasi *et*

al., 2019). Organizational identity reconstruction refers to the process of 'articulating a new conceptualization of the organization that is understood and accepted by its members' (Kjaergaard *et al.*, 2011). We expanded the scope of the original reconstruction definition from 'organization's members' to stakeholders, consistently with the social constructivist approach adopted in our study.

The study aimed to map the stock of knowledge on organizational identity in a digital environment. It focused on social media as a widely used platform for various interactions between individuals, and between individuals and organizations. We systematically reviewed the literature to map the current research landscape and identify gaps that need to be addressed to better understand how organizational identity is constructed in the digital environment. We also provided visual presentations of key themes and outlined promising avenues for future research. To the best of our knowledge, our study is the first systematic literature review focused on digital identity and social media.

The structure of the article includes an introduction followed by a literature review presenting the current state of knowledge in the analysed field of organizational identity in the digital environment. In the next part, we will describe the method selected to perform the study. Part of the results and discussion focused will focus on the presentation and contextualization of the research results. The article will close with conclusions and research recommendations.

LITERATURE REVIEW

The organizational identity construct appeared in the 1980s and consisted in identifying an organization's distinctive elements (Albert *et al.*, 1985). Subsequently, researchers focused on examining related constructs, such as organizational image, culture, or reputation (Brown & Starkey, 2000; Hatch & Schultz, 2002; Whetten & Mackey, 2002). This interest sparked the emergence of several more focused concepts such as corporate identity (Balmer, 1998), organizational personality (Whetten & Godfrey, 1998), organizational communication (Balmer & Gray, 2000), organization image (Fombrun & van Riel, 1997), corporate reputation (Turban *et al.,* 1998), or visual identity (Baker & Balmer, 1997). Starting from the 1990s, the prevailing way of looking at organizational identity became interdisciplinary and combined methods found in management, marketing, and psychology (Abratt, 1989; Barich & Kotler, 1991; Hatch & Schultz, 1997; Thøger Christensen & Askegaard, 2001). With the accumulation of empirical evidence and theoretical advances, the concept definition evolved further. Initially (1980s and 1990s), the relationships and dependencies within the organization were crucial (Albert & Whetten, 1985). Next, scholars defined a set of characteristics that make up the identity in relation to the values and principles with which the organization's members identify. Moreover, scholars also defined organizational identity as a phenomenon involving dependencies occurring only among an organization's members, distinguishing it from the concept of the image focused on external constituencies (Davies *et al.*, 2001). In turn, other definitions emphasize the role and importance of external stakeholders in the process of identity formation (Gioia *et al.*, 2000; Markwick & Fill, 1997). Another approach considered the relationship of organizational identity with communication, reputation and image, which in turn resulted in the creation of the so-called organizational identity mix (Balmer, 2001; Balmer & Gray, 2000; Balmer & Soenen, 1998).

Scholars developed a shared understanding of the key importance of several areas for the creation and relevance of organizational identity. These include organizational culture, strategy, structure, communication, history, type of business, and market area in which the organization operates (Abratt, 1989; Balmer, 1998, 2001; Balmer & Soenen, 1999; van Riel & Balmer, 1997). Founders and leaders shape an organization's identity with their actions (Balmer, 2008) and through organizational attributes such as core values (Balmer & Soenen, 1998), production methods, products and services, and brand (Dutton & Dukerich, 1991; Suvatjis & de Chernatony, 2005). Elements of visual identification are also an important component. These include name, logo, or company colours (Melewar, 2003; Melewar & Jenkins, 2002; Melewar & Karaosmanoglu, 2006; Suvatjis & de Chernatony, 2005), as well as mission, vision, image, and behaviour (Robertson & Arachchige, 2015). Figure 1 shows the organizational identity components.

Communication

External and internal communication, digital communication, direct and indirect communication, controlled and uncontrolled communication.

Behaviour

Employee behaviour, management behaviour, other stakeholders' behaviour.

Culture

Philosophy, value, mission, principles, corporate guidelines, corporate history, founder of the company, country of origin, subculture.

Structure

Brand and organizational structure, relationships between the parent company and its subsidiaries or business units, relations with alliance or franchise partners.

Industry identity

Political, economic, ethical, social, and technological environment, competition, the threat of potential entrants.

Strategy

Brands, products and services strategy, corporate strategy, marketing strategy, differentiation strategy, positioning strategy, management vision.

Corporate visual component

Corporate Visual Identity Systems – CVIS, advertising, applications of CVIS, logos, colour scheme.

Organizational identity

Figure 1. Components and dimensions of organizational identity
Source: own elaboration based on Balmer (2002); Bozkurt and Keefer (2018); Bozkurt and Tu (2016); Gioia, Patvardhan, Hamilton, and Corley (2013).

One of the main components of an organization's identity is communication (Aust, 2004), which consists of primary communication related to products/services and the organization's behaviour, secondary communication involving the activities initiated by the organization to connect with stakehold-

ers, and of third-order communication, which includes messages about the organization sent by other external stakeholders (Balmer, 2001). While organizations can partly control primary and secondary communication, third-order communication is beyond their control. Communication also plays a vital role in creating organizations' identity as they use it to create a clear and coherent image consistently communicated to stakeholders through symbolism, planned dialogue, and behaviour (Cornelissen & Elving, 2003). The influence of digital media on an organization's communication with stakeholders is growing significantly (Andersson & Wikström, 2017). Thus, digital communication plays a significant role in shaping an organization's identity within the digital environment (Napal Fraile *et al.*, 2018).

Digital communication has given a new dimension to communication processes and highlighted the importance of interactive platforms for creating online images (Devereux *et al.*, 2017). Apart from being a source of information, social platforms have become an area of promotion, commerce, image building, branding, and community building by implementing strategies to engage all stakeholders (Sedereviciute & Valentini, 2011). Thus, digital organizational identity is inherently connected with technology and the opportunities it offers (Fieseler *et al.*, 2015). Digital communication platforms allow organizations to shape their digital identity using new channels, among which social media play a dominant role (Dawson, 2018; Gündüz, 2017). Social media is typically associated with the digital technologies that allow users to generate content and interact, but a more precise definition views social media as 'Internet-based, disentrained, and persistent channels of masspersonal communication facilitating perceptions of interactions among users, deriving value primarily from user-generated content' (Carr & Hayes, 2015).

Initially, scholars saw digital organizational identity as a distinctive genuineness in a digitalized environment (Ellison et al., 2012). However, scholars increasingly recognize that digital transformation is substantially more than transferring practices from analogue to digital technology (Jedynak *et al.*, 2021). Instead, it leads to a socio-economic change that is distinct from prior ways of structuring and operating organizations at multiple levels of analysis (Dąbrowska *et al.*, 2022). For instance, at group level digital, scholars define identity as 'collective self-concept(s) of an in-group towards the creation, application, development, and emergence of digital technology built on a sense of community, enthusiasm, being part of something special and common values and norms' (Bouncken & Barwinski, 2019). Interestingly, research on the distinctive features of digital organizational identity has not yet provided a comprehensive definition of this construct. Therefore, scholars call for an in-depth scrutiny of this phenomenon (Dąbrowska *et al.*, 2022). In our study, we map extant literature to identify gaps that may offer promising avenues for further scrutiny.

Organizations may construct their digital identity on several levels through activities involving internal and external stakeholders, investors, or potential future employees (Belasen & Belasen, 2019). Therefore, the usage of social media by organizations must be diverse enough to address all its stakeholders. The organization's activities focused on organization's members build a sense of commitment and confirm the mission and values declared by the organization (Brezoiu, 2014). Actions aimed at acquiring new employees – conducted by HR – using digital organizational identity for recruitment processes are likely to substantially differ (Happonen *et al.*, 2022).

Another aspect is the construction of digital organizational identity through communication activities aimed at investors or potentially interested parties (Stoller, 2013). In each of these cases, online communication serves completely different purposes, although organizations use the same channels – social media – are used to achieve them (Çöteli, 2019). Therefore, when examining the digital organizational identity shaped by organizations in the digital environment, we should focus on micro-interactions on social media, which aggregated can lead to a better understanding of the macro-level phenomenon of digital organizational identity (Schroeder, 2016). In particular, such focus allows us to identify the differences in the ways organizations engage with stakeholders on social media (Devereux *et al.*, 2017; Wang & Yang, 2020).

RESEARCH METHODOLOGY

An essential element of research advancement is the systematic analysis and presentation of existing research (Kumar, 2021). Systematic literature reviews are particularly suitable and established to

this end (Kraus *et al.*, 2020). Essentially, it serves as an auditable and rigorous presentation of the existing literature and allows us to identify relevant research gaps and thus to set out further research directions (Paul & Criado, 2020).

We complemented our systematic literature review with visualizations that allow for advanced meta-analyses and bibliometrics (Jadil *et al.*, 2021). Bibliometrics is an analytical approach to analysing related documents by topic or source to review a research domain (Nicholas & Ritchie, 1978). Visual results are useful to clearly show the relationships between various key features of articles, such as authors, dates, and keywords (Kumar *et al.*, 2022; Rousseau *et al.*, 2008).

Within the scope of a given theme, we based the analysis on the repository of scientific publications related to the role of communication in shaping the digital identity of organizations collected in the Scopus bibliographic database. While recent studies recommend the use of Scopus and/or Web of Science (Kraus *et al.*, 2020a), scholars often use one of them and adopt either WoS when a more selective approach is preferred (Kraus *et al.*, 2020b) or Scopus when a broader selection is needed as this database offers a way more comprehensive coverage (Bhimani *et al.*, 2019). The database is an organized digital collection of published scientific literature, including journal articles, conference proceedings, patents, books, etc. It contains subject descriptions in the form of keywords, authors, subject classification terms, and abstracts (Aria & Cuccurullo, 2017).

We developed the database search keywords based on prior systematic literature reviews on digital transformation, which offer key themes addressed in the existing body of knowledge (Jedynak *et al.*, 2021; Jedynak *et al.*, 2022). For the Scopus search, the original query was:

(TITLE ('DIGITAL' OR 'VIRTUAL' OR 'ONLINE' OR 'SOCIAL MEDIA' OR 'INTERNET' OR 'ELECTRONIC' OR 'TECHNOLOGY' OR 'WEB BASED') AND TITLE ('IDENTITY') AND TITLE ('COMMUNICATION'))

The information for the documents that meet the requirements contained year of publication, language, journal, title, author, affiliation, keywords, document type, abstract, and counts of citations which we exported into CSV format. We retrieved the data on 12th January 2023.

By incorporating specific keywords and manually reviewing all abstracts, the research team created a database of 116 documents. This process aimed to exclude materials not centred on organizational identity as a core subject and those extending beyond the management studies realm. Figure 2 shows numbers for scientific books, book chapters, journal articles, and conference papers by year.
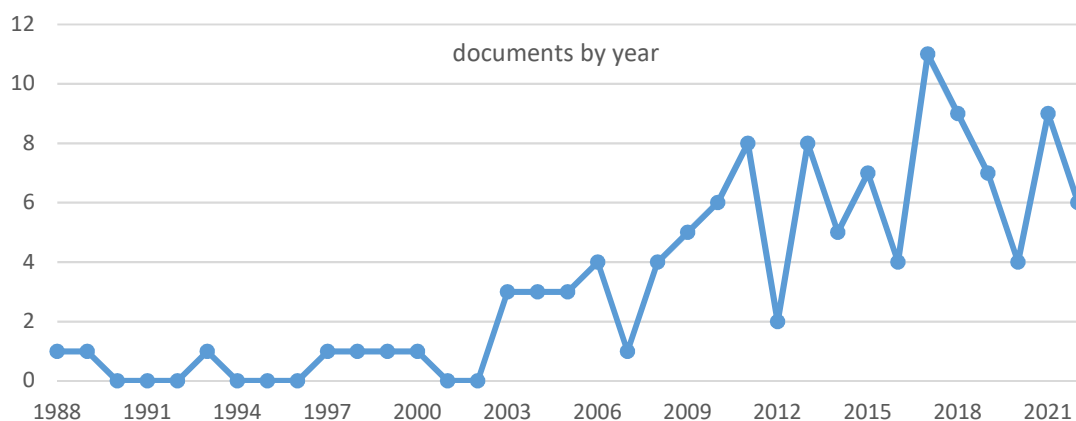
Figure 2. The number of publications in Scopus each year
Source: own elaboration in VOSviewer (version 1.6.18).

Because of the possibilities offered by bibliometric analyses, we opted for VOSviewer (version 1.6.18) (Baker *et al.*, 2020; Bu *et al.*, 2021; van Eck & Waltman, 2010; 2017). VOSviewer allows researchers to define the research gaps covered by published articles and indicate the directions of scientific development (Zema & Sulich, 2022). We opted for a co-occurrence analysis to identify the body

of knowledge related to organizational identity construction in the digital realm. We will present the results on bibliometric maps later in the article.

RESULTS AND DISCUSSION

In the first stage of our research work, we selected a file in the VOSviewer program, which we prepared based on the queries conducted in the Scopus databases. Firstly, we determined a minimum number of one co-occurrence of keywords for each bibliometric map. We run our analysis on full data obtained from 587 keywords. Figure 3 shows a bibliometric map of co-occurrences of keywords. Figure 3 presents the bibliometric map of keyword co-occurrences with a minimum number of thresholds equalling one. The uniqueness of this map comes from the vast number of clusters and their combinations. Few clusters were interconnected, some of these were connected by a minimum of two keywords or were so far apart that the keywords did not strictly form clusters, as there was one keyword in the cluster defined by VOSviewer. Thanks to that, we could identify a research gap visible on the map as a field with no thematic connection in the area: digital identity-organizational identity-digital transformation. Results showed that substantial keywords are related to 'communication,' which occurred 190 times, and 'identity' which occurred 127 times. Other significant keywords included: 'social media' (77), 'information' (56), 'virtual reality' (50), and 'internet' (32).

In the next step, for a more complete analysis, we determined a minimum number of five co-occurrences of keywords for the bibliometric map. In the 587 keywords collection, only six exceeded the required threshold. In the next stage, we excluded another two unrelated words and removed duplicate keywords. Figure 4 presents the bibliometric map of keyword co-occurrences with a minimum number of thresholds equalling five. With this limitation, the digital theme disappeared completely.

In the last step, we verified the periods in which publications with searched keywords appeared. Figures 5 and 6 show this step. Figures 5 and 6 show which keywords have been introduced over time and which have only recently come into use. Years are represented by different colour ranges. Darker colours mark the older publications, while light colours represent the newest publications.
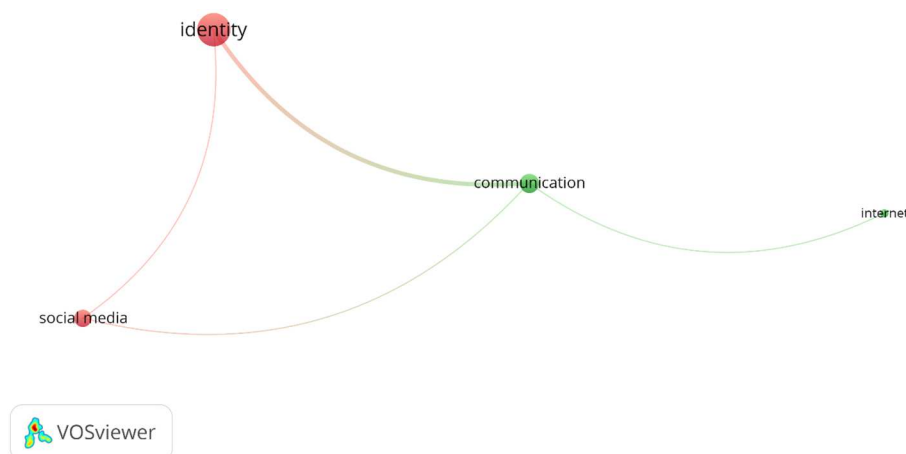
Figure 4. Bibliometric map of keywords in the overlay visualization context, co-occurrences (minimum 5) results
Source: own elaboration in VOSviewer (version 1.6.18).
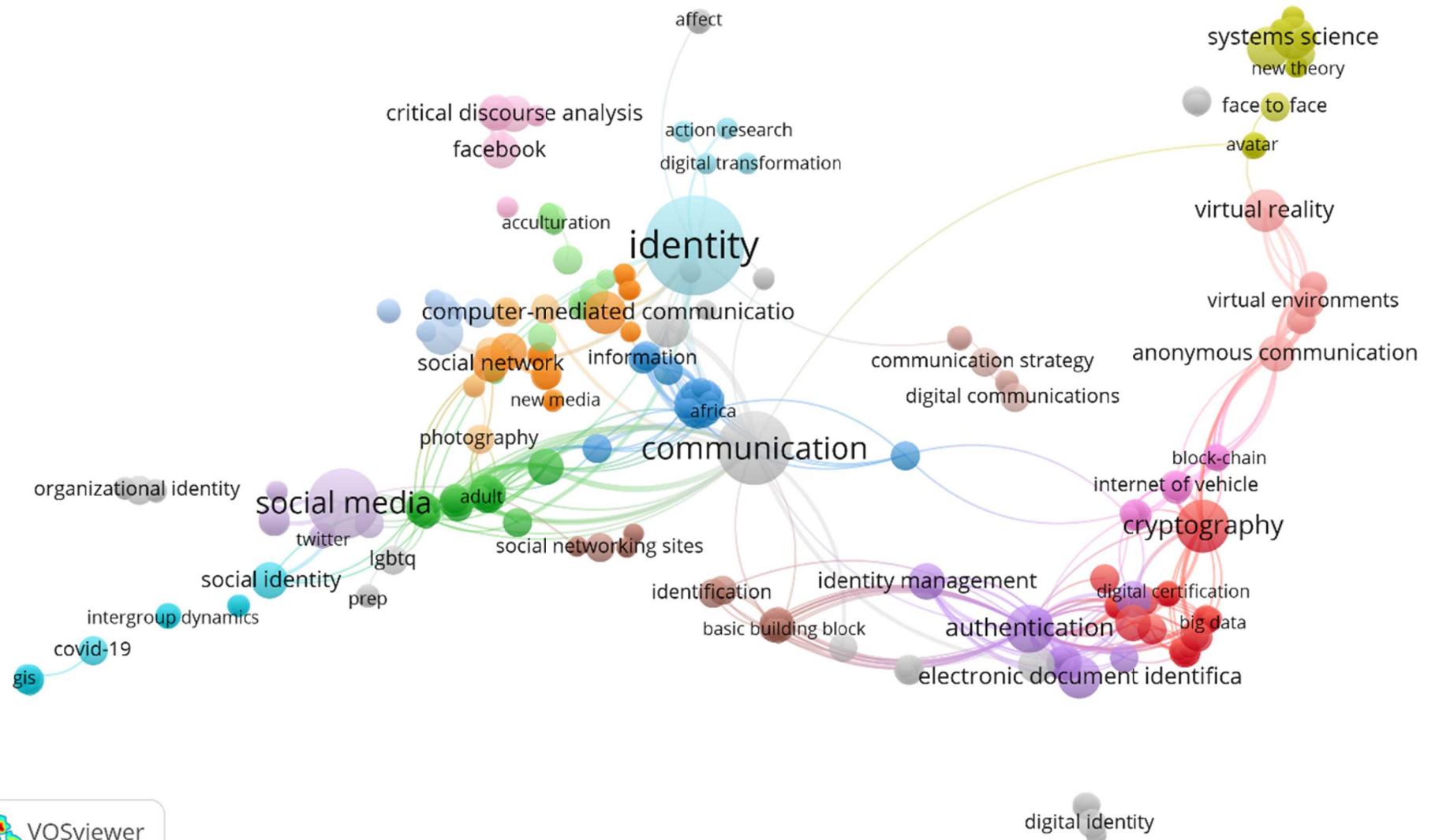
Figure 3. Bibliometric map of keywords in the overlay visualization context, co-occurrences (minimum 1) results
Source: own elaboration in VOSviewer (version 1.6.18).
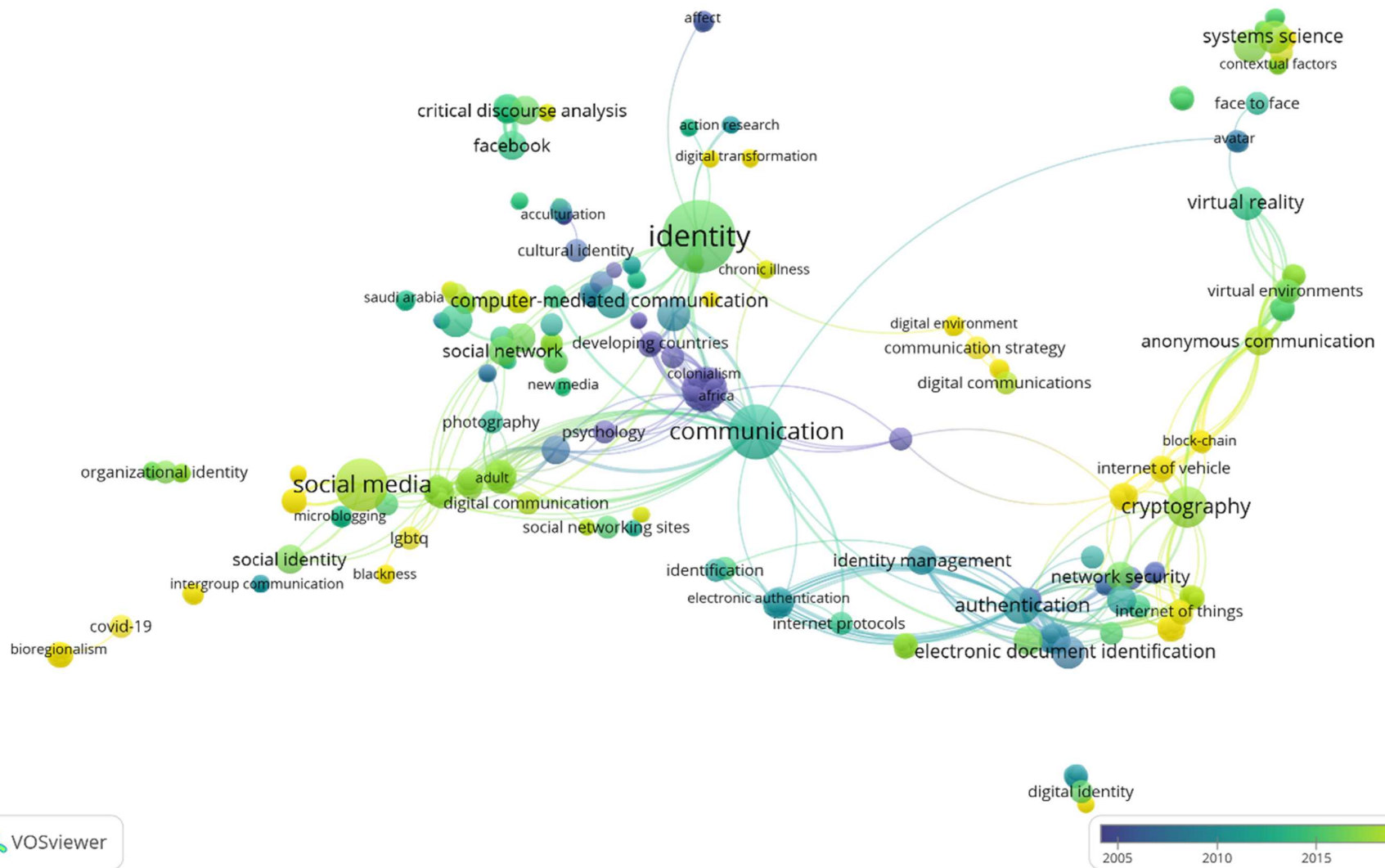
Figure 5. Periodic evolution of keywords
Source: own elaboration in VOSviewer (version 1.6.18).

Figure 6. Periodic evolution of keywords
Source: own elaboration in VOSviewer (version 1.6.18).

CONCLUSIONS

Figure 3 depicts the key finding of our literature review. Indeed, organizational identity and digital identity appear as themes disconnected from mainstream research. This is striking because all other topics are more or less connected, with identity followed by communication and social media being prominent topics. This suggests that the bulk of the literature focused on the individual level of analysis and left other levels unattended.

We identified that some initial views on digital identity have been developed at individual and group level (Bouncken & Barwinski, 2019). At the same time, we concur with Dąbrowska *et al.* (2022) that the organizational level of analysis has been left unattended. This is surprising because the wide-spread use of social platforms incites organizations ranging from political parties, through sports clubs to firms, to engage with individual social media users. We perceive this gap as a major theoretical and empirical vacuum in the literature. Hence, so far, scholars have not empirically examined such important concepts as organizational identity or even conceptualized them in the context of digital transformation. We encourage adopting the organizational level of analysis for the study of digital transformation, especially in the case of communication processes and related constructs.

Symmetrically, we find that the micro-level of analysis has also been left unattended. By micro-level, we mean single interactions such as posts, tweets etc. followed by their streams that may contribute to constructing the organizational identity of organizations in the digital realm. We believe that interactions as such are important in developing such organizational phenomena as routines, culture, citizenship behaviours, and identity. Communication also relates the organization to its external audiences. Social media offer the unique opportunity of tracking those interactions. At the same time, while analogue interactions take place and time, those on social media are indeed micro, *i.e.* short, fragmented, and often discontinued. Further research into the impact of micro-interactions on relevant organizational-level phenomena appears as a promising avenue.

We are aware of several limitations of our study, which stem from both our research design and the current state of research on the focal topic. Regarding our design choices, we focused on one academic database, which has the merit of being more comprehensive than Web of Science. However, it does not capture all books, professional journals, and business press articles. For emerging fields of research, such grey literature might be useful in mapping current debates and practices. As a result, the number of articles in our final sample was relatively low. We encourage research into this topic. Secondly, the state of the field is nascent. Scholars have published relevant conceptual and research agenda articles only recently (Dąbrowska *et al.*, 2022). Therefore, the map that emerged from our study indicates some orientation points and the confines of the field, but for the most part, it identifies

empty spaces corresponding to unattended topics. We strongly recommend filling in the gaps relative to digital organizational identity and its relationship with the currently prevailing social media interactions with relevant stakeholders.

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Authors

The contribution share of authors is equal and amounted to 25% for each of them.
WC - introduction and conclusions, MJ – conceptualization, literature writing, KM- literature writing, AK – methodology, results and discussion.

Wojciech Czakon

Full Professor of Strategy at the Faculty of Management and Communication of the Jagiellonian University in Krakow, Poland. His research revolves around the behavioral underpinnings of strategic decisions and actions. Recent publications focus on the role of trust, perceptions, preferences and frames in various strategic decisions and their performance impact.
Correspondence to: prof. dr hab. Wojciech Czakon, Jagiellonian University, Faculty of Management and Social Communication, ul. S. Łojasiewicza 4, 30-348 Krakow, Poland, e-mail: Wojciech.czakon@uj.edu.pl
ORCID http://orcid.org/0000-0002-8329-0829

Monika Jedynak

Assistant professor at the Institute of Economics, Finance and Management of the Jagiellonian University in Krakow. Her scientific interests focus on inter-organizational cooperation, in particular socially responsible cooperation. A new direction of research is the processes of digital transformation of organizations, the formation of digital identity of organizations and the role of social media in these processes.
Correspondence to: dr Monika Jedynak, Jagiellonian University, Faculty of Management and Social Communication, ul. S. Łojasiewicza 4, 30-348 Krakow, Poland, e-mail: monika.jedynak@uj.edu.pl
ORCID http://orcid.org/0000-0002-0167-5013

Aneta Kuźniarska

Assistant professor at the Institute of Economics, Finance and Management of the Jagiellonian University in Krakow. Her research interests include HRM and green HRM, digital technologies in HRM, sustainable development.
Correspondence to: dr Aneta Kuźniarska, Jagiellonian University, Faculty of Management and Social Communication, ul. S. Łojasiewicza 4, 30-348 Krakow, Poland, e-mail: aneta.kuzniarska@uj.edu.pl
ORCID http://orcid.org/0000-0002-2786-2781

Karolina Mania
Assistant professor in the Institute of Economics, Finance and Management at the Jagiellonian University and an attorney-at-law, PhD in law. She is the author multiple papers on the use of electronic communication in a legal sector and legal technology.
Correspondence to: dr Karolina Mania, Jagiellonian University, Faculty of Management and Social Communication, ul. S. Łojasiewicza 4, 30-348 Krakow, Poland, e-mail: karolina.mania@uj.edu.pl
ORCID ⓘ http://orcid.org/0000-0001-9063-7563

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

An empirical investigation into regional housing market synchronisation in Poland

Radoslaw Trojanek, Michal Gluszak, Michal Kruszka

A B S T R A C T
Objective: The article aims to investigate the synchronisation of metropolitan house prices from 2000 to 2020 based on novel empirical data. We applied several econometric procedures to address the cyclicity of housing markets.
Research Design & Methods: Using a unique dataset of over four million offers, we investigated the synchronisation of 18 regional housing markets in Poland from 2000 to 2020. The study used spectral analysis.
Findings: The study proved the strong synchronisation of housing cycles in Polish regional housing markets. Moreover, when the cycle amplitude was considered, the econometric analysis showed regional disparities in the cyclical behaviour of housing prices. According to the research, Lublin and Opole had the lowest housing cycle magnitude, and Gdańsk, Katowice, and Łódź had the largest magnitude.
Implications & Recommendations: The information about housing cycles has important policy implications. Housing wealth effects generated by cyclical house prices may be more persistent than financial wealth effects. Consequently, they may substantially affect consumption dynamics. Therefore, precisely identifying market cycles and differences in cycle synchronisation is vital when constructing an effective, selective, and well-timed monetary policy.
Contribution & Value Added: The research narrows the knowledge gap on the synchronisation of housing markets in an emerging economic environment. With their distinct institutional structures, Eastern European countries have little knowledge of this issue.

Article type:	research article
Keywords:	housing prices; synchronisation; Poland; housing market; listings
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INTRODUCTION

The recent two decades have brought empirical evidence on business cycle synchronisation and its determinants (Beck, 2019). Following mainstream economic interest, substantial but not entirely consistent research has been done on housing market fluctuations in the short and long run. Furthermore, the body of econometric evidence demonstrates that house prices exhibit cyclical behaviour as other major asset classes and are possibly synchronised due to various factors.

Housing market synchronisation is essential for several reasons. Firstly, housing market synchronisation suggests that positive and negative economic shocks will magnify across regions and countries. Secondly, it has some important policy implications for private and public stakeholders. Miles argues that knowledge about the co-movement of house prices is helpful for developers and institutional investors when building a diversified housing stock portfolio (Miles, 2020). Thus, housing cycles and their potential synchronisation are particularly interesting to policymakers responsible for financial stability and various interlinkages between housing markets, the construction industry, and the economy (Duca

et al., 2021). In the latter case, the synchronisation of housing cycles, or lack thereof, requires a different approach to devising regional housing policy instruments (Miles, 2020).

The synchronisation of house price cycles has been relatively understudied compared to related housing market convergence and spill-over effects. This particular observation is even more apparent in the case of emerging economies, where the relative research gap is substantial. The article narrows the research gap by examining the cyclical behaviour of 18 regional housing markets in Poland. The article investigates the synchronisation of metropolitan house prices from 2000 to 2020 based on novel empirical data. We applied several econometric procedures to address the cyclicity of housing markets.

This article proceeds as follows. The following section will describe the previous research on the synchronisation of house price cycles. In particular, we will focus on similarities and differences found in the regions and countries investigated. The third section will explain our data and methodology. The fourth section will describe the empirical results and discuss the significant implications. Finally, research conclusions, limitations, and directions for further investigation will be found in the last section.

LITERATURE REVIEW

Over the last two decades, mainstream economists have drawn growing attention to the dynamics of house markets, but it has been dramatically amplified since the global financial crisis. As a result, one of the recurrent themes in the economic literature is the housing market cycle. The economic literature in the field may be divided into two distinct categories. The first branch of empirical research addresses the question of the presence of housing market cycle synchronisation. The second branch of the study aims to identify various factors that explain housing market synchronisation. Moreover, several scholars addressed methodological issues in identifying and measuring housing market cycles.

The empirical research suggests that housing market synchronisation has increased substantially globally (Duca, 2020; Hirata et al., 2012). Interestingly, empirical research indicates that the major cities in the world may exhibit different synchronicity patterns than other cities of their respective countries. This phenomenon can be explained by global capital flows (Alter et al., 2019), a conclusion much in line with mainstream economic research. A recent econometric study reveals that capital mobility positively relates to business cycle synchronisation (Beck, 2021; Lazarevic et al., 2022; Lv, 2023). The important influencing factors can also be found in analysing the migration trends and their links with the business cycles and overall financial stability (Vučković & Škuflić, 2021), especially in the case of intellectual migration (Oliinyk et al., 2022). Furthermore, there is a substantial body of empirical evidence that indicates that housing markets dynamics are interconnected with mortgage markets, financial stability, and the broader economy and strongly influenced by investor expectations (Adarov, 2022; Cesa-Bianchi, 2013; Duca, 2020; Duca et al., 2021; Hoesli, 2020; Mizero et al., 2018; Do & Park, 2018; Jorda et al., 2019; Brychko et al., 2021; Brychko et al., 2021; Kuo et al., 2021; Tomal, 2021; Trojanek et al., 2022). The mortgage markets, in their turn, are significantly affected by borrowers' financial ability (Kovacs & Pasztor, 2021). Furthermore, the synchronisation of housing cycles has often been associated with European integration (Alvarez et al., 2010; van Ewijk & Arnold, 2015; Zelazowski, 2018). However, despite the increased synchronisation of housing markets worldwide, significant differences can be found when comparing selected economies.

Like many other research problems related to house price dynamics, the synchronisation of housing cycles has been extensively addressed based on US metropolitan data. In the early yet influential study based on 51 US cities, Ghent and Owyang address the cyclical behaviour of house prices and compare it to the business cycle (Ghent & Owyang, 2010). Other US studies suggest that household price cycle differences may be attributed to geography and the coastal housing market's distinct synchronisation patterns (Flor & Klarl, 2017). Another US study on the house price dynamics in 19 metropolitan areas from 1998 to 2013 reveals that the magnitude of cyclical swings (booms, busts) is negatively related to underlying fundamental growth rates. Therefore, it is more plausible that bigger booms or busts will appear in fast-growing markets with weaker economic bases (Peng et al., 2014). The role of macroeconomic uncertainty in explaining the synchronisation of house price cycles was

addressed using machine learning (Gupta *et al.,* n.d.). In contrast, Marfatia explains the role of time-varying macroeconomic variables in predicting house price variation (Marfatia, 2021).

Established long-run house price indices in the UK have facilitated several empirical studies on the synchronisation of regional house price cycles. For example, estimates based on a Markov switching VAR model demonstrate differences in the duration and magnitude of regional housing cycles (Chowdhury & Maclennan, 2014). Another economic study compares the house prices and affordability cycle to find a significant synchronisation between the two (Pitros & Arayici, 2017). However, recent empirical research suggests that the housing market cycle synchronisation in the UK is weaker than in the US (Miles, 2020).

Scarce evidence on regional housing cycles comes from other European countries. The long-run cyclical behaviour of housing markets in Italy shows that house price cycles in the 1970s and early 1980s were similar to other European countries, not necessarily revealed in official public statistics (Gabrielli *et al.,* 2018). The research on the interlinkages between business and housing price cycles in Spain indicates that house price cycles are more sensitive to shocks than business cycles (Sala-Rios *et al.,* 2018).

Using data from eight Australian metropolitan areas, Akimov *et al*. (2015) identify the cyclical fluctuation of house prices and conclude that despite overall similarities, there are significant differences in the synchronisation of the housing market in Melbourne and Sydney and other provincial cities (Akimov, *et al.,* 2015). The spill-overs between monetary policy, the housing market, and business cycles were investigated using Chinese empirical data from 1998 to 2018 (Li *et al.,* 2021).

The scoping analysis of the prior research in the field suggests that house price cycle synchronisation is still understudied and requires more empirical attention, especially considering the possible multifaced consequences of the Covid-19 pandemic or war in Ukraine that caused asymmetric economic and financial disturbances.

RESEARCH METHODOLOGY

Methods

Determining turning points and cycle phases is complex due to the many approaches for extracting fluctuations in economics time series based on different theoretical premises and using other procedures. As a result, the exterior image of the cycle, the position of turning points, and the duration of phases will vary depending on the process used. In the case of housing cycle analyses, approaches taken from business cycle analyses dominate level cycles (Alqaralleh & Canepa, 2020; André *et al.,* 2019; Bracke, 2013; Girouard *et al.,* 2005), growth cycles (Agnello *et al.,* 2020), and deviation cycles (Akimov *et al.,* 2015; Fan *et al.,* 2019; Gray, 2018; Zelazowski, 2017).

The pioneering work of Nelson and Plosser (1982) showed that the hypothesis that the formation of real GDP (and other variables describing the real sphere of the economy) is a process of a random walk with drift could not be rejected. Hence, such a course can be written as:

$$y_t = \mu + y_{t-1} + \varepsilon_t \tag{1}$$

in which:

μ - ind drift component; $\mu > 0$;

ε - random component.

Considering the above relationship, it can be seen that a one-time disturbance of the previous growth path will result in its permanent deformation with no possibility of returning to the previous course. The analysis of business cycle fluctuations is more complicated because random straying causes the trend to be subject to deviation. Hence, distinguishing the development trend from cyclical changes is more complicated. However, the authors of the real business cycle theory propose statistical methods to overcome such challenges. They are still based on the assumption that the cyclical component of a variable y is the difference between its current value and a measure showing the value of the trend but that the latter component is a weighted average of past, present, and future observations. The estimation of the thus defined trend component (g_t) is realised by the function of the:

The most widely used cyclic component extraction techniques in econometric analysis are Hodrick – Prescott (1997), Baxter–King (1999) and Christiano–Fitzgerald (2003) filters. The first of these (HP) is a

high-pass filter, so the interference of use (parameter selection) is only concerned with defining the eliminated lower band of oscillations. Baxter–King (BK) and Christiano–Fitzgerald (CF) filters are examples of band-pass filter techniques, so the choice of smoothing parameters determines the lower and upper bands of the oscillation frequencies cut off. However, in the case of the BK filter, the initial and final observations are lost, and in the case of the CF filter, it is possible to obtain an apparent phase shift as long as the input series is stationary (Canova & Ferroni, 2011). Realising the advantages and disadvantages of the indicated techniques, it is worth using each of them to capture the common features of the fluctuations of the variables under study, independent of the applied stochastic elimination filter.

$$min[\sum_{t=1}^{T}(y_t - g_t)^2 + \lambda \sum_{t=3}^{T}(\Delta^2 g_t)^2] \tag{2}$$

in which:

λ - the non-negative parameter of smoothing, *i.e.* filtering (cutting off) selected harmonics of the time series.

The next stages of econometric work consisted of conducting a spectral analysis, because the actual course of the economic process, as a stochastic process, can be represented in the form of a trigonometric polynomial:

$$y_t = \sum_{i=1}^{T/2}(a_i\cos 2\pi\omega_i t + b_i\sin2\pi\omega_i t) \tag{3}$$

in which:

$\omega_i = \frac{i}{T}$ - frequency of individual component harmonics, $i = 1,2,\dots,\frac{T}{2}$.

Identifying the frequency of the dominant fluctuations makes it possible to determine the number of cycles per unit of time, while the period indicates how long one cycle lasts. Since the study of the synchronisation of economic fluctuations used a series describing more than a dozen Polish cities, an opportunity arose to capture the relationship between the oscillations of these quantities. Mutual spectral analysis of two stochastic processes makes it possible to calculate the coherence coefficient and the phase angle (Granger, 1969; Priestley, 1981). The former indicates which frequency components are correlated with each other. The latter measures the difference in phase between the corresponding harmonic components of the processes under study. Its representation in degrees makes it possible to determine the temporal relationships (advance or lag) between the variables under study. Warner (1998) shows that this is possible after applying the formula:

$$L(\omega) = L_1(\omega) * \frac{1}{\omega} \tag{4}$$

in which:

$L_1(\omega) = \frac{\varphi(\omega)}{360}$, if $0 \leq \varphi(\omega) \leq 180$ or $L_1(\omega) = \frac{\varphi(\omega)-360}{360}$, if $180 \leq \varphi(\omega) \leq 360$;

$\varphi(\omega)$ - phase angle for frequency ω;

$\frac{1}{\omega}$ - fluctuation period expressed in months.

In general, the methodology – widely used in the literature – allows us to identify frequency patterns in market volatility and leading and lagging relationships, and to quantify the strength of market synchronization. We will also investigate the dynamics and interdependencies between markets.

Data

In Poland, the National Bank of Poland (NBP) and Statistics Poland (SP) provide apartment price indices for provincial cities. In 2010, the NBP was the first to publish hedonic indices for Poland's largest cities (data from Q3 2006). Since 2013, the NBP has been surveying residential and commercial real estate prices as part of the statistical survey program of official. Previously published data on the average transaction and offer prices revealed some discrepancies compared to data from local valuers' databases (Gluszak *et al.,* 2018; Hill & Trojanek, 2022; Konawalczuk, 2014). Since 2015, SP has published average prices for residential units in provincial cities. Noteworthy, these indicators are premise-based; the cooperative ownership right is not included.

Considering some limitations of NBP and SP information, we decided to use a dataset on asking house prices. According to some studies, offer prices can aid in monitoring the current housing market

(Diewert & Shimizu, 2016; Li *et al.,* 2019; Wang *et al.,* 2020). However, they are inconclusive in determining whether offer prices can be used to replace transaction prices in index construction (Anenberg & Laufer, 2017; Ardila *et al.,* 2021; Kolbe *et al.,* 2021; Wang *et al.,* 2020). Nonetheless, they agree that using offer prices in forecasting models improves accuracy. Moreover, in the case of new builds listings can provide more reliable information on the housing market than transactions (Hill *et al.*, 2023).

Considering the above information, the study employed a one-of-a-kind database of over 4.5 million housing offers in 18 provincial capital cities in Poland from 2000 to 2020. Earlier data were obtained from archival advertisements in photocopies, photographs, or actual periodicals, which were then digitally reproduced and organised in a database. Furthermore, data from 2008 were collected several times a quarter from advertising portals (gratka.pl / otodom.pl). Initially, more than 5.5 million offers were collected in the database (after preliminary cleaning to remove offers that did not include a price, surface area, or a specified general or specific location) by both ownership and cooperative ownership of the premises. Furthermore, as a result of the repeated offers, the following had to be removed: offering the same apartment in subsequent months (*e.g.*, January, February, March), offered by different intermediaries (the same apartment was offered more than once), and offering the same apartment in a given quarter at different prices (the lowest price offer was left in the database). Finally, the database contains 4 509 144 apartment offers in 18 Polish provincial cities from 2000 to 2020. Using the data gathered, geometric average prices for 1 m2 of usable floor area in apartments were calculated (Figure 1). Price indices were calculated using the above-mentioned methodology.
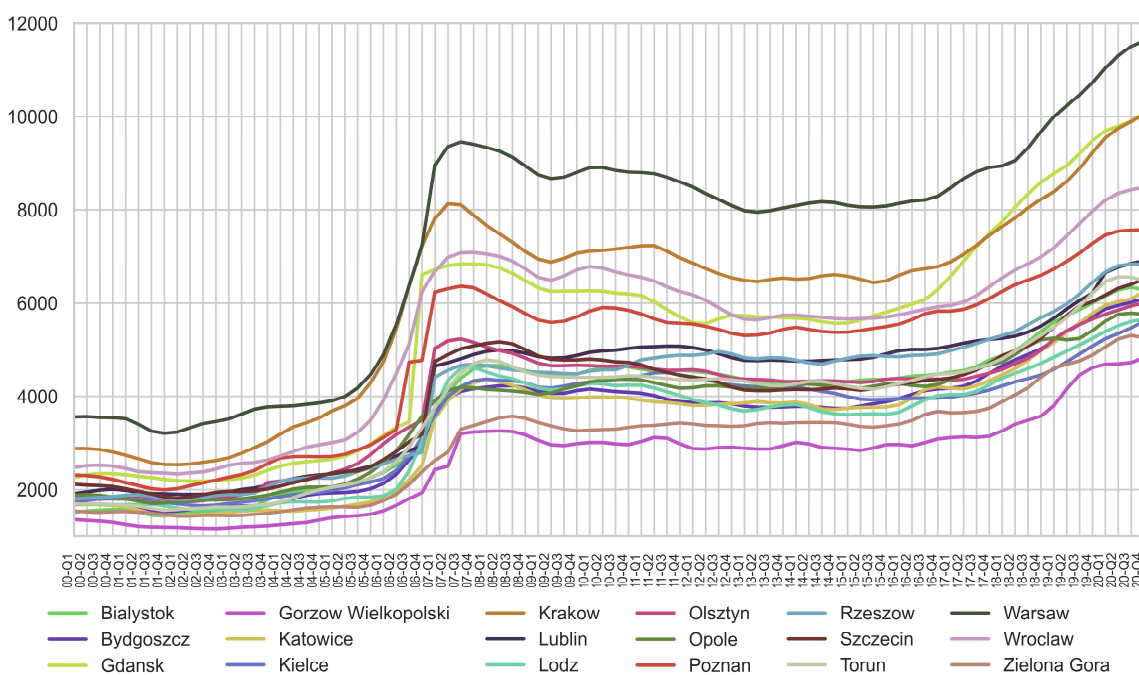
**Figure 1. Geometric average prices for 1 square metre
in provincial capital cities in Poland in 2000-2020**
Source: Trojanek, 2021.

