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Article

Barriers to Financial Innovation—Corporate Finance Perspective

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Abstract: This paper addresses the application of financial innovations from the corporate finance perspective. The objective is to identify and prioritize the main types of barriers to the implementation of financial innovations by nonfinancial firms. The motivation behind the study lies in the importance of financial innovations for the firms' ability to create value. As proven by the extensive literature review, comprehensive studies on financial innovation applications by nonfinancial firms are relatively rare. To cover this cognitive gap, the theoretical argumentation followed by the discussion of results of the empirical research are presented in this paper. The paper provides the results of two-stage survey research, aiming to find opinions of financial managers (end-users) and experts (creators of innovation) on the main barriers to financial innovations in Poland. According to managers, the most important are exogenous barriers, including: (1) Unclear tax and accounting regulations, (2) complex construction of financial innovations, and (3) transaction costs related to their application. On the other side, the experts from financial institutions recognized the greater importance of endogenous factors such as: (1) Lack of sufficient knowledge about financial innovations and (2) the reluctance to change observable in many firms. This study contributes to the ongoing debate on financial innovations by adding the perspective of corporate financial strategy. It also offers insights into the potential actions (at the institutional and individual level) aiming to reduce the barriers and support the implementation of financial innovations by nonfinancial firms.

Keywords: financial innovations; barriers to innovations; corporate finance; financial strategy

1. Introduction

The financial system is highly innovative, with the continuous creation and implementation of new instruments, processes, and financial mechanisms. Financial innovations are widely discussed in the literature from the macroeconomic perspective concerning their consequences for the global financial system, particularly in the context of the financial crisis (Beck et al. 2016; Boz and Mendoza 2014; Den Haan and Sterk 2011; Gai et al. 2008; Henderson and Pearson 2009; Redmond 2013). Another stream of studies focuses on selected types of financial innovations, concerning the process of their creation, implementation, and diffusion in the financial system, usually from the perspective of their creators (Frame and White 2014; Klimontowicz 2019; Klimontowicz and Harasim 2019; Marcinkowska 2012; Merton 1995; Silber 1983; Świecka et al. 2020; Vermeulen 2004) or their end-users (Kieźel and Smyczek 2015; Lebellet et al. 2020; Lorenz and Pommet 2020; Saksonova and Kuzmina-Merlino 2017). In this stream of literature, the dominant approach applies a case-by-case basis, as particular types of financial innovations are analyzed in detail (e.g., Cocco and Gomes 2012; Götze and Gürtler 2019; Harasim and Klimontowicz 2013; Polasik and Wiśniewski 2009; Tapscott and Tapscott 2017).

Although Finnerty (1988) and Tufano (1996) explained the potential application of financial engineering in the corporate strategy, the general perspective of nonfinancial firms as the end-users of financial innovations is relatively rare (e.g., Stradomski 2006). Most of the papers focus on one particular type of innovation and its application in the corporate financial strategy. Here, studies on various

sources and mechanisms of financing dominate (e.g., Ahlers et al. 2015; Coval et al. 2009; Culp 2002; Tang and Zhang 2020; Węclawski 2017). This paper aims to cover this research gap by analyzing the application of financial innovations by nonfinancial firms (other than financial institutions) offering the universal approach.

Thus, the paper proposes to investigate the financial innovations from the corporate finance perspective, offering a comprehensive approach and presenting stylized facts about financial innovations. The importance of this issue arises from the importance of financial innovations for the firms' ability to create value and from the fact that improper usage of financial innovations may not only lead to the deterioration of a firm's efficiency, but may also pose a threat to its future.

The subject of financial innovations application by nonfinancial firms is broad, and it may concern various aspects, among others: The motivation behind the decision to apply financial innovation, the consequences of financial innovation, the analysis of the particular area of financial management and particular instruments and mechanisms, as well as the impact of financial innovations on the ability of the company to create value. Thus, this paper focuses on one aspect, which is important for the effective and efficient application of financial innovation, that is, barriers to financial innovation. That is why the main objective of this paper is to identify and prioritize the main types of barriers to the implementation of financial innovations in corporate finance, particularly in the context of the continuous changes in the business environment. Following Allen (2012) and Shiller (2013), this study applies the positive approach to financial innovations, which assumes that they can be implemented in all areas of corporate financial management, increasing the competitiveness of firms and the ability to create value (by increasing financial revenues, reducing financial costs, optimizing capital structure and minimizing WACC—weighted average cost of capital, reducing income tax burdens, etc.). The literature review proved the lack of comprehensive research on the application of financial innovations by nonfinancial firms. Studies on barriers to the implementation of financial innovations from the firms' perspective are also relatively rare.

Thus, a concept for the original two-stage survey research was developed to gather information on the application of financial innovations in nonfinancial firms on the example of the Polish market. In the first stage, the survey aimed at financial managers, who represent the end-users of financial innovations. In the second stage, the survey addressed experts from financial institutions, who represent the creators of financial innovations. Consequently, the opinions of the demand-side and the supply-side representatives were gathered and confronted. In particular, the paper aims to answer the following research questions:

- RQ1: What are the main types of barriers to financial innovations in the opinion of the financial managers?
- RQ2: Is there a link between the dominant type of barriers pointed to by the managers and the firm characteristics (size, age, organization structure, range of activity)?
- RQ3: What are the main types of barriers to financial innovations in the opinion of experts?
- RQ4: Which factors may stimulate the application of financial innovations in the opinion of experts?

This study contributes to the debate on financial innovations by adding the perspective of nonfinancial firms as the end-users of financial innovations. It also offers insights into the potential actions (at the institutional and individual level) aiming to reduce the barriers and support the implementation of financial innovations in corporate finance. The comprehensive approach applied in the study gives the possibility to understand the factors that may influence the corporate financial strategy with regard to the application of financial innovations and the improvement in its ability to create value.