Statistical analysis was conducted on time series determining an apartment's average price per square metre from 2000 to 2020. Each time, these prices were determined quarterly, which satisfies the prerequisites of using quantitative instruments for studying the economic situation in further stages of the work. The spatial scope of the source data was determined by the set of cities constituting the seat of the authorities of the given voivodeship. A summary list of cities for which average prices per square metre of apartments were analysed is presented in Table 1.

Formally, the 18 cities have the same status, except Warsaw, which, apart from being the capital of a voivodeship, is also the country's capital. However, as demonstrated by the data in Table 1, the individual locations differ significantly in their demographic potential. For this reason, it was decided

to conduct a grouping based on population. The first grouping included cities with less than 200 000 inhabitants, *i.e.* Gorzów Wielkopolski, Kielce, Olsztyn, Opole, Rzeszów, and Zielona Góra. Group no. 2 consists of cities with a population between 200 000 and 500 000. These are Białystok, Bydgoszcz, Gdańsk, Katowice, Lublin, Toruń, and Szczecin. Finally, the third group includes Poland's most populous cities, *i.e.* Kraków, Łódź, Poznań, Wrocław and, above all, Warsaw.

Table 1. Main information about the cities included in the study

No.	City	Voivodship	Population in thousands (2020)	Annual growth rate of housing prices 2000-2020	Housing stock
1.	Białystok	podlaskie	298	12.88%	134359
2.	Bydgoszcz	kujawsko-pomorskie	347	11.46%	152586
3.	Gdańsk	pomorskie	472	14.29%	236119
4.	Gorzów Wielkopolski	lubuskie	123	11.99%	53588
5.	Katowice	śląskie	292	12.76%	146387
6.	Kielce	świętokrzyskie	194	9.16%	86491
7.	Kraków	małopolskie	781	11.16%	402538
8	Lublin	lubelskie	340	12.52%	157147
9.	Łódź	łódzkie	677	10.88%	360921
10.	Olsztyn	warmińsko-mazurskie	172	10.38%	79461
11.	Opole	opolskie	128	8.69%	54830
12.	Poznań	wielkopolskie	534	11.09%	266686
13.	Rzeszów	podkarpackie	197	11.79%	85592
14.	Szczecin	zachodniopomorskie	401	10.13%	183237
15.	Toruń	kujawsko-pomorskie	201	11.86%	92168
16.	Warszawa	mazowieckie	1 794	9.08%	997054
17.	Wrocław	dolnośląskie	644	11.96%	340384
18.	Zielona Góra	lubuskie	141	10.70%	55922

Source: Statistics Poland (2022).

Figure 2 presents the development of residential property prices, broken down into the above groups. As the subject of quantitative analysis in this article is cyclical changes in the series under study, the data were previously subjected to seasonal adjustment, which was conducted under the assumption of the typical pattern of occurrence of trends, cyclical, and seasonal fluctuations in financial time series (Tsay, 2010). Removing seasonal fluctuations was done using the Census X-13 procedure (Sax & Eddelbuettel, 2018). Given the size of the individual groups, it was considered that they would only be represented by the cities with the lowest and highest levels of observed prices as of the end of 2020.

The presented waveforms indicate the co-existence of an upward trend in the observed prices accompanied by cyclical changes. At the same time, there is a nominal price disparity between individual cities, which is not related to their size measured by their population size. Clear evidence is provided by the average prices per square metre of an apartment in Łódź, Gdańsk, and Rzeszów, *i.e.* representatives of the three groups of cities distinguished earlier. Łódź is a more populous city and closer to the capital than Gdańsk. Still, nevertheless, apartments in Łódź are cheaper than in the capital of the Pomeranian Voivodeship. Although based on smaller nominal differences, a similar conclusion applies to residential property prices in Rzeszów, one of the smallest voivodeship cities.

Analysing the data in Figure 1, it should be noted that, generally, a relationship persists, indicating that more populated cities have higher prices per square metre of residential property. However, the universality of the above conclusion applies only to the price leaders of particular population groups. In particular, it should be noted that in Łódź – belonging to the group of cities with the largest population – the price of a unit area of an apartment is not only lower than in Gdańsk (the most expensive of the cities in group 2) but also for many years has not been equal to the prices from Bydgoszcz, which is the cheapest city in the same group.
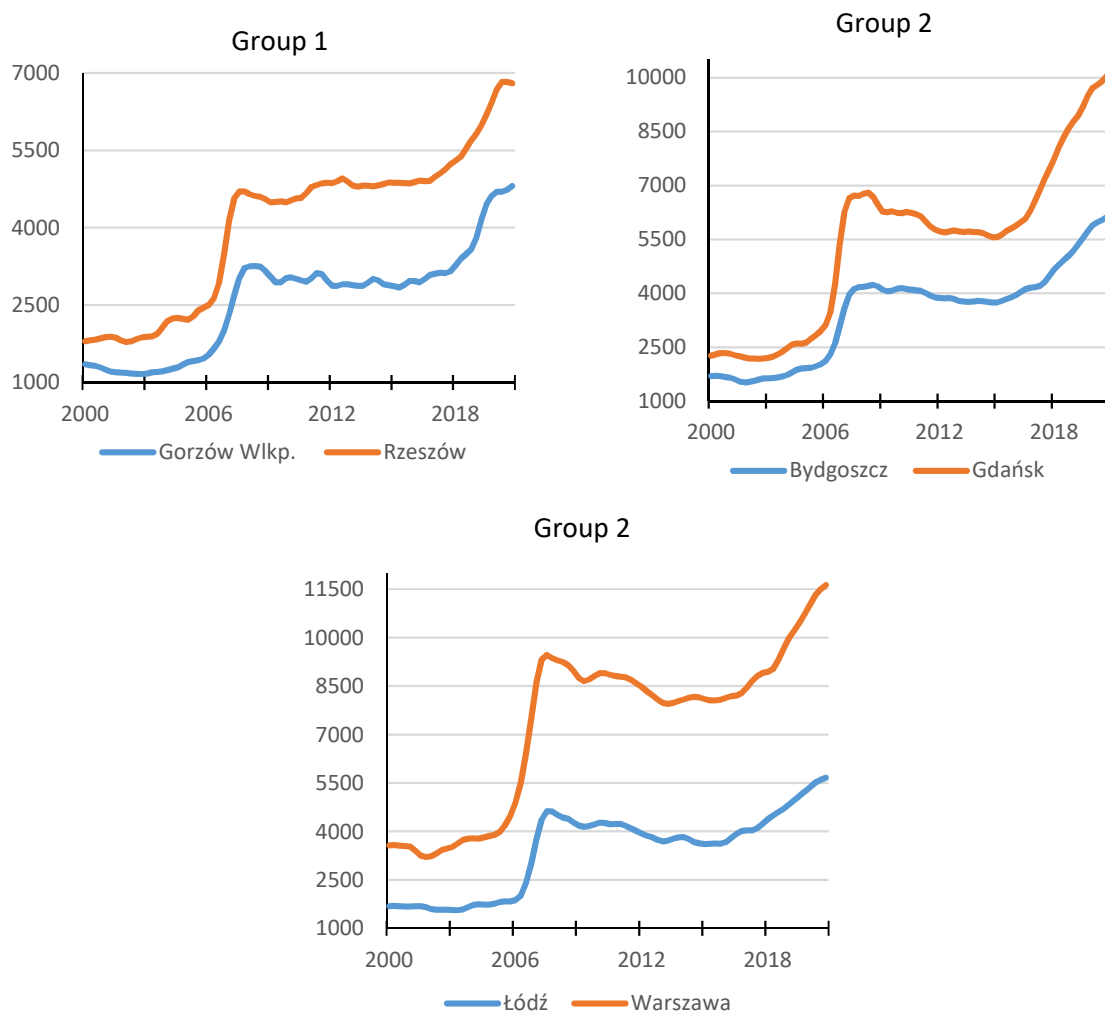
Figure 2. Average prices (in PLN) per square metre of an apartment in selected voivodship cities in Poland between 2000 and 2020
Note: Group 1 – cities with a population below 200 000; Group 2 – cities with a population above 200 000 and below 500 000; Group 3 – cities with a population above 500 000.
Source: own elaboration.

RESULTS AND DISCUSSION

Coinciding Phases of Housing Price Fluctuations

In the further parts of this study, the focus is on examining the cyclical changes occurring in the surveyed residential property price series. As has already been pointed out, it was assumed that there is an upward trend in the structure of the observed quantities, as well as fluctuations of seasonal nature and periods longer than four quarters. Therefore, a seasonal adjustment was made, and the occurrence of a multi-year increase was proved using a graphical analysis (Figure 2).

Concerning cyclical (non-seasonal) changes, the classical approach to analysing business cycle fluctuations can be used, which assumes the examination of the absolute level of a given economic quantity. It is an approach based on the assumption that the business cycle has only two phases: upward and downward. The former lasts from a lower turning point (bottom) to an upper turning point (peak) and the latter in the opposite sequence. Furthermore, this cycle structure allows for

relatively stable dating of turning points, which is particularly important when extending the observed time series. Due to the scarcity of statistical data describing the prices of residential real estate on a regional basis in Poland, it is understandable that researchers wishing to explore this market of tangible assets systematically expand their collections of information. Therefore, it is worth basing the first stage of quantitative analyses on the classic cycle definition, as subsequent observations may influence the estimated form of the trend function.

In the property market, it is possible to adopt an analytical algorithm, described in more detail in the work of Harding and Pagan (2002). At the same time, it should be noted that phases and cycles of different lengths are possible in individual economic sectors. For the real estate market – due to investment processes (land acquisition with construction period), which are much more time-consuming than an industrial activity – longer periods should be assumed. Therefore, as suggested by Bracke (2013) and Girouard *et al*. (2005), it can be considered that a phase (the period between two adjacent differential turning points) cannot be shorter than six quarters and that a complete cycle is at least 12 quarters. Supplying the t-indices identifying the above-defined turning points with calendar dates makes it possible to assign individual quarters and years to the distinguished phases. As a result, it is possible to determine whether there was a phase of price expansion or recession in the property market during a given period.

The results of an analysis assuming the above analytical approach and focusing on selected Polish cities were presented by Trojanek (2021). The Warsaw property market is the largest in Poland, because it is the capital city, which means it is also the centre of economic, scientific, cultural, and political life. Therefore, the price turning points in Warsaw should be particularly distinguished. The summary presented in Trojanek's (2021) work suggests that the price expansion of a square metre of an apartment in Warsaw took place between mid-2002 and Q3 2007 and again from Q3 2013 to the end of the analysed period. Noteworthy, the identical movements accompanied the expansion in the value of residential assets in the Polish capital in at least half of the other examined cities. From the end of 2003 to mid-2007 and the first quarter of 2016, one can even notice a complete synchronisation of the phases. The complete congruence of the dating of the decline phase can also be attributed to significant periods. These are the years 2000-2002 (up to Q2) and 2009-2013 (again up to Q2) and two quarters at the end of 2008 and the beginning of 2009. Importantly, the price changes in Warsaw are a leading indicator for some cities.
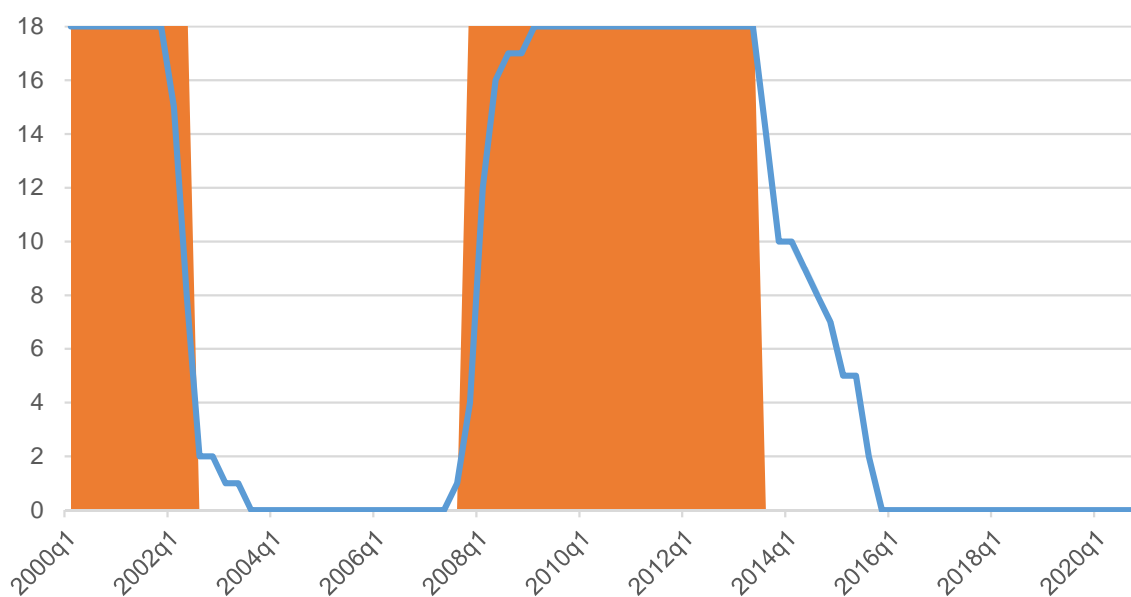
Figure 3. The number of cities with a downward phase in the prices per square metre (in PLN) of an apartment in the years 2000-2020
Note: The shaded area identifies the time range of the price recession in Warsaw.
Source: own elaboration

Residential Property Price Decomposition

Figure 4 presents the obtained cyclical components for selected cities identifying groups distinguished based on population size, see Figure 2. As can be seen, all filtering techniques show far-reaching correspondence during the upward cycle treated as relative deviations from the trend. Moreover, the high ability of econometric filters to identify phases of the classically defined cycle of price changes. An inverse deviation from the isolated development trend can be discerned in each observed price recession. This is not a perfect regularity, but it is understandable given the inevitable shift in the dating of turning points in the classical and growth cycles.

However, differences in the intensity of price changes cannot be overlooked if one identifies them with the cyclical component determined using the filtering technique. For this reason, recourse has been made to the instrumentation used in business cycle surveys since estimating oscillations in relative form makes it possible to calculate the standard deviation of the observed changes. Furthermore, this makes it possible to examine the dispersion of the series around the trend line, which is an expression of the variability of the oscillation. The results obtained are presented in Table 3.

Table 3. Standard deviation (in %) of the cyclical component of the average level of the price per square metre of a dwelling in voivodship cities in Poland from 2000 to 2020

City	Standard deviation (%)			City	Standard deviation (%)		
	BK	CF	HP		BK	CF	HP
Białystok	8.22	6.17	8.27	Olsztyn	8.71	7.28	8.80
Bydgoszcz	8.26	6.55	8.39	Opole	7.50	5.64	7.29
Gdańsk	11.13	8.79	10.81	Poznań	9.90	7.91	9.54
Gorzów Wielkopolski	9.38	7.64	9.15	Rzeszów	8.20	6.80	7.67
Katowice	11.59	9.49	10.87	Szczecin	9.20	7.10	8.99
Kielce	8.24	6.35	7.79	Toruń	8.79	6.90	8.72
Kraków	9.55	7.60	9.91	Warszawa	9.89	8.01	9.43
Lublin	7.79	6.15	7.43	Wrocław	9.87	7.76	9.71
Łódź	11.87	9.50	10.97	Zielona Góra	8.37	6.67	7.78

Note: BK – Baxter–King filter; CF – Christiano–Fitzgerald filter; HP – Hodrick–Prescott filter.
Source: own study.

The results show that using the HP and BK filter results in very similar waveforms of the non-cyclic component, so the relative fluctuations are characterised by comparable dispersion around such a development trend. The use of the CF filter means less smoothing of the stochastic trend, so the cyclical fluctuations are less intense, as some of the harmonic components have been filtered out. The cities with the highest variability of the component responsible for cyclical fluctuations in property prices are Gdańsk, Katowice, and Łódź. The lowest variability of this characteristic is shown by Lublin and Opole.

Spectral Analysis of Cyclical Fluctuations

The following stages of the econometric work consisted of conducting a spectral analysis. However, it must be remembered that a spectral study requires stationary time series. If the variables have a unit root, the spectrum becomes so overwhelmed by low oscillation frequencies that it is almost impossible to isolate the conjunctural components. Therefore, the spectral analysis was preceded by stationarity testing, which used the methods proposed by Dickey and Fuller (1981) and Kwiatkowski, Phillips, Schmidt, and Shin (1992). In the augmented Dickey–Fuller (ADF) test, the null hypothesis assumes the presence of a unit root (non-stationarity).

In contrast, the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test posits the null hypothesis that the variables analysed are stationary. The significance level was assumed to be 5%, and the test equations included a free expression. The resulting empirical ADF and KPSS statistics are included in Tables 4 and 5.

a) Gorzów Wielkopolski

b) Rzeszów

c) Bydgoszcz

d) Gdańsk

e) Łódź

f) Warszawa
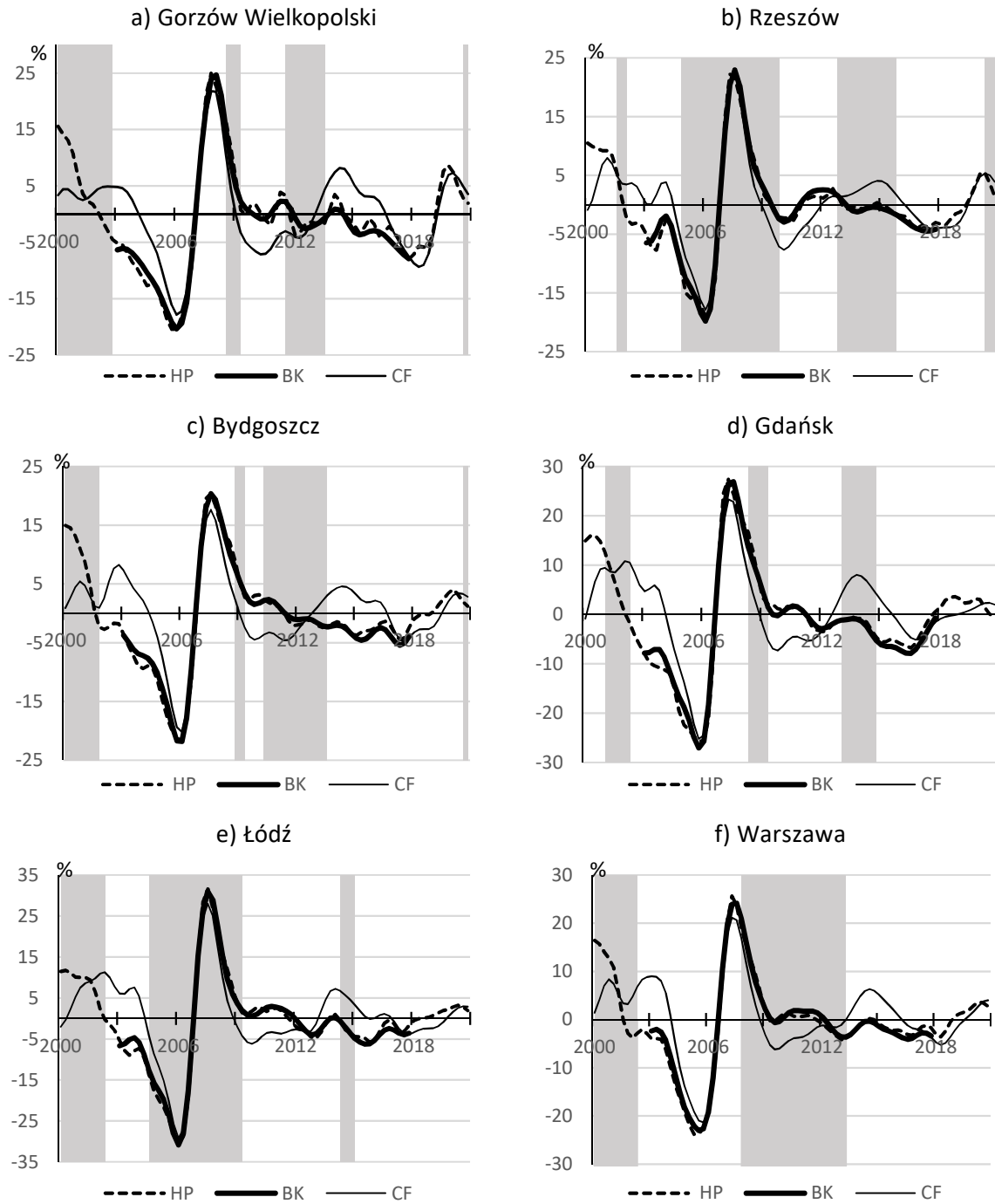
Figure 4. Cyclical component of the average price level of a square metre of an apartment in selected voivodship cities in Poland in the years 2000-2020

Note: BK – Baxter–King filter; CF – Christiano–Fitzgerald filter; HP – Hodrick–Prescott filter.
The shaded area identifies the time range of the price recession in a given city.
Source: own elaboration.

Table 4. ADF test statistics

City	ADF test			City	ADF test		
	BK	CF	HP		BK	CF	HP
Białystok	-3.05	-9.93	-3.56	Olsztyn	-2.53	-9.81	-2.38
Bydgoszcz	-3.16	-9.05	-3.48	Opole	-2.44	-10.17	-2.47
Gdańsk	-3.38	-9.27	-3.33	Poznań	-0.15	-9.39	-4.47
Gorzów Wielkopolski	-2.37	-9.38	-1.82	Rzeszów	-2.68	-9.48	-3.91
Katowice	-3.34	-8.91	-3.72	Szczecin	-2.09	-9.51	-2.19
Kielce	-4.96	-8.80	-3.33	Toruń	-3.53	-9.11	-3.25
Kraków	-3.11	-9.30	-4.13	Warszawa	-2.54	-10.11	-3.49
Lublin	-2.62	-8.60	-3.83	Wrocław	-2.04	-9.21	-3.61
Łódź	-2.72	-9.13	-2.76	Zielona Góra	-3.49	-8.39	-3.18

Note: the critical value of the ADF test statistic was -2.90, with a significance level of 5%. BK – Baxter–King filter;
CF – Christiano–Fitzgerald filter; HP – Hodrick–Prescott filter.
Source: own study.

Table 5. KPSS test statistics

City	KPSS test			City	KPSS test		
	BK	CF	HP		BK	CF	HP
Białystok	0.13	0.04	0.06	Olsztyn	0.11	0.06	0.06
Bydgoszcz	0.13	0.04	0.07	Opole	0.14	0.04	0.07
Gdańsk	0.11	0.04	0.06	Poznań	0.09	0.04	0.06
Gorzów Wielkopolski	0.11	0.05	0.07	Rzeszów	0.11	0.05	0.05
Katowice	0.10	0.04	0.06	Szczecin	0.12	0.05	0.07
Kielce	0.15	0.06	0.06	Toruń	0.13	0.04	0.06
Kraków	0.11	0.05	0.06	Warszawa	0.11	0.04	0.06
Lublin	0.13	0.04	0.06	Wrocław	0.13	0.04	0.07
Łódź	0.11	0.04	0.06	Zielona Góra	0.10	0.04	0.05

Note: the critical value of the ADF test statistic was -2.90, with a significance level of 5%. BK – Baxter–King filter;
CF – Christiano–Fitzgerald filter; HP – Hodrick–Prescott filter.
Source: own study.

Because all the empirical values of the ADF test for the fluctuations obtained with the CF filter were smaller than the critical one, the hypothesis of non-stationarity of the analysed series had to be rejected. Such a conclusion cannot be drawn concerning the fluctuations obtained from the HP filter, especially the BK filter. In the latter case, it is related to the truncated time series. As Caner and Kilian (2001) demonstrated, the ADF test's power decreases for samples with limited observations. Such an effect is not observed when using the KPSS test. None of the empirical values of the KPSS test exceeded the critical one. Therefore, there were no grounds to reject the null hypothesis of stationarity of the cyclical components of the variables under study. This meant that proceeding to the power spectral analysis was possible without fear of very low frequencies dominating the spectrum.

The graphical representation of the harmonic structure is the periodogram. In the present work, it was smoothed with a five-element Parzen spectral window. Due to the voluminous nature of the underlying statistical material, the basic information elements are presented in Tables 6a-b and are limited to the three components with the highest spectral density values.[1]

Considering the fluctuation spectra of prices per square metre of apartments sold on the secondary market, one notices that harmonics with a periodicity equal to 28 quarters prevail in them. Therefore, on average, in the analysed series (consisting of 84 observations), at least two complete cycles should occur, consisting of two complete phases. The information in Figure 3 and the significant concordance of price oscillations shown earlier support this conclusion. However, Figure 3 shows that the concordance

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[1] In the case of the BK filter, the size is reduced, so the periodicity of the harmonic factors (calculated as T/2) is different to that of the CF and HP filters. For this reason, the periodogram for the BK filter is omitted.

of returns was not complete. The reason for these differences was the slightly different distribution of the harmonics dominating the housing price spectra in the different cities, as highlighted in Table 6.

Table 6. The most important harmonic components of cyclical fluctuations of the average price level of a square metre of an apartment in voivodship cities in Poland in the years 2000-2020

CF filter							
City	**Fluctuation period (quarters)**			**City**	**Fluctuation period (quarters)**		
Białystok	28.00	16.80	6.46	Olsztyn	28.00	16.80	12.00
Bydgoszcz	28.00	16.80	12.00	Opole	28.00	16.80	10.50
Gdańsk	21.00	14.00	8.40	Poznań	28.00	16.80	7.00
Gorzów Wielkopolski	28.00	16.80	12.00	Rzeszów	28.00	16.80	8.40
Katowice	28.00	16.80	12.00	Szczecin	28.00	16.80	n.a.
Kielce	28.00	16.80	8.40	Toruń	28.00	16.80	12.00
Kraków	28.00	16.80	7.63	Warszawa	28.00	16.80	7.00
Lublin	28.00	16.80	12.00	Wrocław	28.00	16.80	7.63
Łódź	28.00	12.00	8.40	Zielona Góra	28.00	12.00	7.63
HP filter							
City	**Fluctuation period (quarters)**			**City**	**Fluctuation period (quarters)**		
Białystok	28.00	16.80	9.33	Olsztyn	28.00	16.80	9.33
Bydgoszcz	28.00	16.80	6.00	Opole	28.00	14.00	7.63
Gdańsk	21.00	14.00	7.00	Poznań	28.00	16.80	9.33
Gorzów Wielkopolski	28.00	16.80	12.00	Rzeszów	28.00	16.80	8.40
Katowice	28.00	12.00	9.33	Szczecin	28.00	16.80	9.33
Kielce	28.00	16.80	8.40	Toruń	28.00	16.80	12.00
Kraków	28.00	14.00	6.46	Warszawa	28.00	16.80	9.33
Lublin	28.00	16.80	12.00	Wrocław	28.00	16.80	6.46
Łódź	28.00	14.00	9.33	Zielona Góra	28.00	12.00	9.33

Note: The critical value of the KPSS test statistic was 0.46, with a significance level of 5%. BK – Baxter–King filter; CF – Christiano–Fitzgerald filter; HP – Hodrick–Prescott filter.
Source: own study.

In the study of the reciprocal spectrum, the values of coherence coefficients were estimated, which are the equivalents of correlation coefficients, but concerning the harmonic space for which the arguments of the function under study are the periodicities of fluctuations (expressed in quarters). As already indicated, it was decided that the reference system in each case would be Warsaw, which results from the fact that it is the leading real estate market in Poland and the centre of political and economic activity. Still bearing in mind the division of the 18 analysed cities into three groups distinguished based on population (Figure 1), they were again illustrated with the help of a representative in which, at the end of 2020, the prices of apartments were the lowest or the highest, respectively. In this case, Warsaw was replaced by Wrocław in the last group, as a relational study of price fluctuations in the same city is pointless. The graphical representation of the selected characteristics of the reciprocal spectrum is presented in Figure 5. The abscissa axis is described by the periodicity of the highlighted fluctuations, each time described in quarters. The right axis of ordinates identifies the angle given in phase months and, as relation (7) states, it is shown in months.

The obtained estimates[2] indicated a very high coherence of harmonics with long and medium periods of oscillations determined for Warsaw and a given repeater of the group distinguished based on population. The degree of coherence decreases only with fluctuations of an average period equal to eight quarters. Looking at the values of the phase shift, especially where there is a high degree of

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[2] In this case, only the results obtained for the series smoothed with the CF filter are presented due to the limited possibility of presenting all results. Nevertheless, the main conclusions in terms of co-spectrum remained valid also against the other frequency filtering techniques.

coherence, it is small, as it never exceeds one quarter. Therefore, this is further evidence of the high synchronisation of price fluctuations in local housing markets in Poland.
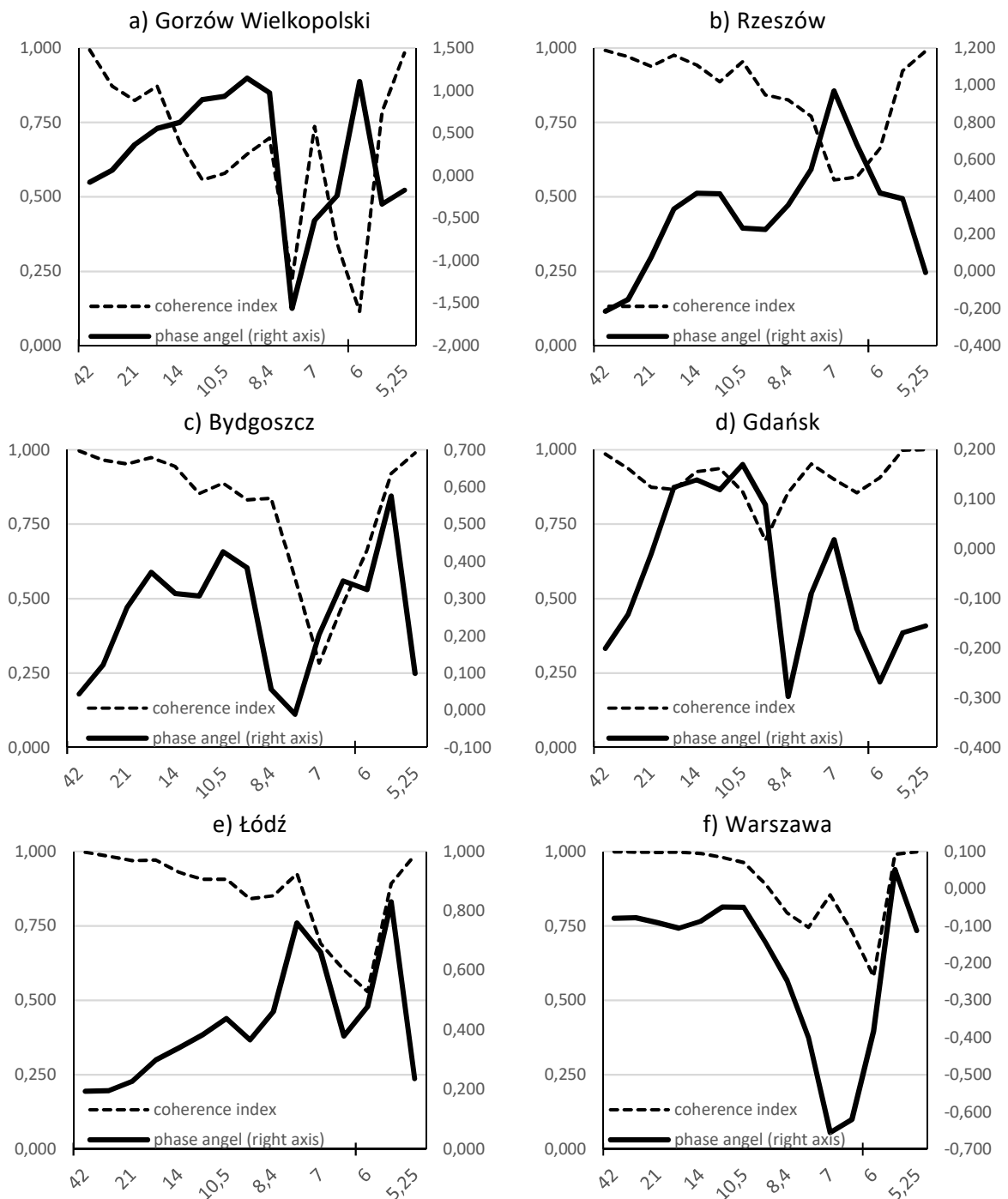
Figure 5. Selected characteristics of the spectrum of mutual cyclical fluctuations of the average price level of a square metre of an apartment in selected voivodship cities in Poland in the years 2000-2020
Source: own elaboration.

CONCLUSIONS

This study contributes to the ongoing economic discourse on housing market synchronization by addressing a notable gap in knowledge pertaining to regional housing markets in emerging economies. While considerable evidence exists for the US and EU, limited research has been conducted within the

Central and Eastern European (CEE) context. Therefore, this study bridges this knowledge gap and sheds light on housing market synchronization in Poland.

We traced the housing market's cyclical behaviour in 18 provincial capital cities in Poland from 2000 to 2020. The article provides empirical evidence of the high synchronisation of house cycles in regional housing markets in Poland. Moreover, econometric investigation demonstrates spatial differences in the cyclical behaviour of house prices when considering the cycle magnitude. The findings suggest that the housing cycle magnitude was the highest in Gdańsk, Katowice, and Łódź and the lowest in Lublin and Opole.

The information about housing cycles has important policy implications. Housing wealth effects generated by cyclical house prices may be more persistent than financial wealth effects (Sousa, 2010). Consequently, they may substantially affect consumption dynamics. Therefore, precisely identifying market cycles and differences in cycle synchronisation is vital when constructing an effective, selective, and well-timed monetary policy (Huang, 2020).

The study has some limitations. The spectral analysis is sensitive to data quality issues and time series length. Additionally, while spectral analysis can identify correlations and patterns in market synchronization, it does not provide direct causal relationships. We have not covered the house price dynamics during the Covid-19 pandemic and after the Russian aggression in Ukraine (Trojanek *et al.*, 2021; Trojanek & Gluszak, 2022). Both exogenous events have likely caused disturbances significantly affecting housing market synchronisation. It remains an interesting area for further research. Future studies could also include smaller cities, where synchronization patterns likely differ from those exhibited in major cities in Poland.

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Authors

Radoslaw Trojanek 40% (conceptualisation, analysis, data collection, final writing for submission),
Michal Gluszak (20%) (literature writing, final writing for submitting),
Michal Kruszka (40%) (draft writing, methodology, calculations).

Radoslaw Trojanek
Associate Professor at the Department of Microeconomics at Poznań University of Economics and Business, Poland. His main areas of research include house price indexes, housing market cycles, and property valuation.
Correspondence to: Dr hab. Radoslaw Trojanek, Prof. UEP, Poznań University of Economics and Business, Al. Niepodległości 10, 61-875 Poznań, Poland, e-mail: radoslaw.trojanek@ue.poznan.pl
ORCID http://orcid.org/0000-0002-8614-9484

Michal Gluszak
Associate Professor at the Department of Real Estate and Investment Economics, Krakow University of Economics. His research interests include microeconomics, housing economics, urban economics, and real estate economics.
Correspondence to: Dr hab. Michal Gluszak, Prof. UEK, Krakow University of Economics, Department of Real Estate and Investment Economics, ul. Rakowicka 27, 31-510 Krakow, Poland, e-mail: gluszakm@uek.krakow.pl
ORCID http://orcid.org/0000-0001-7614-229X

Michal Kruszka
Associate Professor in the Institute of Research in Economics and Finance at Vistula University, Warsaw. His main areas of research include quantitative analysis of the financial market, macroeconomics, and international regulations.
Correspondence to: Dr hab. Michal Kruszka, Prof. AFiBV, Vistula University, ul. Stokłosy 3, 02-787 Warsaw, Poland, e-mail: m.kruszka@vistula.edu.pl
ORCID http://orcid.org/0000-0002-9138-7225

Examining young people's awareness of electricity consumption during the energy crisis from the perspective of economics students in Hungary

Tímea Juhász, Erika Varga, Arnold Tóth

A B S T R A C T
Objective: The objective of our article is to analyse students' knowledge, awareness, feelings and attitudes to the energy crisis, in particular, the rising price of electricity in Hungary to test whether students are aware of their electricity consumption and influenced by the opinion of their close relatives. We also examined how consumption awareness is influenced by the variables of the number of tenants and the person who pays the electricity bill.
Research Design & Methods: In the research, self-administered questionnaires as qualitative research tools tested the previous assumptions. In total, 272 responses from students of economics at a Hungarian university were analysed by using an ANOVA test. The structural equation modelling (SEM) method for modelling latent variables was used for analysis, including the variance-based method (PLS over-analysis).
Findings: Our study showed that the number of occupants does not affect consumption patterns as most changes in savings are explained by either awareness or by a clear understanding of consumption patterns, and only 10.2% by the war and its consequences.
Implications & Recommendations: Savings on energy and awareness are interdependent. It was also pointed out that there are a lot of factors as a source of information such as (social) media in addition to family, friends, and acquaintances, who do not take the lead in terms of credibility.
Contribution & Value Added: Previous research analysed many context- and area-specific determinants of responsible consumption. Our article explores consumption awareness and analyses savings to obtain information about the feelings and attitudes, as well as reactions of Hungarian students of economics to the energy crisis.

INTRODUCTION

As soon as the European Union's economy slowly began to recover from the pandemic, it had to face the challenges of energy security. The EU is now aware of the current energy price crisis, which is mostly caused by market gas instability. Stable and smooth collaboration between governments and institutions is required to support households and enterprises affected by price hikes. The shift to clean energy and energy independence from fossil fuels is a priority due to the current geopolitical and energy market conditions (Khatiwada *et al.*, 2022). The interconnection of gas markets resulted in an overdependence. Independence from fossil fuels should be the EU's long-term objective (Calanter & Zisu, 2022). The extent of our dependence on fossil fuels is incompatible with the EU's decarbonization objectives so low-carbon alternatives are supported by present laws and regulations (Barnes, 2020).

Europe needs to step up its efforts to attain energy independence. The invasion of Ukraine served to highlight Europe's reliance on Russian gas and the necessity of a diverse energy source for energy security.

Previous research analysed many context- and area-specific determinants of responsible consumption (Carrete *et al.*, 2012; Bakó *et al.*, 2021; Győri *et al.*, 2021). However, only the most recent studies examined responsible energy consumption in response to the crisis in 2022. The article aims to fill a gap by exploring consumption awareness and analysing savings to obtain information about the feelings and attitudes, as well as reactions of Hungarian students of economics to the upcoming energy crisis. To this end, research questions were framed on the factors that led to the current situation, the reliable sources of information, changes in consumption patterns, and worries about livelihood.

Our primary research was conducted to examine students' knowledge, awareness, feelings, and attitudes to the energy crisis and the rising price of electricity in Hungary.

In the course of the research, we formulated the following research questions.

RQ1: Are young people aware of their electricity consumption and its financial implications?

RQ2: What factors do respondents think are responsible for their energy situation and how do they save electricity?

RQ3: What do they consider to be a reliable source of information on this issue?

The article is structured as follows. After the introduction, we will discuss the theoretical background of the energy crisis of 2022-2023. Next, we will describe electricity consumption and price in the current situation, along with changes in consumption patterns. Next, we will provide the main analysis of electricity consumption patterns and trends together with the research questions and hypotheses. The final section will present the hypothesis test, conclusions, practical implications, limitations, and the possible future threads of the research.

LITERATURE REVIEW

The Energy Crisis of 2022-2023

As a result of the Ukrainian-Russian war, energy shortages and high prices, Europe's economy was predicted to suffer in the winter of 2022-2023 as energy costs were ten times greater than the five-year average (Jayanti, 2022). According to Eurostat (2023), millions of Europeans now spend a record percentage of their income on energy due to growing wholesale prices for gas and electricity.

Germany suffered significantly as a result of its dependency on Russian gas (Ruhnau, 2022). The British spent twice as much in 2021 (Sharafedin, 2023). In July, Turkey's gas prices more than doubled compared to the previous year, while the country's electricity prices increased by 67% (Sharafedin, 2023). The average price of electricity on the Spanish wholesale market in August 2022 increased by 19.3% from July (EurActiv, 2022). Late in August 2022, energy costs in France also reached all-time highs as they were increased by 25% (France24, 2022).

Consumer Behaviour Towards Electricity

The exploration of consumer needs and the price elasticity of demand in consumer choice theory is well suited for electricity markets, where consumers' reactions to price changes can be explored using mathematical methods (Sharifi *et al.*, 2018). In the case of energy consumption, the problem of climate change requires a transition to carbon-neutral energy. The use of renewable energy sources, including the development of renewable electricity systems, is a complex task (Timmons *et al.*, 2020).

Behavioural economics sought to provide adequate answers to behaviours that were previously unexplainable. The findings show that taking biases into account might have an impact when there is a strong demand for an energy end-service (Good, 2019). Demand response can also be used to improve the reliability of energy systems. Since the tasks related to the model are very complex, artificial intelligence can be used to map consumer preferences, and dynamic pricing, and determine the optimal decision for energy consumption (Antonopoulos *et al.*, 2020). Blasch *et al.* (2017) confirm that investment literacy also plays a role in reducing electricity consumption.

The Current Situation and Hungary's Reaction to the Crisis

The reaction of electricity consumption to changes in price can vary in the European Union, depending on factors such as the overall economic situation, the level of energy efficiency, the availability of alternative energy sources, and the specific regulations and policies in place. Citizens in the EU are adopting voluntary steps to minimize their use of natural gas, fuel, and electricity (Favero & Gross, 2023). Electricity prices in EU countries are connected to energy prices in other EU countries and tied to the green transition from a fossil fuel-based energy production system to one in which renewable energy plays a larger role. Regulatory power market reforms safeguard the transition from a fossil fuel-based energy production system to one in which renewable energy plays a larger role. However, similar patterns of energy market growth may be observed in other nations where liberalization of electricity markets resulted in changes for industry, homes, and other end customers (Bojnec, 2023).

There are not many fossil fuel deposits in Hungary. Therefore, its share of global oil reserves is 0.001%, and that of global natural gas is 0.002%, respectively. Coal makes up a larger portion, *i.e.* 0.28% (Advanced Energy Technologies, 2023). Hungary depends on energy import, and gas is the most prevalent energy source, yet approximately 10% of Hungarian villages lacked access to a gas network, leaving only solid fuel (wood and coal) or electricity as possibilities for heating. Due to the sharp increase in gas prices, many houses shifted to wood heating (Győri *et al*., 2021). This change in energy pricing will have a detrimental effect on the standard of living of many Hungarians (Moldicz, 2022). According to Eurostat, Hungary has the greatest rate of monetary deflation in Europe, with inflation at 21.7% in November (2022). As global energy costs are increasing, food and gasoline prices are continuing to rise. Regarding electricity, the one-year forward price on 1 May 2021 was 60.4 EUR per megawatt-hour, while the price on 6 July 2022 was 515.4% higher, and forward prices for energy commodities have been rising since then (Kovalszky *et al.*, 2022).

The government declared an energy emergency in August 2022, fearing a widespread energy crisis across Europe with an aim to increase energy security and prepare the citizens for the crisis. The previous pricing scheme for both gas and electricity was modified by setting monthly band limits and annual consumption limitations to pay the subsidised, lower price (Magyar Közlöny, 2022). However, individuals who exceed the imposed limits should compensate for the excess at market rates.

These prior empirical results allowed us to assume the following research hypotheses:

H1: The young people surveyed are aware of their electricity consumption, which is influenced by who pays for electricity and by the number of people living in the household.

H2: The young people interviewed are saving electricity because of the current situation.

H3: The young people selected in the survey consider their close relatives as the most credible source of information about the situation and this influences their perception of the reasons for the situation in the electricity market.

RESEARCH METHODOLOGY

Our primary research was conducted with the objective of examining students' knowledge, awareness, feelings, and attitudes to the energy crisis and the rising price of electricity in Hungary.

A study at the Budapest Business School was conducted last year to investigate how students at a business school perceive the current economic situation, including the development of the electricity market, the price of electricity and its related consumption. The institution is the 'number one business university in Hungary' (bge.hu, 2023). The authors chose this institution as a research site because students at the 160-year-old university receive a high level of business education. It was assumed that students of economics follow and recognize the issues of electricity as an important area of business.

The survey was conducted in a form of a questionnaire (Si *et al.*, 2022) with self-administered questionnaires, which were completed anonymously, voluntarily, and exclusively for research purposes. The authors paid attention to the university's ethical rules and those of GDPR while completing the questionnaires, which had not been pre-validated so reliability was checked by re-sampling 15 people with results

similar to the original questionnaire. The questionnaire consisted of 18 closed and two open questions. Before starting the tests, a pilot study was conducted to check if all questions were understandable and not misleading. The respondents did not experience any problems with interpretability, so the originally drafted questionnaire was sent out without any modifications. Social media platforms and classrooms were used for sharing, so willingness to respond could not be measured by the researchers. In total, 272 students completed the questionnaire. All questionnaires were evaluable. The questions were divided into three major groups, the structures of which are presented in Table 1.

Table 1. The structure of the questionnaire

The first group of questions Students' specifications	The second group of questions Electricity consumption habits	The third group of questions Electricity situation
Gender Age How many people live together on the property? Residence? Cost of living? Are you aware of their electricity consumption in kWh and in HUF?	What does conscious electricity use mean for the student? How did the situation change the electricity use of the respondents?	How are you informed about the current electricity situation? What is the cause of the power situation in the world? Are you worried about your livelihood because of the situation?

Source: own study.

The data were analysed using SPSS version 28 with univariate and multivariate analysis and the authors used SMART PLS4 version to build the model.

RESULTS AND DISCUSSION

There are few insights into how particular sociodemographic, behavioural, and attitudinal variables affect home power usage (Wallis *et al*., 2016).

The findings of the research of Wen *et al*. (2022) conducted in China indicated that the intention to energy conservation, personal norms, green trust, and awareness are the key contributors to energy conservation. Consumers are compelled to learn about household energy management and shape their ideas and knowledge about it as a result of social and ecological attitudes, economic conditions, and other factors (Żywiołek *et al.*, 2022).

Consumers' actions, motivations, and attitudes can result in efficient and effective energy management (Slupik *et al*., 2021). While examining behavioural patterns of energy consumption in Bangladesh, Islam *et al.* (2022) highlighted the role of increasing awareness through training and improving responsibility in developing responsible consumption behaviour.

Based on the concepts above, Hypothesis 1 was developed.

H1: The young people surveyed are aware of their electricity consumption, which is influenced by who pays for electricity and by the number of people living in the household.

Young people are viewed by parents as large energy consumers, who are less likely to advocate for energy conservation because they view electronic devices as integral parts of their existence (Schmidt *et al*., 2014).

The main objective of Si *et al.*'s study (2022) was to look into young people's influencing variables and energy-saving activities, which adds to the knowledge about the variables that affect energy-saving practices. Since carbon emissions made energy consumption a significant factor in climate change, academics and policymakers focused on home energy-saving practices and expenditures. It is difficult to turn a household into a carbon-neutral one simply cutting energy costs at the household level (Pio & Managi, 2023). The results of Li *et al*. (2021) also underpin the role of awareness in household energy consumption. By analysing a university campus, Setyowati *et al*. (2019)

concluded that energy saving is only possible if the management of campus energy facilities is properly integrated with the behaviour patterns of the citizens to save energy.

Based on the concepts above, Hypothesis 2 was drafted.

H2: The young people interviewed are saving electricity because of the current situation.

The study by Lusinga and de Groot (2019) examined how primary school students in a low-income neighbourhood use energy. The research offers insights into how geographical and contextual elements, such as the socioeconomic circumstances of the family and social practices, influence children's energy behaviours. Parental nagging and inconsistent behaviour were ineffective in encouraging children to conserve power (Aguirre-Bielschowsky *et al.*, 2018). The two groups that have the largest influence on how children develop their energy conservation knowledge are parents and teachers (Pearce *et al.*, 2020).

The research of Bjønness *et al.* (2022) also concluded that parents are a valuable resource in assisting their adolescent's decision-making processes. Wang *et al.* (2022) confirmed the efficiency of family connections in encouraging energy conservation between parents and children.

Based on these concepts, Hypotheses 3 was formulated.

H3: Young people selected in the survey consider their close relatives as the most credible source of information about the situation and this influences their perception of the reasons for the situation in the electricity market.

In what follows, the authors present their findings on their hypotheses along the lines of their research.

The first results that the authors present are the sample specification results. In total, 272 respondents participated in the survey. The average age of the respondents was 20.58 years with a standard deviation of 3.3 years.

The sample specification is summarised in Table 2.

Table 2. Sample specification (%)

Features	Frequency (%)
Gender	43.4% male 56.6% female
Respondents' place of residence	47.4% Budapest 5.1% city (with more than 100 000 inhabitants) 41.5% town (with inhabitants between 1000 and 100 000) 5.9% village (with less than 1000 inhabitants)
Type of property where they currently live	4.9% student hostel 22.3% rented apartment 5.3% rented room 64.0% with the family on their own property 3.4% with the family in a rented property
Number of persons living on the property	4% 1 26.1% 2 28.3% 3 24.3% 4 17.3% 5 or more
Who pays the electricity bill?	5.9% on their own 16.2% with flatmates 69.1% parents 8.8% they and the parents together 0% other

Note: n = 272.
Source: own study.

In the sample, 70.4% of men lived with their families, compared to 59.1% of women. 20.0% of men and 33.6% of women lived in rented property. There was a correlation between gender and property type in the sample (Chi-square test: Chi-square: 12.867 df: 4 sig.:0.012 p<0.05). The majority (46.7%) of those who paid the bill themselves lived in rented property. Where parents paid the bills, 81.6% of respondents lived with a close relative.

Depending on who pays the electricity bill for the property, the sample was very divided. For those paying with parents, the majority were either renting a property (33.3%) or were still staying at home (58.3%).

In the survey, students were asked to decide to what extent they agreed with statements related to electricity consumption in the context of the current situation. On a Likert scale of one to five, one meant absolutely no and five meant absolutely yes.

In Table 3, we show the extent to which respondents agreed or disagreed with each set of questions.

The authors created several constructs, so-called latent variables, which included understanding consumption patterns, consumption awareness, consumption saving, reasons for the situation and sources of information.

The data show that the respondents are less aware of their electricity consumption although the variances show that there is still a large deviation in this respect. The authors examined how awareness of consumption is influenced by the variables of how many people live in a property and who pays the electricity bill. The number of occupants did not have any impact while both the knowledge of kWh hours (F: 6.352 df: 3 sig.: 0.01 p<0.05) and the knowledge of the amount of the monthly electricity bill (F: 7.954 df: 3 sig.: 0.01 p<0.05) were influenced by the person who pays the electricity bill.

According to the ANOVA test, students' energy awareness was not affected by factors such as who pays the bills and how many people live in a property. Energy conservation is more prevalent among students than their perception of energy awareness. Here, in addition to lighting, the focus is now on the optimal use of electrical appliances. Surprisingly, conservation is not influenced either by the number of occupants in a property or by the person who pays the electricity bill. The high mean scores indicate that it is an important issue, especially saving money on lighting: the standard deviation (SD: 0.726) was very low, indicating that respondents were unanimous on this question.

Not only war but also environmental factors play an important role. Close relatives are regarded as the most credible source of information while the average score is much lower for media, which are seen as no less reliable.

The results also showed that students with different costs of living differ significantly in terms of thrift (I use a light where I am: F: 9.31 df: 4 sig: 0.00, I use energy efficient devices: F: 3.541 df:4 sig.:.0.008). Thus, for example, students living on HUF 200 000 or less per month are significantly more likely to save electricity than those who spend HUF 40 000 or more per month. In total, 42% of students are worried about their financial livelihood because of the energy situation they face, and only 11% were not worried at all. Paying the electricity bill is a problem for 18%, while for 20% it is not.

In the subsequent part of the study, the authors created a model to identify the relationship between knowledge of consumption, energy awareness, saving, reasons for the energy situation, and their sources. The variables in Table 3 and others were not included as they would have degraded the values of the latent variables.

For the analysis, we used the structural equation modelling (SEM) method (Hair *et al.*, 2011; 2013; 2014; 2016) for modelling latent variables, including the variance-based method (PLS over-analysis). In the SEM model, the latent variables generated from the indicators and the relationships between them can be modelled.

The SEM method consists of two parts: the measurement model and the structural model. In the former one, the relationships between the latent variables and the indicators can be analysed while in the latter one, the relationships between the latent variables can be examined.

The latent variables can be endogenous or exogenous. Exogenous variables are the explanatory variables, endogenous variables are the explained variables. For PLS-SEM, items (the manifest variables), the metric measurement-level variables, are not required to be normally distributed (Hair *et al.*, 2016; Kazár, 2014). The indicators were not normally distributed, which the authors tested using the

Kolmogorov-Smirnov and Shapiro-Wilk tests. For all variables, the p-value was less than 0.01, *i.e.* normality could not be confirmed. Table 3 presents latent variables and items.

Table 3. Respondents' views on the current situation, consumption, and sources of information (N, M, SD)

Constructs	Variables	N Valid	Missing	Mean	Std. Deviation
Consumption aware	Aware 1 I am aware of how much (how many kWh hours) of electricity we consume each month in the current dwelling.	272	0	2.95	1.353
	Aware 2 I am aware of the monthly electricity consumption (in HUF) of the current residential property.	272	0	3.41	1.320
	Aware 3 I am aware of how much electricity we use.	272	0	4.07	1.011
Awareness	Conscious 1 I only use electricity for appliances that I am using or that need electricity to run constantly (fridge, freezer).	272	0	3.72	1.298
	Conscious 2 I only use lights in the room where I am.	272	0	4.59	0.763
	Conscious 3 I use energy-efficient electrical appliances and replace those that are not.	272	0	3.17	1.219
Thrift	Thrifty 1 I only power appliances that I am using or that need electricity to run constantly (fridge, freezer).	272	0	4.01	1.165
	Thrifty 2 I only use lights in the room where I am.	272	0	4.66	0.726
	Thrifty 3 I use energy-efficient electrical appliances and replace those that are not.	272	0	3.63	1.236
Reasons 1	Environmental 1 Scarce energy sources.	272	0	3.42	1.107
	Environmental 2 Excessive past consumption.	272	0	3.29	1.193
	Environmental 3 Inefficient use of energy.	272	0	3.44	1.099
Reasons 2	Energy 1 Unreliable information on energy and electricity market developments.	272	0	3.20	1.126
	Energy 2 Buildings not up to date in terms of energy efficiency.	272	0	3.56	1.071
	Energy 3 Lack of public promotion of energy saving.	272	0	3.32	1.163
	Energy 4 Use of electrical equipment that is not up to date.	272	0	3.32	1.085
	Energy 5 High cost of energy upgrades.	272	0	3.45	1.004
Reasons 3	War 1 The Russian-Ukrainian war.	272	0	3.85	0.975
	War 2 EU sanctions.	272	0	3.17	1.164
Source 1	Close relatives 1 Family members	272	0	3.48	0.913
	Close relatives 2 Friends, acquaintances	272	0	3.28	0.821
Source 2	Media 1 TV	272	0	2.65	1.042
	Media 2 Radio	272	0	2.86	1.012
Other	Conscious Other 1 I unplug chargers after charging the device.	272	0	3.53	1.478
Other	Conscious Other 2 I use energy-saving light bulbs.	272	0	4.05	1.071
Other	Thrifty Other 1 I unplug chargers after charging the device.	272	0	4.10	1.294
Other	Conservative Other 2 I use energy-saving light bulbs.	272	0	4.25	0.997

Source: own elaboration, n= 272.

The standardised factor weights, when all items were examined, were above 0.5. The multicollinearity of the indicators, the VIF, is good if it is below 5 (Hair *et al.,* 2016). This was met for all variables.

There are several ways to test the reliability of latent variables. One of them is the CR (composite reliability) value, which should be above 0.7 (Werts *et al*., 1974). The CR values of the latent variables met this requirement. To measure the convergence validity, the AVE (average variance extracted) values were all higher than 0.5, which could be appropriate (Fornell-Larcker, 1981). The results of the above analysis are presented in Table 4.

The test of discriminant validity was conducted according to the Fornell-Larcker (1981) test, where the square root of the mean variance extracted by a construct should be greater than the correlation between the construct and any other construct. For the model, this criterion was fulfilled, except for awareness and thrift (where the variance was very small). The other possibility is cross loading, *i.e.* items can express content more strongly in their own construct than in another latent

variable. This condition was also fulfilled by the model. Due to space constraints, only the Fornell-Larcker criterion and cross-loading results are presented in Tables 5 and 6. The items and constructs were indicated by the authors' labels in Table 3.

Table 4. Standardised factor weights, VIF, validity, and reliability results

Constructs	Variables	Stand. fact. w.	VIF	CR	AVE
Consumption aware	Aware 1 I am aware of how much (how many kWh hours) of electricity we consume each month in the current property.	0.778	2.034		
	Aware 2 I am aware of the monthly electricity consumption (in HUF) of the current residential property.	0.789	2.087	0.820	0.603
	Aware 3 I am aware of how much electricity we use.	0.763	1.104		
Awareness	Conscious 1 I only use electricity for appliances that I am using or that need electricity to run constantly (fridge, freezer).	0.753	1.129		
	Conscious 2 I only use lights in the room where I am.	0.709	1.131	0.766	0.522
	Conscious 3 I use energy-efficient electrical appliances and replace those that are not.	0.706	1.205		
Thrift	Thrifty 1 I only power appliances that I am using or that need electricity to run constantly (fridge, freezer).	0.799	1.345		
	Thrifty 2 I only use lights in the room where I am.	0.757	1.269	0.804	0.578
	Thrifty 3 I use energy-efficient electrical appliances and replace those that are not.	0.723	1.185		
Reasons 1	Environmental 1 Scarce energy sources.	0.858	1.486		
	Environmental 2 Excessive past consumption.	0.603	1.228	0.826	0.619
	Environmental 3 Inefficient use of energy.	0.869	1.594		
Reasons 2	Energy 1 Unreliable information on energy and electricity market developments.	0.676	1.346		
	Energy 2 Buildings not up to date in terms of energy efficiency.	0.796	2.460		
	Energy 3 Lack of public promotion of energy saving.	0.745	1.438	0.850	0.534
	Energy 4 Use of electrical equipment that is not up to date.	0.801	2.429		
	Energy 5 High cost of energy upgrades.	0.620	1.324		
Reasons 3	War 1 The Russian-Ukrainian war.	0.799	1.181	0.819	0.694
	War 2 EU sanctions.	0.866	1.181		
Source 1	Close relatives 1 Family members	0.914	1.865	0.913	0.841
	Close relatives 2 Friends, acquaintances	0.920	1.865		
Source 2	Media 1 TV	0.948	2.683	0.945	0.896
	Media 2 Radio	0.945	2.683		

Note: n = 272.
Source: own study.

The measurement model was adopted by the authors based on the results. To test the significance of the path coefficients in the structured model analysis, the authors used bootstrap sampling with a sub-sample size of 5000 and a p-value of 0.05 significance level. Among other things, the authors analysed whether the independent variables had a significant effect on the dependent variables. Where the significance level was below 0.05, the relationship was confirmed as significant. Beta coefficient values were also analysed, which shows how much one variable influences the other. If this value was above 0.2, then a significant effect was assumed, The R-squared values were also examined, which shows the magnitude of the change in the endogenous variable that is explained by the exogenous variables. Based on these results, the authors developed the following model (Figure 1).

Only the endogenous variables have numbers in the rings. These are R-squared values, which indicate how much of the change in a given endogenous variable is explained by the exogenous variable or variables. One number in the arrows is the significance level p (in parentheses) and the other is the β value. In the model, not all latent variables have a significant effect on each other. If the value of p does not exceed 0.05, there is a significant relationship. There are mediator variables in the model that

mediate between two latent variables. Through the mediating variables, there is an indirect effect between the latent variables, and if there is no mediating variable, there is a direct effect. The direct and indirect effects together constitute the total effect. The relationship between each variable is shown in Tables 7 and 8. The Table shows the beta values, the T-statistic, which if above 1.96 indicates a plausible relationship, and there is a significance level, which if below 0.05 indicates a significant relationship. For indirect relationships, we present only the significant ones.

Table 5. Fornell-Larcker criterion

Variables	Consumption aware	Source 1	Source 2	Reasons 1	Reasons 2	Reasons 3	Savings	Awareness
Consumption aware	**0.777**							
Source 1	0.131	**0.917**						
Source 2	-0.007	0.177	**0.947**					
Reasons 1	0.232	0.067	0.041	**0.787**				
Reasons 2	0.177	0.052	-0.118	0.507	**0.731**			
Reasons 3	0.028	0.176	0.294	0.033	-0.101	**0.833**		
Savings	0.357	0.068	-0.016	0.287	0.269	0.076	**0.760**	
Awareness	0.375	0.053	-0.090	0.235	0.241	0.011	0.767	**0.723**

Note: n = 272; the highlighted values are the square root of the AVE values.
Source: own elaboration.

Table 6. Cross loading

Variables	Consumption aware	Source1	Source 2	Reasons 1	Reasons 2	Reasons 3	Savings	Awareness
Energy 2	0.151	0.064	-0.100	0.419	0.796	-0.125	0.163	0.153
Energy 3	0.167	0.046	-0.115	0.381	0.745	-0.102	0.202	0.207
Energy 4	0.168	0.112	-0.052	0.449	0.801	-0.097	0.183	0.196
Energy 5	0.027	-0.001	-0.060	0.366	0.620	0.040	0.229	0.127
Energy 1	0.106	-0.046	-0.097	0.234	0.676	-0.059	0.214	0.181
War 1	0.027	0.148	0.205	0.055	-0.035	0.799	0.088	-0.006
War 2	0.020	0.146	0.280	0.005	-0.125	0.866	0.044	0.021
Environment 1	0.191	0.019	0.070	0.858	0.398	0.060	0.282	0.225
Environmental 2	0.055	0.083	0.073	0.603	0.318	0.097	0.146	0.089
Environmental 3	0.251	0.079	-0.022	0.869	0.472	-0.040	0.225	0.205
Close relatives 1	0.140	0.914	0.212	0.046	-0.001	0.178	0.047	0.036
Close relatives 2	0.100	0.920	0.115	0.077	0.095	0.145	0.078	0.060
Media1	0.013	0.157	0.948	0.031	-0.120	0.281	0.006	-0.066
Media2	-0.027	0.179	0.945	0.048	-0.102	0.275	-0.037	-0.105
Thrifty 2	0.340	0.074	-0.012	0.239	0.174	0.090	0.757	0.569
Thrifty 3	0.257	-0.010	-0.029	0.197	0.268	-0.019	0.723	0.580
Thrifty1	0.218	0.090	0.003	0.218	0.173	0.101	0.799	0.600
Aware1	0.778	0.073	-0.010	0.104	0.075	0.040	0.250	0.271
Aware2	0.789	0.014	-0.035	0.123	0.079	-0.030	0.215	0.237
Aware3	0.763	0.175	0.017	0.267	0.215	0.040	0.332	0.337
Conscious 2	0.298	-0.029	-0.076	0.253	0.134	0.016	0.550	0.709
Conscious 3	0.269	-0.012	-0.096	0.138	0.268	-0.013	0.543	0.706
Conscious1	0.246	0.158	-0.021	0.116	0.119	0.020	0.570	0.753

Note: n = 272; we indicated which item belongs to which latent variable.
Source: own study.

The results show that the media affects who and what students blame for the situation, such as war (β: 0.271, t: 4.650 p: 0.00) or energetics (although negative β was confirmed: β: -0.131, t: 2.18 p: 0.029). The absence of environmental factors affects students' awareness of their consumption (β: 0.188, t: 2.752 p: 0.006), while clarity has a strong effect on awareness (β: 0.330, t: 6.025 p: 0.000). On the other hand, awareness has a strong effect on students' saving (β: 0.713, t: 13.520 p: 0.000).
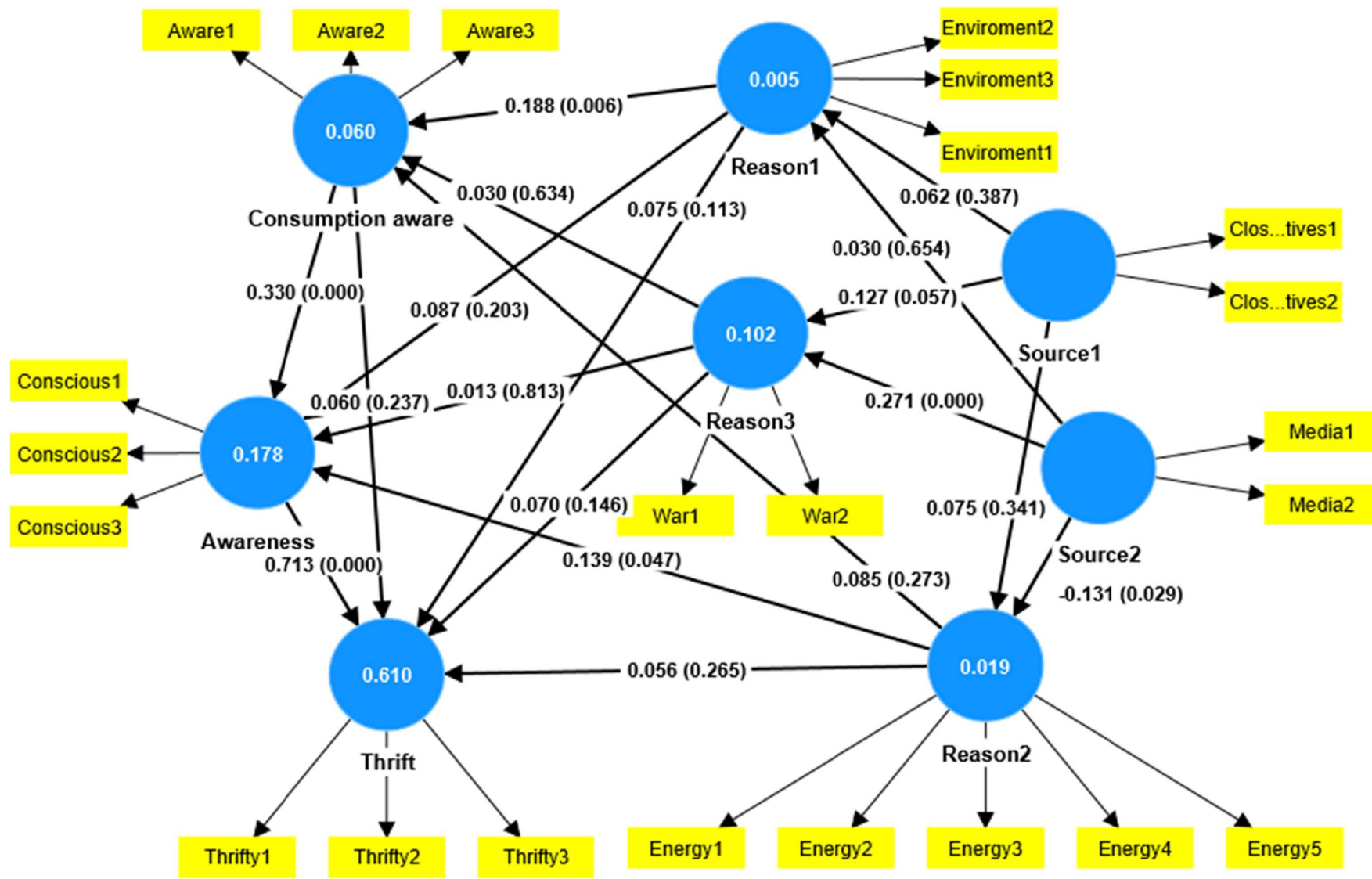
Figure 1. The model with SMART PLS4
Source: own elaboration.

Table 7. Direct relationships (p=0.05)

Paths	β	T statistics	P values
Consumption aware -> Savings	0.060	1.183	0.237
Consumption aware -> Awareness	0.330	6.025	0.000
Source 1 -> Reasons 1	0.062	0.865	0.387
Source 1 -> Reasons 2	0.075	0.953	0.341
Source 1 -> Reasons 3	0.127	1.907	0.057
Source 2 -> Reasons 1	0.030	0.448	0.654
Source 2 -> Reasons 2	-0.131	2.180	0.029
Source 2 -> Reasons 3	0.271	4.650	0.000
Reasons 1 -> Consumption aware	0.188	2.752	0.006
Reasons 1 -> Savings	0.075	1.583	0.113
Reasons 1 -> Awareness	0.087	1.273	0.203
Reasons 2 -> Consumption aware	0.085	1.096	0.273
Reasons 2 -> Savings	0.056	1.114	0.265
Reasons 2 -> Awareness	0.139	1.985	0.047
Reasons 3 -> Consumption aware	0.030	0.476	0.634
Reasons 3 -> Savings	0.070	1.455	0.146
Reasons 3 -> Awareness	0.013	0.237	0.813
Awareness -> Savings	0.713	13.520	0.000

Note: n= 272; we marked significant relationships in grey.
Source: own study.

Table 8. Indirect relationships (p=0.05)

Paths	β	T statistics	P values
Reasons 1 -> Consumption aware -> Awareness	0.062	2.594	0.010
Reasons 1 -> Consumption aware-> Awareness -> Savings	0.044	2.538	0.011
Reasons 2 -> Awareness -> Savings	0.099	1.974	0.048
Consumption aware -> Awareness -> Savings	0.235	5.294	0.000

Note: n= 272.
Source: own study.

Table 9. Research hypotheses

Hypothesis	Accepted/ rejected	Reason
The young people surveyed are currently aware of their electricity consumption, which is influenced by who pays for electricity and the number of people in the household.	Rejected	The young people surveyed were not really aware of their consumption data in kWh hours or in HUF, and this fact was only influenced by who pays the bills.
Young people interviewed are saving electricity because of the current situation.	Accepted	The students in the study were attentive to saving. Their energy awareness was the main determinant of their saving, which, in turn, was determined by how aware they were of their consumption.
The young people selected in the survey consider their close relatives as the most credible source of information about the situation and this influences their perception of the reasons for the situation in the electricity market.	Rejected	The young people in the sample tended to listen to their close relatives on this issue, but while there was a significant effect for the media on war and energy reasons, this effect was not confirmed for family members.

Source: own study.

Moreover, we analysed indirect relationships, showing only significant relationships in Table 8, which were no longer directly significant (Table 7 values).

We were able to conclude the following about the R squares. About 61% of the change in thrift is explained by awareness, while 17.8% of the differences in awareness can be explained by understanding consumption patterns, and 10.2% of the changes in war and its consequences as a reason can be attributed to the media for students.

Overall, our hypotheses can be evaluated as follows in Table 9.

CONCLUSIONS

Our research examined consumption awareness to obtain information about the feelings and attitudes of students of economics at a Hungarian university, which has some common points with the 2022 study by Wei and Du on university students' energy-saving behaviour.

The research is in parallel with the findings of Zanocco *et al*. (2022) while examining how well-prepared customers are to make the best decisions in a more dynamic energy system while Hahnel (2022) also offered important insights into consumers' awareness of their electricity use patterns.

The research indicated that young people's awareness of their electricity consumption should be improved as they generally do not know how much they consume as they entrust this information to the person in charge of paying the bill. It is thought-provoking to note that the majority of students surveyed (33.5%) believe that the rise in energy prices could increase their monthly living costs by up to 20-40%, while one in six think this figure will be between 40-80%.

It was one of the most important practical implications of the research to conclude that savings on energy and awareness are interdependent. As for policy and managerial implications, a steady and efficient collaboration between governments, institutions, and other stakeholders is essential to assist households and businesses affected by price increases.

Finally, there are a lot of factors as a source of information such as (social) media in addition to family, friends, and acquaintances, who do not take the lead in terms of credibility.

As a future continuation of the research, we would like to conduct studies in other EU countries to see how young people perceive their own consumption and what factors influence this. The authors will also carry out longitudinal research on how students' perceptions of their consumption change after the winter period.

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Authors

The contribution share of authors is equal and amounts to ⅓ for each of them.

Tímea Juhász

PhD in management and business administration (2010); habilitation (2019). Associate Professor and Deputy Dean of the Faculty of International Management and Business at the Budapest Business University. Her research interests include a wide range of management and economic topics. She has more than 250 publications.
Correspondence to: Dr. habil. Tímea Juhász, Budapest Business School, H-1165 Budapest, Diósy L. u. 22-24. Hungary, e-mail: juhasz.timea@uni-bge.hu
ORCID http://orcid.org/0000-0001-5386-0678

Erika Varga

PhD in management and business administration (2015); habilitation in management and business administration (2021). Associate Professor at the Institute of Rural Development and Sustainable Economy, Hungarian University of Agriculture and Life Sciences (Gödöllő, Hungary). Her research interests include HR, management, leadership issues, competencies and work-life balance.
Correspondence to: Dr. habil. Erika Varga, Hungarian University of Agriculture and Life Sciences, H-2100 Gödöllő, Páter K. u. 1. Hungary, e-mail: varga.erika@uni-mate.hu
ORCID http://orcid.org/0000-0001-5105-7187

Arnold Tóth

PhD in economics (2014) at Budapest Corvinus University. Associate professor at the Department of Business Economics of Budapest Business University. Moreover, he is a secretary at the Consumption Economic Committee of the Hungarian Academy of Sciences. His research fields include the labour market, competitiveness, and economic development.
Correspondence to: Dr. Arnold Tóth, Budapest Business School, H-1149 Budapest, Buzogány u. 10-12. Hungary, e-mail: toth.arnold@uni-bge.hu
ORCID http://orcid.org/0000-0003-0860-6405

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Anti-crisis activities and export performance in the Covid-19 pandemic: The case of Polish exporters

Nelly Daszkiewicz, Aleksandra Kordalska, Magdalena Olczyk

A B S T R A C T
Objective: The article aims to investigate the impact of anti-crisis activities undertaken by the Polish exporting firms on their export sales during the Covid-19 pandemic.
Research Design & Methods: In our study, we used a quantitative research design. We conducted the survey on the sample of 161 manufacturing Polish exporting firms between April 21 and June 25, 2021. To verify the assumed relationships, we used the probit regression model.
Findings: We found that some firm key features, such as firm size, the territorial scope of international activity, the share of foreign ownership in assets, the degree of innovation, and the presence of a market diversification strategy significantly impacted export sales during the pandemic. The results also suggest that a temporary reduction in employment, the sale of new/adapted products, and the search for new foreign export partners strongly supported the sales growth of Polish exporters during the Covid-19 pandemic.
Implications & Recommendations: This study can be valuable for researchers, managers, and policymakers. First, we highlight activities that promote export/sales during the pandemic period, which can be helpful for both researchers and policymakers in creating support tools for exporters. Second, managers may gain valuable lessons on the importance of having an internationalisation strategy and marketing strategies in place during demand and supply shocks.
Contribution & Value Added: The main novelty is a firm-level analysis of the Covid-19 pandemic impact on exporting firms from the perspective of the anti-crisis activities they undertook, which fills a gap in the literature and informs discussions of the potential impact of Covid-19 on export performance.

INTRODUCTION

In 2020, the Covid-19 outbreak rocked the world's economies. The Covid-19 pandemic spread at an alarming rate, infecting millions of people and bringing economies to a near standstill as countries have imposed strict travel restrictions to stop the spread of the virus (World Bank, 2020). The pandemic-related restrictions on economic activity resulted in supply shocks (unexpected changes in production caused by lockdowns, mobility restrictions, production stoppages, disruptions of global value chains, and uncertainty about short-term prospects) accompanied by a supply chain disruption (Attinasi *et al.*, 2021). The supply shock rapidly turned into a demand shock, *i.e.* changes to the households' expenditure related to job layoffs, reduced work time and wages, and decreased disposable incomes and taxes (Szustak *et al.*, 2021).

One of the business activities most affected by the pandemic was international trade. The pandemic triggered supply chain disruptions, which particularly affected globally oriented and highly interconnected sectors and companies (Sforza & Steininger, 2020). This was because international flows of intermediate inputs constitute two-thirds of international trade and half of global trade is embodied in global value chains (GVCs) (Antràs, 2020). Moreover, international trade companies struggled also with the increase in trade costs (Li & Lin, 2021).

The specificity of firms operating in foreign trade means that they are strongly and immediately exposed to both supply and demand shocks. This is because major global traders are closely linked in global value chains, *i.e.* as they are both suppliers and buyers of inputs (Baldwin & Tomiura, 2020). On the one hand, Covid-19 causes direct shocks to total consumption by changing household behaviour in almost all countries in the world and indirect demand shocks through the closures of non-essential sectors (Gourinchas *et al.*, 2022; Halmai, 2022; Dao *et al.*, 2022; Rybaczewska *et al.*, 2023). We may see how severe the demand shock for international companies was thanks to the analysis of Andersen *et al.* (2020), who compared personal expenditure between Denmark, a country that imposed a lockdown, and Sweden, a country that did not. Andersen *et al.* (2020) found that consumption expenditures fell in both countries by similar amounts. On the other hand, firms operating in foreign trade experienced significant supply-side disruptions (restriction of labour supply and limitation of workforce management) caused by external lockdowns. This is especially noticeable in the labour-intensive trade sectors and international activities with lower capacity to allow workers to work from home (Papanikolaou & Schmidt, 2020; Mishchuk *et al.*, 2023). Some authors (*e.g.* de Lucio *et al.*, 2022) argue that demand factors play a more important role in explaining the shock, but other researchers (*e.g.* Meza, 2020) conclude that both shocks (demand and supply) are present in the crisis and emphasize the role of global value chains in the transmission of shocks.

Furthermore, Borino *et al.* (2021) suggest that international firms are simply more susceptible to shocks than firms operating only domestically. They also claim that firms can respond to different shocks in many ways. Generally, a firms' response to a negative shock is determined by three factors: the shock's nature, the firm's particular situation when the shock occurs, and the firm's product and labour market environments (Fabiani *et al.*, 2015). For instance, firms can cope with a supply shock by finding alternative sources of inputs, including green energies sources (Androniceanu & Sabie, 2022). They may also reduce production in response to a demand shock. In turn, this can involve laying off workers or reducing investments. However, firms rather use a cocktail of actions to deal which a shock like looking for new suppliers, moving sales online, or instating a policy of remote work. Such coincidental use of several actions was especially important during the Covid-19 crisis.

Borino *et al.* (2021) used a firm-level dataset from the ITC Covid-19 Business Impact Survey in their research. They found that the Covid-19 pandemic hit international firms harder along both supply and demand channels than domestic firms due to their exposure to international markets. On the other hand, they proved that international firms were more resilient to the Covid-19 crisis than domestic firms. Moreover, international firms were less likely than domestic ones to lay off workers or file for bankruptcy and more likely to adopt different activities to continue production *e.g.* remote work.

Our study concentrated on anti-crisis activities undertaken by exporting firms on their export sales during the Covid-19 pandemic based on the survey conducted on the sample of 161 manufacturing Polish exporting firms between April 21 and June 25, 2021. This study contributes to the existing literature in two ways. Firstly, it joins the growing literature of firm-level analyses of the impact of Covid-19 on exporters' performance (see for exploring forms from Slovenia (*e.g.* Jaklič & Burger, 2020); Nord Macedonia (*e.g.* Srbinoski *et al.*, 2022); Indonesia (*e.g.* Eschachasthi, 2022), and South Africa (*e.g.* Matthee *et al.*, 2022). Secondly, the study was exploratory in nature and analysed multiple dimensions of Polish firm activity related to anti-crisis activities undertaken by exporting firms. The novelty of the paper lies in estimating the impact of individual exporters' anti-crisis activities and of a mix of these activities on export sales, based on firm-level data.

The study is organized as follows. In Section Two, we will review the recent literature on the impact of Covid-19 on exporting businesses. In Section Three, we will summarise the survey and describe the data and methods used. In Section Four, we will assess the impact of Covid-19 on Polish exporters. In Section Five, we will provide concluding remarks.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Covid-19 Pandemic and International Business/Export Operations (Firm-Level Impact)

The literature related to Covid-19 consequences on international businesses at the firm level is still scarce but rapidly growing. Marinov and Marinova (2021) draw attention to the fact that the detailed impact of the Covid-19 pandemic on international business is still unknown. Moreover, Barber and Ojala (2021) agree that the impact of the Covid-19 pandemic on the international business environment is tremendous, incontrovertible, and not yet clear. In turn, Tesar (2020) claims that in modern times, no other systemic interruptions like wars or dictatorships have hindered the international operations of firms as much as the coronavirus. Undoubtedly, the Covid-19 pandemic disturbed even the most stable international operations, in particular export operations. Thus, during the pandemic export operations, direct exports were perceived as high-risk operations. Having international relationships and receiving most of the export orders over the Internet is crucial (Hadasik & Kubiczek, 2020). Moreover, international firms will have to reconsider their strategies and national governments – their trade and investment policies that can best support the international firms in the future (Marinov & Marinova, 2021).

The literature related to firm-level analyses of the Covid-19 impact concentrates on very different aspects, *i.e.* the impact of Covid-19 pandemic on the liquidity of companies (Acharya & Steffen, 2020; Bilan *et al.,* 2023; Kryeziu *et al.*, 2022), financial flexibility (Fahlenbrach *et al.*, 2021), stock prices of company shares (Ramelli & Wagner, 2020; Kaźmierska-Jóźwiak *et al.,* 2021), the equity shortfall (Carletti *et al.*, 2020), price-setting decisions of firms (Balleer *et al.*, 2020), supply chain disruptions (Aral *et al.*, 2020; Gigauri & Bogacz-Wojtanowska, 2022), government policies on firms' aid, and furlough decisions (Bennedsen *et al.*, 2020; Kudej *et al.*, 2021, Androniceanu, 2020). However, only a few of these studies directly address exporters and the impact of the Covid-19 pandemic on their activities.

Previous exporters-level analyses focused mainly on identifying difficulties, risk areas, and areas of exporters' activity that have been most affected by the Covid-19 pandemic. Analyses based on exporter surveys from China (Dai *et al.*, 2021) and North Macedonia (Srbinoski *et al.*, 2022) indicate that exporters experienced a systematic slowdown in their growth rates in sales, profits, investment, capital, employment, and wages. The supply difficulties and a decline in demand were the biggest risks for exporting firms during the pandemic (Lebastard *et al.*, 2023).

Additionally, firm-level analyses of Covid-19 pandemic impact on exporting firms try to identify factors, which determine why some exporters cope with the pandemic better than others. Exporters with limited access to finance, high import dependence on EU markets, high labour intensity, export dependence on non-EU markets, and lower competitiveness were less resilient to the shocks of the pandemic (Matthee *et al.*, 2022). A survey of Colombian export companies confirms that larger companies are more likely to survive despite weaker export growth (Benguria, 2021). The research of Polish exporting companies shows that the impact of the pandemic on companies' exports (performance and outlook) also depends on the type of economic activity and sectors, *e.g.*, the automotive, computer, and electronic equipment sectors were more affected than the other sectors (Talar *et al.*, 2023).

Our research focused on a completely new aspect in the study of exporters. We tried to assess what actions taken by exporters during the difficult time of the pandemic turned out to be effective and positively impacted export performance.

Determinants of Export Performance and Hypotheses Development

The analysis of the determinants of export performance is one of the most widely discussed subjects in internationalization research (Vološin *et al.,* 2011; Cieślik *et al.*, 2012; Nikensari *et al.,* 2021; Pini & Tchorek, 2022).

Scholars generally agree that having a planned internationalization strategy (formal or informal) contributes to good firm export performance (Daszkiewicz, 2016). Noteworthy, any foreign market entry requires applying an internationalization strategy, which is a strategy considering foreign factors. In the literature, there are many classifications of internationalization strategies according to different

dimensions and configurations (Daszkiewicz & Wach, 2012), *e.g.* market concentration vs. market diversification strategy or offensive vs. defensive strategy. Nevertheless, to increase their export performance, firms need to develop competitive strategies that enable them to compete in competitive markets by leveraging profits and a sustainable market strategy (Zehir *et al.*, 2015; Wach & Głodowska, 2021; Kiforenko, 2023). Especially marketing strategy and capabilities considerably enhance firm export activities. Leonidou *et al.* (2002) did a meta-analysis on the relationship between marketing strategy and export performance and found that the implementation of a well-designed export marketing strategy can indeed determine export success, as the vast majority of marketing strategy variables (market segmentation, product quality, pricing strategy, dealer support, and promotion) are significantly associated with overall export success rates. Moreover, Pham *et al.* (2017) and Haddoud *et al.* (2019) confirm that marketing capabilities could be a source of low costs and branding advantages and then contribute to a firm's competitive advantage in foreign markets.

Thus, we formulated the following hypotheses:

H1: Firms with the internationalization strategy (formal or informal) are more likely to increase their export sales/increased their exports more often.

H2: Firms that implemented new marketing activities (promotion, market diversification) in the face of the Covid-19 pandemic are more likely to increase their export sales/increased their exports more often.

After the decision to start export activities, choosing a foreign market expansion strategy is one of the key decisions in the firm internationalization process (Cos *et al.*, 2019). It relates to two aspects: market concertation and geographic diversification. Noteworthy, researchers discussed two alternative diversification strategies – the geographic diversification of export sales and key markets – many times. The discussion concerned different areas, *i.e.* export, management, strategy, entrepreneurship, and economics. Nevertheless, they have not unequivocally stated how these strategies impact the performance of international sales. Some research affirms that an export market concentration strategy leads to better export performance (*e.g.* Bodur, 1994). However, more studies showed that there is a positive association between export performance and geographic diversification strategy (*e.g.* Aulakh *et al.*, 2000). It is all the more interesting to examine whether any of the strategies employed proved useful in boosting export performance during the pandemic.