The remainder of the paper is structured as follows. Section 2 presents the underlying theoretical concepts behind this study. In Section 3, the research design and methods are explained. The next section discusses the results of empirical investigations. The final section concludes.

2. Literature Review

In the conceptual dimension, this study is framed on the merger of two streams of the literature: Theory of innovation (in this financial innovation) and theory of corporate finance. Within the first stream, the paper focuses on the definitions, types, and functions of financial innovations analyzed from the financial system perspective. In the second stream, the paper addresses the potential application of financial innovation in financial management concerning the motives and consequences of their effective implementation. The discussion about the barriers to financial innovation application in corporate financial management is the issue that links both theories.

2.1. Financial Innovation as a Special Type of Innovation

Innovation is a very broad concept, widely investigated both in the theoretical and empirical studies. In the 1930s, J. Schumpeter defined innovation as the introduction of new or qualitative change in existing products, processes, markets, sources of supply, and organizations. Innovation encompasses a creative activity, the element of novelty, as well as disruptive change, and is often described as a complex, multi-actor process, determined by many, various factors (Assink 2006; Boer and During 2001; Mikl-Horke 2004). Baregheh et al. (2009) analyzed the definitions of innovations from the different disciplines and identified key attributes of innovations: (1) Nature of innovation (new, improve, change); (2) type of innovation (product, service, process, technological, financial); (3) stages of innovation (creation, generation, implementation, development, adoption/diffusion); (4) social context (organizations, firms, customers, social systems, employees, developers/creators, end-users); (5) means of innovation (technology, ideas, inventions, creativity, market); and (6) aim of innovation (succeed, differentiate, compete, create value).

The sources of innovations can be analyzed from various perspectives. According to the demand theory, innovations are created as a response to the demand of firms that want to acquire a competitive advantage in their business environment (the demand-driven or market pull innovations described by Drucker 2002). However, this demand can be influenced either by the internal needs of the firm aiming to improve its activity or by the changes in its environment requiring the proper adjustment in its business strategy.

The second approach stresses the role of the supply-side factors, as innovations are first created by the innovation providers (creators), and then they are applied by their end-users (households and firms). The supply-driven innovations (linked to technology-push hypothesis) result from the process consisting of three phases: (1) The creativity phase (invention), (2) the innovation phase, and (3) the diffusion phase (realized either by imitation or by commercialization) (Dabic et al. 2011). However, Di Stefano et al. (2012) described how firms may match technology with demand and capitalize on technology and demand as sources of innovation.

The latest approach refers to the category of open innovation, in which firms use inflows of knowledge to accelerate internal innovation and outflows of knowledge to expand the markets for external use of innovation (Chesbrough 2006). Chesbrough and Bogers (2014) redefine open innovation as ‘a distributed innovation process based on purposively managed knowledge flows across organizational boundaries.’ The open innovation is linked to various related innovation phenomena, such as users as innovators (Bogers et al. 2010; Piller and West 2014), innovation communities (Dahlander et al. 2008), and open knowledge or open-source software development (von Krogh et al. 2012).

Innovations, regardless of their nature, are the driving force of the economy, a source of competitive advantage, and a chance to improve social welfare. Financial innovations, which occur in the financial system, play a particular role in this context. According to the dynamic and evolutionary approach to finance, the ability of the financial system to create innovations leads to transformations in the socio-economic system and the political and legal system (Evstigneev et al. 2004; Nesvetailova 2014).

Financial innovations are not a new issue, as they have been accompanying technological innovations from the very beginning (Michalopoulos et al. 2009). It is indisputable that financial and

technical innovations are bound together, and they evolve together over time. Financial innovations provide a mechanism to finance innovative technological projects, while technological progress creates a basis for new financial solutions. The latest financial innovations are created through the development of the Fintech and blockchain technology, in particular (Chen et al. 2019; Nicoletti 2017; Tapscott and Tapscott 2017; Zheng et al. 2018). As Laeven et al. (2015) stated, financial innovations are essential for technological innovations and economic growth. This observation underlines the importance of financial innovations for the individual entities, as well as for the entire society as suggested by (Allen 2012; Lerner and Tufano 2011; Michalopoulos et al. 2009). The detailed comparison of technological and financial innovations is presented in (Kapoor and Mention 2015; Pyka 2013; Stradomski 2006).

The definition of financial innovations can be analyzed in a broad or narrow meaning. In most of the studies, the financial innovations are presented in a narrow meaning, as mainly the new developments in financial instruments (product innovations) are described (compare: Anderloni and Bongini 2009; Frame and White 2014; Pyka 2013). The product financial innovations can be in a form of entirely new instruments, a combination, or a modification of traditional instruments or new applications of these instruments. Llewellyn (2009) categorized financial innovations as: (1) Product innovations; (2) process innovations, and (3) risk-shifting innovations, taking into account the form of financial innovations and their function.

However, taking into account the main aim of this study, in order to show the variety of financial innovations, the broad definition is applied following Lerner and Tufano (2011), Merton (1995), and Miller (1986). According to this approach, financial innovations are described as a process of change resulting in the new concepts, solutions, and developments in all elements of the financial system: Financial markets, institutions, instruments, and regulations. Consequently, financial innovations constitute a huge and variable group of new developments that are created and implemented to increase the efficiency of the financial system in general, and by this, to enhance the economic growth and social welfare. The relationship between these groups of financial innovations is multidimensional and can be described as ‘the spiral of innovations,’ whereby one innovation begets the next, as suggested by Miller (1986) and further developed by Persons and Warther (1997) and Lerner and Tufano (2011).