Although seeking new markets could help firms to survive or even increase their export sales, Reymen *et al.* (2015) claim that entrepreneurs could respond to environmental uncertainty by modifying the scope of the firm activity and changing the way they do business. Covid-19 suddenly forced firms to adapt their strategies to lower demand and so they had lower costs. The costs are related to employee costs such as wages and labour productivity. Some firms (SMEs) are less resilient and flexible in dealing with the costs the COVID-19 pandemic, so they can change work processes, which may involve a shift to remote work (OECD, 2020).

Thus, we formulated the following hypotheses:

H3: Firms that increased the geographical scope of their activities (entered into new foreign markets or found new suppliers) in the face of the Covid-19 pandemic are more likely to increase their export sales.

H4: Firms that reduced employee costs (layoffs, remote work) in the face of the Covid-19 pandemic are more likely to increase their export sales.

In our study, in addition to the above-mentioned potential factors affecting the export performance of Polish exporters during the pandemic, we also wanted to consider control variables, which – as confirmed in the literature – impact companies' export. The factors are: company's age (export intensity is negatively associated with firm age: *e.g.* Kirpalani & McIntosh, 1980), firm size (firm size leads to higher export volumes: *e.g.* Hirsch & Adar, 1974; Daszkiewicz & Wach, 2013) firms' innovativeness (exporting is positively related to both product and process innovations, *e.g.* Cieślik & Michałek, 2017) or the ownership status (exporters with foreign capital are more export-oriented and have better performance than indigenous firms *e.g.* Jongwanich and Kohpaiboon, 2008).

RESEARCH METHODOLOGY

In this article, with the aid of econometric modelling tools, we quantitatively examined the impact of anti-crisis activities undertaken by Polish exporting firms during the Covid-19 pandemic on their export performance increase. To do this, we conducted a survey among Polish exporting manufacturers between April 21 and June 25, 2021. We retrieved the database for this study from Kompass Poland Sp. z o.o. and it covered 2 500 firms. We shared the survey questionnaire online and supported it with the CATI method. The response rate amounted to 11.7%. It allowed us to collect information from 292 Polish exporting firms. In total, 161 firms filled the questionnaire fully (185 of them filled in the form in at least 83%). In our study, we considered manufacturing enterprises only.

We did not obtain the sample in the database of 2 500 exporting firms randomly. Thus, the sample was not representative. The results from the survey characterize the group of firms mentioned above only and we cannot generalise them to the population of all Polish exporting firms.

In the final sample of exporting firms that answered the survey questions, medium-sized firms (45.6%) and small-sized firms (27.7%) dominated. The share of micro and large firms in the total number of enterprises was equal and amounted to 13.3% (Table 1). It means the overrepresentation of large firms and underrepresentation of micro firms in comparison to the size structure of a number of exporting firms in Poland (Doryń, 2016).

Table 1. Size distribution of surveyed firms

CATEGORY	Frequency	Percentage
Micro firm (1-9 employees)	26	13.33
Small firm (10-49 employees)	54	27.69
Medium firm (50-249 employees)	89	45.64
Large firm (250 employees)	26	13.33
Total:	195	100.00

Source: own elaboration based on the conducted survey.

Among all firms in our sample, the largest share, *i.e.* 33.3% is for exporters with 25-30 years of experience. The majority of examined firms were manufacturers of fabricated metal products (17.7%), rubber and plastic products (10.3%), and machinery and equipment non-else classified (9.7%). Table 2 presents a full sectoral coverage. The share of foreign assets in total firms' assets indicates that the sample is dominated by domestic enterprises (92.6%). Considering firms' geographical distribution, the largest representation came from Mazowieckie, Śląskie, and Pomorskie voivodships, which was 18.6%, 14.9%, and 12.8% respectively (Table 3). The geographical scope of exporting activity supported the thesis on the importance of regional trade linkages. In total, 38.8% of firms exported their products to directly neighbouring countries. An additional 8.8% were opened to the other Central Eastern European countries and the Western European countries are the market for a further 33.3% of firms. Only 19% of them spread their exporting activity beyond Europe.

Table 2. Geographic distribution of surveyed firms

Voivodeship	Frequency	Percentage	Voivodeship	Frequency	Percentage
Dolnośląskie	11	5.85	Podlaskie	5	2.66
Kujawsko-Pomorskie	11	5.85	Pomorskie	24	12.77
Lubelskie	8	4.26	Śląskie	28	14.89
Łódzkie	12	6.38	Świętokrzyskie	2	1.06
Mazowieckie	35	18.62	Warmińsko-mazurskie	3	1.6
Małopolskie	15	7.98	Wielkopolskie	13	6.91
Opolskie	2	1.06	Zachodniopomorskie	5	2.66
Podkarpackie	14	7.45	**Total:**	188	100.00

Source: own elaboration based on the conducted survey.

Table 3. Industrial distribution of surveyed firms

Industry	Industry description. Manufacture of:	Frequency	Percentage
10	food products	11	6.29
11	beverages	1	0.57
13	textiles	6	3.43
14	wearing apparel	7	4.00
15	leather and related products	1	0.57
16	wood and of products of wood and cork	3	1.71
18	printing and reproduction of recorded media	4	2.29
19	coke and refined petroleum products	1	0.57
20	chemicals and chemical products	15	8.57
21	basic pharmaceutical products and pharmaceutical preparations	2	1.14
22	rubber and plastic products	18	10.29
23	other non-metallic mineral products	3	1.71
24	basic metals	4	2.29
25	fabricated metal products, except machinery and equipment	31	17.71
26	computer, electronic, and optical products	8	4.57
27	electrical equipment	13	7.43
28	machinery and equipment n.e.c.	17	9.71
29	motor vehicles, trailers, and semi-trailers	5	2.86
30	other transport equipment	4	2.29
31	furniture	2	1.14
32	other manufacturing	13	7.43
33	repair and installation of machinery and equipment	6	3.43
	Total:	175	100.00

Source: own elaboration based on the conducted survey.

The sample description presented above provides the background for the main aim of the research. In our survey, we asked the question whether the Covid-19 pandemic affected the sale of the firm's products, in particular, whether the firm noted: (*i*) a decrease in domestic sales, (*ii*) an increase in domestic sales (*iii*) a decrease in export sales, and (*iv*) an increase in export sales. Focusing on the last answer, we obtain a dummy variable that we coded as '1' when the firm recorded an increase in export sales, and '0' if it did not. Taking into account firms' sales, 18% of these firms reached the growth of export sales (Table 4).

Table 4. The percentage of firms which noted the changes in their sales during the pandemic

Characteristics	Frequency	Percentage
Decrease in domestic sales	49	34.03
Increase in domestic sales	27	18.75
Decrease in export sales	45	31.25
Increase in export sales	26	18.06

Note: n=144, the question 'Did the COVID-19 pandemic affect the sale of the firm's products' was a multiple-choice question.
Source: own elaboration based on the conducted survey.

In our survey, we considered a group of factors related to two types of strategies undertaken by firms. The first factor was more general and concerned the possession of internationalisation strategies that were both formally and informally formulated. Such frames for a firm's activity in foreign markets possess slightly less than 40% of surveyed enterprises (Figure 1). In the second step, we examined the specific activities that firms undertook during the Covid-19 crisis and related to three particular areas – (i) employees and their wages (*COV-19 Strategy1*), (ii) marketing activities and new products (*COV19-Strategy2*), and (iii) new markets and new suppliers of intermediate products (*COV19-Strategy3*). The most used tools are related to *COV-19 Strategy1* – nearly 80% of responders employed one or more solutions connected to employees and their wages, specifically, these solutions

considered temporary employment reduction (*EmpReduction*), dismissing of employees (*EmpDismiss*), wages reduction (*WageReduction*), and remote work (*RemoteWork*).
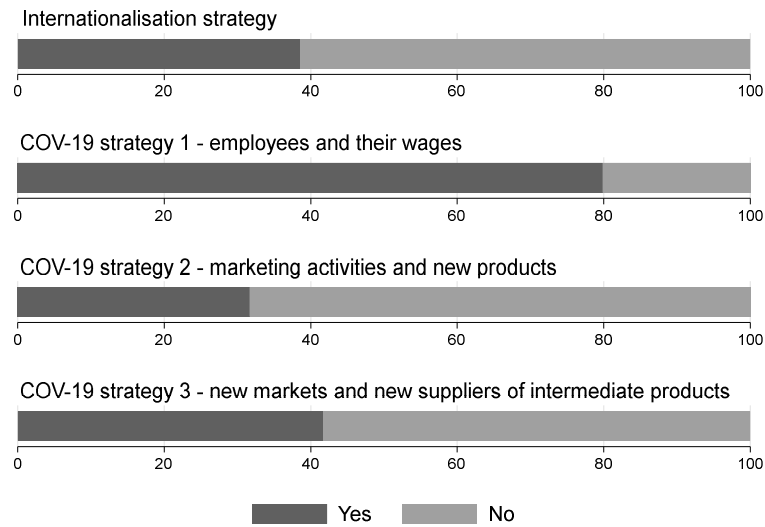
Figure 1. The possession and the use of Covid-19 strategies by Polish exporting firms (%)
Source: own elaboration based on the conducted survey.

The second group of Covid-19 anti-crisis activities (*COV-19 Strategy2*) focused on the intensification of marketing activities (*Marketing*), and sales of new/custom products (*Products*). Only 31.7% of firms made efforts in that direction.

The Covid-19 crisis significantly affected value chains. They shortened and became more regional than global. Firms were forced to search for new materials or/and new intermediate products from new suppliers (*BackwardLinks*), and/or search for new foreign partners in exports (*ForwardLinks*). These activities formed the third strategy named *COV-19 Strategy3*. Slightly above 40% of exporters decided to use one or both paths to protect their enterprises.
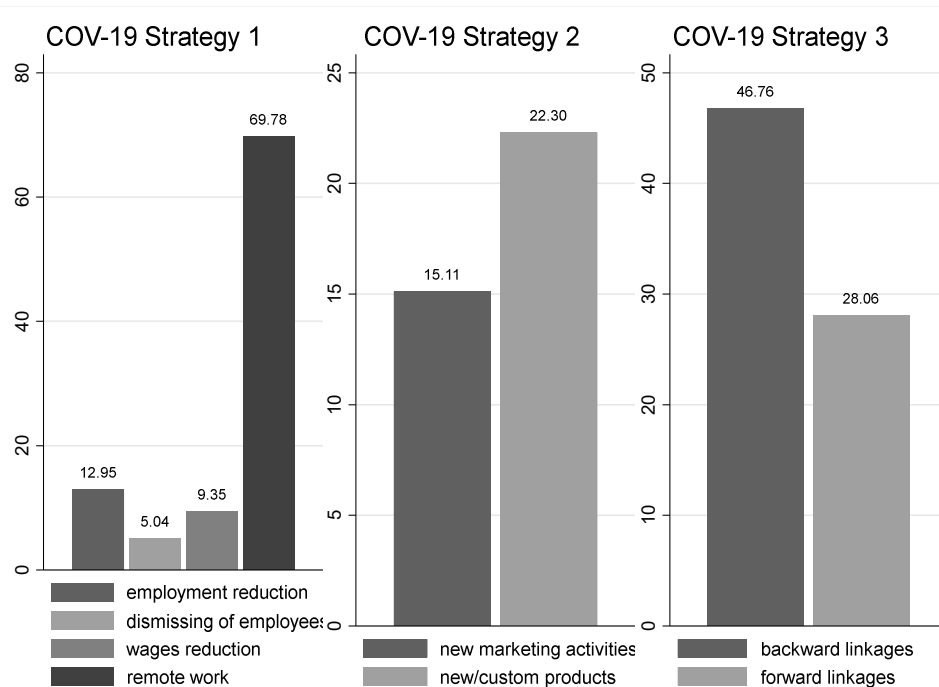
Figure 2. The use of Covid-19 sub-strategies in % of surveyed firms
Source: own elaboration based on the conducted survey.

During the analysed period firms refrained from reducing employment and wages. The usage of these instruments was rare in comparison to others (Figure 2). The most used strategies related to remote work – 69.78% of firms employed this solution; to backward linkages understood as new intermediate products or new suppliers of intermediates (46.76%); and the search for new or customised products (22.30%).

Table 5. Summary statistics for variables used in model estimation

Variable	Obs	Mean	Standard Deviation	Min	Max
Δexports>0	144	0.181	0.386	0	1
COV-19 Strategy1	139	0.971	0.691	0	4
EmpReduction	139	0.129	0.337	0	1
EmpDismiss	139	0.050	0.219	0	1
WageReduction	139	0.094	0.292	0	1
RemoteWork	139	0.698	0.461	0	1
COV-19 Strategy2	139	0.374	0.593	0	2
Marketing	139	0.151	0.359	0	1
Products	139	0.223	0.418	0	1
COV-19 Strategy3	139	0.748	0.723	0	2
BackwardLinks	139	0.468	0.501	0	1
ForwardLinks	139	0.281	0.451	0	1
Age	186	35.946	27.000	3	175
Size	195	2.590	0.883	1	4
ForeignMarket	143	2.629	1.249	1	4
Ownership	182	13.950	33.328	0	100
Inno	142	0.387	0.489	0	1

Source: own elaboration based on the conducted survey.

To evaluate the impact of Covid-19 strategies on firms' export performance growth (*Δexports*), we formulated the following regression:

$$\Delta exports_i = \beta_o + \gamma_1 IntStrategy_i + \gamma_2 COV-19\ Strategy_i + \beta_1 Z_i + \varepsilon_i \tag{1}$$

in which *COV-19 Strategy* contains the firm's activities related to Covid anti-crisis strategies as described above and *Z* is a matrix of control variables. It covers the firm's characteristics such as age (*Age*), size (*Size*), the number of foreign markets on which a particular firm operates (*ForMarket*), the ownership structure (*Ownership*), and the firms' innovativeness (*Inno*). The summary statistics are presented in Table 5. Moreover, we controlled the exports growth for industry fixed effects and NUTS2 region fixed effects respectively. Finally, ε_i is a random disturbance.

In the next step, we transformed the latent variable *Δexports* into a binary variable *y* defined as below:

$$y = y_i = \begin{cases} 1, & if\ \Delta exports > 0 \\ 0, & otherwise \end{cases} \tag{2}$$

This allowed us to consider a binary choice model:

$$\begin{aligned} P(y = 1 | IntStrategy, COV-19\ Strategy, Z) \\ = f(\beta_o + \gamma_1 IntStrategy_i + \gamma_2 COV-19\ Strategy_i + \beta_1 Z_i) \end{aligned} \tag{3}$$

Assuming that f in (3) is a standard normal cumulative distribution function, our model took the form of a probit regression model with normally distributed error terms. We estimated this model with the aid of the maximum likelihood method. Next, to measure the magnitude of the particular explanatory variables' impact, we used the average marginal effects.

RESULTS AND DISCUSSION

Our empirical analysis started with the assessment of correlation coefficients for all explanatory factors. Because of the relatively high association between main Covid-19 strategies and their

Table 6. Correlation matrix for the explanatory variables

Variable	IntStrategy	COV19-Strategy1	Emp Reduction	EmpDismiss	Wage Reduction	RemoteWork	COV19-Strategy2	Marketing	Products	COV19-Strategy3	BackwardLinks	ForwardLinks	Age	Size	Foreign MarketN	Ownership	Inno
IntStrategy	1.000																
COV-19 Strategy1	0.141	1.000															
EmpReduction	0.086	0.514*	1.000														
EmpDismiss	0.153	0.488*	0.205	1.000													
WageReduction	-0.004	0.552*	0.171	0.265*	1.000												
RemoteWork	0.079	0.541*	-0.166	-0.063	-0.058	1.000											
COV-19 Strategy2	0.067	-0.027	-0.099	0.021	0.006	0.019	1.000										
Marketing	0.115	0.018	-0.103	-0.005	0.003	0.103	0.719*	1.000									
Products	-0.005	-0.053	-0.052	0.035	0.006	-0.062	0.801*	0.160	1.000								
COV-19 Strategy3	0.274*	-0.073	-0.044	-0.057	-0.059	-0.013	0.255*	0.231*	0.163	1.000							
BackwardLinks	0.285*	-0.087	0.025	-0.084	-0.053	-0.074	0.090	0.007	0.121	0.788*	1.000						
ForwardLinks	0.123	-0.020	-0.098	0.003	-0.036	0.062	0.309*	0.363*	0.127	0.729*	0.153	1.000					
Age	-0.111	0.065	0.021	-0.047	0.083	0.052	0.085	-0.022	0.140	0.020	0.025	0.005	1.000				
Size	-0.061	0.016	0.080	0.087	0.121	-0.152	-0.097	-0.025	-0.115	0.025	0.000	0.039	-0.134	1.000			
ForeignMarketN	0.342*	0.122	0.018	-0.061	-0.154	0.294*	0.151	0.149	0.088	0.211	0.049	0.279*	-0.041	-0.220*	1.000		
Ownership	0.075	0.095	-0.007	0.121	0.018	0.075	0.019	-0.001	0.027	-0.118	-0.021	-0.167	-0.074	-0.338*	0.134	1.000	
Inno	0.264*	0.141	0.052	0.023	0.003	0.161	0.209	0.127	0.188	0.206	0.202	0.107	0.193	-0.129	0.289*	0.011	1.000

Note: * indicates a statistically significant correlation at the 1% level.

Source: own elaboration based on the conducted survey.

sub-strat-egies (Table 6), we considered COV-19 Strategy1, COV-19 Strategy2, and COV-19 Strategy3 in a separate model specification and particular firms' anti-Covid activities in another one.

Possessing internationalisation strategy, both formally and informally formulated makes the analysed firms more likely to export (Table 7). This result is robust to different model specifications. Main Covid-19 strategies presented in specifications (1), (2), (4), and (6) clearly indicated a lack of importance of tools gathered in Strategy 1. In turn, *COV-19 Strategy2* which focused on new marketing actions and new products offered on the market, was statistically significant in explaining export performance growth. It means that the increasing number of tools related to this strategy and used by the firm increases the probability of improving the export performance by about 13 percentage points (columns (1) and (4)). The significance of the third strategy depends on whether we consider it separately (model (6)) or together with other Covid-19 strategies (1).

Taking a closer look at individual activities set in order to avoid/overcome Covid-19 effects, we can see that even if only a small portion of firms decided to reduce their employment during the pandemic, this instrument became significant in increasing export probability. Moreover, within the other strategies, particular tools (searching for new or customised products, and searching for new partners for exported goods) importantly affected firms which were more prone to export.

Table 7. Estimation results for the increase in export sales

Dependent variable	1=firm increased its export sale, 0=firm did not increase its export sale						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IntStrategy	0.285***	0.332***	0.379***	0.309***	0.308***	0.252***	0.250***
	[0.911]	[0.079]	[0.074]	[0.078]	[0.078]	[0.080]	[0.083]
Cov-19 Strategy 1	-0.510	-0.036					
(Employment and Wages)	[0.046]	[0.043]					
EmpReduction			0.201*				
			[0.105]				
EmpDismiss			-0.064				
			[0.150]				
WageReduction			-0.168				
			[0.142]				
RemoteWork			-0.074				
			[0.062]				
Cov-19 Strategy 2	0.126**			0.134***			
(Marketing and Products)	[0.053]			[0.050]			
Marketing					0.120		
					[0.096]		
Products					0.146*		
					[0.075]		
Cov-19 Strategy 3	0.073					0.100**	
(Forward, Backward Links)	[0.045]					[0.044]	
BackwardLinks							0.009
							[0.068]
ForwardLinks							0.182***
							[0.068]
Pseudo-R2	0.368	0.302	0.352	0.342	0.342	0.327	0.348
N	113	113	113	113	113	113	113
Wald chi2	411.240	315.589	376.410	362.326	360.522	393.66	321.953
p-val for chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: * p<0.10, ** p<0.05, *** p<0.01; coefficients reflect marginal effects for probit models; robust standard errors in parentheses; *pseudo-R2, chi2 test statistics and p-value for chi2 are for original probit models*; each specification contains constant, fixed effects for manufacturing industries and voivodeship.

Source: own elaboration based on the conducted survey.

In Table 8, we examined the impact of possessing an internationalisation strategy and anti-crisis activities undertaken by Polish exporting firms, taking into account the control variables described in the previous section. These results supported our findings from Table 3. Additional control factors kept our estimates robust. Omitting nonsignificant *COVID-19 Strategy1* makes both remaining strategies start significant regardless of whether they entered the model together (specification (1)) or were considered separately (model (2) and (4)).

Generally, all control variables, except for firms' age, positively and significantly affected the propensity to increase export, but the older the firm was the lower probability that this firm would boost its exports.

Our results highlighted the exceptional role of the exporter's internationalization strategy. We tried to find a combination of anti-crisis actions and evaluate their impact on export sales growth during the pandemic period. Only when we combined the fact that the firm formulates its internationalisation strategy and creates new value chain linkages (COVID Strategy 3) did we observe a synergistic effect (Table 9). A deeper look into Strategy 3, allowed us to note that the firms which formulate their internationalisation strategy and look intensively for new export partners gain in exports (specification 4). Therefore, support programs to strengthen exporters' resilience to pandemics should not only focus on employment or financial support, but also contribute to the creation or consolidation a long-term internationalisation strategy.

Table 8. Estimation results for the increase of export sales (with control variables Z)

Dependent variable	1=firm increased its export sale, 0=firm did not increase its export sale				
	(1)	(2)	(3)	(4)	(5)
IntStrategy	0.472**	0.513***	0.583***	0.283***	0.318***
	[0.193]	[0.160]	[0.132]	[0.081]	[0.085]
Cov-19 Strategy 2	0.236**	0.247***			
(Marketing and Products)	[0.091]	[0.071]			
Marketing			0.037		
			[0.087]		
Products			0.396***		
			[0.063]		
Cov-19 Strategy 3	0.202**			0.195***	
(Forward, Backward Links)	[0.093]			[0.064]	
BackwardLinks					0.121*
					[0.073]
ForwardLinks					0.289***
					[0.073]
Age	-0.011***	-0.008***	-0.010***	-0.007***	-0.008***
	[0.003]	[0.002]	[0.003]	[0.001]	[0.002]
Size	0.004	0.135**	0.193***	0.095	0.105*
	[0.106]	[0.066]	[0.047]	[0.066]	[0.063]
ForMarket	0.266***	0.203***	0.274***	0.196***	0.196***
	[0.075]	[0.045]	[0.041]	[0.030]	[0.031]
Ownership	0.003***	0.002**	0.002***	0.003***	0.004***
	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]
Inno	0.293***	0.124*	0.302***	0.270***	0.307***
	[0.101]	[0.070]	[0.076]	[0.064]	[0.058]
Pseudo-R2	0.723	0.674	0.743	0.624	0.647
N	105	105	105	105	105
Wald chi2	642.040	556.213	612.788	493.780	487.227
p-val for chi2	0.000	0.000	0.000	0.000	0.000

Note: * p<0.10, ** p<0.05, *** p<0.01; coefficients reflect marginal effects for probit models; robust standard errors in parentheses; *pseudo-R2, chi2 test statistics, and p-value for chi2 are for original probit models;* each specification contains constant, fixed effects for manufacturing industries and voivodeship.
Source: own elaboration based on the conducted survey.

Table 9. Estimation results for the increase of export sales including interactions between firms' strategies

Dependent variable	1=firm increased its export sale, 0=firm did not increase its export sale				
	(1)	(2)	(3)	(4)	(5)
IntStrategy	0.314***	0.373***	0.092	0.109	0.274***
	[0.110]	[0.111]	[0.123]	[0.112]	[0.094]
Cov-19 Strategy 2 (Marketing and Products)	0.192**		0.096*		0.177**
	[0.078]		[0.056]		[0.087]
Marketing		0.254*			
		[0.134]			
Products		0.235**			
		[0.112]			
Cov-19 Strategy 3 (Forward, Backward Links)	0.090*		-0.015		0.092*
	[0.048]		[0.066]		[0.053]
BackwardLinks				-0.050	
				[0.093]	
ForwardLinks				0.000	
				[0.122]	
I n t e r a c t i o n s					
IntStrategy # Cov-19 Strategy 2	-0.136				
	[0.114]				
IntStrategy # Marketing		-0.054			
		[0.162]			
IntStrategy # Products		-0.047			
		[0.151]			
Marketing # Products		-0.282			
		[0.202]			
IntStrategy # Cov-19 Strategy 3			0.185**		
			[0.090]		
IntStrategy # BackwardLinks				0.135	
				[0.120]	
IntStrategy # ForwardLinks				0.240*	
				[0.124]	
BackwardLinks # ForwardLinks				0.038	
				[0.131]	
Cov-19 Strategy 2 # Cov-19 Strategy 3					-0.055
					[0.067]
Pseudo-R2	0.3698	0.3605	0.3883	0.3826	0.3622
N	113	113	113	113	113
Wald chi2	345.13	351.27	367.52	345.94	387.34
p-val for chi2	0.000	0.000	0.000	0.000	0.000

Note: * p<0.10, ** p<0.05, *** p<0.01; coefficients reflect marginal effects for probit models; robust standard errors in parentheses; pseudo-R2, chi2 test statistics and p-value for chi2 are for original probit models; each specification contains constant, fixed effects for manufacturing industries and voivodeship.
Source: own elaboration based on the conducted survey.

We hope that our research results will constitute an important voice in the discussion on the resilience of exporting firms in the face of the pandemic. The Covid-19 pandemic crisis was sudden and unexpected and many researchers all over the world tried to find how enterprises, including firms operating internationally, cope with it. Thus far, conducted studies have been rather fragmentary. They identify anti-crisis actions but do not estimate their impact on firms' performance, which makes

them difficult to compare with each other. However, the key anti-crisis activities undertaken by exporters to cope with the crisis analysed in our article are generally consistent with other research (*e.g.* Borino *et al.*, 2021; Gorynia & Trąpczyński, 2022). Gorynia and Trąpczyński (2022) claim that the level of internationalisation, both in terms of its depth (*i.e.* intensity of servicing foreign markets) and breadth (*i.e.* the number of foreign markets served) may have a moderating role in relation to the effects of the pandemic crisis. Stronger international engagement compensates for external shocks by recurring to different sources of demand. Firms may also benefit from a more diversified sourcing and production base. Moreover, using a dataset of 4433 enterprises across 133 countries, Borino *et al.* (2021) show that despite being more strongly affected by the Covid-19 crisis, firms engaged in international trade have taken more resilient actions than firms that only operate domestically.

Therefore, our research complements the widely held knowledge in the economic literature that multinational firms are more vulnerable to shocks than firms that operate only within the country (Vannoorenberghe, 2012; Kurz & Senses, 2016). This is certainly the case, but as our research shows, exporting firms are able to take actions that not only counteract the pandemic's effects o but also lead to an increase in export sales. Of course, many questions remain, *e.g.* what determines the effectiveness of these actions, and whether these actions will work in the conditions of the next pandemic. Thus, future and more in-depth research is required.

CONCLUSIONS

Although most countries have already managed the Covid-19 pandemic, the question of the effectiveness and range of tools (what has worked, what has not) that certain countries have used to support businesses during the pandemic is highly relevant (OECD, 2022). However, we believe that the more interesting question is what the companies did themselves during this Covid-19 period and which of their anti-crisis activities were most successful. In our study, we focused on exporters, *i.e.* companies exposed to international and domestic disruptions (weaker foreign demand for export goods and services, shortages of intermediate goods, transportation, and travel restrictions).

Based on a survey of 161 Polish manufacturing export firms between April 21 and June 25, we identified crucial anti-crisis activities undertaken by firms to increase their export sales during the pandemic period. We found that some key firm characteristics such as firm size, foreign ownership, scale of international operations, innovation degree, and market diversification strategy have significantly impacted export sales during the pandemic period. Three anti-crisis activities such as temporary reduction in employment, selling new/adapted products, and finding new foreign export partners strongly supported Polish exporters' sales growth during the Covid-19 pandemic.

The results of our empirical analysis have some policy implications. The main effective anti-crisis activity undertaken by exporters was temporary job reduction. Hence, it is important to support export firms in this area. We believe that governments should develop job retention programs that are adapted to the needs of exporters and can be launched quickly during the next pandemic. The development of automation of export production and digital tools that can replace on-site production should also be a key part of export-supporting policies against future pandemics.

Moreover, we showed that the sale of new/adapted products and the search for new foreign export partners strongly supported the sales growth of Polish exporters during the pandemic Covid-19. Our findings indicate the need to implement resource flexibility management programs as a way to adapt to an uncertain environment. This should increase companies' ability to expand or change the pallet of their products or services in the future. Moreover, in sectors that are heavily dependent on a small group of buyers, smart diversification efforts must become policymakers' major priority.

Furthermore, our analysis resulted in some recommendations for management. Our findings highlighted the importance of export market diversification in building resilient business models among exporters. We also recommend focusing on product innovation as the core of resilient business models that help exporters not only survive the pandemic period but also expand the export sale during such a period.

Our research has some limitations. They are related to the small sample size and the analysis of exporters from only one country. To test the robustness of our results, it is necessary to conduct research based on a much larger sample of exporters. It would also be desirable if the sample included exporters from other EU countries. This would allow for formulating recommendations for the entire EU in the area of support instruments for exporters during the pandemic. Further research could also focus on additional firm features that impact their export performance in the pandemic period like the degree of innovation, having different internationalization/marketing strategies, possessing resources, or functioning in different networks or clusters. Moreover, the review of the existing research on actions undertaken by firms during different shocks in the past decades like *e.g.* financial crisis of 2008-2009, Covid-19, or the Russian invasion of Ukraine also shows several possible directions for further investigation. *i.e.* taking into account supply-side factors like *e.g.* alternative input sources.

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Authors

The contribution share of authors is equal and amounts to ⅓ for each of them.

Nelly Daszkiewicz

Full Professor in the Department of Economics, Faculty of Management and Economics, Gdansk University of Technology (Poland). Her main research areas include international entrepreneurship, in particular internationalization of firms and small and medium-sized enterprises. She is the author and co-author of several books and numerous scientific articles. She is a member of scientific committees of national and international scientific conferences and a reviewer of many journals. She was the promoter of three doctoral dissertations and a reviewer in numerous doctoral proceedings. Since 2019, she has been the head of the Department of Economics.

Correspondence to: Prof. dr hab. Nelly Daszkiewicz, Gdańsk University of Technology, Faculty of Management and Economics, Narutowicza 11/12, 80-233 Gdańsk, Poland, e-mail: Nelly.Daszkiewicz@zie.pg.edu.pl

ORCID http://orcid.org/0000-0001-6620-627X

Aleksandra Kordalska

Assistant Professor at Gdańsk University of Technology (Poland). PhD in economics (2005, Gdańsk University of Technology, Poland). Her scientific interests focus on international trade, in particular on international trade of Central and Eastern European economies. Her main research works are related to global value chains, functional specialisation, technological specialisation, and manufacturing servicification.
Correspondence to: Aleksandra Kordalska, PhD, Gdańsk University of Technology, Faculty of Management and Economics, Narutowicza 11/12, 80-233 Gdańsk, Poland, e-mail: Aleksandra.Kordalska@zie.pg.edu.pl
ORCID ⓘ http://orcid.org/0000-0002-8842-4777

Magdalena Olczyk

Associate Professor in the Department of Economics, Faculty of Management and Economics at the Gdansk University of Technology (Poland). Master's degree in economics, specialising in foreign trade from the University of Gdansk (Poland). PhD in Economics from Gdansk University of Technology (2006). Habilitated Doctor (dr hab.) in Economics from Gdansk University of Technology (2018). She is the author and co-author of over 80 publications in the field of international economics, mainly on international competitiveness, functional specialisation and global value chains in Central and Eastern European countries.
Correspondence to: Dr hab. Magdalena Olczyk, Prof. PG, Gdańsk University of Technology, Faculty of Management and Economics, Narutowicza 11/12, 80-233 Gdańsk, Poland, e-mail: Magdalena.Olczyk@zie.pg.edu.pl
ORCID ⓘ http://orcid.org/0000-0002-4880-5890

Artificial-intelligence-powered customer service management in the logistics industry

Marta Brzozowska, Katarzyna Kolasińska-Morawska, Łukasz Sułkowski, Paweł Morawski

A B S T R A C T
Objective: The article aims to show how people perceive future implications for logistics customer service resulting from the implementation of new technologies in the form of game-changer artificial intelligence (AI) solutions in the spirit of economy 4.0 and society 5.0.
Research Design & Methods: The research process used a nomothetic approach based on the methodology of mixed research. The qualitative approach included a research study of monographs, publications, reports, and netographic sources. We used the technique of critical content analysis based on the co-occurrence of terms. In turn, we based the quantitative approach on the diagnostic survey method with the computer-assisted web interviewing (CAWI) technique. The sample size was 233. For further analysis, we used the statistical package for the social sciences (SPSS).
Findings: The research shows that customer service in logistics already uses different forms of AI-based solutions (like Chabtbots, Voicebots, and voice assistants). Even customers positively evaluate those solutions, among others, for efficiency, competence, and service quality. Moreover, customers are aware of AI-based solutions and know that their usage will deepen in the future, as it is a game changer for the competitiveness of customer service in logistics.
Implications & Recommendations: The conducted research indicates the need to constantly improve the digital competences of the users of last-mile logistics services in the context of technologization of transaction processes. Different areas of business will widely use AI-based solutions, because there is a need to develop systems which will help with the human-machine communication. This technology should be constructed as safe for people and easy to use; both with regard to users and customers. As a result of these processes, there is a greater need to educate people about AI-based solutions to develop awareness and improve future outcomes.
Contribution & Value Added: The article's main advantage is determining new possibilities in the area of logistics customer service as a result of the dissemination of solutions in the AI field, which may be a helpful instrument for enterprises in managing the last-mile scenario in the future.

Article type:	research article
Keywords:	artificial intelligence; automation; logistics; logistics customer service; Industry 4.0
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INTRODUCTION

The development of the Internet and the newer solutions and tools hugely impact the development of logistics both in Poland and worldwide (Liu, 2019). The digitalization of almost everything results in a constant migration of people between meetspace and cyberspace. According to the World Economic Forum, in the future, the growing demand for e-commerce will lead to an increase in demand not so much for classic last-mile services but for innovations in their implementation. The push for logistics to go digital comes from artificial intelligence (AI), which logistics business managers view as a game-

changing sixth sense in the virtual realm. Artificial intelligence is a branch of computer science that deals with the creation of machines and algorithms that can exhibit intelligence characteristics such as reasoning, learning, pattern recognition, planning, natural language processing, and decision-making. Artificial intelligence became a kind of trigger for a new business reality after a series of incremental changes represented by the emergence of individual technological solutions over the years, which include automation, robotic process automation (RPA), and blockchain technology used to track shipments. Importantly, RPA is a technology that enables the automation of business processes using special computer robots, meaning that RPA is about programming robots that can perform repetitive actions according to specific rules and algorithms. Moreover, AI also increased transactions' security and authenticity level in the supply chain as the internet of things (IoT) helps track and monitor the location, temperature and condition of goods in transport and virtual reality (VR) and augmented reality (AR) provide customers with interactive experiences (Menti *et al.*, 2023). In recent years, as a game changer, AI has started to play an increasingly important role in logistics (Du *et al.*, 2023). With the development of technology and increasing customer demands, almost every company must be able to provide fast, reliable, and effective customer service.

In terms of quality and efficiency, customer service allows the company to build a strong brand that stands out from the competition and allows it to attract more regular customers, which leads to increased profits and obtaining and maintaining a competitive advantage in the long term. In this context, AI offers tools that can help companies improve the quality of logistics customer service, and even take it to a completely new, unprecedented level. Thus, it is important to study AI's impact on the changes taking place in logistics last-mile customer service. We aimed to indicate how people perceive future implications for logistics customer service resulting from the implementation of new technologies in the form of game-changer artificial intelligence (AI) solutions in the spirit of economy 4.0 and society 5.0. We predicted that in the future, in many cases, existing technologies in customer service give way to AI-based solutions. After all, the development of AI and its applications in logistics offer many benefits for companies. Thanks to AI algorithms, companies can improve customer service quality, increase the speed of order fulfilment, reduce costs, and improve overall efficiency. Nevertheless, AI is not without flaws and limitations. In this context, it is necessary to remember possible risks such as data security and the possibility of reducing employment in companies. In this article, we will understand logistic last-mile customer service an element of after-sales service in the context of e-commerce, when customers expect appropriate service in the field of delivery logistics (Janjevic *et al.*, 2021).

Following the article's goal, we pose the following research questions:

1. How does awareness of using AI solutions affect the customer experience in last-mile logistics?
2. In which representations will the use of AI-based solutions accelerate the reconfiguration of last-mile logistics services in 10-15 years?
3. How will the use of AI solutions affect the improvement of logistics customer service processes in the future?

In the research process, we adopted a nomothetic approach based on the methodology of mixed research. The qualitative approach included a research study of monographs, publications, reports, and netographic sources. We used the technique of critical content analysis based on the co-occurrence of terms. In turn, we based the quantitative approach on the diagnostic survey method with the CAWI technique.

The research novelty of the article is the perspective of logistics companies' customers. We based the research on customers of online stores but in the context of logistic customer service. Previous research focused on assistance during transactions (Xu *et al.*, 2020) and mainly concerned chatbots solutions (Chen *et al.*, 2023). However, it is also important for customers to be aware that they are interacting with AI-based services. The awareness of non-human service can affect the customer's attitude and thus direct her to certain behaviours, which is worth investigating.

The next part of the article will present a literature review of technologies used in the logistics processes, including AI-based solutions. Then, we will describe the research methodology. Next, we

will focus on results and discussion with existing research outcomes. Finally, we will end the article with conclusions and future research recommendations.

LITERATURE REVIEW

Recent years marked by the fourth industrial revolution (Behie *et al.*, 2023; Hassoun *et al.*, 2023; Kunrath *et al.*, 2023) have seen the use of various technologies in the activities of individual enterprises and entire supply chains. Among many digital technologies, AI began to show new, hitherto unavailable possibilities, becoming the basis for the upcoming changes (Noble *et al.*, 2022; Chaabi, 2022). Their representation has led to the fifth industrial revolution, which results from the experiences of the digitalized world of Industry 4.0 and the pandemic (Sarfraz *et al.*, 2021). These experiences made it necessary to implement technological innovations, while taking into account the social aspect, which is not so much a distinguishing feature as a distinctive component. This social aspect can relate to people's role in the use of modern technologies, their safety, and the ability to control innovation. However, such a socialized version of technologization may be necessary to build a world that will be better from the society's perspective, *i.e.* in terms of protecting human health and the environment (Iqbal *et al.*, 2022; Cortés-Leal *et al.*, 2022). According to many researchers, the excessive use of technology may pose a threat to social life (Giza & Wilk, 2021). Therefore, perhaps we should approach the concept of full automation with caution and smoothly transition to the concept of society 5.0 (Huang *et al.*, 2022), which may prove more needed in the development of civilization than a technocracy of machines. A review of the literature indicates that artificial intelligence may be a breakthrough in building society 5.0 (Taj & Jhanjhi, 2022; Shahidan *et al.*, 2021).

However, the variety of nomenclature requires the systematization of digitization, digitalization, and technologization concepts (Gobble, 2018). Digitization refers to the transfer of data to the digital sphere, *i.e.* it refers to the digital version of data. Digitalization concerns entire processes conducted in the digital sphere. Finally, technologization means the introduction of technological elements, *e.g.* information systems, which primarily intend to serve general development (Vasyltsiv *et al.*, 2021). For business development to be possible – thus to create unique customer value that affects loyalty (Wijaya, 2017) – it is worth to mention that AI algorithms as technological, environmental, and socio-cultural representations will significantly impact a number of organizations' management processes (Wang *et al.*, 2022) and in particular logistics customer service (Ngai *et al.*, 2021). Concerning that researchers assume that up to 75 billion devices in the network will function in the world by 2025 (Turban, 2018), the combination of AI technology and the internet of things will be a kind of technological game changer in the virtual space of the smart society. Here are some examples illustrating how AI supports customer service in logistics companies today: chatbots, predictive analytics, natural language processing (NLP), and voice assistants. Therefore, various forms of AI are becoming an important part of solutions supporting logistic customer service processes.

Considering the above, customers' knowledge and awareness about the ongoing changes in logistics customer service is becoming more and more important (Xu *et al.*, 2020). Despite the many existing applications of AI in logistics customer service, this technology is still vulnerable to failures and problems (Li *et al.*, 2023; Yang *et al.*, 2023). Customers certainly understand it. However, companies are still trying to educate customers and thus increase AI awareness. An important aspect is that customers very often misunderstand the service, *e.g.* when using chatbots (Nguyen & Prentice, 2020). This may be due to the fact that these systems are not very empathetic or do not meet all behavioural expectations (Lajante *et al.*, 2023). However, if customers' experience is positive they are likely to see the benefits of AI support as well (Jan *et al.*, 2023). The sensitivity of AI-based systems is particularly important when building customer loyalty (Balinado *et al.*, 2021; Javed & Mu, 2020). Therefore, we can assume that AI may play an important role in customer service processes regarding the logistics services experience at the last-mile stage and thus shape the customer-supplier relationship in the perspective of 10-15 years.

Customer experience management is certainly easier when you can fully control the customer service process. This is possible thanks to the CRM class systems (customer relationship management). Thanks to the databases concerning customer contacts, it is possible to individualize the offer with

greater precision and adapt to the expectations of individual recipients (Agnihotri *et al.*, 2017). Research points that there already exist AI-driven models of CRM systems (Li & Xu, 2022). This may be just the beginning of changes in the field of logistics customer service that may appear in the future. Moreover, AI supports customer service not only through direct contact with the customer but also through supply network planning (Pengfei *et al.*, 2023), cost reduction, accuracy of delivery time scheduling (Rosendorf *et al.*, 2021), and data collection management (Jucha, 2021). Therefore, we may assume that the adoption of AI-based solutions will significantly reconfigurate the processes of last-mile logistics services, thus becoming a game changer.

RESEARCH METHODOLOGY

At the turn of 2021 and 2022, we prepared and implemented a research project based on primary sources. We wanted to answer how the innovative AI-digital solutions introduced in the process of logistics customer service influence the current and will influence future customer choices regarding the last-mile services offered by international representatives of the Polish courier-express-parcel (CEP) industry. It was an explanatory study of a descriptive and explanatory nature. We aimed to identify the important attributes of AI digital technologies used in last-mile logistics services. Because of the scope of the measurement method, this study was fragmentary, deterministic, and representative of the selected study population.

The surveyed group were residents of Poland aged over 16, who during the three months before the study at least once participated in the process of purchasing goods through Polish and foreign entities operating on the Internet. Based on the established selection criteria, we determined the minimum sample size, taking into account the fraction. In the calculation processes, we assumed the population of Poland to be 31 811 795 people as of 31 December 2020, regarding people over 16 years old. We further defined the fraction of the value of the proportion related to online transaction execution using research results from Statistics Poland regarding online activities. For people aged 16 and over and using the Internet regularly (at least once a week) and searching there for information about goods and services, the size of the fraction was 0.814 and 0.186 for other people. Moreover, the measurement assumed the possibility of a random error within +/- 5%, taking into account the confidence level of 0.95. The calculations resulted in a sample size n_{min}=233 units. We conducted calculations using an Excel spreadsheet.

Obtaining data from primary sources was possible thanks to the use of the diagnostic survey method with the user-centric CAWI technique. We used the artificial measurement tool, *i.e.* questionnaire consisting of 43 closed questions, including 14 based on the scaling of attitudes according to Rensis Likert. We uploaded the electronic questionnaire to the ebadania.pl platform. We then exported raw data results collected on the ebadania.pl to a .por format and imported them to SPSS for further analysis.

In the first stage of the analysis, we defined the variables distribution, *i.e.* the values of response variants obtained from individual questions in the questionnaire. The collected answers allowed us to conclude that women dominated among the study participants (53.2% of the respondents; men – 46.8% of the respondents). Because of respondents' age, the largest group were respondents aged up to 55. In detail, the groups were 35-44 years (19.3%), 25-34 years (16.3%), 45-54 years (16.1%), respectively, and 16-24 years (12.3%). City dwellers dominated the sample (59.9%); compared to rural dwellers (40.1%).

In the second stage, we verified the tested sample and determined its representativeness For this purpose, we used the method of comparative analysis of the existing population of Polish residents and respondents forming the study sample in the area of selected comparative characteristics. In this process, we applied a non-parametric significance test, *i.e.* a test of conformity based on the χ^2 statistics. Assuming that the statistics have a $\chi^2\alpha$ with distribution k=(r-1), in which k is the number of degrees of freedom and r is the number of class intervals. In turn, we calculated the empirical value of the χ^2 statistics based on the data obtained in the study. The formula for the critical set was P ($\chi^2 < \chi^2\alpha$) = α, in which $\chi^2\alpha$ is the critical value determined from the distribution tables χ^2 for k = r-1 the degree of freedom and p = α. As a result of the calculations, we obtained the data presented in Table 1.

Table 1. Verification of the sample in relation to the population based on the significance test χ²

Variable	Value χ² Real	Value χ²ₐ Theoretical	Test realization χ²<χ²ₐ
Sex	0.103	3.841	concordance
Age	2.204	12.592	concordance
Place of residence	4.197	11.07	concordance

Note: a α – confidence level
Source: own study.

The verification analysis allowed us to confirm that the distribution of variables characterizing the study sample was consistent with the population of Polish residents in terms of sex, age, and place of residence. However, because we used non-random sampling (snowball method) in the process of sampling units, we could not assess the sample's representativeness in the statistical sense in the inference procedure. However, thanks to the results of the χ² significance test and the sample size, we could make summaries and assumptions about the choices, indications, and opinions of Polish residents aged 16 and over, buying on the Internet and using CEP services on the territory of Poland when making deliveries in the last-mile area.

After determining the representativeness of the study sample, in the third stage of the analysis, we referenced the answers to the essential questions and the metrics and compiled the results in the form of contingency tables. Wherever it was possible and made logical sense and was statistically significant, we indicated the existence of stochastic dependence or independence of random variables. For this purpose, we used the χ² independence test with the significance level α at <= 0.05. We conducted calculations using SPSS software. Thus, we could indicate the variables' mutual dependence. We used Cramér's V coefficient to measure the verification value. We made every effort in the process of preparing, conducting, and analysing the study results. However, we are aware of certain limitations resulting from the available research budget and the limited time devoted to the research project.

RESULTS AND DISCUSSION

The research helped us examine how well people understand innovative logistics solutions involving AI algorithms and specific technology used in customer service processes. Most of the survey participants admitted that shopping is a pleasure for them (71.4%). The surveyed respondents most often used smartphones (96.3%), laptops (88.8%), and tablets (65.4%) when shopping online. The use of mobile devices allows for greater freedom in choosing the time and place of purchase. When asked about the knowledge and use of innovative technological solutions in purchasing processes, the respondents answered that they often and very often used them (68.8%). Among the innovative solutions that they were aware of, knew, and used in transaction and service processes, the respondents most often indicated cloud computing solutions (55.3%), ubiquitous connectivity (55.1%), chatbots/voicebots as representatives of AI solutions (43.3%), VR solutions (34.7%), and work on large data sets (big-data-as-a-service; BdaaS and big data analytics; BDA) (42.2%). When asked about where they had seen innovative technology concepts applied in transaction and service processes, they indicated trade (79.8%), transport (58.2%) and the logistics of handling purchase transactions (47.8%).

We asked the respondents who had contact with the AI representation at least once in the purchasing and delivery process, *i.e.* they communicated with the bot before the purchase and used its services in the delivery tracking process, to evaluate such interaction by assigning a score from -3 points to +3 points; -3 meant the lowest grade and +3 the highest. When assigning points, the respondents indicated that they value interaction with the bot the most for efficiency (2.14), helpfulness (2.13), competence (2.11), empathy (2.07), communicativeness (2.04), speed of action (2.00), answers accuracy (1.99), quality of service (1.91), competence in providing information (1.87), offer (1.80), and understanding the client's situation (1.26). Such results indicate that respondents accepted the implementation of AI solutions. Although participants in the purchasing and delivery process appreciated the ability to communicate with the bot for its efficiency, they indicated that techno-communication

solutions will not replace humans in terms of human understanding of reality, way of thinking, and identifying and solving complex problems.

According to the respondents, the dissemination of AI in logistics services will transform customer service, which will take various forms in 10-15 years. Analysing the forecasts for the dissemination of representation in the AI field, the respondents pointed to the progressing process of increasing the number of autonomous delivery vehicles (93.3%). Most frequently, people sharing this opinion were women (31.6%) (men (19.2%)), people aged 35-44 (12.5%), and city dwellers (30.0%). Moreover, the respondents indicated an increase in the delivery speed due to algorithmizing represented by business intelligence (BI) (90.4%). Most frequently, people sharing this opinion were women (37.7%) (men (23.3%), people aged 45-54 (11.1%), and city dwellers (36.9%).

Table 2. Representations of the use of AI in logistics customer service processes in 10-15 years

Variable	Gender			Age			Place of residence		
	χ^{2a}	p^b	V^c	χ^2	P	V	χ^2	p	V
Every sphere of human existence will involve information selection and analysis	141.095	0.001	0.463	100.209	0.001	0.195	288.660	0.001	0.331
Integrated communication systems	35.637	0.001	0.233	175.911	0.001	0.299	191.285	0.001	0.311
Increasing the automation of transaction processes (reducing the need for human sellers)	49.672	0.001	0.275	130.473	0.001	0.257	321.701	0.001	0.404
Increasing the number of robots in delivery processes	111.526	0.001	0.412	134.151	0.001	0.226	157.417	0.001	0.245
AI will increase the delivery speed	80.334	0.001	0.349	69.079	0.001	0.162	213.588	0.001	0.258
Increasing the devices' ability to communicate with each other (IoT), which will exclude humans from purchasing processes	40.865	0.001	0.249	123.377	0.001	0.254	278.158	0.001	0.375
The number of autonomous vehicles making deliveries will increase	138.216	0.001	0.458	223.063	0.001	0.291	202.089	0.001	0.277
You will not need to have documents, a face/pupil scan will be enough to verify the person authorized to pay/collect the parcel	55.874	0.001	0.291	145.760	0.001	0.235	264.135	0.001	0.317

Note: [a] χ^2 – test value with $\alpha=0.05$; [b] p – asymptotic significance; [c] relationship strength calculated using V-Cramer.
Source: own study.

According to the respondents, in the future, it will not be necessary to have documents, because a face or pupil scan will be enough to verify the person authorized to collect the parcel (84.4%). This opinion was more frequent among women (35.3%) than men (26.0%), people aged 35-44 (14.3%), and inhabitants of rural areas (31.6%). Moreover, according to the respondents, in the future we can expect an increase in the automation of transaction processes (reducing the need for human sellers) (81.1%). This opinion was more frequent among women (29.8%) than men (27.1%), people aged 35-44 (12.5%), and city dwellers (28.8%). The respondents also declared that every sphere of human existence will be subject selecting and analysing information (80.1%). This opinion was more frequent among women (38.9%) than men (24.3%), people aged 35-44 (12.8%), and city dwellers (34.2%). Moreover, according to the respondents, the number of robots participating in delivery processes will increase in the future (64.0%). This opinion is shared by the majority of women (38.3%) than men (23.1%), people aged 35-44 (16.4%), and city dwellers (39.9%). Moreover, respondents stated that integrated communication systems will become a commonplace (61.5%). Although devices' possibility to communicate with each other (IoT) will increase, people will still participate in purchasing processes as customers (56.3%). The $\chi 2$ test of independence with the strength of the relationship determined by V-Cramer confirmed the existence of the indicated relationships (Table 2).

Respondents believe that AI will change the way people and machines function in the socio-economic space. According to the majority of respondents (84.2%), the speed of transactional and warranty processes will 'definitely' and 'rather' increase thanks to autonomous and intelligent systems

capable of self-configuration, self-control, and self-repair. This opinion was more frequent among women (37.1%) than men (30.1%), people aged 25-34 (12.4%), and city dwellers (39.9%).

Table 3. A new image of people in the socio-economic space shaped by AI

Variable	Gender			Age			Place of residence		
	χ^{2a}	p^b	V^c	χ^2	P	V	χ^2	p	V
People will be integrated with the world of machines (transhumanism) thanks to implanted chips that allow for constant communication with the environment (applications allowing you to control both virtual and real space), which will enable the download of current information about transactions at every stage.	34.522	0.001	0.229	73.739	0.001	0.193	160.211	0.001	0.285
The socio-economic space will be fully reactive to the individual needs and expectations of specific people, creating a new type of adjustment in the field of sales and logistics customer service, the so-called techno-customization.	51.727	0.001	0.280	77.269	0.001	0.198	265.067	0.001	0.366
Each person will have their individual guardian (assistant program – angel) supporting them in functioning both in the digital and real layer.	70.840	0.001	0.328	123.100	0.001	0.250	181.908	0.001	0.304
The speed of transactional and warranty processes will increase thanks to autonomous and intelligent systems with the ability to self-configure, self-control, and self-repair.	11.844	0.001	0.134	93.275	0.001	0.217	148.116	0.001	0.274

Note: [a] χ^2 – test value with α=0.05; [b] p – asymptotic significance; [c] Relationship strength calculated using V-Cramer.
Source: own study.

Moreover, the socio-economic space will be fully reactive to the individual needs and expectations of specific people, creating a new type of adjustment in the field of sales and logistics customer service, the so-called techno-customization, which three out of four respondents emphasized (76.3%). This opinion was slightly more frequent among women (37.7%) than men (22.8%), people aged 25-34 (24.6%), and city dwellers (38.6%). The respondents believed that in the future, each person will have their guardian supporting them in functioning both in the digital and real layer, which more than half of the respondents indicated (68%). This opinion was slightly more frequent among women (36.5%) than men (33.2%), people aged 35-44 (12.8%), and city dwellers (40.2%). It may also be that every human will be integrated with the world of machines (transhumanism) thanks to implanted chips that will allow for constant communication with the environment (applications allow you to control both virtual and real space), which, subsequently, will allow for the download of current information about transactions stage on each of them as emphasized by nearly half of the respondents (42.7%). This opinion was slightly more frequent among women (37.7%) than men (26.2%), people aged 25-34 (12.3%), and city dwellers (36.3%). The χ2 test of independence with the strength of the relationship determined by V-Cramer (Table 3) confirmed the existence of the indicated relationships.

Due to the new subject matter, there are not that many studies that we could use for the sake of comparison. Thus far, researchers focused on AI's cognitive aspects. The aforementioned research concerned the sphere of the possibility of using AI in customer service, or the possibility of supporting these processes. However, researchers have not delved deeply into the context of AI-supported systems working with customers, which is mainly due to the low applicability level of such solutions resulting from the implementation cost.

However, considering other research conducted in the AI context, researchers indicate the use of AI-based technologies in the field of customer service, where chatbots do not fulfil their tasks when the issues are too complicated (Xu *et al.*, 2020). Moreover, research also indicates that customers pay attention to the service provided by employees which they treat as a positive aspect;

they feel appreciated and distinguished (Nguyen & Prentice, 2020). This is an important element, because by comparing the service provided by AI-supported systems and systems that still use human work, we can find common features and improve processes. Certainly, a significant change will be the introduction of systems that will be closer to being operated by an employee (Hsu & Lin, 2023). Moreover, scholars also state that generative AI can help with process automation which will speed up customer service (Korzynski *et al.*, 2023).

However, studies also indicate that trust in bots is increasing (Chen *et al.*, 2023). An important aspect is also the transaction's subject. In our research it is mainly about obtaining information to provide the service. In the case of products, their attributes affect the customers' reflections on the chatbots' services (Ruan & Mezei, 2022). Research (Prentice *et al.*, 2020) shows that this may also be related to AI's analytical capabilities. Providing up-to-date and error-free information to the customer may turn out to be the key to service satisfaction. An additional aspect is the use of AI to analyse data obtained after the customer service process to effectively improve this process. Artificial intelligence provides the opportunity to analyse customer satisfaction from individual stages of logistics customer service, indicating areas that require improvement (Barik *et al.*, 2023). Furthermore, researchers continuously point to the possibility of using AI in analytics to enable the prediction of risky events. Thus, they advocate building resilient supply chains, resistant to situations caused primarily by unforeseen situations (Modgil *et al.*, 2021).

Summing up, the study results indicate that customers of logistics services are aware of the presence of AI solutions. Their experience in this area is positive. They value AI solutions used in the process of providing last-mile logistics services for efficiency, helpfulness, competence, empathy, communicativeness, speed of action, precision, service quality, competence, personalization, and understanding of the customer's situation. These positive experiences indicate a promising future for companies that have adopted or will adopt AI solutions. Thus, we may assume that in the future, logistics processes supporting sales will be AI-dominated because of this positive customer response. Study participants believe that AI-based technological innovations will take various forms, ranging from exclusive software, through automation and robotization, to integrating man with the world of machines. The usability and possibilities of artificial intelligence solutions aiding customers in logistics will boost the transformation and reconfiguration of last-mile logistics services. Well-chosen solutions will improve the functioning of companies and customer satisfaction.

CONCLUSIONS

Modern logistics is a process of continuous improvement and adapting to changes taking place in the world, both locally and globally. The pace of logistics development and pressure put on it has reached an unprecedented level in recent years. The already high-speed digitalization represented by AI resulted in the dynamic development of automation, which is conducive to increasing companies' efficiency, effectiveness, and productivity (Korzynski *et al.*, 2023). These activities undoubtedly illustrate that economy 4.0 (Qin, 2016) and the upcoming economy 5.0 are changing the economic face of societies moving towards society 5.0.

The analysis of literature and research indicates that customer service logistics widely applies AI solutions, which customers are aware of and accept. Technologization in verification processes and automation of transactional processes gradually contributes to the reconfiguration transformation of logistics customer service processes. The speed of transactional and warranty processes is increasing thanks to autonomous and intelligent systems capable of self-configuration, self-control, and self-repair, which means that AI is becoming an indispensable and integrating link. Chatbots, predictive analytics, NLP, and voice assistants as a representation are increasingly used today.

Regarding the first research question 'How does awareness of using AI solutions affect the customer experience in the last mile?,' we can answer that the solutions in the field of new technologies like chatbots/voicebots described in theory as representations of AI solutions, are known and used in transactional and transport practice as well as in the logistics of purchasing transactions, which we see reflected

in the answers of the survey participants. The customers of last-mile logistics services positively evaluated AI in the lateral representation. They especially appreciated the efficiency, helpfulness, competence, empathy, communicativeness, speed of action, response precision, and service quality.

In turn, in response to the second research question, *i.e.* 'In which representations will the use of AI-based solutions accelerate the reconfiguration of last-mile logistics services in 10-15 years?,' we can indicate that according to customers of logistics services, there will be an increase in the number of autonomous delivery vehicles, the applicability of BI and personal verification systems, the automatisation level of transaction processes, the number of robots participating in delivery processes and integrated systems of communication. Customers are aware and anticipate that the current use of AI solutions will deepen as a result of the growing adoption of solutions based on the experience of system users, and this will contribute to the reconfiguration of logistics services.

Finally, in response to the third research question, 'How will the use of AI solutions affect the improvement of logistics customer service processes in the future?,' we can answer that AI will become an integral part of the ecosystem of solutions supporting logistics customer service processes. Thus, AI tools and systems will become an integral part of solutions supporting logistic customer service processes. Today's high demand for data will certainly increase in the future and thus AI will be necessary. Efficient flow of up-to-date and reliable data and its processing affects and will affect the implementation of service logistics processes. Delivering the right products, in good quantity and condition, at the right time, to the right place, to the right customer is and will increasingly depend on algorithms that allow companies to control and supervise processes and bring machines and devices to life. However, although AI algorithms and robots or autonomous vehicles can perform repetitive activities, they will not replace people in making decisions and solving complex, unusual problems. According to the customers of last-mile logistics services participating in the study, AI will change the way people and machines function in the socio-economic space. The speed of transaction and warranty processes will increase thanks to autonomous and intelligent systems. Moreover, the logistics process of customer service will be subject to change, which is more and more often marked by techno-customization, which means a smaller share of people and a larger share of IT systems and machines, which may manifest itself in the fact that each person will have their individual guardian (assistant-guard program) supporting them in functioning both in the digital and real world, or each person will be integrated with the world of machines (transhumanism) thanks to implanted chips that will allow them to maintain constant communication with the environment. Regardless of the variants of potential solutions used, they will undoubtedly be AI-based.

The answers to the three research questions posed above allow us to conclude that the presence of solutions represented by AI force the transformation of logistics customer service systems towards greater automation and robotisation, which requires knowledge, skills, and digital competences supporting human-machine cooperation. The conducted research indicates the need to take care of education to improve digital competences in the context of the technologization of transaction processes, both among employees and users of the supply logistics system. The presence of solutions represented by AI algorithms make it necessary to have such knowledge, skills, and competences (Wach *et al.*, 2023) that will allow for human-machine collaboration.

To sum up, the futuristic vision is becoming physical reality today. The analysed secondary sources and the material collected in the course of the survey allow us to conclude that we achieved the our aim, *i.e.* we showed how people perceive future implications for logistics customer service resulting from the implementation of new technologies in the form of game-changer AI solutions in the spirit of economy 4.0 and society 5.0. The intensification of the spread of AI-based solutions as a game changer in logistics will require reorganization of business models. Already today, customers of last-mile logistics services using AI-based solutions evaluate them positively, emphasizing the advantages of service components. In the context of the next 10-15 years, they indicate an increase in AI-based applications and the level of automation of logistics customer service processes, both in technical and executive as well as relational and communication terms. The central point of activities will be a human supported by a powerful accelerator speeding up the decision-making process based on the obtained and processed information. More and more frequently, the AI-based solutions will handle logistics processes and robots will perform them. People's role will change from contractors to facilitators. This requires

proper preparation of both entrepreneurs and customers from the technical and communication side. We hope that the material collected in the article will be helpful in this regard.

Finally, taking into account the dynamic technological development in the field of AI methods and techniques, scholars should repeat research in this area within five and ten years to re-verify current observations and conclusions. Moreover, it would be worth considering the possibilities of strategic use of AI in business processes, as also indicated by Akter *et al.* (2023). This may also be related to research on business implications, *i.e.* what are the possibilities of using AI in B2B contacts, which are subject to many additional aspects (Li *et al.*, 2021). Therefore, a look from client's and the company's side could be an interesting contribution to our research results.

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Authors

Łukasz Sułkowski (25% – conceptualization, draft writing, revisions), Marta Brzozowska (25% – draft writing, revisions), Katarzyna Kolasińska-Morawska (25% – conceptualization, methodology, draft writing, revisions), Paweł Morawski (25% – draft writing, revisions).

Marta Brzozowska

PhD in Management (2018, University of Social Sciences, Lodz, Poland); Associate Professor at the Jan Kochanowski University of Kielce (Poland). Her research interests include Logistics services, supply chain management, and innovative technologies.

Correspondence to: Dr inż. Marta Brzozowska, Uniwersytet Jana Kochanowskiego w Kielcach, Wydział Prawa i Nauk Społecznych, Instytut Zarządzania, ul. Żeromskiego 5, 25-369 Kielce, Poland, e-mail: marta.brzozowska@ujk.edu.pl

ORCID http://orcid.org/0000-0003-3072-0562

Katarzyna Kolasińska-Morawska

Adjunct professor at the Krakow University of Economics. She holds PhD in management with specialisation in logistics management. Her area of research interests includes distribution processes, logistics, and consumer behaviour.

Correspondence to: Dr Katarzyna Kolasińska-Morawska, Uniwersytet Ekonomiczny w Krakowie, Instytut Zarządzania, Katedra Zarządzania, ul. Rakowicka 27, 31-510 Kraków, Poland, e-mail: kolasink@uek.krakow.pl

ORCID http://orcid.org/0000-0002-4035-8272

Paweł Morawski

Adjunct professor at the Krakow University of Economics. He holds PhD in logistics management and Master's degree in computer sciences. His areas of interest include management information systems, logistics customer service, and digital transformation.

Correspondence to: Dr inż. Paweł Morawski, Uniwersytet Ekonomiczny w Krakowie, Instytut Zarządzania, Katedra Zarządzania, ul. Rakowicka 27, 31-510 Kraków, Poland, e-mail: morawskp@uek.krakow.pl

ORCID http://orcid.org/0000-0002-7682-620X

Łukasz Sułkowski

Full professor of economic sciences, specializing in management sciences. Currently employed in the Institute of Public Affairs of the Jagiellonian University. Vice-dean of the WSB Academy in Dąbrowa Górnicza. He is also the President of PCG Polska.

Correspondence to: Prof. zw. dr hab. Łukasz Sułkowski, Uniwersytet Jagieloński, Katedra Zarządzania Instytucjami Szkolnictwa Wyższego, Instytut Spraw Publicznych, ul. prof. St. Łojasiewicza 4, 30-348 Kraków, Poland, e-mail: lukasz.sulkowski@uj.edu.pl

ORCID http://orcid.org/0000-0002-1248-2743

How environmental understanding affects the green entrepreneurial intention of Centennials in Vietnam

Trung Ngoc Phat Le, Kim Hanh Nguyen, Ngoc Truc Han Nguyen

A B S T R A C T
Objective: The article aims to explore the role of environmental understanding in forming green entrepreneurial intention of the Centennials in Vietnam besides the effect of entrepreneurship education.
Research Design & Methods: We constructed the research model based on the theory of planned behaviour and entrepreneurial event theory. We collected data by surveying 275 university students, who belong to the Centennials in Vietnam. Then, we employed partial least square structural equation modelling (PLS-SEM) to explore how environmental understanding and entrepreneurship education contribute to forming a green entrepreneurial intention.
Findings: The outcomes evidenced that environmental understanding positively impacts entrepreneurship education and start-up desirability but has a detrimental effect on entrepreneurial self-efficacy. Moreover, entrepreneurship education has a positive impact on desirability and self-efficacy, both of which are confirmed to positively affect the green entrepreneurial intention of Centennials in Vietnam. Interestingly, environmental understanding and entrepreneurship education indirectly affect green business intention.
Implications & Recommendations: To stimulate green entrepreneurial intention, the government and universities should intensify entrepreneurship education activities and launch some campaigns to raise environmental perception in parallel.
Contribution & Value Added: This article pioneers in exploring the association between environmental understanding and green entrepreneurial intention. Such novelty contributes to enriching extant literature and consolidating the research model of green entrepreneurship.

INTRODUCTION

Various scholars indicate that green economics and circular economics is the most viable approach to merge economic development and environmental protection for sustaining the long-term prosperity of future generations (Qazi *et al.,* 2020; Soomro *et al.*, 2020). In fact, transferring to green economy is an appropriate solution to leverage quality of life, eliminate poverty, and overcome overwhelming environmental problems (Rahman *et al.,* 2014). Noteworthy, recent environmental matters such as global warming, natural resources depletion, and the Covid-19 pandemic have posed a worldwide urgent requirement in fostering green economies. Many countries are enacting a series of policies and programmes that aim to achieve a green ecosystem through recycling and reducing carbon emissions (Yi, 2021). The Vietnamese government issued decision No. 622/2017/QD-TTg and decision No. 687/2022/QD-TTg to hasten eco-friendly business practices and pave the way towards a circular economy by 2050.

Apart from green consumption, green entrepreneurship also plays a pivotal role in transforming the market economy towards green economy. Elfenbein *et al.* (2010) affirm that start-up activities could escalate economic growth by generating thousands of jobs and stimulating innovation. Shepherd and Patzelt also (2011) argue that green entrepreneurship is an essential socio-economic solution that not only generates numerous green jobs but also commits to saving the ecosystem.

Entrepreneurship has been gaining importance and attracting significant attention from academia for its crucial contribution to economic development (Liñán & Chen, 2009). Thus, investigating entre-preneurial intention is important because this is the best predictor of start-up behaviours (Fayolle *et al.*, 2006; Ajzen, 1991). Numerous entrepreneurship studies have applied the theory of planned be-haviour (TPB) (Ajzen, 1991) and entrepreneurial event theory (EET) (Shapero & Sokol, 1982) and proved that personal attitude or desirability and entrepreneurial self-efficacy significantly affect en-trepreneurial intention (EI) among university students in India (Paray & Kumar, 2020), Indonesia (Ba-haruddin & Ab Rahman, 2021), America (Barton *et al.*, 2018), and Europe (Mueller, 2011). Meanwhile, Widjaja *et al.* (2022) and Loan *et al.* (2021) only find a positive relationship between self-efficacy and EI of university students in Indonesia and Vietnam.

Recently, a few scholars have shifted their attention to the green entrepreneurship domain (Al-varez-Risco *et al.*, 2021; Ramayah *et al.,* 2019). Alvarez-Risco *et al.* (2021) show that entrepreneurial self-efficacy, which is influenced by government and educational support, directly affects the green business intention of university students in Peru. Involving entrepreneurship behaviour of Pakistani students, Soomro *et al.* (2020) and Qazi *et al.* (2020) indicate that green educational support plays a vital role in fostering green EI.

Previous entrepreneurship studies intensively expressed the importance of entrepreneurship educa-tion in boosting the intention of new firm creation. Liguori and Winkler (2020) argue that entrepreneur-ship education provides essential knowledge for operating a new firm and an entrepreneurial mindset for students. Hattab (2014) states that entrepreneurship education not only has a direct impact on EI but also has a considerable effect on personal attitude and self-efficacy. Noteworthy, Barba-Sánchez *et al.* (2022) mention the concept of environmental awareness when studying EI of Spanish students. They indicate that environmental awareness has a positive relationship with personal attitudes and social norms, however, there is no evidence of the relationship between environmental awareness and EI.

To the best of our knowledge, few studies have explored the role of environmental understand-ing in forming EI, particularly in fostering green EI. This is a noteworthy research gap that our study addresses. Logically, individuals' perceptions about the role of the environment may awaken their compassion for catastrophic environmental problems, thereby inspiring people to develop a busi-ness model that is more eco-friendly and socially responsible.

The novelty of this study lies in exploring the role of both environmental understanding and entrepreneurship education in fostering green EI among university students in Vietnam. As in pre-vious entrepreneurship research, we applied both TPB and EET models to study green EI. Specifi-cally, green start-up intention is determined by self-efficacy and desirability, which are affected by environmental understanding and entrepreneurship education.

Our study focuses on the start-up context in Vietnam, which ranks 48th on the list of the most innovative economies in the world (Dutta *et al.,* 2022). In fact, entrepreneurship is one of the ut-most concerns in Vietnam since the government has deployed the National Programme 844 namely 'Initiative for the start-up ecosystem in Viet Nam until 2025' (ISEV). The main purpose of ISEV is to produce favourable conditions to stimulate and support entrepreneurship activities. The Vietnam-ese government enacted several policies to drive Vietnam's economic development towards sus-tainability and eco-friendliness, and especially, launched National Technology Innovation Fund in 2011 to provide support for new enterprises.

Our study aimed to investigate the role of environmental understanding and entrepreneurship ed-ucation in forming green EI of Centennials, specifically, the case of a Vietnamese university. The rest of our study will be structured as follows: section two will describe our arguments to develop research hypotheses and section three will illustrate research methodology. Section four will reveal the statis-tical results and related discussions. The last section will provide conclusions and implications.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Green Entrepreneurship Definition

Green entrepreneurship is a kind of business behaviour that focuses on achieving economic benefits as usual and creates environmental value by providing ecological products and services. Yi (2021) indicates that green entrepreneurship behaviour is a harmonious combination of economic, social, and ecological objectives during the execution of business operations. Soomro *et al.* (2020) argue that green start-up is an innovative entrepreneurship model that prioritises operating business activities in an environmental-oriented.

Yi (2021) states that EI is one of the crucial predictors of forming a future business. Hence, studying green EI as a primary effort is essential to promote green start-up behaviours in the coming times. In this study, green EI is the tendency to start or own an enterprise that could generate profitability while integrating eco-friendly behaviours into business activities. Basically, green EI reflects the degree of willingness of founders to execute a business that provides green products.

Entrepreneurial Intention Theories

In the TPB model, Ajzen (1991) suggests that personal attitude (desirability), subjective norms, and perceived behavioural control (self-efficacy) are determinants of intention towards a particular behaviour. In the entrepreneurship domain, Moriano *et al.* (2012) apply the TPB model to investigate the EI of 1074 master students from Germany, India, Iran, Poland, Spain, and the Netherlands. They state that attitudes and self-efficacy have favourable impacts on EI irrespective of nationality differentiation. In addition to attitude and perceived behavioural control, Mueller (2011) indicates that some types of educational measures considerably impact the business intention of European students, while, Zhang *et al.* (2015) add short-term risk-taking and psychological well-being as other factors that affect EI of American students. Empirical evidence from the study of Paray and Kumar (2020) shows that entrepreneurship education and student background have a positive association with the EI of students in India.

The EET theory (Shapero & Sokol, 1982) states that exogenous variables like social and cultural elements have a substantial impact on an individual's perception of start-ups. This perception, including perceived desirability and perceived feasibility, is associated with new firm creation. Applying the EET model, Solesvik *et al.* (2014) evince a significant impact of perceived feasibility and perceived desirability on the EI of university students in Ukraine.

Noticeably, Liñán and Chen (2009) incorporate both TPB and EET to study start-up behaviours in Spain and Taiwan. Their outcomes emphasised that perceived desirability and perceived feasibility, which are both affected by entrepreneurship education, have a favourable effect on the EI.

Green Entrepreneurship: Previous Studies

The 'going green' concept has received considerable attention from scholars in the entrepreneurship domain (Bergset & Fichter, 2015). Past studies have explored the significant role of green entrepreneurship in promoting energy efficiency (Drago & Gatto, 2022) and economic and social development (Neumann, 2022). Based on their study of green entrepreneurship practices in Ghana, Amankwah and Sesen (2021) state that there is a certain relationship between entrepreneurship education, green EI, and green entrepreneurship behaviour. Yi (2021) also evidences that university and external institutional supports contribute to promoting green EI to become green entrepreneurship behaviour.

Few empirical studies have focused on identifying factors that promote green EI. Koe *et al.* (2014) employed Pearson correlation analysis and proved that sustainability attitude, social norm, perceived desirability, and perceived feasibility are positively correlated to inclination for sustainable entrepreneurship in Malaysia. Recent papers by Alvarez-Risco *et al.* (2021) and Robayo-Acuña *et al.* (2023) indicate that government, educational, and technical support significantly affect entrepreneurial self-efficacy which has a positive impact on green EI of university students in Peru and Colombia. However, Soomro *et al.* (2020) did not find any impact of self-efficacy on green EI. Their results show that sustainability orientation and education favourably impact green EI in Pakistan. Qazi *et al.* (2020) revealed

that personal traits and university green entrepreneurial support have a positive relationship with the green EI of Pakistani students. Moreover, those relationships are moderated by environmental values, which constitute the important feeling of environmental protection. Nguyen *et al.* (2022) indicate that educational support, attitude, and self-efficacy do not affect green EI. Meanwhile, subjective norms and risk aversion have a significant impact on the green EI of Vietnamese students.

Several studies show that entrepreneurship education significantly affects the process of forming business intention and green EI, but their results are controversial. Because the impact of environmental understanding on green EI has not been fully investigated, this study employed TPB and EET models to explore the role of both environmental understanding and entrepreneurship education in fostering green EI.

Hypothesis

Our study augmented TPB and EET models to investigate the green EI of Vietnamese students. We expected environmental understanding and entrepreneurship education to significantly impact start-ups' desirability and entrepreneur self-efficacy. Moreover, we expected desirability and self-efficacy to have a positive relationship with green EI as was the case in previous entrepreneurship studies. This pioneering study examined the relationship between environmental understanding and entrepreneurship education. Understanding this relationship will provide some suggestions to enhance the practices of entrepreneurship education in the context of significantly increasing environmental concerns. Figure 1 illustrates our research model.
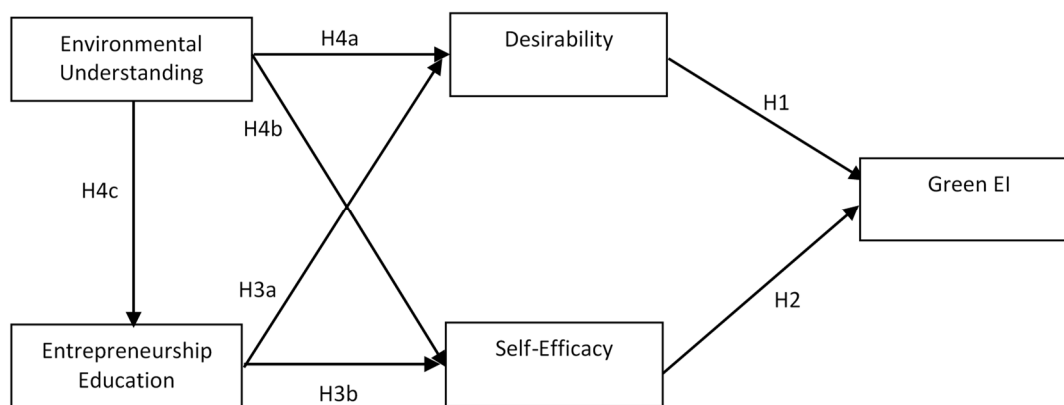
Figure 1. Research model
Source: own elaboration

Self-Efficacy and Desirability

Ajzen (1991) states that perceived behavioural control is the cognizance of how easy it is to successfully perform a behaviour, while personal attitude expresses an individual's emotion or passion towards that behaviour. Similarly, Shapero and Sokol (1982) indicate that the perceived feasibility of entrepreneurship reflects the personal belief that they own the essential ability to successfully run a start-up. In addition, EET theory defines entrepreneurship desirability as an individual's feeling of the attractiveness of starting a business, which arises through social and cultural factors.

Both TPB and EET models indicate that individuals will form start-up intentions if they fancy doing business and strongly believe in their entrepreneurial ability. In fact, numerous studies applied TPB and EET models and reaffirmed that perceived behavioural control and personal attitude have a favourable effect on EI (Barton *et al.*, 2018; Mueller, 2011).

In the context of green entrepreneurship, entrepreneurial self-efficacy expresses how individuals believe in their ability to successfully establish a green business. Besides, the desire to start a green start-up is defined as the passion for generating a green business since it will bring enormous social beneficiaries. Logically, green EI forms when people feel confident that they can smoothly run an eco-friendly business model and genuinely fancy that model since it brings enormous social benefits. Recently, Alvarez-

Risco *et al.* (2021) and Soomro *et al.* (2020) have evinced a positive relationship between self-efficacy and green EI. Meanwhile, Koe *et al.* (2014) and Ramayah *et al.* (2019) agree that both self-efficacy and desirability have a positive impact on green EI. Hence, this study assumes that the more they have a strong passion for green entrepreneurship and confidence in their business ability, the more their green start-up ambition will be heightened. We adopted the following hypotheses:

H1: Desirability has a positive and significant effect on green EI..

H2: Self-efficacy has a positive and significant effect on green EI.

Entrepreneurship Education

Entrepreneurship education is a set of educating and training activities that aims to illuminate individuals on how to start and operate business ventures smoothly (Bae *et al.,* 2014). In entrepreneurship education programmes, participants are instructed on how to identify possible opportunities and risks when starting a business and how to utilise resources reasonably to sustain that new firm. To put it simply, entrepreneurship education activities equip participants with essential managerial skills and mindsets to fluidly run a new firm. Moreover, programmes inspire participants through successful entrepreneurs who are usually invited to those activities to share their start-up stories. Therefore, attending entrepreneurship education activities will intensify entrepreneurial self-efficacy and wake up the business desire.

Fayolle *et al.* (2006) propose that entrepreneurship education has a significant effect on the development of beliefs and attitudes in TPB models. In fact, the positive relationship between entrepreneurship education with perceived desirability and self-efficacy has been examined in a few studies. Alvarez-Risco *et al.* (2021) prove that entrepreneurship education positively affects entrepreneurial self-efficacy, meanwhile, research by Hattab (2014) shows a positive relationship between entrepreneurship education and entrepreneurship desirability. Peterman and Kennedy (2003) state that entrepreneurship education positively affects both self-efficacy and desirability. Hence, we hypothesise that:

H3a: Desirability has a positive and significant effect on green EI..

H3b: Self-efficacy has a positive and significant effect on green EI.

Environmental Understanding

Environmental understanding is defined as a personal knowledge of the hazardous impacts of environmental matters including acid rain, ozone depletion, natural resources exhaustion, deforestation, and global warming (Jiang, 1999). Bruyere and Rappe (2007) state that people with high environmental awareness are more committed to seeking solutions that solve ecological matters. Obviously, green entrepreneurship is a feasible measure to address the above environmental issues mainly because its critical objective is to offer eco-friendly products to society. Therefore, it is reasonable to argue that the founders of green enterprises clearly understand the importance of the environment and feel responsible for protecting the ecosystem.

Apart from entrepreneurship education, environmental understanding is considered the exogenous variable as proposed in the EET model. Almost all previous entrepreneurship studies have focused on investigating the effect of entrepreneurship education, perceived desirability, and perceived feasibility on EI. However, few studies have examined the role of environmental awareness in fostering EI. Noticeably, Barba-Sánchez *et al.* (2022) demonstrate that environmental awareness has a positive relationship with students' attitudes towards entrepreneurship but does not have any impact on perceived behavioural control.

Understanding the environment and its detrimental effect may wake up the empathy inside each person and therefore encourage them to protect the ecosystem (Barba-Sánchez *et al*., 2022; Murphy & Coombes, 2009). For Centennials, green start-ups may be one of the utmost ways to express their environmental responsibility. Hence, we hypothesise that:

H4a: Environmental understanding has a positive and significant effect on desirability.

However, an in-depth understanding of environmental matters may entail individuals, especially the non-risk takers, who are too afraid that their start-up project is unfeasible since they are unable to over-

come the hazardous impacts of ecological problems. In fact, thousands of small enterprises slumped or went bankrupt due to the consequences of the Covid-19 pandemic (Ngo, 2020). As a result, there emerges an invisible psychological barrier once starting a new enterprise. Thus, we expected the environmental understanding to negatively affect personal belief in successfully running green start-ups:

H4b: Environmental understanding has a positive and significant effect on desirability.

On the other hand, entrepreneurship education programmes may implicit some sustainability solutions to address the concern about environmental matters (Masjud, 2020) or may help to visualise how to run an eco-friendly business idea. Hence, individuals with high environmental awareness are willing to attend entrepreneurship education to seek some feasible business ideas that may both solve environmental problems and provide economic benefits. To the best of our knowledge, this is the pioneering study that investigates the relationship between entrepreneurship education and environmental understanding in the context of green entrepreneurship. We expected that environmental understanding would not only motivate individuals to attend entrepreneurship education activities but also elevate the efficiency of entrepreneurship education:

H4c: Environmental understanding has a positive and significant effect on entrepreneurship education.

RESEARCH METHODOLOGY

Data Collection

This study focused on the green EI of university students in Vietnam. Our targeted respondents were the Centennials (also referred to as Gen Z) who were born in the period 1995-2012 (Maloni *et al.*, 2019). This generation is expected to play a pivotal role in the transformation into a green economy, because they are well-educated, possess incredible creative capability, and feel high responsibility for the environment (Soomro *et al.,* 2020). Moreover, university students are more likely to consider start-ups as a career since they still do not have a job.

We applied a non-probability sampling method to collect primary data. We conveniently distributed the survey questionnaires to the Centennials at Can Tho University, which is one of the top-tier Vietnam universities and also the host of the International Symposium of Sustainable Development of the Mekong Delta – a crucial economic zone of Vietnam. Initially, we invited 10 students to participate in the pilot research so that we could assess the questionnaire's structure and content. Afterwards, we conducted the official survey within two weeks by emailing 630 students to invite them to complete it. In total, 300 respondents answered the questionnaires (the response rate was 47.6%) but after removing some junk responses, 275 responses remained. Our sample size met the minimum requirement (at least 200 observations) to conduct PLS-SEM as proposed by Hair *et al.* (2014).

Measurement Indicators

To measure the factor of entrepreneurship education (EE), we adapted five items from the studies of Liñán and Chen (2009). Based on the studies of Bohlen *et al.* (1993) and Jiang (1999), we developed seven items to measure the factor of environmental understanding (EU). Five items measured the factor of Self-efficacy (SE) and six items measured the factor of Green EI (GEI). We adapted both of them from the research by Barba-Sánchez *et al*. (2022) and Liñán and Chen (2009). Finally, we utilised three items that Krueger (1993) suggested to use when measuring the construct of desirability (DE). We measured all indicators of those constructs by using the 5-point Likert scale. Table 1 describes our measurement variables.

Data Analysis

This study employed the PLS-SEM approach, because it is appropriate for exploratory research and theory development and does not require a large sample size or normal data distribution (Hair *et al.,* 2014). We utilised SmartPLS 4.0 to analyse data through a rigid process that begins with speci-

fying the inner model (structural model) and outer models (measurement models). Then, we assessed the reliability, convergent validity, and discriminant validity of the five constructs. Lastly, we performed the bootstrapping method (5000 subsamples) to examine our hypotheses.

Table 1. Description of indicators

Construct	Indicator	Descriptions
Environmental understanding (EU)	EU1	Environment is what surrounds and influences human life.
	EU2	Environment plays a key role in protecting life on Earth.
	EU3	Soil, water, air, and ecosystems are the basic components of environment.
	EU4	Environment provides natural resources and contains waste.
	EU5	Human activities are the root cause of pollution and environmental problems.
	EU6	Soil, water, and air pollution are three kinds of environmental pollution.
	EU7	Environmental issues are closely linked to population matters, poverty, and disease.
Entrepreneurship education (EE)	EE1	My university and local authorities provide essential knowledge about entrepreneurship.
	EE2	My university and local government develop my entrepreneurial skills and abilities.
	EE3	I have access to many start-up activities thanks to my university and local authorities.
	EE4	University education inspires me to become an entrepreneur.
	EE5	Business courses help me learn about practical entrepreneurial circumstances.
Desirability (DE)	DE1	I prefer forming a green start-up rather than not.
	DE2	If I have an opportunity, enough capital, and ability to start a green business and I desire to do so.
	DE3	I am not worried about starting a green business.
Self-efficacy (SE)	SE1	Establishing and operating a green firm is easy for me.
	SE2	I have enough knowledge and experience to start a green firm.
	SE3	I can control the formation process of a green start-up.
	SE4	I know how to develop a green start-up project.
	SE5	If I ran a green start-up, I would have a high chance of success.
Green entrepreneurial intention (GEI)	GEI1	I am willing to do everything to become a green entrepreneur.
	GEI2	Becoming a green entrepreneur is my career objective.
	GEI3	I will try my best to form and run my own green firm in the future.
	GEI4	I am determined to create a green firm in the future.
	GEI5	I have been seriously considering starting a green business in the future.
	GEI6	I will definitely establish a green firm in the future.

Source: own study.

RESULTS AND DISCUSSION

Respondents' Demographic

Our sample size included 275 students who were born in the period 1998-2004. There was a considerable imbalance between men and women respondents, as there were 74.2% women and 25.8% men. In fact, women are more likely to be empathetic than men (Mestre *et al.,* 2009) so they are more sensitive to environmental problems. Therefore, in comparison with men, more women were willing to attend our study which investigated green EI.