The process of creating financial innovations usually includes several stages: (1) Source of innovation—initializing factor, (2) idea—response to the factor, (3) invention—creating innovation, (4) implementation—applying innovation, (5) effect of innovation—assessing the results of the application, (6) withdrawal of unsuccessful innovations or modification—improvement of successful innovations, (7) diffusion by imitation or commercialization. Due to the low level of patent protection and advanced techniques of communication, the diffusion of financial innovations is very fast (Kapoor and Mention 2015; Lerner et al. 2020). Thus, successful innovations can be spread around the global financial system very quickly. It is worth stressing that most of the financial innovations are evolutionary adaptations of prior developments. Therefore, the financial system has many incremental innovations rather than radical ones.

The demand-side and the supply-side theories of financial innovations explain the motives of creation, implementation, and diffusion of new financial developments (Awrey 2013). The demand-side theory indicates that the main reasons for financial innovations are the imperfections of the financial system, mainly the asymmetric information, agency costs, transaction costs, market risk, and taxes (Fabozzi et al. 2003; Tufano 2003). It is often stressed that, if the financial markets were perfect and complete, there would be no opportunities for financial innovations. Silber (1983) also states that financial innovations are created to lessen the financial constraints (both internal and external) imposed on firms. According to the demand-side theory, financial innovations should be created as a response to the financial system participants’ needs aiming to meet their individual goals and requirements (the demand-driven financial innovations).

Simultaneously, since the beginning of the 1980s, the intense activity of the financial institutions creating new financial developments has been observed, being the subject of the analysis of the

supply-side theory. Financial innovations are created by financial institutions to increase their competitive advantage, to improve their performance, or to protect their market situation. A large number of financial innovations are offered to the clients in various fields of the financial activity: New forms of investment, savings and financing products, payment instruments and mechanisms (the supply-driven financial innovations). The most important exogenous factors influencing the increased activity of the financial institutions in creating and implementing financial innovations include globalization and disintermediation (leading to the development of Alternative Finance), increased volatility of the financial market, deregulation, and liberalization of the capital flows and the dynamic development of the communication technologies, in this dynamic growth of the FinTech sector (Chen et al. 2019; Nicoletti 2017). Endogenous factors that have an impact on the potential of the financial institutions to create new solutions include intense competition among financial institutions (traditional ones and others), short-term perspective on the financial results, searching for new sources of revenues (other than interest revenues), and the increasing importance of the risk management process (Anderloni and Bongini 2009; Fabozzi et al. 2003; Llewellyn 2009).

A huge variety of new financial developments resulted in a diversified classification concerning sources, factors, motives, types, forms, and effects of financial innovations (Błach 2011; Miller 1986; Llewellyn 2009; Lumpkin 2010; Nesvetailova 2014). By focusing only on the functional approach, financial innovations are categorized regarding their purpose: (1) Price-risk transferring, (2) credit-risk transferring, (3) liquidity-generating, (4) credit-generating, and (5) equity-generating instruments (Fabozzi et al. 2003). However, taking into account the assumptions that financial innovations should enhance the efficiency of the financial system in fulfilling its core functions, the functions of the financial innovations can be classified in the same way as the functions of the financial system. According to this proposition, the functions of the financial innovations can be described as follows: (1) Payment function (increasing the liquidity of the financial system), (2) investment function (increasing the variety of investment opportunities better-adjusted to the risk-return profile of the investor), (3) financing function (improving access to the sources of funds), (4) pricing function (improving the process of assets valuation and risk), and (5) risk management function (increasing the possibilities of transferring risk) (Błach 2011).

However, the impact of financial innovations should be analyzed with caution. In times of global financial crisis, financial innovations were criticized for their role in it, regarded as a source of confusion and a way to enhance investors to take on more risk than they realized (Henderson and Pearson 2009; Jenkinson et al. 2008; Redmond 2013). One of the consequences of the financial crisis is limited trust in financial innovations. However, recently, there have been presented opinions that financial innovations are neither good nor bad in general, but they contain a mixture of elements and their consequences depend on the way they are applied (Allen 2012). What is more, Shiller (2013) underlined that financial innovations are required to achieve society's goals and Beck et al. (2016) found that the net effect of financial innovation on economic growth is positive.

Thus, the sustainable (true) financial innovations (applied correctly) are expected to bring benefits in reducing the imperfections of the financial system by decreasing the level of risk, closing the information gap, lowering the transaction cost, and minimizing the tax payments. Simultaneously, they are expected to enhance the positive aspects of the financial system by maintaining its stability, increasing its efficiency in performing its core functions, and providing services and instruments better-adjusted to the system participants' needs and goals. Meanwhile, the harmful financial innovations (applied in the wrong way) may damage the financial system and the entire economy, so they should be avoided. In this study, a positive approach to financial innovation is applied focusing on the potential positive consequences of their application from the corporate financial strategy perspective.

2.2. Application of Financial Innovations in the Corporate Financial Strategy

Financial innovations may be applied by various end-users: Households, small firms, and large corporations, governments, and financial institutions. This paper focuses on the decisions of nonfinancial firms (operating in various sectors: Production, construction, trade, and service) concerning the application of financial innovations. This issue leads to the second part of the conceptual framework related to corporate financial management. Nowadays, smaller and larger firms face many challenges that force them to be innovative, using both technological and financial innovations. The decision of the firm to use financial innovations can be determined by the internal or/and external factors. Internal factors (endogenous determinants) are connected with (1) the firm's characteristics (e.g., size, age, legal form, ownership structure, operating and financial risk, financial performance, capital structure and dividend policy, and attitude toward risk and innovations), (2) its development strategy (related to the available resources and stage of life cycle), (3) defined objectives (financial and nonfinancial goals formulated to meet the expectations of various stakeholders), and (4) various needs (e.g., investment projects, process of endogenous or exogenous growth), while external factors (exogenous determinants) arise from the firm's business environment and changes in the market conditions (e.g., general macroeconomic situation, development of financial market, activity of the financial institutions in creating innovations, tax and accounting regulations, volatility of the market parameters). The impact of the business environment on the firm's decisions, goals, and strategy is evident. Although the internal factors are very important, as they are mainly determined by the changes in the business conditions, it can be assumed that the major impulses to implement financial innovations in corporate financial management come from its environment. Thus, the application of financial innovations in the corporate financial strategy is not necessarily connected with the firm's individual needs and objectives (based on the rational analysis of the costs and benefits related to particular financial innovation application), but it can be dictated by the actions explained by the herd behavior. This behavioral approach to financial innovation is used in the studies by: [Lievens et al. \(1999\)](#) and [Redmond \(2013\)](#).