The majority of respondents were second and third-year students which accounted for 40.7% and 38.5% respectively. These statistical outcomes show that second, third and fourth-year students were seriously considering entrepreneurship activities. Meanwhile, first-year students only presented 4.8% of the total respondents due to a lack of knowledge and experience so they were less excited about entrepreneurship. Moreover, the response rate of the fourth-year (and above) students was low (16%), because they might have been overwhelmed with writing their thesis or looking for a job.

Outer Model

The results from PLS-Algorithm (Table 2) indicated that our measurement model was reliable and suitable for the sample data. After deleting indicators EU4 and DES3 due to low factor loading (smaller than 0.7),

the rest of all indicators' factor loading satisfied the requirement proposed by Hair *et al.* (2014) who state that the factor loading of each indicator in the outer model must be above 0.7. Moreover, Hair *et al.* (2014) also suggest that the composite reliability (CR) values of each construct should be greater than 0.7 and each construct's average variance extracted (AVE) scores must be above 0.5 to meet the requirement of reliability and validity. From Table 2, we see that all CR values of five constructs were greater than 0.8 and all AVE scores were above 0.6. Furthermore, Cronbach's alpha of each construct was higher than 0.8, thus, the reliability and convergent validity of the five constructs in our measurement model were appropriate.

Table 2. Reliability and convergent validity

Construct	Factor loading	Cronbach's alpha	CR	AVE
DE	[0.931~0.938]	0.855	0.857	0.874
EE	[0.770~0.852]	0.869	0.872	0.658
EU	[0.731~0.842]	0.878	0.878	0.622
GEI	[0.803~0.875]	0.914	0.915	0.701
SE	[0.783~0.879]	0.895	0.906	0.705

Source: own study.

Table 3 indicated that all five constructs met the discriminant validity because all the square roots of each construct's AVE (bold numbers in the Fornell-Larcker Matrix) were greater than the highest squared correlations with any other constructs (Hair *et al.,* 2014) and all the values in the Heterotrait-monotrait ratio (HTMT) were lower than 0.85 (Henseler *et al.*, 2014).

Table 3. Discriminant validity

Construct	Fornell-Larcker Matrix					HTMT Matrix				
	DE	EE	EU	GEI	SE	DE	EE	EU	GEI	SE
DE	**0.935**									
EE	0.529	**0.811**				0.610				
EU	0.498	0.532	**0.789**			0.576	0.611			
GEI	0.565	0.531	0.281	**0.837**		0.639	0.595	0.317		
SE	0.314	0.451	0.016	0.594	**0.839**	0.348	0.499	0.102	0.648	

Source: own study.

Inner Model

All the VIF scores (less than two) shown in Table 4 indicated that our regression model did not violate multicollinearity. Besides, Figure 2 illustrated that our study predicted accurately above 50% of green business intention (R-square = 0.511).

Table 4. VIF analysis result

Factor	EE	DE	SE	GEI
DE				1.110
EE		1.395	1.395	
EU	1.000	1.395	1.395	
SE				1.110

Source: own study.

In Table 5, the estimated results demonstrated that both desirability and self-efficacy had a significant and positive impact on green EI. Moreover, entrepreneurship education had significant and positive impacts on both desirability and self-efficacy. Meanwhile, environmental understanding had a positive effect on desirability but an adverse impact on self-efficacy. Besides, Table 6 revealed that desirability and self-efficacy mediate the relationship between entrepreneurship education and green business intention. Particularly, environmental understanding had an indirect effect on green EI via entrepreneurship education, desirability, and self-efficacy.
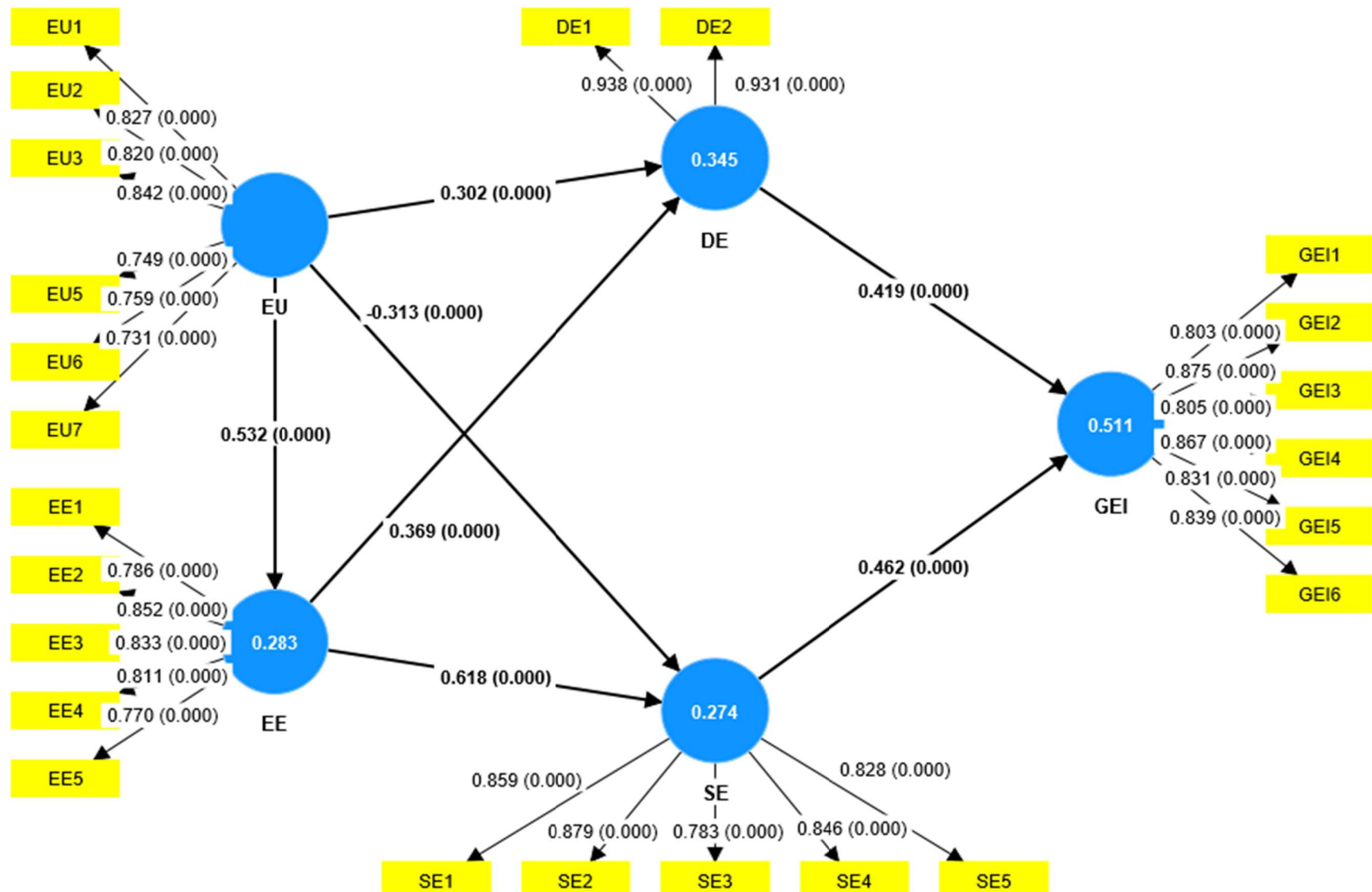
Figure 2. Structural model results
Source: own elaboration in.

Table 5. Hypothesis testing results

Hypothesis	Path relationship	Path coefficient	T statistics	Decision	f^2
H1	SE -> GEI	0.462	10.394*	Accepted	0.394
H2	DE -> GEI	0.419	10.502*	Accepted	0.324
H3a	EE -> DE	0.369	5.898*	Accepted	0.149
H3b	EE -> SE	0.618	11.535*	Accepted	0.376
H4a	EU -> DE	0.302	4.933*	Accepted	0.100
H4b	EU -> SE	-0.313	4.214*	Accepted	0.096
H4c	EU -> EE	0.532	9.299*	Accepted	0.395

Note: *p-value < 0.01
Source: own study.

Table 6. Mediation effects

Indirect path relationship	Specific indirect effect	T statistics
EU->DE->GEI	0.127	4.137*
EU->SE->GEI	-0.145	3.827*
EU->EE->SE->GEI	0.152	5.087*
EU->EE->DE->GEI	0.082	3.849*
EE->SE->GEI	0.286	7.390*
EE->DE->GEI	0.155	5.066*

Note: *p-value < 0.01
Source: own study.

Discussion

In this study, the positive correlation between green EI and desirability as well as self-efficacy implies that if we want to foster green start-up intentions of Centennials, we should enhance their enthusiasm for green business and strengthen their belief about self-efficacy to start a green business. This result is in line with previous entrepreneurship studies such as Baharuddin and Ab Rahman (2021), Barton *et al.* (2018), Mueller (2011), and especially, research done by Koe *et al.* (2014) and Ramayah *et al.* (2019) who also study green start-up behaviours. Moreover, based on the categorization of Cohen (1988), we see that the effect size of self-efficacy on green EI is relatively large (f^2 = 0.394 > 0.35). Meanwhile, the effect size of desirability on green EI was medium (0.15 < f^2 = 0.324 < 0.35). This outcome is critically inverse to the study of Barba-Sánchez *et al.* (2022) who showed that the effect size of perceived desirability is much larger than self-efficacy. This novel finding implies that Vietnamese Centennials possess a prudent characteristic. To put it simply, instead of being driven by emotions, Gen Z students heavily rely on their intellect and carefully consider their capabilities when deciding to start an eco-business. Additionally, the positive influence of entrepreneurship education on self-efficacy, as also demonstrated in the studies of Alvarez-Risco *et al*. (2021), further supports this notion. Peterman and Kennedy (2003) and Robayo-Acuña *et al.* (2023) indicate that entrepreneurship education activities raise students' belief in smoothly running a start-up. Moreover, the large effect size of entrepreneurship education on self-efficacy (f^2 = 0.376 > 0.35) emphasises that entrepreneurship education plays a pivotal role in raising participants' entrepreneurial self-efficacy. In Vietnam, entrepreneurship education programmes, which are usually financed by the government, are constructed by combining various business modules that provide essential business knowledge and skills to manage an enterprise.

Entrepreneurship education is also positively correlated with desirability as in the study of Hattab (2014) and Peterman and Kennedy (2003). Nevertheless, this effect size was relatively small (f^2 = 0.149 < 0.15). Practical information from those training and educating programmes may disclose some potential start-up chances, from that, cultivating the ambitions of starting a green business. In Vietnam, entrepreneurship education activities frequently invite successful entrepreneurs to share their entrepreneurship stories. Those emotional stories may inspire participants and awaken their desire for start-up.

In accordance with the study of Barba-Sánchez *et al.* (2022) who confirmed a positive relationship between environmental awareness and the perception of desirability, our study evidences that

the more Gen Z students understand the importance of the environment, the more enthusiastic they become about starting a green business. Moreover, Soomro *et al*. (2020) agree that Centennials are well-educated and have a high sense of environmental awareness, thus, they have a special interest in eco-friendly activities such as prioritizing utilizing eco-friendly products, actively participating in Earth Hour events, or even starting an eco-friendly business.

Noticeably, while Barba-Sánchez *et al.* (2022) did not find any relationship between environmental awareness and perceived feasibility, our study found that environmental understanding has a detrimental effect on entrepreneurial self-efficacy. Our fascinating result implies that the severity of environmental issues such as climate change, disease, and environmental disasters, causes Centennials to feel that they are unable to fluidly operate their businesses under such harsh environmental conditions. Particularly, the recent failure of many start-ups caused by the consequence of the Covid-19 pandemic severely impairs the self-efficacy of young prospective entrepreneurs in Vietnam (Loan *et al.,* 2021*)*. Furthermore, this negative correlation reinforces the argument that Vietnamese Centennials are cautious individuals who are unwilling to jeopardise their careers by running a start-up if they feel that their business model and/or management capability will not be enough to address environmental issues adequately. Importantly, this outcome implies that amplifying environmental understanding is necessary but it is more important to consolidate the self-confidence of Gen Z students about their green business model.

To the best of our knowledge, this is the trailblazer study that explored the relationship between environmental understanding and entrepreneurship education. As expected, environmental understanding causes a positive impact on entrepreneurship education activities and this effect size is extremely large (f^2=0.395>0.35). Logically, comprehending the environment and empathizing with its concerns will compel people to act with greater environmental responsibility, thus encouraging individuals to engage in entrepreneurial education activities. Such activities will offer vital management skills and knowledge to solidify their business ideas aimed at nurturing a green ecosystem.

Furthermore, environmental understanding and entrepreneurship education indirectly influence green EI. These novelty findings emphasise that enhancing knowledge of the environment and intensifying entrepreneurship education activities will bolster the intention to pursue green business by increasing the desire for start-ups and consolidating entrepreneurial self-efficacy.

CONCLUSIONS

This study investigated the role of environmental understanding and entrepreneurship education in forming green EI of Centennials who were university students in Vietnam. Similarly to previous EI studies, our statistical outcomes confirmed the significant impact of desirability and self-efficacy on green EI. Moreover, this study emphasises that entrepreneurship education is the key element that contributes to elevating self-efficacy and desirability among university students, who are knowledgeable and have high environmental accountability. Interestingly, our study revealed some novelty findings, namely that environmental understanding contributes to awakening the desire for start-ups and boosting entrepreneurship education activities. However, the more Gen Z students know about the environment and its problems, the more they are afraid that they lack the required management capability to overcome those problems. Additionally, desirability and self-efficacy mediate the relationship between environmental understanding, entrepreneurship education and green EI. These interesting findings lead to several theoretical and practical implications.

Theoretical Implications

Our study contributes to the extant entrepreneurship literature. This is the pioneer study that explored the significant role of environmental understanding in predicting green start-up intention. Apart from entrepreneurship education, environmental understanding is another exogenous variable that substantially affects personal belief and desire for start-ups. Additionally, this study has shed light on how entrepreneurship education associates with environmental understanding. These novelties contribute to enriching

the entrepreneurship literature and providing a typical research model of green start-ups for future studies. Furthermore, the outcomes of this study reveal the cautious nature of Centennials. Thus, our study provides valuable hints for future research on the entrepreneurship behaviour of this generation.

Practical Implications

Entrepreneurship education and environmental understanding play a vital role in the progress of forming green EI. Hence, universities and governments should intensify entrepreneurship training activities that adequately equip Gen Z students with the knowledge and skills to confidently start a green business. Moreover, universities should integrate start-up education into university programmes as a mandatory subject to encourage their students to consider entrepreneurship as their future career option. Besides, Centennials regularly use social media, thus, local governments and universities must utilise social media platforms to broadcast the most pressing environmental messages related to climate change, disease, and pollution. Such messages may enhance Centennials' understanding of the environment and awaken their aspiration for green business.

Furthermore, the content of entrepreneurship education activities needs improvement by incorporating some materials related to environmental understanding. If applicable, the content of entrepreneurship education should prioritise providing viable business approaches to cope with environmental matters. The improvement of entrepreneurship education will consolidate the belief of Centennials that they are able to run their green business model even if the natural environment is unfavourable.

Limitations and Future Studies

There are a few limitations to our study that future studies should address. Firstly, the research scope and sample size need to be expanded to include numerous universities in Vietnam or even Asian universities. Secondly, future research should augment the current model by adding more factors such as government assistance policies, infrastructural conditions, family support, and self-esteem/self-actualization mentioned in Maslow's hierarchy of needs. Thirdly, research subjects should be extended to include graduate students to investigate their willingness to start their businesses even if they have stable jobs. Lastly, future studies should focus on studying entrepreneurship behaviours in a particular business domain such as in the field of technology, organic agriculture, or circular business, because these domains represent the trends of future global economic development.

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Authors

Trung Ngoc Phat Le 50% (conceptualisation, literature writing, research methodology, and discussion), Kim Hanh Nguyen 25% (draft correction), Ngoc Truc Han Nguyen 25% (data collection, statistics).

Trung Ngoc Phat Le

Trung Ngoc Phat Le obtained an MBA degree from the International University of Japan. He is a lecturer at the Faculty of Business Administration, Can Tho University (Vietnam). His research interests include entrepreneurship behaviour, green business, business strategy, and international trade.
Correspondence to: Trung Ngoc Phat Le, Faculty of Business Administration, School of Economics, Can Tho University, 3/2 Street, Ninh Kieu, Can Tho, Vietnam, e-mail: ltnphat@ctu.edu.vn
ORCID ⓘ http://orcid.org/0000-0002-2196-1594

Kim Hanh Nguyen

Kim Hanh Nguyen received a Master's degree in Economics from the International University of Japan and a Bachelor's degree in Foreign Trade Economics from Can Tho University (Vietnam). She is a lecturer at the Faculty of International Business, Can Tho University (Vietnam). Her research interests include economics, international economics, international trade, and educational management.
Correspondence to: Kim Hanh Nguyen, Faculty of International Business, School of Economics, Can Tho University, 3/2 Street, Ninh Kieu, Can Tho, Vietnam, e-mail: nkhanh@ctu.edu.vn
ORCID ⓘ http://orcid.org/0009-0003-7975-9967

Ngoc Truc Han Nguyen

Ngoc Truc Han Nguyen received her Bachelor's degree in Business Administration from Can Tho University/Vietnam. She is currently an educational consultant at Lien Viet Education Joint Stock company, Ho Chi Minh city (Vietnam). Her research interests include green business and educational management.
Correspondence to: Ngoc Truc Han Nguyen, Lien Viet Education Joint Stock company, 352, 3/2 Street, District 10, Ho Chi Minh City, Vietnam, e-mail: lienhe@lienviet.edu.vn
ORCID ⓘ http://orcid.org/0009-0008-7123-1902

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The role of foreign venture capital and foreign business angels in start-ups' early internationalization: The case of Polish ICT start-ups

Krystian Bigos, Adam Michalik

A B S T R A C T
Objective: The objective of the article is to examine the role of foreign venture capital and foreign business angels in companies' early internationalization based on the example of Polish ICT start-ups.
Research Design & Methods: We based the scientific argument on an analysis of the existing state of knowledge in this area and the empirical research conducted among 220 Polish start-ups, which founded our logistic regression model.
Findings: Based on the study, a positive relationship exists between the involvement of foreign venture capital funds in start-ups and their early internationalization.
Implications & Recommendations: Start-ups should cooperate with foreign institutions, such as venture capital funds, as their knowledge and experience can be a source of start-ups' early internationalization. We recommend that scholars conduct further in-depth panel studies on the impact of foreign investment funds on the early internationalization process.
Contribution & Value Added: The article covers research yet to be undertaken in research analyses in early internationalization and can serve as a starting point for further in-depth studies of the phenomenon, also based on start-ups from other countries.

Article type:	research article
Keywords:	venture capital; business angel; early internationalization; international entrepreneurship; financial capital
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INTRODUCTION

Many business entities show increasing interest in international expansion because the domestic market often fails to meet their growth expectations. Internationalization offers numerous opportunities for each company, including market expansion and the desire to diversify operational risks. Over the past few decades, the research on business internationalization has intensified. Researchers typically analyse this phenomenon from various perspectives using *e.g.* organizational or strategic management theories (Ruzzier *et al.*, 2006; Kollmann & Dobrovič, 2022; Jalil *et al.*, 2022). Although researchers initially focused on the internationalization processes of large corporations (in the 1960s, 70s, and 80s), more recently, research on the internationalization of micro, small, and medium-sized enterprises (since the early 21st century) has become much more popular.

For decades, scholars have explained the internationalization of companies mainly sequentially. This approach became popular because of Swedish researchers Johanson and Vahlne (1974), who presented their model of internationalization known as the Uppsala internationalization model. A breakthrough in

such research occurred around the mid-1990s when Oviatt and McDougall (1994) and Cavusgil (1994) simultaneously demonstrated that not all companies follow an incremental internationalization path. Some of them can also 'leapfrog' certain stages of internationalization, not necessarily gradually increasing their involvement in foreign markets. Oviatt and McDougall (1994) were the first to define what is known as international new ventures, also referred to as international start-ups. According to researchers, some ventures may engage in their first international expansion shortly after their establishment. As a result, Oviatt and McDougall (1994) initiated the discourse on the early internationalization of micro, small, and medium-sized enterprises discussed within the context of the international entrepreneurship school (Machado & Bischoff, 2021). Scholars have revised the original version of the Uppsala model from 1977 several times. The first significant modification occurred under the influence of the development of the network approach to the internationalization processes of firms, as a result of which the network Uppsala model emerged in 2009. Hult, Gonzalez-Perez, and Lagerström see many potential applications of these revised models, especially the one published in 2017, in international business research, especially in such areas as technology entrepreneurship or the digitization of global business (Vahlne & Johanson, 2017; Wach, 2021). Vahlne (2020) claims that the Uppsala internationalization model changed from explaining internationalization to explaining evolution. According to the researcher, the profitability of ventures depends mainly on how to manage the acceptable risk level under conditions of uncertainty (Vahlne, 2020). As mentioned earlier, the latest version of the Uppsala model emphasizes the importance of evolution in accessing and developing knowledge. Consequently, in this article, we will show indirectly that the presence of foreign venture capital funds and foreign angel investors may impact the likelihood of early internationalization because of the access of start-up founders to the knowledge and experience that these entities have.

The international entrepreneurship school has revolutionized research on micro, small, and medium-sized enterprises (start-ups and born globals) within international business. Essentially, the occurrence of early internationalization stems from complex interactions between changes in the international market environment and the diffusion of knowledge among managers and entrepreneurs with a solid international vision for their companies (Zucchella *et al*., 2007; Civelek, & Krajčík, 2022; Ključnikov *et al*., 2022a; Pokrivcak & Toth, 2022; Szczepańska-Woszczyna, & Gatnar, 2022) as well as the ongoing digitalization in the economy (Bilan *et al.,* 2023; Cavusgil & Knight, 2015; Lee *et al*., 2019; Roshchyk *et al.,* 2022; Androniceanu, 2023), which continually alters the business landscape. Early internationalization has somewhat challenged the foundations of the widely accepted stage theory of internationalization (Cavusgil, 1994; McDougall, 1989; Romanello & Chiarvesio, 2019) sparking a lively discourse in international business research (Reuber *et al*., 2017). Li (2023) suggests that there are still unanswered questions in the literature about why start-ups choose to internationalize early. Li argues that researchers must pay greater attention to the collective effect of both individual and contextual antecedents and their interactions (Li, 2023; Yang *et al*., 2020; Zhang *et al*., 2016).

Scholars have adopted different approaches in discussions on the internationalization process of start-ups, generating diverse research directions in this field, resulting in extensive and fragmented studies on the described phenomenon (Morais & Ferreira, 2020). Consequently, there needs to be more consensus among many researchers regarding the course of this phenomenon. The absence of agreement deepens further because of the dynamically evolving economic transformations we are witnessing, including the digitization of the economy, which compels start-ups to continually adapt to new economic realities.

We aimed to verify whether the presence of foreign external entities (venture capital and business angels) in the ownership structures of ICT start-ups contributes to their higher propensity for early internationalization. In the cognitive context, the article presents the relationships between foreign venture capital funds and foreign business angels and the propensity of start-ups for early internationalization in the Polish cultural context. The article consists of theoretical and empirical parts. In the theoretical part, we will conduct a literature review presenting the potential relationship between venture capital and business angels and start-ups' early internationalization. In this part, we will apply a similar approach as Liang, Watters, and Lemański (2022) to identify the abovementioned relationship. The empirical part will present the results of empirical research conducted on 220 Polish start-ups.

In the article, we analysed impact of presence of foreign venture capital and foreign business angels in the ownership on propensity to early internationalization of polish ICT start-ups using a binomial logistic regression model. The structure of the article is as follows: (1) introduction, (2) literature review, (3) research methodology, (4) results and discussion, (5) conclusions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Financial Capital and its Role in Start-up Development

Financial capital plays a crucial role in the development of a business unit. In line with the resource approach, the entrepreneurship literature identifies it as a determinant of the success of new ventures (Kirwan *et al*., 2019; Ključnikov *et al.,* 2022b; Shkodra *et al*., 2021; Tong & Serrasqueiro, 2021), and its lack is a key disincentive to starting a new business in the early stages of an organization's life cycle (Cassar, 2004; Clarysse & Bruneel, 2007; Karas & Režňáková, 2021).

Many studies have shown that the development of start-ups is limited by the lack of access to traditional financing sources (*e.g.* Aga & Reilly, 2011; Akyüz *et al*., 2006), which in turn is due to market failures underlying new ventures and is associated with significant information asymmetries (Kirwan *et al.*, 2019; Robb & Robinson, 2014; Waleczek *et al.*, 2018). Start-ups struggle to raise external capital (Hamilton & Fox, 1998; Westhead *et al*., 2001). Hence, many studies mention the financing gap that small businesses face in attracting long-term financing from market players such as banks and venture capital firms. This is particularly relevant for start-ups operating in the high-tech industry, which experience high uncertainty related mainly to research and development activities (Carpenter & Petersen, 2002). Moreover, start-ups lack a spectacular track record on which they can base their bargaining power in negotiations with investors (Kirwan *et al.*, 2019).

Many start-ups operate in an era of noticeably rapid global technological development. Thus, these ventures function in the information and communications technology (ICT) industry, offering products or services that revolutionize international trade and accelerate their internationalization process (Deng *et al.*, 2022). Considerable start-up founders discover cross-border opportunities (Jiang, *et al.*, 2020); therefore, the internationalization of ICT start-ups occurs early, as they offer many products or services that are unique and desired by the international community. Difficult (or even often lacking) access to financing for start-ups has led to the emergence of many organizations that provide financial support for such ventures (Kirwan *et al.*, 2019; Kézai & Konczos Szombathelyi, 2021). Over the past decades, many public and private institutions have emerged that continue to provide capital to innovative enterprises, such as start-ups (Kirwan *et al.*, 2019). Nowadays, traditional models of entrepreneurial financing primarily include informal investments by the founders themselves (*i.e.* financial bootstrapping) (Ebben, 2009; Ebben & Johnson, 2006) - including loans from friends, family, and colleagues (Zavatta, 2008), public financing (seed fund; from seed capital) and venture capital investments in promising entrepreneurial companies, especially in developed countries (Fernandez, 2021). Moreover, there are other new alternative procedures for accessing start-up financings, such as business angels (Zinecker *et al*., 2021) and crowdfunding (Cumming *et al*., 2019; Cumming & Groh, 2018; Fernandez, 2021).

The Link Between Source of Financing and Early Internationalization

Venture Capital

One source of start-up funding is venture capital (Dalal, 2022; Zbierowski & Gojny-Zbierowska, 2022). This fund invests mainly in small, young, and innovative companies by providing them with the financial capital they need to grow internationally (Park & LiPuma, 2020) in exchange for shares (Drover *et al.*, 2017). Scholars usually see venture capital as an active and temporary (5 to 10 years) partner in the ventures in which it invests and is usually a minority shareholder. This type of entity earns a rate of return mainly through a capital gain through an exit rather than through dividend income (Landström, 2007). Furthermore, venture capitals are usually managed by individuals with extensive international business experience. Hence, they transfer business knowledge to start-ups (Clercq & Manigart, 2007; Cumming & MacIntosh, 2003), facilitating the internationalization of new ventures (Fernhaber & McDougall, 2009; Fernhaber *et al.*, 2009).

Over the past few years, more and more studies on the internationalization of start-ups financed through venture capital have appeared (*e.g.* Clercq *et al.*, 2012; Fernhaber *et al.*, 2009; Park & LiPuma, 2020; Woo, 2020). George *et al.* (2005) note that the presence of equity capital in start-ups could influence management attitudes towards internationalization risk. The researchers found that start-ups whose shareholders are venture capitalists exhibit less risk aversion and are more inclined to increase the scale and scope of internationalization (George *et al.*, 2005). Zahra *et al.* (2007) conducted a similar study. They verified the impact of the presence of venture capital in the ownership structure of a start-up on its internationalization. They found that the participation of venture capital in the ownership structure of a start-up can be positively related to the venture's global knowledge resources and consequently impact the entity's internationalization (Zahra *et al.*, 2007). Fernhaber and McDougall (2009) hold a similar view. They believe that the international knowledge held by venture capital influences the internationalization of start-ups, as they indirectly use it and thus enrich the venture's resource base.

Moreover, Fernhaber and McDougall (2009) noted that the impact of venture capital's international knowledge on the internationalization of a new venture is more significant when the venture capital is a reputable entity.

Interestingly, among early-stage enterprises (start-ups), the resources held by venture capital play a more significant role than for other entities (Lockett *et al.*, 2008). On the other hand, based on empirical results, Woo (2020) found that the foreign origin of venture capital is positively related to the internationalization of start-ups in terms of both the probability of internationalization and the intensity of foreign sales. St-Pierre *et al.* (2018) also note that venture capital in smaller business entities facilitates foreign operations. The results of the study showed that entities in which venture capital has been invested gain credibility in the eyes of financial institutions by making it easier to obtain financing for export activities (St-Pierre *et al.*, 2018). Rossi *et al.* (2018) observe that European small and medium-sized entities show a higher propensity to export when owned by venture capital, which may, for example, be since funds are more likely to create business networks. These findings are consistent with Humphery-Jenner and Suchard's (2013) research on Chinese ventures. Foreign venture capitalists assist smaller entities in overseas expansion by leveraging their connections, financial resources, and institutional knowledge. Based on the above considerations, a start-up will have a greater propensity for early internationalization if foreign venture capital is included in its structures. Accordingly, we hypothesised:

H1: Foreign venture capital funds' presence in the start-ups' structures increases the likelihood of their early internationalization.

Business Angels

The practice of wealthy individuals investing in high-risk start-up projects has existed since the early days of economic activity in society (Landström, 2007). In the literature, such investors as business angels are willing to invest their capital in unlisted young ventures (Drover *et al.*, 2017; Kościółek, 2022), usually in exchange for convertible debt or shares (Grilli, 2019). Business angels are mainly ex-entrepreneurs who seek to fund and add value to start-ups through extensive advice in their area of expertise (Drover *et al.*, 2017) - *e.g.* support in business management, bringing extensive business contacts to the start-up (Zinecker *et al.*, 2021). According to White and Dumay (2017), these types of investors represent the largest funding source for early-stage pre-ventures, *i.e.* start-ups. They fill a critical funding gap between funds from family and friends and institutional funds (venture capital), which is why some researchers equate business angels to informal venture capital for a good reason (Mason, *et al.*, 2019; Zinecker *et al.*, 2021).

Typically, start-ups try to reach out to an angel investor who can add value to the venture (other than what venture capital offers), such as their experience, networks, and connection to other investors, especially foreign investors (Crick & Crick, 2018). This can result in the beginning of international cooperation for them. Moen *et al.* (2008) indicate a lack of research in the literature on investors with a global orientation. Business angels mainly include experienced successful entrepreneurs (Ramadani, 2009) and high-level corporate executives (Kelly, 2007) who would like to allocate part of their savings to a venture with high growth potential. Hence, we may assume that

such individuals have extensive international experience, which may be the main reason for early internationalization (Paul & Rosado-Serrano, 2019). Thus, we hypothesised:

H2: Foreign business angels' presence in the start-ups' structures increases the likelihood of their early internationalization.

RESEARCH METHODOLOGY

Data Collection and Research Sample

We conducted the study among Polish start-ups, characterized as new, young micro- and small enterprises operating in the information and communication technology (ICT) sector. We selected potential start-ups for the study through the ORBIS portal, which gathers comprehensive information on hundreds of millions of private and public enterprises worldwide. From this database, we selected enterprises established between 2017 and 2021 belonging to the IT/ICT industry (NACE codes: 26.1, 26.2, 26.3, 26.4, 26.8; 58.2, 61-62, 63.11). Additionally, the study considered micro and small ventures originating from Poland based on their size classification, according to the European Commission. Therefore, these entities in the classification context had to meet the following criteria: (1) employ fewer than 50 workers[1] and (2) the total sales turnover or the total sum of assets is at most 10 million EUR per year. Furthermore, we excluded from the analysis those entities which established a company only to settle work time with the current employer (we asked about it at the beginning of each interview).

We conducted the quantitative research in two phases. In the first phase, we conducted a pilot study using the computer-aided web interview (CAWI) technique. As a result, we obtained 45 responses. Subsequently, several months later, we initiated the main study, which we conducted using the CATI (computer-aided telephone interview) technique among 200 randomly selected Polish start-ups. Ultimately, we obtained 245 responses, of which 25 were invalid/outliers. Therefore, in the final analysis, we considered 220 responses from founders of Polish start-ups.

In spatial terms, the relatively largest group comprised entities established in 2018, accounting for 28.6% of the total sample. The next groups were start-ups founded in 2017 (27.3% of the total sample), in 2019 (20.9%), in 2020 (15.9%), and in 2021 (7.3%).

Table 1. Simple statistics

Variable	N	Mean	Standard deviation	Coefficient of variation
1. EARLY_INTERN	220	0.43	0.50	116.28
2. GENDER	220	0.79	0.41	51.90
3. AGE	220	35.68	7.79	21.83
4. R_D	220	0.47	0.50	106.38
5. FOR_VENT_CAP	220	0.04	0.19	475.00
6. FOR_BUS_ANG	220	0.03	0.16	533.33

Source: own elaboration in PQStat.

Table 1 shows that over half of the research sample consisted of companies oriented towards domestic sales (57.3% of the total sample). Consequently, 42.7% were companies oriented towards international sales. Regarding the gender of the leading startup founder, we noted that over three out of four founders were men, and the average age of the startup founder was nearly 36 years. Close to half of the analysed startups engaged in research and development activities, while relatively few of them financed their operations using foreign venture capital funds or funds offered by foreign business angels.

Research Model

We verified the two research hypotheses proposed in the study based on a created logistic regression model. This model type verifies relationships between dichotomous independent variables and the dependent variable as it is based on the so-called 'logarithm of odds' (Hosmer *et al.*, 2013).

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[1] We measured this indicator in annual work units (AWU).

Based on Figure 1, we observed that the proposed research model suggests a positive relationship between the dependent variable describing early internationalization and the presence of two sources of financial capital, namely foreign venture capital funds and foreign business angels within startup structures.

Figure 1. Proposed research model
Source: own elaboration.

Measures

The study's dependent variable (EARLY_INTERN) was early internationalization, which is measured as a binary variable (0 or 1). The literature extensively defines early internationalization. Moreover, scholars typically operationalize it as realizing the first foreign sale within three to four years of establishment or commencement of business activities. While some researchers (*e.g.* Wach & Głodowska, 2021) argue that early internationalization typically occurs within three years of start-up establishment (*e.g.* Zucchella *et al.*, 2007), there are also voices suggesting that this period may be slightly longer (*e.g.* Capik & Brockerhoff, 2017). In this article, we assumed that early internationalization occurs within four years of start-up establishment, consistent with Hewerdine, Rumyantseva, and Welch (2014), if a start-up achieved such foreign sales, we assigned it the value of 1; otherwise, we assigned the value of 0.

We mention two independent variables: the presence of foreign venture capital (FOR_VENT_CAP) and foreign business angels (FOR_BUS_ANG) within start-up structures. Similar to the dependent variable, these variables are dichotomous. If a respondent positively indicated the presence of foreign venture capital and/or foreign business angels within the start-up structures, we assigned them the value of 1; otherwise – 0. Some other scholars proposing similar independent variables are *e.g.* Woo (2020) and Baier Baier-Fuentes *et al*. (2018).

We included three control variables that could potentially affect the estimation results of the other variables in the model.

− GENDER of the leading start-up founder (dummy variable: 1 – men, 0 – woman).
− AGE of the leading start-up founder (continuous variable).
− R_D (Q: Does the start-up conduct research and development activities? 1 – yes, 0 – no).

The first control variable was GENDER, because we believe that the main start-up founder's gender can affect its propensity to internationalize early. Typically, men demonstrate a higher proclivity for risky ventures than women, who are characterized by a higher degree of risk aversion. The second control variable was AGE, because we believe that older people have relatively more work experience and, therefore, are better competent to evaluate economic facts. The last control variable was R_D, because we believe that the internationalization process requires ventures to take an innovative approach, so R&D activities may favour the early internationalization of start-ups.

RESULTS AND DISCUSSION

Based on the results of the likelihood ratio test, it showed the desired statistical significance (model 1: chi-square = 15.277, $p < 0.01$; model 2: chi-square = 15.028, $p < 0.01$; model 3: chi-square = 12.127, $p < 0.01$; model 4: chi-square = 29.087, $p < 0.01$). However, in the case of the Hosmer-Lemeshow test, we also observed its lack of significance, which is an expected result (model 1: chi-square = 4.323, $p =$

0.827; model 2: chi-square = 9.339, *p* = 0.315; model 3: chi-square = 6.694, *p* = 0.570; model 4: chi-square = 3.839, *p* = 0.871). Regarding the Akaike information criterion, out of the four analysed econometric models, model 2 is relatively the best fit. Based on the above statistical tests, we can conclude that the estimated econometric models are well-fitted to the data.

We conducted the verification of the quality assessment of the estimated econometric models based on the analysis of pseudo-R-squared values measured using Negelkerke's method and the Cox-Snella method (Table 3). In the case of the first analysed econometric model, we observed that the pseudo-R-squared coefficient measured by Negelkerke's method was 0.090, while when measured by the Cox-Snella method, it was slightly lower, precisely 0.067. Similarly, the coefficients appeared in the next logistic regression model, in which Negelkerke's pseudo-R-squared was 0.089, while the Cox-Snella pseudo-R-squared was 0.066. We recorded slightly lower values of the pseudo-R-squared coefficients in the case of the third estimated logistic regression model, in which Negelkerke's pseudo-R-squared coefficient and the Cox-Snella pseudo-R-squared coefficient were 0.072 and 0.054, respectively. In the last econometric model, the pseudo-R-squared coefficients measured by Negelkerke's and Cox-Snella methods were 0.106 and 0.079, respectively.

In this part of the study, we also verified associations between nominal variables. For this purpose, we used *V*-Cramer coefficients (Table 2). Among the analysed independent variables, the variable AGE was relatively more strongly associated with the variable EARLY_INTERN (v = 0.359, chi-square = 28.496), but we found statistically significant associations for the variables R_D (v = 0.184, chi-square = 7.447, $p < 0.01$) and FOR_VENT_CAP (v = 0.127, chi-square = 3.533, $p < 0.1$). The remaining variables were relatively less strongly associated with the dependent variable. Regarding the control variables, we observed that the variable R_D was significantly associated with the variable FOR_BUS_ANG to a relatively higher degree (v = 0.123, chi-square = 3.303, $p < 0.1$), and the variable FOR_VENT_CAP was associated with the variable FOR_BUS_ANG (v = 0.266, chi-square = 15.524, $p < 0.001$).

Table 2. V-Cramer coefficients

Variable	1	2	3	4	5	6
1. EARLY_INTERN	1					
2. GENDER	0.024	1				
3. AGE	0.359	0.422	1			
4. R_D	**0.184****	0.067	0.375	1		
5. FOR_VENT_CAP	**0.127**+	0.077	0.373	0.062	1	
6. FOR_BUS_ANG	0.081	0.049	0.339	**0.123**+	**0.266*****	1

Note: significant codes were: + *p* < 0.1, * *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001.
Source: own elaboration in PQStat.

The logistic regression models included three control variables: GENDER, AGE, and R_D. Regarding the control variable AGE, it was negatively associated with the dependent variable in all models. We observed a similar relationship in the context of the GENDER variable, but it was not statistically significant (Table 3). As for the control variable related to research and development activities (B_R), we observed that it was positively associated with the likelihood of early internationalization and was statistically significant.

Based on the information provided in Table 3, we observed that the presence of foreign venture capital funds in the structures of the investigated ventures positively influenced the likelihood of early internationalization (model 1: exp(*b*) = 4.263, *p* < 0.1; model 2: exp(*b*) = 4.577, *p* < 0.1; model 4: exp(*b*) = 9.708, *p* < 0.05). In models 1 and 2, it occurred over four times more frequently in start-ups with such funds in their ownership structure than in other ventures. However, in model 4, the probability of early internationalization was even higher among those ventures that also had foreign business angels in their structures (almost ten times higher). Based on model 4, we observed that the variable FOR_BUS_ANG served as a moderator in the relationship between the variables FOR_VENT_CAP and EARLY_INTERN, as evidenced by the statistically significant interaction between the variables FOR_BUS_ANG and FOR_VENT_CAP. This means that the presence of foreign business angels in the start-up's structure in-

creased the strength of the relationship between the dependent variable describing early internationalization and the independent variable referring to the presence of foreign venture capital funds. Based on the above considerations, we could finally accept H1, according to which in start-ups with at least one foreign venture capital fund, the likelihood of early internationalization is higher than in other ventures.

Table 3. The list of estimated models

Variable	Model 1	Model 2	Model 3	Model 4
const.	0.699 (0.788)	0.701 (0.787)	0.652 (0.779)	0.840 (0.799)
GENDER	-0.015 (0.356)	-0.025 (0.355)	-0.052 (0.352)	0.054 (0.364)
AGE	**-0.039* (0.019)**	**-0.039* (0.019)**	**-0.036+ (0.019)**	**-0.045* (0.020)**
R_D	**0.740** (0.286)**	**0.757** (0.284)**	**0.749** (0.283)**	**0.701* (0.288)**
FOR_VENT_CAP	**1.450+ (0.871)**	**1.521+ (0.853)**	–	**2.273* (1.140)**
FOR_BUS_ANG	0.464 (0.942)	–	0.781 (0.888)	1.389 (1.188)
FOR_VENT_CAP x FOR_BUS_ANG	–	–	–	**-3.695+ (2.223)**
Likelihood ratio test	15.277**	15.028**	12.127**	18.087**
H.-L. test	4.323 ($p = 0.827$)	9.339 ($p = 0.315$)	6.694 ($p = 0.570$)	3.839 ($p = 0.871$)
R2 (Negelkerke)	0.090	0.089	0.072	0.106
R2 (Cox-Snell)	0.067	0.066	0.054	0.079
AIC	295.037	293.285	296.127	294.226
N	220	220	220	220

Note: significant codes were + $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$. Standard error in parentheses.
Source: own elaboration in PQStat.

Regarding foreign business angels (private investors), we observed that having such investors in the structures results in a higher inclination of these ventures towards early internationalization (model 1: exp(b) = 1.590; model 3: exp(b) = 2.184; model 4: exp(b) = 4.011). Based on the econometric models presented in Table 3, we noticed a positive relationship between the variables FOR_BUS_ANG and EARLY_INTERN. However, the analysed independent variable was not statistically significant in all econometric models. Thus, we had no basis to accept or reject H2.

During the conducted study, we observed that the results were consistent with Woo (2020) who noted that investments from foreign venture capital funds are positively related to the likelihood of internationalization in ventures, in which scholars have invested such funds. According to Woo, foreign venture capital funds provide practical knowledge about foreign markets to the companies in which they hold shares. Internationalization can create several benefits for young start-ups, such as reducing their dependence on domestic market conditions (Woo, 2020). Therefore, foreign venture capital funds are entities with extensive investment experience (Park & LiPuma, 2020). Empirical evidence also suggests that the international experience of venture capital investors assists start-ups in international expansion (*e.g.* Fernhaber & McDougall, 2009; Guler & Guillén, 2010; Meuleman & Wright, 2011).

In this study, we found no direct relationship between the presence of foreign business angels/industry investors and the propensity of start-ups for early internationalization (H2). However, we observed that the variable FOR_BUS_ANG moderates the relationship between variables related to the presence of foreign venture capital funds and the propensity of start-ups for early internationalization. Croce, Schwienbacher, and Ughetto (2023) indicate the existence of a relationship between the propensity of business angels to internationalize their investments and the presence of a foreign business angel in the structure

of their venture. Indirectly, this may suggest a connection between the propensity of start-ups for early internationalization and the presence of a foreign business angel in their structure.