Regarding the corporate financial strategy perspective, functions of the financial innovations can be analyzed in four basic dimensions connected with: (1) Financing decisions, (2) investment, (3) risk management, and (4) working capital management decisions. Financial innovations within the financing decisions aim to improve access to various sources of funds, decreasing the cost of capital, and increasing the flexibility of the capital structure (e.g., innovations in equity and debt securities, hybrid securities and structured instruments, crowdfunding and private equity financing). Thus, their role is crucial for the realization of the business strategy and the firm's development. Financial innovations applied to improve access to corporate funds are presented in numerous papers (e.g., [Ahlers et al. 2015](#); [Allen and Yago 2010](#); [Coval et al. 2009](#); [Culp 2002](#); [Lebelle et al. 2020](#); [Sieradzka 2020](#); [Tang and Zhang 2020](#); [Węclawski 2017](#)).

Financial innovations within the investment decisions are applied to ensure the rate of return on investment projects, to decrease the investment risk and transaction costs, or to improve the access to various investment opportunities. Firms may use various innovations in investment opportunities available in the market, also for other types of investors, such as: Alternative investment funds, structured products, derivatives, innovations in equities and fixed-income securities. New investment opportunities are discussed in many papers, e.g., [Amenc et al. \(2003\)](#), [Campbell \(2008\)](#), [Eichholtz and Yönder \(2015\)](#), [Moskal and Zawadzka \(2014\)](#), and [Poterba and Shoven \(2002\)](#).

Financial innovation within the risk management decisions may be implemented to stabilize firm cash flows, reduce the market risk, increase efficiency, and reduce the costs of the risk management process (e.g., various classes of derivatives and innovations in insurance products). They also offer the possibility to combine risk management with financing or investment decisions (e.g., structured securities: Equity-linked, interest rate-linked, exchange rate-linked, or commodity-linked structured bonds). They result from the convergence of the capital and insurance market (e.g., contingent capital solutions, insurance-linked securities, weather derivatives). These innovations are analyzed in the

studies by: Bolton and Samama (2012), Bouriaux and MacMinn (2009), Culp (2002), Cummins et al. (2001), and Wieczorek-Kosmala (2020).

Within working capital management, financial innovations may be introduced to improve financial liquidity, reduce transaction costs, or accelerate the cash conversion cycle (e.g., mobile banking platform, contactless payment instruments, cryptocurrencies, innovations in treasury management, new mechanisms of supply chain financing, developments in cash pooling and factoring). Particular types of financial innovations improving working capital management are presented in (Gupta 2013; Mucelli et al. 2020; Polasik and Fiszeder 2010; Tsai and Peng 2017).

Thus, financial innovations can be implemented in the corporate financial strategy due to many reasons that are related to the specificity and purpose of financial management. Overall, financial innovations may improve the firm's ability to use opportunities and to protect against threats more effectively. Sustainable financial innovations are expected to enhance financial management and increase the ability of the firm to create value. This is consistent with the normative approach related to neoclassical finance, according to which financial innovations should be implemented only if the benefits are higher than the costs related to their implementation. This approach is based on the Rational-Efficiency Hypothesis, which states that financial innovations are created and implemented to generate profit for their users. A normative approach is applied in this study, following (e.g., Frame and White 2014; Molyneux and Shamroukh 1999; Tufano 2003; Lerner 2006; Rossignoli and Arnaboldi 2009). Thus, the proper application of financial innovation may increase revenues (financial revenues) and reduce costs (financial costs, cost of capital), improving the ability of the company to create profit and value (which may be identified through the economic value-added perspective). The theoretical framework illustrating the application of financial innovations in the corporate financial strategy is presented in Figure 1.