CONCLUSIONS

The results indicate that the collaboration between Polish start-ups and foreign venture capital funds (H1) translates into their propensity for early international expansion. We confirmed this with the statistically significant parameter values in logistic regression models 1, 2, and 4, which allowed us to accept H1. The collaboration of start-ups with foreign venture capital funds facilitates the sharing of business experience, including the area of internationalization.

During the study, we found no statistically significant relationship between early internationalization and foreign business angels in the start-up's structure. Thus, we had no grounds to accept or reject H2. However, we noted that the presence of such investors may enhance the involvement of foreign venture capital funds in a given start-up. At this point, there may also be a potential reverse causality in the study, namely, a start-up that has internationalized will attract foreign investors. Nevertheless, we did not verify this relationship due to the study's limitations.

Like all empirical studies, this study has several limitations. Firstly, we conducted it using two methods, namely CAWI and CATI. In such studies, there is a risk that respondents could have provided dishonest answers to the questions, which could distort the objectivity of the obtained results. Another limitation was the sample size (n = 220). Despite using random selection, there is always a risk of lack of representativeness in this type of research. The results obtained in this study are difficult to generalize, because they are based on responses from a relatively small group of start-ups belonging to the information and communication technology industry.

Furthermore, we conducted the research in a Polish cultural context. Hence, we should treat the obtained results cautiously, especially regarding their generalizability, which scholars often emphasise in the case of such research (*e.g.* Abdullahi *et al.*, 2022). Furthermore, the study omitted the stage of start-up development, which unfortunately may have resulted in the need for more definitive results, particularly in financing through foreign business angels. Moreover, dichotomizing variables (presenting variables on a weak scale) may raise particular concerns.

We based this empirical study on a relatively small sample of 220 Polish start-ups. Thus, future research should include more respondents. It would also be beneficial to conduct panel surveys of the studied start-ups since early internationalization is a dynamic phenomenon that changes over time. This would enable capturing the evolving trends in the continuously evolving theory of internationalization. Furthermore, while quantitative research allows for some objectivity in responses, it would be valuable to incorporate qualitative or mixed methods in the research on early internationalization, as emphasized in the literature (*e.g.* Onkelinx & Sleuwaegen, 2010; Rialp *et al.*, 2005), which would shed further light on the internationalization process. Future researchers could expand this study to other institutional contexts, including emerging markets and developing economies, thereby broadening our knowledge of the impact of foreign venture capital funds and business angels on early internationalization. Onkelinx *et al.* (2016) and Sekliuckeine (2015) have similar suggestions in this regard. It would also be worth conducting research in a different cultural context to confirm whether our results allow for generalization and replicability. In future research, it would undoubtedly be necessary, especially in the context of financial capital, to consider the stage of development of the analysed start-ups since some studies indicate that the source of financial capital may differ depending on the stage of development of a given start-up (*e.g.* Klačmer *et al.*, 2014).

The study has several practical implications. Suppose new entrepreneurs need more solid international experience and networks. In that case, acquiring them by hiring qualified managers in this area and supporting activities focused on developing cooperation in various entrepreneurial organizations is beneficial. This can enable founders to have easier access to external investors. In terms of financial capital, operationalized in this study through the variables FOR_VENT_CAP and FOR_BUS_ANG, governments of individual countries should try to eliminate barriers to accessing financing for international business activities for start-ups.

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Authors

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

Krystian Bigos

Assistant Professor at Krakow University of Economics, Department of International Trade at College of Economics, Finance and Law. His research interests include early and rapid internationalisation, international start-ups, and international entrepreneurship.
Correspondence to: Krystian Bigos, PhD, Department of International Trade, Krakow University of Economics, ul. Rakowicka 27, 31-510 Kraków, Poland, e-mail: bigosk@uek.krakow.pl
ORCID http://orcid.org/0000-0001-6030-4119

Adam Michalik

Assistant Professor at Krakow University of Economics, Department of International Trade at College of Economics, Finance and Law. His research interests include entrepreneurship, foreign investments, and the security of business transactions.
Correspondence to: Adam Michalik, PhD, Department of International Trade, Krakow University of Economics, ul. Rakowicka 27, 31-510 Kraków, Poland, e-mail: michalia@uek.krakow.pl
ORCID http://orcid.org/0000-0002-9333-408X

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Talent management practices and the performance of firms: Evidence from Polish SMEs

Aleksy Pocztowski, Urban Pauli

A B S T R A C T
Objective: This article aims to identify and explore a potential relationship between talent management (TM) practices and performance in small and medium-sized enterprises (SMEs). Despite the growing number of publications on talent management, scholars rarely investigate such a link in this type of enterprise.
Research Design & Methods: We collected data from 200 randomly selected Polish SMEs. We interviewed respondents about the characteristics of TM practices they apply and the performance they achieve. The data revealed three clusters of approaches to TM (acquisition, retention, and complex) and two frequencies in running talent management activities (systematic and occasional). These verified a potential link with HR-related, organisational, and business performance outcomes.
Findings: Analyses revealed a statistically significant relationship between TM practices and most HR-related outcomes, some organizational outcomes, and almost no business performance outcomes. Moreover, we proved relationships between approaches to talent management and some performance indicators.
Implications & Recommendations: Small and medium-sized enterprises benefit from using a systematic approach to TM in the form of a positive impact on particular performance areas referring to business outcomes and brand recognition. The TM practices SMEs apply help overcome challenges they face. Thus, we advise defining the main goal of TM should before undertaking particular actions.
Contribution & Value Added: This article contributes to the body of knowledge on TM in SMEs and explores the relationship between TM practices and performance. Part of the examined relationships between indicators of TM and those describing performance was confirmed as statistically significant.

INTRODUCTION

Talent management (TM) has emerged as a field of scientific interest as confirmed by the number of publications on this topic (McDonnell *et al.*, 2017). The foundation for the development of this area of research were publications relating to large and international organisations. These types of entities have well-developed HR departments, advanced HR processes and, most importantly, are able to identify outperformers and/or individuals with high potential. Identifying such employees requires designing activities for managing them as they constitute a key value for the organisation. The analysis of these activities is in line with the best-practice approach in research, aimed at defining the scope of activities that are effective both in retaining talents and in the optimal use of their potential. Nevertheless, research shows that full compliance between the implementation of TM solutions based on best-practice and the performance of the organisation does not always occur (Valverde *et al.*, 2013; Krishnan & Scullion, 2017). Moreover, scholars indicate that some organisations which implement

other activities or configure them differently may achieve better results. These findings are in line with the best-fit approach, which includes implemented practices and achieved outcomes. This approach has also enabled significant development of TM research in entities that are not large and international. The research showed that by taking into account specific conditions, it is possible to identify not only different TM practices but also various perceptions of who a talented employee really is for a particular organisation. As a result of such a change in approach, scholars published studies on TM in SMEs (Festing *et al.*, 2013; Valverde *et al.*, 2013; Krishnan & Scullion, 2017; Bethe-Langeneger *et al.*, 2018; Pauli & Pocztowski, 2019), which despite not being able to implement the same solutions as large entities, also undertake actions aimed at talent management. A multitude of perspectives and the diversity of context have resulted in the lack of a coherent approach to defining talents (Gallardo-Gallardo *et al.*, 2017; McDonnell *et al.*, 2017). Furthermore, research shows that obtaining a consensus on this issue may not be possible. In existing research, the relationship between TM in SMEs and the company's outcomes is not sufficiently represented. Moreover, Harney and Alkhalaf (2021) indicate that there is insufficient evidence in research about the impact of HRM practices on SMEs' performance. Thus, this article addresses the research gap in approaches to TM in SMEs and the link between TM practices and performance. It also contributes to the body of knowledge on TM in SMEs operating in emerging markets, which Sparrow *et al.* (2015) recommended as a research direction.

The article aims to present approaches to TM applicable in SMEs and their association with firms' performance. The article will start with a literature review presenting determinants of HRM and TM in SMEs, approaches to TM, and links between TM and performance. Next, we will present hypotheses, measures applied, and sample description and then – the results and discussion. Finally, we will focus on research limitations and possible directions of studies.

This article contributes to the existing body of knowledge by extending evidence relating to TM practices in SMEs and provides information about approaches to TM in SMEs that can be applied and the scope of particular practices. It also provides evidence about the link between TM and SMEs' performance.

LITERATURE REVIEW

HRM and TM in SMEs

Human capital is significant for SMEs, because they have a limited availability of resources and thus focus on taking full advantage of what they have. Employees are a key resource and therefore, SMEs should properly implement HRM processes. Nevertheless, in these types of organizations, owners and managers focus more on operational activities than on implementing professional solutions in supporting functions, which is considered to be HRM. This approach is in opposition to the results of research aimed at identifying the relationship between HRM and the performance of SMEs, which confirms that the potential of SMEs in building a sustainable competitive advantage is strongly related to the quality of HRM (Vlachos, 2009; Patel & Cardon, 2010; Razouk, 2011; Sheehan, 2014). Moreover, the results of the Rauch and Hatak's (2016) meta-analysis showed that HR practices (HR-, motivation-, and empowerment-enhancing) positively impact SME performance.

The implementation of professional HRM solutions in SMEs is problematic, not only because owners and managers concentrate on major processes but also because of limited employment or organisational challenges. Implementing HR solutions may require changes in organisational structure and generate costs that SMEs cannot afford (Patel & Cardon, 2010). However, there are no general solutions for SMEs due to their heterogeneity (Wappshot & Mallet, 2016). These companies operate in diverse contexts, which makes it difficult to find a common approach to the execution of HRM activities. Moreover, due to this heterogeneity and the lack of HR departments or HR-related positions, it is not possible to adopt solutions used in large organisations (Pauli & Pocztowski, 2019).

Based on results of research on HRM in SMEs conducted two decades ago, Cardon and Stevens (2004) indicated that SMEs experience many challenges in HRM, including attracting talents, employer branding, and maintaining employment flexibility, thus ensuring the development of employees who could support running the business in a changing environment. Growing competition and emerging shocks make TM crucial for SMEs. Research on TM has led to the conclusion that professional TM is a key success

factor in building a competitive advantage (McDonnell *et al.,* 2017) and in international organisations, the TM process can even be considered a critical capability (Morley *et al.* 2015). Nevertheless, the topic of TM in SMEs remains under-investigated and there is a lack of studies showing various approaches and their impact on the overall functioning of these types of organisations. In 2013, Festing *et al.* (2013) and Valverde *et al.* (2013) published two very important publications on TM in SMEs, which highlighted the insufficient amount of research on TM in SMEs. The publications also indicate that TM practices cannot be implemented in SMEs indiscriminately without taking into account their specific context and organisational, resource, and economic constraints (Heneman *et al.,* 2000; Festing *et al.*, 2013; Krishnan & Scullion, 2017). An additional challenge in investigating TM in SMEs stems from the lack of a unanimous definition of talent and a coherent understanding of who a talented person is. As Dries (2013a) concludes, talent can be defined in various ways by different people or organisations (for the potential definition of talent see Dries, 2013b; Pocztowski *et al.*, 2021). Valverde *et al.* (2013) confirmed it in the SMEs context by presenting a variety of approaches to defining talent in Spanish SMEs.

Publications on TM define its scope in various ways. For example, Stahl *et al.* (2007) indicate that TM includes recruitment and selection, succession planning, training and development, performance management, compensation and benefits, retention, and employer branding. Valverde *et al.* (2013) conclude that TM includes all activities aimed at identifying, selecting, developing, and retaining the best employees for strategic positions. Collings and Mellahi (2009) claim that TM comprises all activities and strategies that involve the systematic identification of key positions that have a direct impact on sustainable competitive advantage and on the creation and development of talents who can fill these positions. Nijs *et al.* (2014) indicate that TM encompasses strategic investments regarding talent identification, selection, development, planning, and retention. Cappelli and Keller (2014) indicate that TM is a critical process through which organisations anticipate and meet their needs for talent in strategic jobs. Luna-Arocas and Morley (2015) define TM as a systematic approach to the attraction, development, and retention of people with excellent competencies.

Based on the above definitions, we may indicate that TM should be a systematic approach aimed at identifying, acquiring, evaluating, developing, and rewarding employees of key importance to the organisation. However, these definitions were developed mostly based on research on large entities and as mentioned before, researchers postulate not to transfer TM solutions from large organisations to SMEs as they design and implement HRM and TM practices differently (Krishnan & Scullion, 2017). Moreover, these definitions are based mainly on the best-practice approach, which assumes that it is possible to create an optimal configuration of TM solutions. However, scholars have questioned this approach due to the diversity of the context SMEs operate in and as a result, the application of the best-fit approach is postulated (Gallardo-Gallardo *et al.*, 2017).

Approaches to TM in SMEs

The considerations presented in the previous section indicate that TM should include systematic activities related to various areas and that a best-practice or best-fit approach could be applied. Nevertheless, taking into account the heterogeneity of SMEs, the complexity of the context they operate in, and the specificity of HRM solutions, TM in such organisations should be analysed individually (Pocztowski & Pauli, 2022). This is consistent with the approach by which we should understand TM in the context of firms' strategic capabilities and include a unique configuration of activities and initiatives (Joyce & Slocum, 2012). Krishnan and Scullion (2017) also indicate that changes in SMEs resulting from their growth cause structural modifications, which limits the possibility of identifying key/strategic positions and acquiring and developing talents in advance to take up these positions. The authors also claimed that the best-practice approach is applicable to large, international organisations rather than to SMEs (Krishnan & Scullion, 2017).

The results of research on TM in SMEs prove that in these organizations there are different configurations of practices and they rarely overlap with those defined for large entities. Valverde *et al.* (2013) claims that SMEs define talents in different ways. Moreover, many SMEs undertake activities related to talents without naming it TM. Bethke-Langenegger *et al.* (2011) also present the differentiation of approaches to TM in SMEs. They indicated that in SMEs, there are four possible aspects of

TM, *i.e.* supporting corporate strategy, enabling succession planning, attracting and retaining talents, and developing talents. Festing *et al.* (2013) indicate the existence of three approaches to TM referring to the scope of activities executed: highly engaged TM, retention-based TM, and reactive TM. Dalal and Akdere (2021) also adopted the practice-based classification in their study, in which the authors divided TM-related practices into acquisition, engagement, development, and retention. In their classification, Pauli and Pocztowski (2019) and Pocztowski *et al.* (2021) included information concerning the understanding of talent, participants of TM programmes, goals of development, frequency of implementation and goals of TM practices. They developed a model including six clusters, *i.e.* high-performance manager, high-performance specialist, high-potential internal consultant, high-potential specialist, high-potential manager, and creator.

Based on the presented publications, we may indicate that there are studies aimed at systematising knowledge about TM in SMEs. The recurring element in the discussed concept is the frequency and scope of activities focused on people recognised as talents. The scope depends on the needs of a specific company and may be modified depending on the situation. Such actions are fully consistent with the general approach to the implementation of HRM in SMEs, which is characterised by a low level of formalisation and high flexibility. In this context, according to Krishnan and Scullion (2017), we may conclude that in SMEs, a dynamic approach to TM is more appropriate.

Talent Management and Firms' Performance

From the organisational perspective, it is crucial to find the relationship between activities aimed at the optimal use of human capital and their impact on performance (Collings, 2014). According to Cardon and Stevens (2004), the approaches introduced in particular organisations for staffing, compensation, development, performance management, organisational change, and labour relations have a direct impact on how companies deal with contextual challenges and thus influence their performance. According to Glaister *et al.* (2018), TM is a key mechanism by which HR-oriented practices interact with organisational performance. Furthermore, Collings *et al.* (2018) indicated that TM in the context of performance is an important research direction.

There are various measures applied to analyse the association between HRM and firms' performance which we may evaluate with the use of reported outcomes. However, Dyer and Reeves' (1994) approach seems to be the most coherent and comprehensive as it refers to the most important categories of performance indicators. It includes HR-related, organisational, and financial outcomes. Schuler (2015) presents a slightly different division of TM outcomes focusing on the 'consequences' of implemented programs. In his model, he analysed effects on three levels: individual, organisational, and national. In our study, the 'consequences' indicated at the organisational level are particularly important and they include building the employer's brand, employee retention, increasing work efficiency, improving flexibility, and increasing motivation. According to Mensah (2015), TM practices do not increase performance directly but generate 'outputs' that are the basis for outcomes. Moreover, Mensah (2015) claims that TM practices build job satisfaction, engagement, motivation, commitment, and perceived organizational support, which in turn impact performance. Skuza (2018) analysed the impact of TM on the learning processes of enterprises and their results in medium and large companies. The study used the concept of TM maturity, indicating that the higher the maturity of TM, the stronger the impact on results.

Research on the link between TM and performance uses different approaches both in terms of TM and performance indicators. Concerning TM, scholars adopt either a holistic approach treating TM as a coherent system or analyse specific processes or approaches. Concerning performance, scholars also use various measures which generally refer to HR-related, organisational, and business performance areas.

Glaister *et al.* (2018) showed that all HR practices have an impact on performance, which they calculated using a subjective comparison to other firms in the same industry. However, Glaister *et al.* (2018) indicated that the strongest relationship was observable in stimulating learning, project teams, networking, in-house development programmes, cross-disciplinary working, formal career plans, coaching, and mentoring. Bethke-Langeneger *et al.* (2011) claim that with HR-related outcomes, there are relationships between 'focus on developing talents' and job satisfaction; performance motivation,

commitment and trust in leaders; 'focus on attracting and retaining' and work quality and qualifications. Regarding organisational outcomes, 'focus on developing' talents impacts an employer's attractiveness. Regarding corporate profit, there is a relationship between 'focus on succession planning' and the company's results, while 'focus on attracting and retaining' talents has no impact on the company's profit. The results of a study by Lančarič *et al.* (2021) confirmed that various 'phases' of TM affect performance differently. The TM strategy, talent identification and evaluation do not affect organisational performance. Talent development and retention have a significant impact on organisational performance. Harsch and Festing (2020) showed that TM affects flexibility, innovation, proactivity, quality, profitability, customer orientation, transparency, coopetition, and entrepreneurship. Dalal and Akdere (2021) claim that TM practices covering acquisition, development engagement, and retention have a significant impact on willingness to stay, job engagement, affective commitment, job satisfaction, and competency. Jimoh and Kee (2022) indicate that talent attraction and talent development have a significant impact on task performance. They did not identify any relationship between talent retention and task performance. Kumar (2022) claims that employee turnover and retention are directly related to TM practices, including recruitment and selection, teamwork and management support, performance and career management, and salary and compensation. Das *et al.* (2023) assessed corporate reputation, financial performance, and non-financial performance. The results proved that there is a relationship between TM practices and all investigated indicators. Noteworthy, thanks to the implementation of various types of development programs, TM can build the interdisciplinarity of employees. Talents are then able to perform various tasks and thus contribute to an organisation's development by improving processes, products, or technologies. Furthermore, such activities may be a response to the shortage of highly qualified people (Levenson, 2012). The research results confirm that there is a relationship between TM and company outcomes. These dependencies have been demonstrated between particular practices and various performance indicators and between the generally understood TM and specific dimensions of outcomes. The research analyses show that there is no coherent approach to assessing the relationship between TM and performance. Even when using the model proposed by Dyer and Reeves (1994), different measures are used.

Based on the literature review, we may indicate that TM practices should be continually implemented as only the systematic realisation of HRM initiatives enables achieving the assumed level of performance. On this basis, we formulated the first hypothesis:

H1: The SMEs executing TM practices systematically report better outcomes than those introducing these practices occasionally.

H1a: The SMEs executing TM practices systematically report better HR-related outcomes.

H1b: The SMEs executing TM practices systematically report better organisational outcomes.

H1c: The SMEs executing TM practices systematically report better business outcomes.

According to the literature review (Stahl *et al.*, 2007; Valverde *et al.*, 2013; Collings & Mellahi, 2009; Nijs *et al.*, 2014; Luna-Arocas & Morley, 2015), TM models should include a set of interconnected practices that constitute a coherent system. This assumption is mainly based on the concept of best-practice, but some researchers postulate that a best-fit approach should be applied to SMEs. Therefore, SMEs can implement different approaches to TM taking into account particular practices to a greater or lesser extent. Thus, we hypothesised the following:

H2: The approach SMEs apply to TM practices is associated with company outcomes.

H2a: The approach SMEs apply impacts HR-related outcomes.

H2b: The approach SMEs apply impacts organisational outcomes.

H2c: The approach SMEs apply impacts business performance outcomes.

Therefore, we assumed that the SME's approach to TM would have an impact on the company's results. According to the theoretical background, companies with the most comprehensive TM solutions should achieve better results than those implementing practices focusing only on certain areas.

RESEARCH METHODOLOGY

Sample

The research employed questionnaire interviews with managers and people dealing with HR matters. We randomly selected the participating 200 companies from the Statistics Poland database. To qualify for selection, the companies had to confirm the implementation of TM practices. In accordance with the definition provided by the EC, we included companies employing 10-250 people. Table 1 presents the sample characteristics.

Table 1. Sample characteristics (in %)

Activity range	Local		Regional		Domestic		International	
	16.0		36.0		35.0		13.0	
Age	3-5 years	5-8 years		9-12 years	13-16 years		over 16 years	
	10.5	17.5		18.0	25.5		28.5	
Sector	Industry	Transport	Retail	Construction		Consulting		Others
	22.0	19.0	17.5	16.5		7.0		18.0
Number of employees	up to 50				51-250			
	67.0				33.0			

Source: own study.

Measures Applied

Frequency of executing TM: we asked respondents to indicate whether they run TM activities systematically or occasionally. Of the surveyed companies, 10% did not answer this question. Among the remaining group, 35.6% indicated the implementation of activities occasionally and 64.4% systematically.

Approach to TM: we asked the respondents to indicate which TM processes they implement (acquisition, identification, appraisal, development, remuneration and compensation, careers). Based on the obtained answers, we identified three approaches to TM:

− Acquisition-oriented (51 entities, 25.5%) – companies that only execute activities related to searching for talents outside the organisation, recruiting talents, and identifying them within the firm.
− Retention-oriented (75 entities, 37.5%) – companies implementing a combination of various activities related to talent development, assessing, and planning career paths. These entities did not run acquisition-oriented activities.
− Complex (74 entities, 37%) – companies implementing a diverse combination of activities related to talent acquisition and development, evaluation, remuneration, bonuses, and career paths.

Based on the general classification by Dyer and Reeves (1994), we developed a set of measures to evaluate HR-related, organisational, and business performance outcomes. We present detailed information about the measures and their scales below. The reliability of this part of the questionnaire – calculated with the use of Cronbach's alpha – was at the level of 0.74 which is acceptable.

HR Related Outcomes

− Number of employees – we asked respondents to evaluate changes in employment within the last five years using a five-grade scale (definitely decreased – definitely increased).
− The image on the internal labour market – categorical measures referring to the way employees perceive the organisation (categories are presented in Table 2).
− The image on the external labour market – referred to the employer brand and the way potential candidates perceive a particular organisation (categories are presented in Table 2).
− Employee engagement – referred to perceived overall employee engagement, assessed with the use of a five-grade scale (very low – very high).

Organisational Outcomes

− Measures referring to three areas of improvement: (1) products/services, (2) technology, and (3) internal processes. We evaluated the scope of modifications within the last three years with the use of a three-grade scale (we have not introduced any changes, we have introduced minor changes, we have introduced significant changes).

− Company image – we asked respondents to evaluate whether they 'have not built their image', they have 'a positive' or 'a positive and well-grounded' image.

− Brand recognition – we asked respondents to evaluate changes in brand recognition among customers within the last five years using a three-grade scale.

Business Performance Outcomes (Changes Within the Last Five Years)

We asked respondents to evaluate changes in the listed business performance indicators within the last five years using a five-grade scale (definitely decreased – definitely increased). The indicators included sales volume, sales value, profits, number of customers, and overall financial condition.

Analytical Procedure

Firstly, we analysed and classified the TM practices implemented in SMEs. On this basis, we identified three approaches to TM, which we later used to verify the second hypothesis. Because the variables used in the study were categorical, to assess the occurrence of relationships, we used a Chi-squared test (Bors, 2018, pp. 228-232). We performed the dependency analysis for three p-value levels: < 0.05, 0.01, and 0.001. In some cases, we also conducted a discussion for statistically significant relationships with $p<0.1$. Although this value is above those commonly used and recommended in statistical analyses, it may indicate the presence of potential relationships for more homogeneous populations. Discussing the occurrence of potential relationships may therefore help define further research directions.

RESULTS AND DISCUSSION

TM and HR-Related Outcomes

Based on the research results, we may indicate a statistically significant relationship between the approach to TM and the image of the employer both on the internal and external labour market (see Table 2). Employees perceive the vast majority of companies (86.5%) with complex TM as offering a diversified employee value proposition. The share of companies with such a brand among retention-oriented entities is 68% and among acquisition-oriented companies – less than half. On the external labour market, the surveyed companies build their image in relation to certain task areas. Almost 71% of companies with complex TM are perceived as potential employers in some areas of their activity, among retention-oriented companies, there are nearly 49% with such a brand and 33% in acquisition-oriented companies. Moreover, in the group of companies with complex TM, there is the largest share of entities claiming that people perceived them as an employer of choice.

These research results are consistent with the findings of Bethke-Langeneger *et al.* (2011) who showed that *focus on developing talents* (which in our research is a component of complex and retention-oriented TM) positively impacts employer's attractiveness and with the results of Das *et al.* (2023) who confirmed that TM practices positively impact company reputation. Acquisition-oriented companies have not built an employer brand, which can make it difficult to attract valuable employees. In these entities, the focus on acquisition may result from a talent shortage, which hinders the functioning of organisations. By implementing activities aimed at attracting talents, firms want to acquire employees with particular competencies. This is related to the conclusions of Cardon and Stevens (2004) that through appropriate HR practices, SMEs try to address the challenges they face.

There is also a potential relationship ($p<0.1$) between changes in employment, the engagement level and the approach to TM. In the majority of acquisition-oriented companies (68.8%), employment has not changed over the last five years, while in over 40% of retention-oriented and complex companies,

Table 2. Relationship between the approach and frequency of TM and outcomes

Indicators of HR-Related outcomes	Approach			Frequency	
	Acquisition	Retention	Complex	Occasion-ally	Systemati-cally
Number of employees	χ2=13.78155, p=0.08764			χ2=7.954833, p=0.09325	
Definitely decreased	2.1	1.4	4.4	1.7	0.0
Slightly decreased	8.3	10.0	16.2	15.5	11.9
Remained stable	68.8	47.1	36.8	48.3	50.5
Slightly increased	12.5	25.7	29.4	29.3	20.2
Definitely increased	8.3	15.7	13.2	5.2	17.4
The image on the internal labour market	χ2=27.6, p=0.00056			χ2=19.69413, p=0.00057	
Our employees do not perceive us in a unique way.	33.3	13.3	6.8	31.3	7.8
We are a firm offering interesting tasks or projects and jobs adequate to employees' competences.	5.9	5.3	5.4	1.6	5.2
We are a firm with a friendly social climate and addressing employees' needs.	3.9	5.3	1.4	4.7	3.5
We are a firm offering attractive working conditions, salary and development.	7.8	8.0	0.00	6.3	3.5
We are a firm offering diversified employee value propositions.	49.0	68.0	86.5	56.3	80.2
The image on the external labour market	χ2=21.0519, p=0.00180			χ2=26.35731, p=0.00001	
We are not recognised on the labour market; candidates respond to job offers.	29.4	9.3	5.4	28.1	4.3
Potential candidates identify us on the labour market but there is nothing that distinguishes us from others.	21.6	24.0	14.9	25.0	16.9
We are perceived as a potential employer but only in some areas of our activity.	33.3	49.3	60.8	32.8	57.8
Candidates perceive us as a good employer, and they want to work with us.	15.7	17.3	18.9	14.1	21.6
Employee engagement	χ2=13.74412, p=0.08868			χ2=7.497159, p=0.11183	
Very low	2.0	0.0	0.00	1.6	0.0
Low	7.8	12.0	6.8	14.1	6.0
Average	23.5	37.3	31.1	34.4	31.0
High	47.1	40.0	56.8	37.5	53.5
Very high	19.6	10.7	5.4	12.5	9.5

Source: own study.

employment has increased. Therefore, we may assume that the implementation of retention-oriented or complex TM approaches builds the employer brand and supports processes related to retaining or acquiring talents. Actions aimed at acquisition without the implementation of activities aimed at ensuring the appropriate employee value proposition do not bring expected results. This is in line with the conclusions of Kumar (2022), who showed that employee turnover and retention intentions are related to a set of diverse TM practices. The results related to the assessment of the level of employee engagement are surprising. Among the surveyed companies, entities implementing acquisition-oriented TM (66.7%) rated engagement most often high or very high, while 50.7% with retention-oriented TM and 62.2% with complex TM indicated level of engagement as high or very high. Employee engagement was rated the highest in the group of companies that do not take any actions aimed at retaining talents and focus only on acquisition. This conclusion is contrary to the results of Bethke-Langeneger *et al.* (2011) who showed that focus on developing talents is strongly related to job commitment; Mensah (2015) – who showed that TM practices build engagement, and Dalal and Akdere (2022) – who showed that comprehensive solutions in TM have an impact on job engagement. Based on the research results, H2a was

supported – there is an association between TM approaches and HR-related outcomes, but it works the opposite way. These are HR-related outcomes that create the approach to TM in SMEs.

Referring to the link between the frequency of executing TM and HR-related outcomes, there is a statistically significant relationship between the frequency and the image on the internal and external labour market (Table 2). Over 80% of companies implementing TM systematically declare that they are perceived as offering a diversified employee value proposition, compared to 56% of companies implementing TM occasionally. Moreover, over 31% of companies implementing TM occasionally do not have a good employer brand among their employees. Nearly 53% of companies implementing TM occasionally declare that they are not recognised by candidates or that there is nothing that would distinguish them from other entities. Among the companies that implement TM systematically, nearly 22% declare that they have built an employer of choice brand and nearly 58% state that they are a desirable employer in selected areas (p<0.001). The obtained results indicate that there may also be a relationship between the frequency of TM-related activities and changes in the number of employees. However, the distribution of answers in these two groups does not indicate any differences. Companies implementing TM activities systematically declare employment stability or increase slightly more often (p<0.1). The distribution of answers given in relation to employee engagement shows that companies implementing TM systematically assess its level higher than those implementing TM practices occasionally. However, this relationship is not statistically significant. The research results showed that there is a statistically significant relationship between the frequency of undertaking actions aimed at talents and the image of the organisation on the internal and external labour market and that there may be a relationship between the frequency and changes in employment (p<0.1). Therefore, H1a was partially supported.

TM and Organisational Outcomes

The research results showed that there was a statistically significant relationship between the approach to TM and the company's image and brand recognition (see Table 3). Over 20% of complex TM companies had a good and well-grounded image, while in retention oriented it was 12% and in acquisition oriented – 6%. Nearly 80% of entities in each category of approaches believed that they had a positive market image. The relationship between the approach and the image of the organisation was statistically significant. Concerning changes in brand recognition, entities with complex TM most often confirmed positive changes. Moreover, nearly 60% of acquisition-oriented companies believed that their brand recognition had not changed over the last five years. The results of our studies, stating that companies with complex TM to the greatest extent declare that they have built a strong and positive brand and that the recognition of their company is increasing, are consistent with the conclusions formulated by Schuler (2015).

Regarding technology improvements, internal processes, and approaches to TM, there was no statistically significant relationship. Concerning changes in products and services, there were differences between companies declaring different approaches, but these dependencies were statistically significant for p<0.1. Most often, acquisition-oriented companies (14%) were the ones to introduce considerable improvement. However, changes (minor and significant) most often appeared in companies with complex TM. This partly contradicts the results of Harsch and Festing (2020), who indicated that TM has an impact on innovation. Regarding organisational outcomes, the approach to TM has an impact on the image of the organisation and its changes. In the group of companies with complex TM, significant or minor improvements in products and services were most often implemented. However, this relationship was significant for p<0.1, and we found no statistically significant relationship with regard to changes in internal processes and technology. Therefore, H2b was partially supported.

Regarding the frequency of activities aimed at talents, we confirmed a statistically significant relationship only in relation to the organisation's image. Almost all companies organising TM systematically showed that they had a positive image, of which nearly 16% declared that it was additionally well-grounded. Frequency in the implementation of TM programs seems to have little impact on organisational outcomes. We observed a statistically significant relationship only in relation to company image. Regularity in the implementation of TM practices supports building a positive

image of the organisation. Regarding the remaining determinants, we confirmed no statistically significant relationship, thus, we rejected H1b.

Table 3. Relationship between the approach and frequency of TM and organisational outcomes

Indicators of organisational outcomes	Approach			Frequency	
	Acquisition	Retention	Complex	Occasionally	Systematically
Improvements in products and services	χ2=8.990788, p=0.06133			χ2=2.131273, p=0.34451	
Not introduced	27.5	45.3	25.7	28.1	35.3
Minor modifications	58.8	45.3	66.2	59.4	57.8
Significant improvements	13.7	9.3	8.1	12.5	6.9
Improvements in technology	χ2=3.619306, p=0.45997			χ2=0.770674, p=0.68022	
Not introduced	33.3	29.3	37.8	28.1	34.5
Minor modifications	60.8	60.0	48.7	60.9	55.2
Significant improvements	5.9	10.7	13.5	10.9	10.3
Improvements in internal processes	χ2=2.878715, p=0.57832			χ2=1.383777, p=0.50063	
Not introduced	27.5	32.0	20.3	21.9	27.6
Minor modifications	45.1	45.3	52.7	54.7	45.7
Significant improvements	27.5	22.7	27.0	23.4	26.7
Company Image	χ2=13.76258, p=0.00809			χ2=20.99448, p=0.00003	
We have not built our company's image	15.7	6.7	1.4	18.8	0.9
We have a positive image	78.4	81.3	78.4	73.4	82.8
We have a good and well-grounded image	5.9	12.0	20.3	7.8	16.4
Brand recognition	χ2=17.48385, p=0.02545			χ2=5.67897, p=0.22444	
Definitely decreased	4.1	1.4	2.9	1.7	0.9
Slightly decreased	2.0	4.3	16.2	3.4	10.1
Remained stable	59.2	45.7	32.4	49.2	41.3
Slightly increased	24.5	35.7	29.4	37.3	30.3
Definitely increased	10.2	12.9	19.1	8.5	17.4

Source: own study.

TM and Business Performance Outcomes

The analysis of links between the approach to TM and business performance outcomes confirmed the existence of a statistically significant relationship only with sales volume (see Table 4). Retention-oriented companies most often indicated that sales volume had increased. Regarding other indicators, we noticed that companies implementing retention-oriented and complex TM declared better results than those that were acquisition oriented. However, we did not statistically confirm these relationships. This is partly consistent with the findings of Bethke-Langeneger *et al.* (2011), according to whom *focus on attracting and retaining* talents does not impact company profit. Similarly, Lančarič *et al.* (2021) indicated that *focus on strategy*, *talent identification and appraisal* does not affect performance. However, they claimed that talent development and retention influence performance. Our results oppose also Das *et al.* (2023), who demonstrated the impact of TM practices on financial performance. Statistical analyses confirmed a relationship between TM approach and business performance outcomes only in relation to sales volume. Based on the obtained results, we rejected H2c.

Regarding the links between the frequency of executing TM and business performance indicators, we observed that entities systematically implementing these practices more often indicated positive changes than those implementing them occasionally. Nevertheless, we confirmed statistical dependence only for the number of customers. Nearly 54% of companies running TM practices systematically indicated that the number of clients increased slightly or definitely, while in the group of entities that run TM practices occasionally, only 35% recorded increases. In the case of business outcomes, we confirmed a statistically significant relationship only with the number of customers, thus, we rejected H1c.

Table 4. Relationship between the approach and frequency of TM and business performance outcomes

Indicators of business performance outcomes	Approach			Frequency	
	Acquisition	Retention	Complex	Occasionally	Systematically
Sales volume	χ2=23.32947, p=0.00297			χ2=5.65406, p=0.22652	
Definitely decreased	6.3	2.8	8.8	3.5	3.6
Slightly decreased	6.3	8.5	14.7	15.5	7.3
Remained stable	62.5	45.1	33.8	50.0	41.8
Slightly increased	8.3	38.0	26.5	22.4	31.8
Definitely increased	16.7	5.6	16.2	8.6	15.5
Sales value	χ2=10.1666, p=0.25353			χ2=4.805688, p=0.30782	
Definitely decreased	4.2	1.4	3.0	1.7	0.9
Slightly decreased	12.5	16.9	19.4	19.0	14.7
Remained stable	52.1	32.4	28.4	43.1	31.2
Slightly increased	20.8	38.0	32.8	27.6	36.7
Definitely increased	10.4	11.3	16.4	8.6	16.5
Profits	χ2=8.932685, p=0.34801			χ2=3.503672, p=0.47732	
Definitely decreased	8.7	3.0	2.9	3.6	2.8
Slightly decreased	6.5	7.5	7.4	10.9	4.7
Remained stable	54.4	44.8	38.2	45.5	44.9
Slightly increased	21.7	38.8	38.2	34.6	36.5
Definitely increased	8.7	6.0	13.2	5.5	11.2
Number of customers	χ2=9.817245, p=0.27809			**χ2=11.378, p=0.02263**	
Definitely decreased	4.2	4.4	2.9	5.1	0.0
Slightly decreased	6.3	10.1	10.3	13.6	6.5
Remained stable	56.3	34.8	36.8	45.8	39.3
Slightly increased	20.8	42.0	33.8	28.8	38.3
Definitely increased	12.5	8.7	16.2	6.8	15.9
Overall financial condition	χ2=9.559644, p=0.29730			χ2=3.302731, p=0.50850	
Definitely decreased	2.1	1.4	4.4	0.0	0.9
Slightly decreased	8.5	11.4	16.2	14.0	12.8
Remained stable	57.5	40.0	36.8	43.9	42.2
Slightly increased	21.3	37.1	26.5	35.1	28.4
Definitely increased	10.6	10.0	16.2	7.0	15.6

Source: own study.

CONCLUSIONS

The main aim of this article was to identify and explore the potential relationship between TM practices and performance in SMEs. Our research showed that the greatest dependence between the approach to TM and the performance occurs with regard to HR-related outcomes. This is fully in line with the conclusions formulated by Cardon and Stevens (2004) that SMEs face challenges referring to the acquisition of talents, employer branding, and maintaining employment flexibility. Companies that do not have a properly constructed image as an employer implementing acquisition-oriented TM and, because they evaluate employee engagement as high, do not take retention-focused actions. Retention-oriented entities least often indicate a decrease in the number of employees, declaring their stability or increase and that is why they do not undertake acquisition-oriented activities, but they assess the level of engagement at the lowest, which causes a focus on training, motivation and reward. Small and medium-sized enterprises implementing complex TM evaluate employee engagement as quite high, but they rarely indicate very high engagement (p<0.1). This may be the reason behind undertaking retention-oriented activities. Moreover, these entities declare the highest level of staff turnover and it is therefore necessary to take actions aimed at acquiring talents.

We rejected both hypotheses referring to the link between the approach to TM, its frequency, and business performance outcomes. However, when analysing the distribution of the answers, we observed that companies with a complex and retention-oriented approach declared better results than companies focused solely on acquisition. A similar situation occurred with regard to frequency. Entities systematically implementing TM activities more often declare positive changes in business performance indicators.

Based on our research findings, we may conclude that in SMEs, there is a link between TM practices and outcomes but mostly with regard to HR-related and organisational categories. It is difficult to indicate direct relationships between TM and business performance. Owners of SMEs should be aware that implementing talent-oriented activities may not result in an instant return on investment. Moreover, to benefit from managing talents, they should also implement some actions in other processes and functional areas. As Ingram (2016) concludes, managers should also focus on creating an appropriate organisational climate, because the creation of a TM program itself might be insufficient. As we have stated, it seems that TM practices are based on the challenges SMEs face with managing employees. Thus, SMEs' owners ought to pay attention to general goals that should be defined with regard to HRM while defining the scope of TM activities. Moreover, based on our analysis, we may conclude that focusing on a narrow scope of TM practices does not bring expected outcomes as all these actions should be integrated in a coherent system.

Based on our findings, we might draw some theoretical and managerial implications. Regarding theoretical implications, the most important one refers to the measures applied when analysing the link between HRM/TM and performance in SMEs. Developing a set of fairly universal criteria for evaluating the impact of HRM and TM practices on SMEs' performance seems to be substantial. The classification proposed by Dyer and Reeves (1994) is a very good foundation but requires more detailed indicators and measures. Moreover, as we have concluded, these are HR-related outcomes that shape the TM approach (not the opposite way); the cause-effect relationship should be deeply investigated with regard to other outcomes in the case of SMEs.

Regarding managerial implications, we may state that since the owners and/or managers play a crucial role in TM in SMEs, there is a need to develop their mindset and competences in the field of managing talents. Building competences in this area is a key challenge for managers/owners. Secondly, although the scope of TM practices is diverse and reflects the current business needs, a complex approach to TM seems to most often positively impact firms' performance. Moving from a reactive approach to TM towards a systemic and holistic approach is a current need. Thirdly, when designing TM policies and practices, managers have to take into account specific internal and external factors that can impact them. The creation of a sustainable environment for TM in diversified SMEs is a timely issue.

The limitations of our research are related to two main issues. The first concerns the sample. It was based solely on Polish enterprises. The surveyed entities were very diverse with regard to context and profile. Moreover, it was impossible to identify the whole population of SMEs that run TM programmes, so it was very difficult to choose a representative study sample. The second limitation relates to the applied analysis criteria. We developed our own set of indicators based on those applied in various studies. As a result, we may only partly compare our results to those obtained by other researchers. However, the implementation of TM in SMEs remains under-studied and our research may help in developing a more coherent concept of researching TM in these organisations and identifying their impact on the functioning of SMEs.

Considering the above facts, further research is needed. One possible direction could be the analysis of various groups of SMEs. For example, scholars may adopt a division concerning industry or size. Another possible research direction is to take into account, to a greater extent, the employee perspective and their perception of TM practices. Furthermore, we recommend changing the approach in studying TM/HRM in SMEs from treating these activities as predetermined and intended towards exploration without preliminary assumptions. This approach provides new opportunities for a more in-depth understanding of the nature and specificity of HRM in SMEs. Exploring this issue in the context of new employment models emerging after crises is also important.

Research on the above problems requires the use of a more holistic and context-sensitive approach taking into account achievements of various research perspectives, namely universalistic (best-practice),

contingency (best-fit), resource-based, and ecological theories (Harney, 2021). This will enable the use of various approaches to TM in SMEs and help overcome the limitations of individual research approaches.