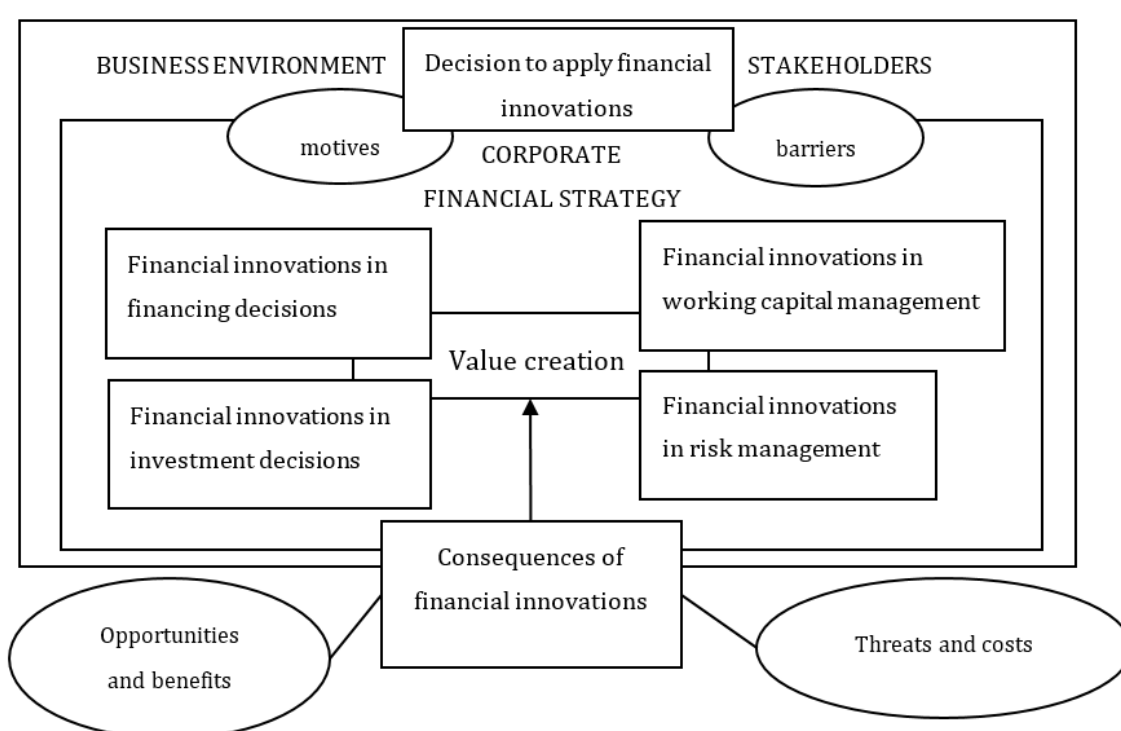


Figure 1. Application of financial innovations in the corporate financial strategy.

2.3. Barriers to Financial Innovations Implementation in the Corporate Financial Strategy

However, the correct application of financial innovations may be hampered due to various obstacles. This leads to another issue—barriers to innovations, which may be analyzed concerning: (1) The stages of the innovation process (knowledge, invention, implementation, diffusion, and adaptation),

(2) the levels of innovation (microeconomic and macroeconomic barriers), and (3) the nature of factors (financial, personal and organizational, socio-cultural and legal factors). The variety of barriers to innovation has been recently discussed in (Assink 2006; Hueske and Guenther 2015; Madeira et al. 2017). Although these studies discuss barriers to technological innovations, their findings may be applied to financial innovations. Besides, it should be noted that the issue of barriers to financial innovations (in the general context) is rarely discussed in the literature.

From the macroeconomic perspective, the process of creation and diffusion of financial innovation may be hindered by various types of barriers that fall into four broad categories: (1) Bureaucratic barriers (including legal barriers), (2) economic barriers (including financial and market barriers), (3) technical barriers, and (4) psycho-social barriers (related to end users and their attitude toward innovation), as noted by Rogers (1995) and Spence (1994). Identifying barriers and subsequently taking action to eliminate them should enhance the diffusion of financial innovation. However, it should be stressed that despite taking such steps, the innovation process may fail. The diffusion of financial innovation in the socio-economic system also requires appropriate law regulations and collective acceptance in society. Meeting these conditions is necessary to increase the scale of financial innovation in the economy.

From the microeconomic perspective, barriers to the creation and diffusion of financial innovation may be analyzed based on the OECD methodology, which distinguishes between the following groups of factors (Marcinkowska 2012):

- financial barriers (e.g., high costs of innovative activity, lack of sources of financing, transaction costs and fees),
- knowledge barriers (e.g., lack of knowledge on financial innovation, lack of qualified employees),
- market barriers (e.g., lack of information on the market offer of financial innovation, lack of matching offer),
- institutional regulations (e.g., tax and accounting regulations),
- psychological factors (e.g., lack of need to create innovations, negative attitude toward innovative processes).

From the end-user perspective, it has to be stressed that some factors are beyond the control of an individual firm—these are institutional and market factors, that form exogenous barriers. Financial factors, psychological factors, and those related to knowledge (forming endogenous barriers) may be reduced to some extent by, e.g., changes in the organizational structure, introduction of new technology, or employee training and development (Drew 1995; Vermeulen 2004). In the context of the application of financial innovations, the barriers related to knowledge and financial literacy are of the highest importance and they are widely discussed among others in (Frączek and Klimontowicz 2015; Gustman et al. 2012; Kieźel and Smyczek 2015; Shiller 2013) or (Świecka et al. 2020).

Thus, the identification and prioritization of the main barriers to financial innovations may help to develop the mechanisms (at the institutional and individual level) aiming at their reduction, and consequently improving the efficiency and effectiveness of financial innovation application in the corporate financial strategy. As it was already mentioned, studies on financial innovation application in firms, as well as studies on the barriers to financial innovations implementations in firms, are relatively rare. Thus, this paper aims to cover this gap.

3. Materials and Methods

3.1. Research Design

The main aim of the empirical study was to identify and prioritize the barriers to the application of financial innovation in the nonfinancial firms on the example of the Polish market. The study consisted of two stages and used survey research, which is relatively common in the analysis of the innovative activity of firms (e.g., Santoro et al. 2018; Skuras et al. 2008).

The first stage of empirical research aimed to obtain information on financial innovations applied by Polish firms directly from their financial managers. This investigation referred to the decisions of firms—end-users of financial innovations and factors related to their demand for financial innovations, including various types of barriers. In the second stage of empirical research, the opinions of experts, who represent financial institutions (creators of financial innovations), were gathered. Their opinions referred both to the factors determining the demand and the supply of financial innovations in the Polish market, which—due to its size and characteristics—can be treated as a good representative of other Central European economies.