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Authors

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

Aleksy Pocztowski

Professor and Chair of Human Capital Management Department at Krakow University of Economics (Poland). Research interests: transformation of HR functions, strategic and international HR management, performance management, leadership, talent management, and diversity issues.
Correspondence to: Prof. dr hab. Aleksy Pocztowski, Krakow University of Economics, Department of Human Capital Management, ul. Rakowicka 27, 31-436 Krakow, Poland, e-mail: aleksy.pocztowski@uek.krakow.pl
ORCID http://orcid.org/0000-0001-7966-7251

Urban Pauli

Associate Professor, PhD habil. in management, works at the Department of Human Capital Management at Krakow University of Economics (Poland). His research interests cover issues of HRM in SMEs, talent management, competency models, and human resource development.
Correspondence to: Prof. UEK, dr hab. Urban Pauli, Krakow University of Economics, Department of Human Capital Management, ul. Rakowicka 27, 31-436 Krakow, Poland, e-mail: urban.pauli@uek.krakow.pl
ORCID http://orcid.org/0000-0002-0196-451X

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Longitudinal evidence of entrepreneurial behaviour in a blockchain-based decentralized autonomous organization: Case study of the Nano cryptocurrency

Alexander Poeschl

A B S T R A C T

Objective: The article aims to investigate how entrepreneurial behaviour among members of decentralized autonomous organizations (DAO) changes over time. Decentralized autonomous organizations allow for the creation of distributed organizations driven by organizational entrepreneurship, many of which are based on blockchain technology. The self-organization of DAO members and their entrepreneurial behaviour are crucial to the organization's development. Research on entrepreneurial behaviour in DAOs is scarce. Cryptocurrency markets, blockchain technologies, and community sentiment can evolve rapidly, making it important to longitudinally research such organizations and the entrepreneurship among their members.

Research Design & Methods: We formulated research propositions and combined qualitative and longitudinal interviews with entrepreneurially active members of a DAO with data science-based sentiment analysis of the main Nano community over the course of 16 months.

Findings: The entrepreneurial behaviour of DAO members can hinge on external circumstances, such as the health of the overall cryptocurrency market. Partly resulting from a crypto downturn, some of Nano's entrepreneurially active members reduced their engagement and stopped or downsized their conduction of entrepreneurial tasks. This change was also linked to lower levels of community activity and deteriorating sentiment scores. Entrepreneurial tasks such as marketing or outreach to customers were conducted to a lesser extent. The resulting picture is one of a fluid state of entrepreneurship within this DAO. We also found internal factors influencing entrepreneurial behaviour, especially related to the distinction between technology-oriented and market-oriented members and their changing levels of activity.

Implications & Recommendations: The findings highlight the influence of external factors – such as the health of the cryptocurrency market – on the entrepreneurial behaviour of DAO members. This suggests that the success and engagement of entrepreneurial individuals within a DAO can be subject to volatility and fluctuations in the broader market, emphasizing the need for adaptability and resilience.

Contribution & Value Added: This is one of the first articles to address the connection between entrepreneurship and DAOs based on blockchain. In doing so, it benefits from a unique data set comprising quantitative and qualitative elements.

INTRODUCTION

According to Mises (1996), entrepreneurship is inherent in every action and is executed as a function. Firm founders can perform this function or delegate it to managers or employees (Freiling, 2006; Freil-

ing & Reckenfelderbäumer, 2010). The understanding of entrepreneurship as a function to be executed is particularly relevant against the background of decentralized autonomous organizations (DAOs). These DAOs govern a group of people who share the same interests and goals (Hsieh *et al.*, 2018; Shermin, 2017; Weking *et al.*, 2020) and typically operate without central headquarters or formal organizations. Instead, they rely on a decentralized network of users and consensus- and voting-based governance and decision-making (Narayanan *et al.*, 2016). Especially in the world of blockchains and cryptocurrencies, DAOs have been widely established and described as scalable networks that are open and self-organized (De Filippi & Wright, 2018). Their main promise lies in being a digital alternative to traditional legal entities, making them easier to execute and join and achieving coordination among participants through cryptocurrency-linked economic incentives (De Filippi & Wright, 2018). As such, they allow for the creation of distributed organizations driven by organizational entrepreneurship (Bellavitis *et al.*, 2022). The intersection between entrepreneurship and DAOs presents an important area for entrepreneurship scholars as DAOs allow for the creation of new business models (Bellavitis *et al.*, 2022), the utilization of alternative funding sources (Adhami *et al.*, 2018), or the seeking of new venture legitimacy (Ingram & Morisse, 2016). Thus, DAOs demonstrate a way to perform the function of entrepreneurship. However, our knowledge of social dynamics and changes to DAO members' self-organization and conducting entrepreneurial functions is very limited (Sun *et al.*, 2022; Lustig & Nardi, 2015; Sun *et al.*, 2022; Tana *et al.*, 2019).

Consequently, we aimed to answer the following research question: how and why does members' entrepreneurial behaviour in a blockchain-based DAO change over time? To answer this research question, we studied the decentralized, blockchain-based community surrounding the NANO cryptocurrency (ticker symbol: XNO). Combining qualitative, longitudinal research with data science, we focused on a 16-month period between June 2021 and November 2022. Using semi-structured, qualitative research interviews, we interviewed five DAO members at the beginning and end of this period. Utilizing web scraping and data science techniques, we conducted a sentiment analysis of Nano's online community's central place of exchange. In doing so, we could put into context the statements by the five entrepreneurial DAO members and match them with overall sentiments and trends in this decentralized community.

In the next section, we will conduct the literature review. Then, we will justify our research question and describe the research methodology. Next, we will present the results and findings. Finally, we will close with a discussion and conclusions.

LITERATURE REVIEW

Decentralized autonomous organizations represent a unique organizational model that relies on community consensus, making decisions via voting processes and implementing tasks through automated procedures (Hsieh *et al.*, 2018; Kondova & Barba, 2019). To illustrate, Nano utilizes open representative voting (ORV) as a consensus-driven decision-making mechanism (LeMahieu, 2018), which entails user-selected representative nodes, responsible for voting on transactions, with other nodes independently verifying transaction validity upon achieving a quorum of votes, resulting in swift transaction confirmation. Users possess the flexibility to delegate their voting influence to representatives at their discretion (LeMahieu, 2018).

As shared public ledgers, Blockchains offer traceability and immutability, enabling DAOs to self-govern effectively while reducing communication and transaction expenses (Adams *et al.*, 2017). The blockchain ledger also guarantees the preservation of all DAO activities, fostering transparency and potentially enhancing community trust and confidence (Kypriotaki *et al.*, 2015). Nano is built 'upon parallel blockchains' (Xiao *et al.*, 2020, p. 26), *i.e.* each node runs its own blockchain.

Crucially, a DAO's individual voting members hold extensive power over the organization's direction. For instance, in the case of the first DAO, members voted on hiring or investment decisions (Adams *et al.*, 2017). The DAO members or entrepreneurs within such a DAO perform practical tasks, *e.g.* they create marketing materials, talk to regulators (Ingram & Morisse, 2016), or even create their own projects on top of the cryptocurrency or blockchain (Beck *et al.*, 2018). This fits our understanding of entrepreneurship as a function to be conducted. Therefore, we defined entrepreneurial behaviour as

conducting entrepreneurial functions (Freiling, 2006). After all, as Mises (1996, p. 253) states: 'Economics, when discussing entrepreneurs, focuses on a specific role rather than individuals.' Freiling (2006) notes that one interpretation of entrepreneurship focuses on entrepreneurial actions and the performance of entrepreneurial functions as opposed to the creation of new businesses alone. This perspective fits well our study on individual entrepreneurs and their entrepreneurial behaviour within DAO. However, such decentralized entrepreneurial behaviour can prove surprisingly complicated regarding actors' coordination (Dupont, 2018) and the DAO suffered from 'a worrisome lack of managerial prowess that would typically use forms of rationalizing behaviour' (Dupont, 2018, p. 12). This is because DAO members 'continuously and dynamically self-organize around projects and outcomes' (Kaal, 2020, p. 34) and all this within a decentralized, autonomous setting where the 'actual mode of operation is in need of a more accurate and detailed definition' (Kypriotaki *et al.*, 2015, p. 8). Generally, DAO members 'aim to educate, promote the adoption, and support the growth of cryptocurrency and blockchain ecosystems' (Tana *et al.*, 2019, p. 5) with differing individual skills and approaches. Stemming from this, the first empirical evidence suggests that 'distributed, large digital community with no central structure can operate in much the same way as a large MNC' (Ingram & Morisse, 2016, p. 4090). However, further research is necessary to back up those claims (El Faqir *et al.*, 2020).

Research on social dynamics and motivations within decentralized organizations is notably scarce (Lustig & Nardi, 2015; Sun *et al.*, 2022; Tana *et al.*, 2019; Yetis-Larsson *et al.*, 2015). This knowledge gap is concerning given the significant variance in how participants perceive common currencies in decentralized communities (Lustig & Nardi, 2015). The motivations and decisions of individual actors are especially critical, considering that DAOs emphasize decentralization by distributing decision-making power among members instead of a central authority (El Faqir *et al.*, 2020).

While current empirical research focuses primarily on technological aspects (Weking *et al.*, 2020), scholars have devoted limited attention to the study of entrepreneurship within these emerging decentralized organizations (Kher *et al.*, 2021). Given that the first DAO was introduced only in 2016 (Liu *et al.*, 2020), governance and work coordination within these organizations remain largely unexplored (Chohan, 2017). The disintermediating potential of blockchain-based organizations represents a promising avenue for future research, particularly when gathering insights from practitioners (Adams *et al.*, 2017).

It is crucial to understand how blockchain-based DAOs influence the orchestration of entrepreneurial functions among their members, as the decisions of all members govern these organizations (Kondova & Barba, 2019). Moreover, the element of time becomes increasingly relevant. Longitudinal research is essential to comprehending the roles and trajectories of DAO members over time, considering the rapid evolution of blockchain technology, community ideology, and market volatility within the cryptocurrency realm (Chalmers *et al.,* 2021). Existing evidence indicates that behavioural aspects of cryptocurrencies, such as herding effects, exhibit significant fluctuations over time (Bouri *et al.*, 2019). Previous DAOs have undergone dramatic changes over time (DuPont, 2018). Therefore, accounting for time is crucial in DAO and blockchain research, especially within the context of entrepreneurship, which involves a series of evolving events (McMullen & Dimov, 2013).

Moreover, it remains unclear how non-financial incentives are aligned within DAO or how any further strategic and operational development of a particular DAO is incentivized (Beck *et al.*, 2018). This remains an important question as a DAO's decentralized dynamics can lead to it changing significantly over time, such as starting as an instrument for members' collective investment 'and then morph into a community, a grant organization, a sponsor of creative work, an incubator of entrepreneurial ventures, a trading platform, or anything else' (Slavin & Werbach, 2022, p. 13). This becomes even more relevant as scholars found that members and investors interested in decentralized structures possess different motivations (Fisch *et al.*, 2021; Tana *et al.*, 2019). As cryptocurrencies can be prone to herding behaviour (Bouri *et al.,* 2019) or be dependent on stakeholders' happiness and sentiment (Naeem *et al.*, 2021), DAO members' feelings and attitudes and their effect on the DAO still constitute a research gap.

Based on the discussion above, we formulated two research propositions that guided our data collection and analysis. Based on earlier literature contributions highlighting the variance of DAO members within communities, we propose:

***Proposition* 1*:** The DAO members motivated by cryptocurrency's technological aspects will display a different entrepreneurial behaviour over time than the members mainly motivated by financial aspects.

Based on the discussion surrounding different motivations and sentiments among DAO members, we propose:

***Proposition* 2*:** The DAO members' perception of the health and desired direction of the DAO influences these individuals' entrepreneurial behaviour.

RESEARCH METHODOLOGY

To gain a comprehensive understanding of this relatively unexplored topic (Tana *et al*., 2019; Yetis-Larsson *et al*., 2015; Sun *et al*., 2022), we employed a research methodology that involved studying the topic in real-life contexts and using multiple evidence sources (Yin, 2013). Due to the limited prior research on DAOs, we opted for a qualitative approach to collect information from informants about their entrepreneurial experiences (Maxwell, 2005). We chose an exploratory and inductive approach to gain a deep understanding of this phenomenon since existing research lacked a clear basis for forming hypotheses (El Faqir *et al*., 2020; Gioia *et al*., 2013; Bortz & Döring, 2006). We aimed to uncover the subjective interpretations of the informants' organizational settings and follow an interpretive research paradigm, considering informants as creators of their social reality (Maxwell, 2005; Burrell & Morgan, 1979). We employed qualitative methods as they are better at uncovering subjective interpretations than quantitative methods (Denzin & Lincoln, 2005).

For qualitative sampling, we contacted entrepreneurially active Nano community members via direct Reddit messages and purposively selected them based on theoretical reasons (Miles *et al*., 2014). Five individuals responded positively and we interviewed them. Table 1 outlines the key characteristics of this research. The interviews, conducted in June 2021 and November 2022, were semi-structured and lasted an average of 31 minutes, aligning with typical qualitative interview durations (DiCicco-Bloom & Crabtree, 2006). Due to logistical constraints, all interviews, we held all interviews via Zoom, audio-recorded them with consent, and transcribed them verbatim, which resulted in 60 single-spaced transcript pages. This approach allowed for longitudinal, qualitative data collection (Hermanowicz, 2013). In the data analysis process, we followed the steps outlined by Miles *et al*. (2014). Initially, we assigned first-level codes using MaxQDA, reflecting interviewees' statements. We then grouped these codes into higher-level categories after referencing prior literature (Gioia *et al*., 2013).

Finally, data interpretation involved identifying patterns and relationships among the higher-level categories to address the research question (Creswell, 2013). This process led to the creation of various tables summarizing the qualitative data (Miles *et al*., 2014). Importantly, the small-sample and purposive approach limit the generalizability of our findings (Bortz & Döring, 2006). However, in case studies, generalization is more analytic than statistical (Yin, 2013). Further research with larger and more probabilistic samples is needed for statistical generalizability and it can utilize our research propositions to guide future studies (Bortz & Döring, 2006). This iterative research approach can enhance our understanding of entrepreneurial behaviour in DAOs (Maxwell, 2005).

Table 1. Main characteristics of interview participants

Pseudonym	Role in Nano DAO	First interview	Second interview
CREATOR (C)	Built start-up based on Nano.	June 2021	November 2022
MARKETER (M)	Created information materials on Nano.	June 2021	November 2022
DEVELOPER (D)	Engaged in further developing of Nano.	June 2021	November 2022
TECHNOLOGIST (T)	Built web app using Nano.	June 2021	November 2022
INFORMER (I)	Spread Nano information on Twitter.	June 2021	November 2022

Source: own study.

To complement our semi-structured qualitative interviews, which revealed herding behaviour and sentiment dependencies within DAO (Bouri *et al*., 2019; Naeem *et al*., 2021), we incorporated data

science-driven quantitative sentiment analysis. This approach allowed us to triangulate and expand upon the insights gained from qualitative interviews.

Sentiment analysis is grounded in the concept that individuals' emotional evaluations of situations provide valuable insights into their feelings and potential reactions (Bortz & Döring, 2006). While scholars have traditionally applied lexicon-based sentiment analysis in the context of cryptocurrencies, often for price prediction purposes (Anamika *et al.*, 2021; Ayvaz & Shiha, 2018; Sasmaz & Tek, 2021), we focused on analysing Nano community members' sentiment over a 16-month period and its impact on their engagement in entrepreneurial activities.

We collected data from Nano's two primary online communities on Reddit.com, namely r/nanotrade, which emphasizes price discussions and attracts users interested in Nano's financial aspects, and r/nanocurrency, where technological discussions and the broader direction of Nano are central. Using an R web scraping script, we gathered post titles from these communities over the 16-month period, resulting in a dataset of 977 rows from r/nanotrade and 1.147 from r/nanocurrency. Table 2 presents a sample of the scraped data.

Table 2. Example data of subreddit scraping

Title	Author	CreatedDate
Volume on coinmarketcap has gone bonkers	sometimesimakeshitup	2022-11-26T19:24:50.000Z
Just deposit your Nano here, its 'safu'	melonmeta	2022-11-26T18:02:25.000Z
It's pumping!	Majestic_Magician243	2022-11-23T19:17:40.000Z
Remove your Nano from exchanges	marshall1905	2022-11-25T07:21:12.000Z

Source: own elaboration based on web scraping from Reddit.com.

We performed cleansing to remove hashtags, emojis, mentions, URLs, punctuations or extra white spaces. We completely removed titles consisting of simply URLs. We reduced words to their root form and converted them to lowercase. We used stop words such as 'dailygeneraldiscussion' next to the standard English stopwords dictionary. After cleansing, 796 and 965 rows remained, respectively. Next to a general emotion lexicon (Mohammad & Turney, 2013), we used a cryptocurrency-focused sentiment lexicon (Sasmaz & Tek, 2021) as a starting position for data labelling. Moreover, we added. some Nano-specific terms such as 'faucet' for the purpose of data labelling. Table 3 outlines an example of our data labeling. After data scraping and cleansing, we used the resulting term-document matrix to perform an R sentiment analysis based on the NRC package returning the data frame with each row classified as an emotion. We also measured vector scores (see Table 5 for a vector summary of both Nano subreddit communities). They served as the basis for the analysis of sentiment over time (Figure 1).

Table 3. Example of data labelling

Positive	Negative
Rise of Nano this week alone	I am so done with Nano
Nano is the future	Why it keeps dropping

Source: own elaboration based on web scraping from Reddit.com.

As DAO stakeholders' have been found to be sensitive to price movements of the underlying cryptocurrencies (Naeem *et al.*, 2021), we scraped Nano's price development using public sources and plotted alongside the number of comments in both r/nanotrade and r/nanocurrency. In doing so, we could track and match overall activity levels with informants' statements.

RESULTS AND DISCUSSION

Results

All interviewees praised the Nano community's vitality in 2021 and prior. They emphasized that during this period, Nano experienced frequent code sharing, active discussions to improve Nano, and a steady influx of new members in Reddit communities. According to CREATOR, Nano exemplified a 'transac-

tional and innovative' ethos, initially being entirely community-driven. This era followed Nano's price surge to 11 USD in April 2021, maintaining a range of 5-9 USD throughout much of autumn 2021, which was a notable increase from its previous range of 1-2 USD from 2018 to 2020. The interviewees actively contributed by responding to inquiries, evaluating concepts, crafting marketing materials, and developing Nano-based applications to showcase its technological potential. Their enthusiasm stemmed from Nano's minimal or zero transaction fees. Table 4 highlights interviewees' substantial involvement within Nano's DAO in 2021, reflecting a thriving community.

Figures 6 and 7 illustrate the significant activity in the two Nano forums leading up to the initial research interviews, aligning with Nano's rising market prices. Both segments of the Nano community predominantly conveyed positive sentiment, occasionally surpassing negative sentiment, particularly in the technology-focused r/nanocurrency. Figures 2 and 3 underscore the primary themes in these communities, with technical discussions prominent in r/nanocurrency and financial aspects in r/nanotrade. Figures 4 and 5 indicate that the majority of emotions expressed in both communities were positive, including anticipation, joy, and trust.

Table 4. Summary of qualitative interviews

Feature / Member	CREATOR	MARKETER	DEVELOPER	TECHOLOG.	INFORMER
Level of activity 2021	Very high (built start-up)	Very high (performed marketing)	High (uses Nano tech)	High (uses Nano tech)	Very high (performed Twitter marketing)
Level of activity 2022	Very high (continues with start-up)	Lower (no more marketing, fewer community visits)	High (uses Nano tech)	Low (abandoned project)	High (more active behind curtains)
Overall sentiment 2021	Very positive (Nano met personal criteria)	Very positive (believes in decentralized Nano with limited supply)	Positive (Nano as means to a technological end)	Positive (initially just investment, then appreciation of community)	Very positive (believed in Nano from the outset)
Overall sentiment 2022	Positive (still believes in Nano, cites tough environment)	Moderate (shift towards inner-circle of Nano users)	Positive (Nano still means to a technological end)	Indifferent (no longer active in the community)	Very positive (believed in Nano from the outset)
Main tasks 2021	Being a delegate for voting, figure of trust, community figurehead	Spreading information, writing marketing materials, community Q&A	Developing a payment product based on Nano	Built and showcased Nano web app	Spreading information, organizing community events
Main tasks 2022	Being a delegate for voting, figure of trust, community figurehead	Answering community questions here and then	Still operating the product as showcase	No longer active	Spreading information, organizing community events
Definition of success in 2021	Size of Nano community (subreddit members), the evolvement of Nano as a payment option	Size of Nano community (subreddit members), businesses that adopted Nano	Usable Nano technology and protocol (*e.g.* eliminating spam attacks), independent of number of users	Adoption of Nano as fast payment option, price	Wide, real-life adoption of Nano
Perception of success achievement in 2022	Split in community, users interested in price left, the challenging business environment for start-ups as crypto sentiment deteriorated	Market size for Nano decreased, fewer users, and shift towards inner circle instead of outreach via social media	No change, work on Nano tech going on	Crypto and Nano downturn erased momentum	No change, work on Nano technology going on

Source: own elaboration based on research interviews.

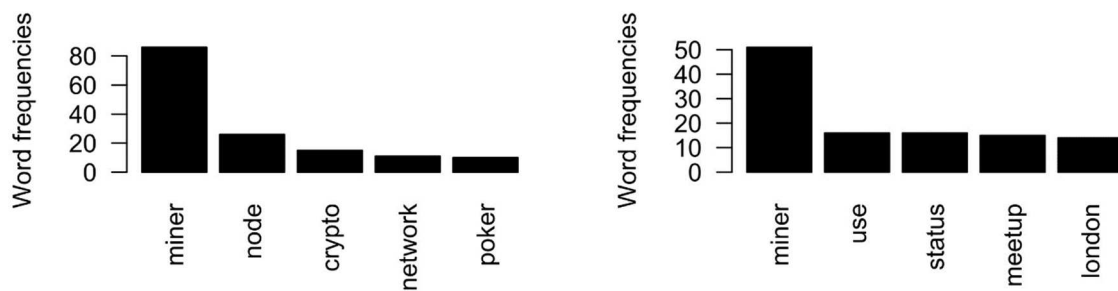**Table 5. Vector summary scores for the two Nano subreddits overall**

| Community	Min.	1st Q.	Median	Mean	3rd Q.	Max.
r/nanocurrency	-2.100	-0.600	0.250	0.638	1.200	3.550
r/nanotrade	-2.350	-0.600	-0.600	-0.4055	0.100	2.800

Source: own study.
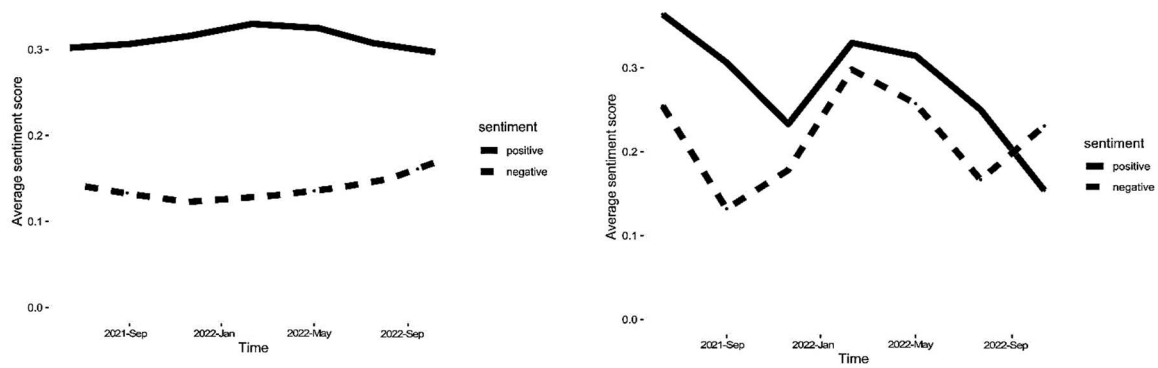
Figure 1. Sentiment over time: r/nanocurrency (left), r/nanotrade (right)
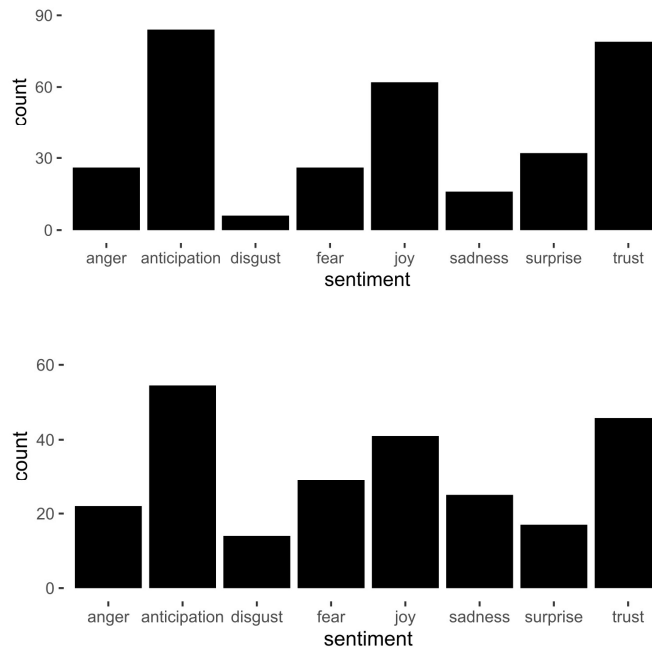Source: own elaboration based on web scraping from Reddit.com.

Figure 2. r/nanocurrency – most frequent words in data set after cleansing: June 2021 to February 2022 (left), March to November 2022 (right)
Source: own elaboration based on web scraping from Reddit.com.
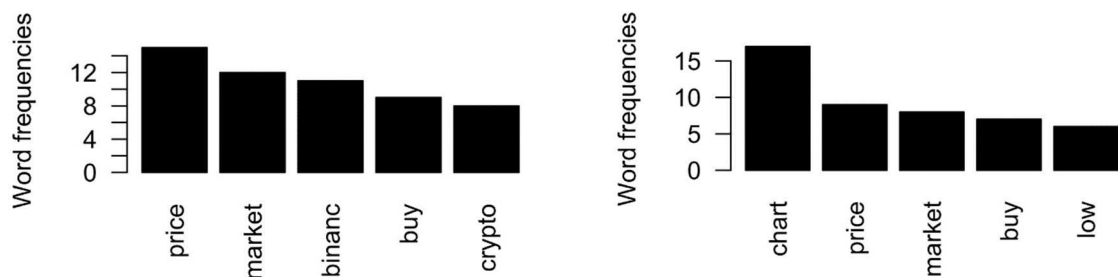

Figure 3. r/nanotrade – most frequent words in the data set after cleansing: June 2021 to February 2022 (left), March to November 2022 (right)
Source: own elaboration based on web scraping from Reddit.com.

**Figure 4. r/nanocurrency – the proportion of words associated with each emotion in the data set:
June 2021 to February 2022 (top), March to November 2022 (bottom)**
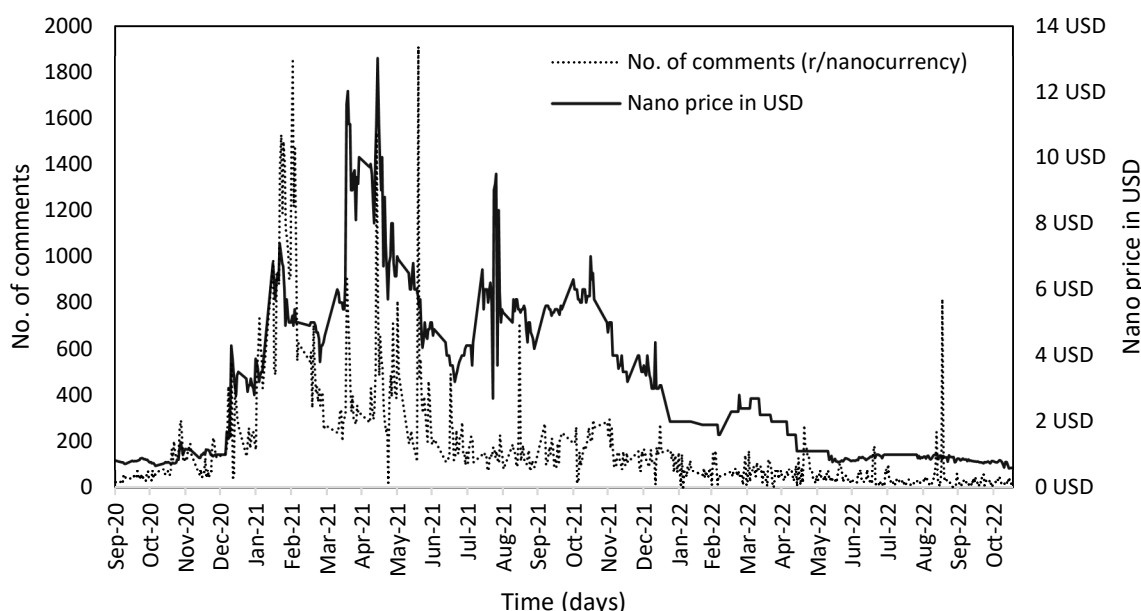Source: own elaboration based on web scraping from Reddit.com.
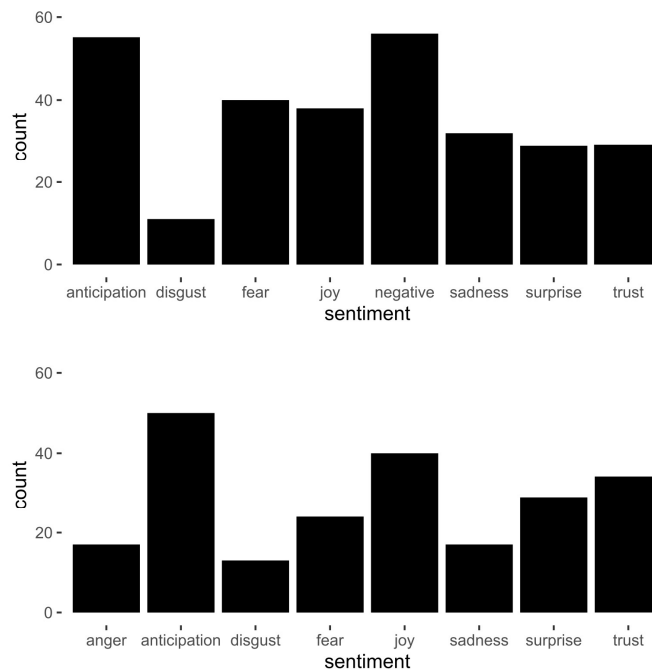
**Figure 5. r/nanotrade – the proportion of words associated with each emotion in the data set:
June June 2021 to February 2022 (top), March to November 2022 (bottom)**
Source: own elaboration based on web scraping from Reddit.com.

In 2022, significant changes occurred in the crypto landscape, with prices plummeting, including Nano, which dropped below 1 USD before stabilizing around 1-2 USD. This downturn affected the overall crypto sentiment. CREATOR described the situation as fluctuating, with mainly Nano enthusiasts remaining active. MARKETER noted reduced engagement on Reddit due to basic topics saturation, and DEVELOPER likened the environment to a 'ghost town.' INFORMER emphasized the resilience of Nano's dedicated supporters.

From an entrepreneurial standpoint, the price decline impacted perceptions and made it challenging to engage business leaders in crypto investments. CREATOR shifted conversations towards customer engagement to navigate this. Outreach to businesses by Nano members declined in 2022, potentially due to crypto's reduced popularity and market size. TECHNOLOGIST observed fewer news and projects compared to Nano's past, leading to motivation challenges for DEVELOPER. The overall crypto downturn discouraged people from collaboration.

Figure 1 shows a narrowing gap between positive and negative sentiment in r/nanocurrency in mid-2022. In r/nanotrade, the negative curve surpassed the positive one. Both Nano Reddit segments maintained technology and finance-related discussions. An upcoming member meetup in London indicated positive developments. In r/nanotrade, negative emotions like sadness, fear, and disgust scored higher than in 2021, while r/nanocurrency also saw an increase in negative sentiment, including fear, sadness, and disgust. Figures 6 and 7 demonstrate a noticeable decrease in comments on Nano-related topics in spring 2022, with minimal activity during the summer months.

TECHNOLOGIST theorized that Nano's lack of new features like NFTs and decentralized finance contributed to member attrition. CREATOR, MARKETER, and DEVELOPER found that their self-defined success indicators for Nano's community were not met by November 2022, leading to downsizing or abandonment of entrepreneurial activities within the Nano DAO for MARKETER and DEVELOPER. CREATOR faced a more challenging business environment for their Nano-based startup. INFORMER and TECHNOLOGIST were content with Nano enthusiasts' continued work on Nano's code and technology. DEVELOPER highlighted the absence of substitutes for actively engaged members like MARKETER, with no news or project developments.

Figure 6. Number of comments in r/nanocurrency and Nano's price movements over time
Source: own elaboration based on web scraping from Reddit.com.
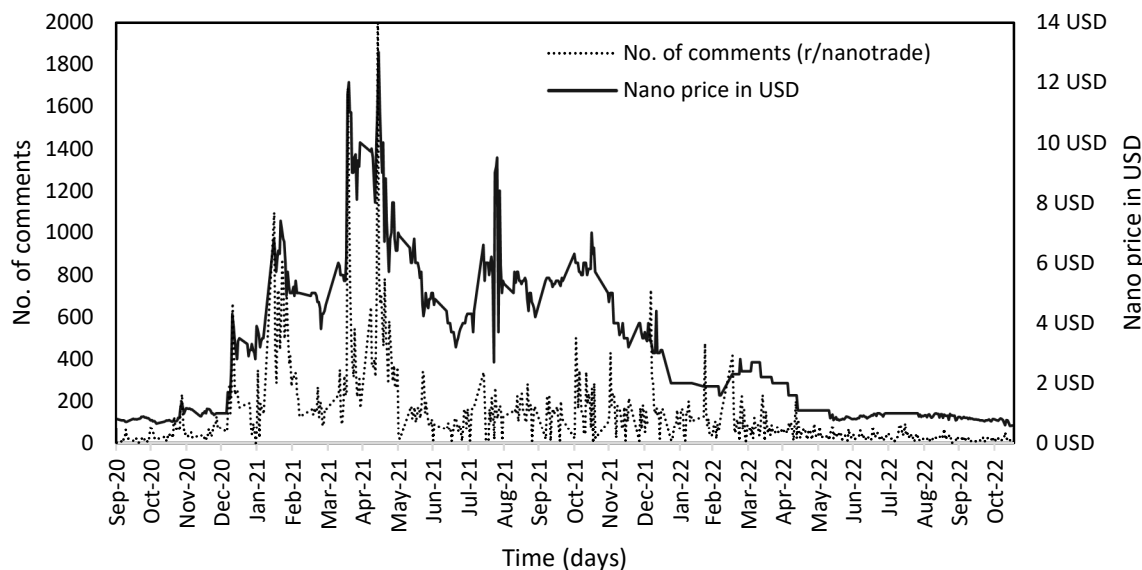
Figure 7. Number of comments in r/nanotrade and Nano's price movements over time
Source: own elaboration based on web scraping from Reddit.com.

Proposition Check

Based on these findings, we can now revisit our initial research propositions. According to our first proposition, DAO' members motivated by technological aspects of the cryptocurrency will feature a different entrepreneurial behaviour over time than those mainly motivated by financial aspects. We confirm this proposition. Both our sentiment analysis in r/nanocurrency and r/nanotrade as well as interview responses from participants show diverging entrepreneurial behaviour among those two groups of DAO members.

> **Proposition 1 (confirmed)**: The DAO members motivated by cryptocurrency's technological as-pects will display a different entrepreneurial behaviour over time than the members mainly motivated by financial aspects.

As to our second proposition, we expected DAO members' perception of the health and desired direction of the DAO to influence their entrepreneurial behaviour. Looking at our results, we modified and substantiated this proposition as follows:

> **Proposition 2 (modified)**: The DAO members' perception of the health and desired direction of the DAO influences these individuals' entrepreneurial behaviour.

Furthermore, and in line with our iterative approach to research, we can formulate a third research proposition after data analysis:

> **Proposition 3 (new)**: Developments in the broader cryptocurrency market influence DAO members' entrepreneurial behaviour.

Discussion

In response to recommendations for longitudinal research on DAO and member trajectories (Lustig & Nardi, 2015; Sun *et al.,* 2022; Tana *et al.*, 2019; Yetis-Larsson *et al.*, 2015), we conducted a 16-month study of the Nano DAO. The findings revealed a dynamic landscape of entrepreneurship within the DAO.

Initially, members displayed high motivation and fascination with various aspects of the Nano DAO in mid-2021. However, these sentiments waned over the subsequent twelve months, leading to the departure of many Nano DAO members. This phenomenon aligns with prior observations of herding behaviour in cryptocurrency communities (Bouri *et al.*, 2019; Naeem *et al.*, 2021). Notably, our study

Table 6. Selected quotes from interviews: 2021 and 2022

By	2021	2022
C	I really have certain criteria that I want to use so that I can innovate in this world … so I scoured the world of cryptocurrency to look for some payment platform that fit those criteria. … It [Nano] had that 'want to use this to transact and do cool things with that' mindset.	My perception is that [Nano technology] has evolved at a pace that is expected. … so once the novelty of the technology reaches a certain saturation, the number of interesting things to talk about in that space becomes less and less. Now, the focus turned to the entrepreneurs to use that technology to then create even more interesting business applications.
C	That was highly fascinating to me because my whole passion for the digital currency ecosystem was the ability to transact with minimal fees … and so I saw a lot of business opportunities there, a lot of room for innovation and new innovative business models that didn't exist before, because you always had a payment fee.	It ebbs and flows. … The price drop matters for perception. The business leaders I speak to talk about crypto as an investment and do not want to do it when prices are down. Which is why we try to steer the conversation away from crypto. Or we say we can use stablecoins. So the price erosion makes it more challenging for me as an entrepreneur.
M	I am quite active on the public forums. … Sort of helping them try it out or answering any questions. On the other hand, for example, writing articles about it, that can then be shared. … Essentially spreading knowledge and just helping people in the community. Also sort of bringing people together because I have been around the community for quite a while now.	Reddit declined a lot since we last spoke, *e.g.* the daily discussion thread changed to a weekly discussion thread as there is not much to talk about. … The deeper tech level of discussion has stayed solid. Outreach has decreased, maybe because crypto is less popular.
M	And in that channel, for example, [a user] came up with a poll saying, which is the current biggest challenge for Nano to achieve our objectives, *et cetera*. And then people can vote.	For example, I go less to the subreddit myself. I write fewer articles because I think most basics are covered. But generally, I am just less active because there is less to reply to.
T	Nano is a perfect fit for my project because it showcases the speed. If you were to use any other cryptocurrency that would take a lot longer than Nano. And they have fees.	Yes, still running the [*project*]. A couple of users use it.
T	I cannot say it was my intention to contribute to the community. Nano just served as an excellent avenue to create this project. I'm somewhat of a hobbyist with the electronics, and I thought it would be very fun to create a project like this. Nano just happened to be the perfect solution for this project. I am happy now, too, that the project may have introduced some people to Nano.	It is still a blend of all the groups but it is trending more towards technology now that the price is not so exciting. I see more discussions about technology and projects that leverage the fundamentals of the tech rather than discussions of price and speculation. For example, there are two subreddits, Nano price [nanotrade] and Nano tech [nanocurrency] and in the past, the price one was more popular and now it has become the other round.
D	Initially, it was only an investment. … And I learned about which cryptocurrency project I should invest, and Nano is one of the projects that I see has a lot of people in the community. And for me, that is a good sign. Right. So I dug deeper and deeper.	[*Web app based on Nano*] is still online, I am not maintaining it though. A guy telegrammed me and said that he liked the project and could bring people on the website. Nothing came out of it though. I am not active in the community anymore; I got a new job that I am learning now.
D	I see every day that people keep adding new code and make Nano better. And that part is awesome. … To create a system and tap into the network without asking anyone. And that gives a lot of possibility to a person. So yeah, basically it just opened a whole new world.	Nowadays, it feels like a ghost town. Are we still active? I just checked and there seems to be no news or ideas, no projects.
I	There are definitely the gold diggers that are like the investors, the traders …., But, I think, as far as the people pushing the code and further adoption goes I think that's most probably those people who have that shared vision of the centralized cash, because they're the ones that stick around, even if the price goes to zero, right.	The price drop certainly flushed out some people who were more interested in the money side of things. But the people dedicated to bringing Nano forward are still there. Still working on the technology, still improving it.

Source: own study.

extended these findings by indicating that external circumstances can impact entrepreneurial behaviour within a DAO, including the execution of entrepreneurial tasks and functions.

The broader cryptocurrency market's downturn and competition from cryptocurrencies with novel features emerged as key factors prompting individuals to exit the Nano DAO. This exodus further discouraged previously active entrepreneurial members. Activities such as marketing, community engagement, content creation, outreach to potential clients, and app development to showcase Nano's technology were among the entrepreneurial tasks that saw reduced participation from DAO members in 2022. Moreover, our study extends findings regarding DAO members' shared motivations and goals (Hsieh *et al.*, 2018; Shermin, 2017; Weking *et al.*, 2020). In the case of Nano, those more interested in the actual technology were less affected by the declining levels of community activity than those who valued a sizable and growing membership. On the contrary, the technology-focused members indicated to continue their entrepreneurial tasks, mainly working on Nano's code. Still, it appears that some sort of critical mass of community members that populate the online forums, answer questions, or contribute ideas is beneficial to the motivation of a wider set of entrepreneurially active DAO members. This represents an intriguing finding as it suggests that a DAO's overall entrepreneurial behaviour is more active when both technologically oriented as well as market-oriented members are satisfied with internal and external environments. Thus, while our evidence confirms Lustig and Nardi's findings (2015) concerning the variance among DAO members, we extended previous knowledge. Our research also adds to findings concerning the dynamic self-organization of DAO members around projects and tasks (Kaal, 2020). We observed that self-organization can result in entrepreneurial tasks not being completed or being done less effectively.

CONCLUSIONS

How and why does the execution of entrepreneurial tasks change within a blockchain-based DAO? Our investigation revealed that external factors, particularly the overall health of the cryptocurrency market can significantly influence the motivation and commitment of DAO members. During a substantial cryptocurrency downturn in much of 2022, some active Nano DAO members engaged less or scaled down their entrepreneurial activities. This shift correlated with a sharp decline in community engagement, primarily driven by price-focused members exiting the community or migrating to Nano's competitors. The dwindling community size led to reduced activity and motivation among previously enthusiastic and entrepreneurial members. While our study did not explore the self-reinforcing dynamics in-depth, it does suggest the need for further research on how a decentralized autonomous organization can break free from such negative, self-reinforcing cycles.

Our study offers a crucial insight for DAO members by emphasizing the importance of bridging the gap between technology-oriented and market-oriented individuals within the organization. These two groups exhibit distinct motivations and behaviours, however, our findings underscore the tangible benefits of fostering participation from both segments within the DAO. Addressing these differing motivations and aligning group-level goals can serve as a practical recommendation for DAO members seeking to sustain or enhance entrepreneurial activity within the community.

While our study benefits from a unique and comprehensive dataset from the Nano community, it comes with several limitations due to its exploratory nature. Firstly, empirical generalization is hardly possible as cryptocurrency-based DAOs can vary considerably, especially in terms of technology. Employing replication logic, following Eisenhardt and Graebner (2007), could aid in constructing more robust theories, paving the way for future research to build upon our findings. Secondly, our study relied on interviews with only five DAO members, leaving room for potential biases in their responses. While we employed some general triangulation level, particularly in comparing interviews with the outcomes of our sentiment analysis, inherent limitations remain. Lastly, despite its longitudinal design, our study encompassed a relatively narrow timeframe of 16 months, limiting its capacity to make predictions about the DAO's future. Consequently, we recommend future research in the intersection of entrepreneurship and DAOs to expand the sample size of DAO entrepreneurs and extend the research period for a more comprehensive understanding.

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Author

Alexander Pöschl

Full Professor of Entrepreneurship at University of Applied Sciences Saarbrücken, Saarland (Germany). His research interests include pivoting in start-ups, digital entrepreneurship, and entrepreneurial buy-ins.
Correspondence to: Prof. dr. Alexander Pöschl, University of Applied Sciences Saarbrücken, Waldhausweg 14, 66123 Saarbrücken, Germany, e-mail: Alexander.poeschl@htwsaar.de
ORCID ⓘ http://orcid.org/0000-0001-6657-8807

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