The first stage of the research aimed to gather information on the scale and types of financial innovations applied by the Polish firms. The respondents were asked about the motives and consequences of financial innovations application, as well as barriers limiting their use. The respondents were financial managers (directors or business owners) responsible for making financial decisions and having sufficient knowledge about financial instruments, products, and services applied by the firm. The invitation to participate in the research was directed to 1000 randomly selected firms (nonfinancial Polish companies of different sizes and from various sectors). Complete responses were received from 127 firms (which gives a 12.7% response rate). The study was conducted in February and March 2017 using the questionnaire technique and its variations: CAWI (Computer-Assisted Web Interview) and CAPI (Computer-Aided Personal Interview). The analysis of the responses was carried out for the entire sample and further broken down into subcategories based on the firms' characteristics presented in Table 1. To analyze the responses, descriptive statistics techniques were used. Besides, correlation analysis of the variables was performed using the rho-Spearman correlation coefficient, which applies to features measured on the ordinal scale. To assess the significance of differences between subcategories of firms (according to their characteristics, see Table 1), the Kruskal–Wallis nonparametric significance test was used.

Table 1. Firms characteristics.

Characteristics	Description	Subcategories
Size (SE)	Number of employees	Small—SE_SM—up till 250
		Large—SE_L—200–2500
		Very large—SE_VL—above 2500
Size (SR)	Total revenues (in PLN million)	Small—SR_SM—up till 200
		Large—SR_L—200–500
		Very large—SR_VL—above 500
Age (AG)	Number of years since inception	Young—AG_Y—up till 5 years of operation
		Medium-aged—AG_G—5–15 years of operation
		Mature—AG_M—above 15 years of operation
Organization structure (OS)	Form of organization structure	OS_IB—independent business organization
		OS_PG—part of national capital group
		OS_IG—part of international capital group
Range of activity (RA)	Market of operations	RA_DM—only domestic market
		RA_IM—international market

The purpose of the second stage of the research was to obtain experts' opinions on the application of financial innovations in the Polish firms. The original questionnaire was directed to selected employees of financial institutions: Banks, insurance companies, investment funds, Private Equity funds, and Fin-Tech firms, involved in creating an offer for firms and having experience in cooperation with business clients in the field of new products, services, instruments, and financial solutions. The study was conducted in February and March 2017 using the CAWI (Computer-Assisted Web

Interview) and CAPI (Computer-Aided Personal Interview) methods. Following Guest et al. (2006), by using the concept of saturation, the number of answers was limited to 40. To analyze the opinions of experts, the frequency of the answers was supplemented with elements of descriptive statistics: The measure of position, dispersion, and asymmetry. Figure 2 illustrates the research design.

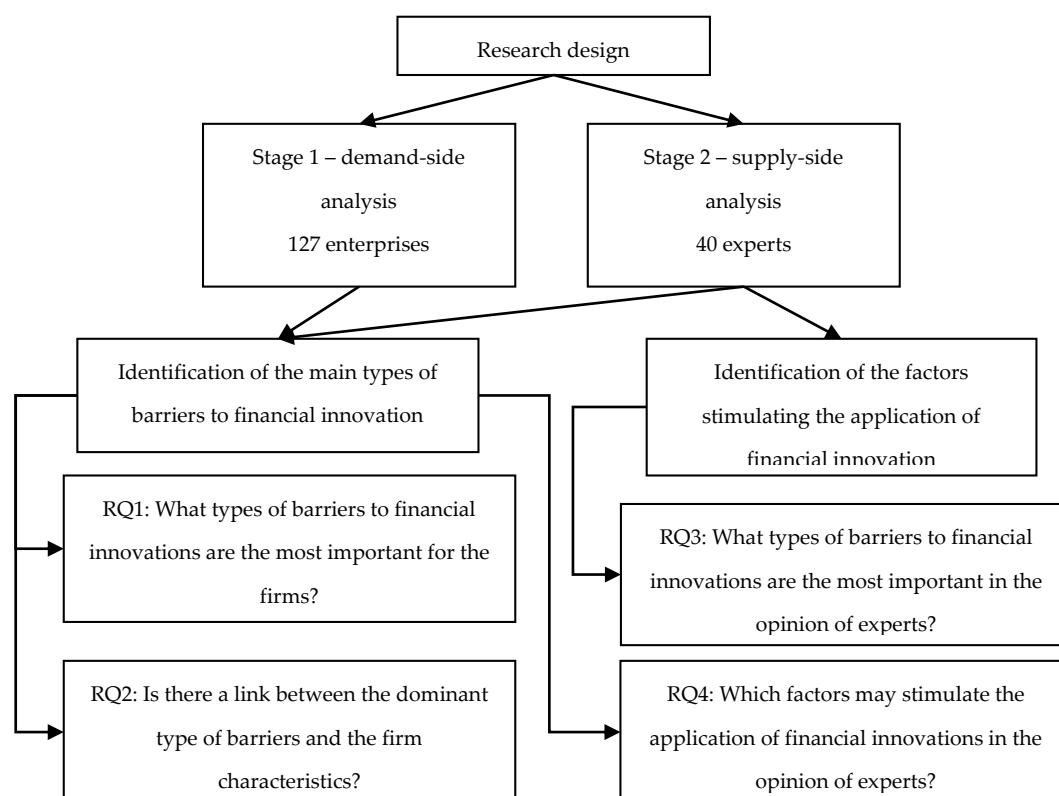


Figure 2. Research design.

3.2. Structure of the Research Sample

After the initial verification of the completeness of the received questionnaires, responses from 127 firms were included in the study. The surveyed firms constitute a diversified group of entities due to their size, age, range of activity, or organizational structure (as presented in Table 2).

Table 2. Structure of the surveyed firms.

Size (Employment)		Size (Revenues)		Age		Organization Structure		Range of Activity	
SE_SM	59%	SR_SM	57%	AG_Y	17%	OS_IB	47%	RA_DM	41%
SE_L	27%	SR_L	13%	AG_G	36%	OS_PG	32%	RA_IM	59%
SE_VL	14%	SR_VL	30%	AG_M	47%	OS_IG	21%		

Taking into account the size, the sample is dominated by the SMEs (Small and Medium-sized Enterprises), both concerning the number of employees and the total revenues. The percentage share of SMEs according to both criteria is similar and amounts to nearly 60% of the sample (SE_SM and SR_SM). In the theory of innovation, there is no clear relationship between the firm's size and its innovative activity, as the presented results of the prior research are mixed. Another distinguishing feature is the age of the firm, which according to the theory of innovation, is inversely related to the scale of innovation. The sample is dominated by mature firms (AG_M) operating on the market for over 15 years. A feature that can be important for the diffusion and implementation of financial

innovations is the organization structure in the form of capital groups, particularly international groups as proven by [Gołębiowski and Lewandowska \(2015\)](#). Firms, which belong to a capital group (either national or international), represent more than 50% of the sample (with a dominant share of the OS_PG subcategory). As suggested by [Gurkov \(2005\)](#), the experience in the international business environment may affect the transfer of knowledge about innovations in general and financial innovations in particular and the possibility of their application in financial management. Firms operating in the international market (RA_IM) constitute the larger part of the sample.

4. Results and Discussion

4.1. Types of the Applied Financial Innovations

In the original questionnaire addressed to financial managers, several general and more detailed questions were included (Appendix A). The questions were designed to find out the motives, effects, and barriers to financial innovations application by the surveyed firms. In this paper, we focus only on the barriers to financial innovations implementation as indicated by the respondents. (The complete analysis of results is presented in the Polish language in ([Błach 2018](#)).)

All of the analyzed firms (127 firms) confirmed the application of financial innovations in their financial strategy (in one or more areas of financial management). Following the functional approach, in the first place, firms indicated the application of the financial innovations supporting working capital and financial liquidity management (e.g., internet and mobile banking, e-invoicing, mobile payment solutions)—69% of firms. The next place was given to financial innovations supporting risk management (e.g., various types of financial and commodity derivatives) with 15% of responses and successively—financing decisions (e.g., hybrid securities, structured bonds) with 13% of responses. Meanwhile, financial innovations in the investment decisions were quite rarely applied (e.g., hedge funds, exchange-traded funds, on-line trading platforms) with only 3% of responses. This observation confirms the complementary role of financial investment in the corporate finance strategy, as well as the dominant importance of safety for firm survival and development (maintaining liquidity, reducing risk). Detailed information on the types of applied financial innovations is presented in Figure 3.

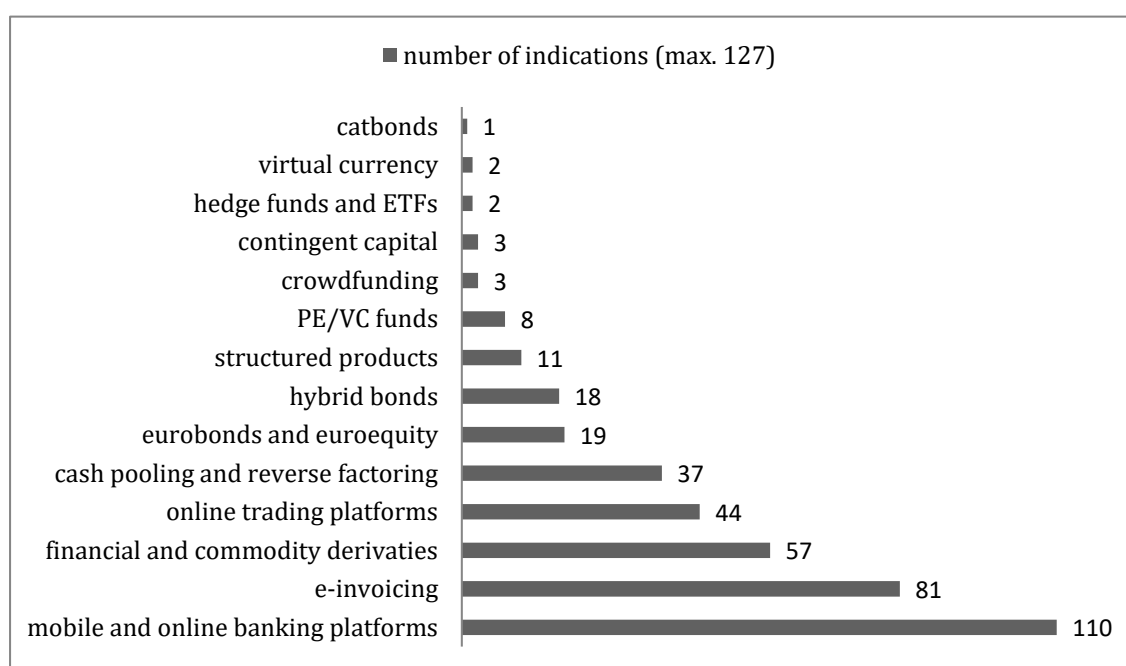


Figure 3. Types of financial innovations applied by the analyzed firms.

The respondents were asked to indicate the main motives for using financial innovations. Leading financial motives include: (1) Access to sources of funds with a lower cost of capital; (2) potential to increase the firm's profitability and efficiency; and (3) stabilization of cash flows. The main nonfinancial motives were indicated as: (1) Searching for competitive advantage; (2) necessity to adjust to changes in the business environment, and (3) necessity to adapt to changes in law regulations. The analyzed firms assessed the effects of applied financial innovations positively (close to 90% of respondents), as they observed: (1) An increase in corporate value; (2) improvement in financial liquidity, and (3) reduction in the level of financial risk. The positive experience in the past influences the decision of the firms to use financial innovations in the future, as 75% of firms declared plans to use financial innovations in their financial strategy (in one or more area of financial management).

4.2. The Main Types of Barriers to Financial Innovations—Firms' Perspective

Concerning the issue of barriers, the respondents were presented with a list of potential endogenous (ENB) and exogenous (EXB) barriers. There were listed 10 types of barriers identified during theoretical studies with a request to indicate the most important ones (5 barriers assessed as the most difficult) related to the applied financial innovations. Figure 4 presents the detailed answers of respondents expressed as a percentage share in the total indications (max. 100%). The percentage share of answers indicates the relative importance and strength of a particular type of barrier.

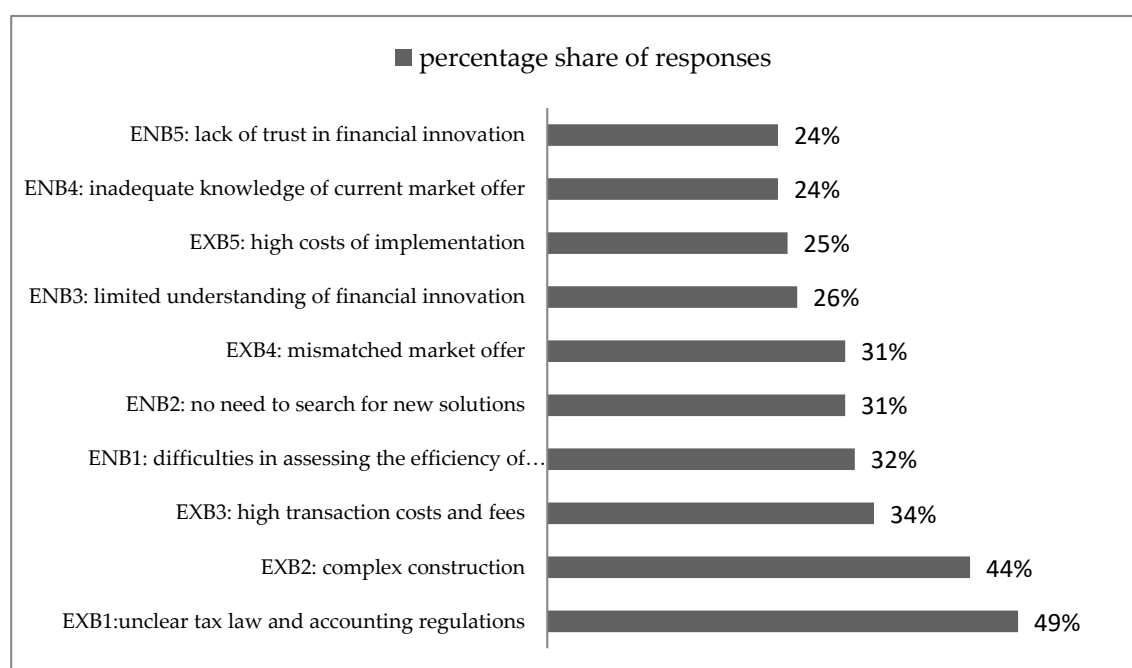


Figure 4. The relative importance of barriers to financial innovation according to managers.

In the first place, the respondents indicated various types of exogenous barriers (EXB). The most important barriers according to them are related to unclear tax law and accounting regulations (EXB1). Complex construction and difficult mechanisms of innovations (EXB2), as well as high transaction costs and fees related to their application (EXB3), form the next group of barriers indicated by respondents. These exogenous barriers have the highest strength and may limit the usage of financial innovations by firms significantly. Thus, the main actions aiming to reduce barriers should address these issues.

Concerning the endogenous barriers (ENB), respondents pointed out such factors as (1) difficulties in assessing the efficiency of applying innovations (ENB1) and (2) the lack of need to search for new financial solutions (ENB2). These factors related in general to knowledge about financial innovations

may hamper the effective application of financial innovations. This observation confirms findings presented in Kieźel and Smyczek (2015) or Świecka et al. (2020).

Taking into account the total number of answers, it can be concluded that in the respondents' opinion, the exogenous barriers (EXB) are more important than the endogenous (ENB) ones (247 to 166 indications). The main constraints hindering the application of financial innovations have their sources in regulatory (institutional) and market factors that are beyond the control of the single firm.

For further analysis, the exogenous barriers ratio (R_{EXB}) was applied, indicating the type of dominant barriers (the higher the value of the ratio, the higher the strength of exogenous barriers). It was calculated as a percentage share of answers indicating exogenous barriers (I_{EXB}) in the total number of indications (I_{TB}):

$$R_{EXB} = \frac{I_{EXB}}{I_{TB}} \times 100\%$$

The results of the preliminary analysis of the relationship between firms' characteristics and the exogenous barriers ratio (R_{EXB}) carried out using the rho-Spearman correlation are presented in Table 3.

Table 3. Correlation matrix: Firm characteristics and exogenous barriers ratio.

Firm Characteristics	SE	SR	AG	OS	RA
R_EXB	0.178 **	0.230 *	−0.004	0.162	0.117

* statistically significant at $\alpha = 0.01$; ** statistically significant at $\alpha = 0.05$.

Positive, statistically significant relationships, albeit of low intensity, were recorded only in the case of the exogenous barriers ratio (R_{EXB}) and firm size measured by total revenues (SR) and the number of employees (SE). Therefore, it can be assumed that larger firms tend to indicate exogenous barriers more often than smaller ones. That may be as large firms have already achieved such organizational capacity, which allows them to implement financial innovations; thus, endogenous barriers are not so crucial. Exogenous factors become vital barriers when the application of financial innovations would lead to further development. Detailed results of the R_{EXB} ratios for the entire sample, as well as for subcategories of firms, are presented in Figure 5.

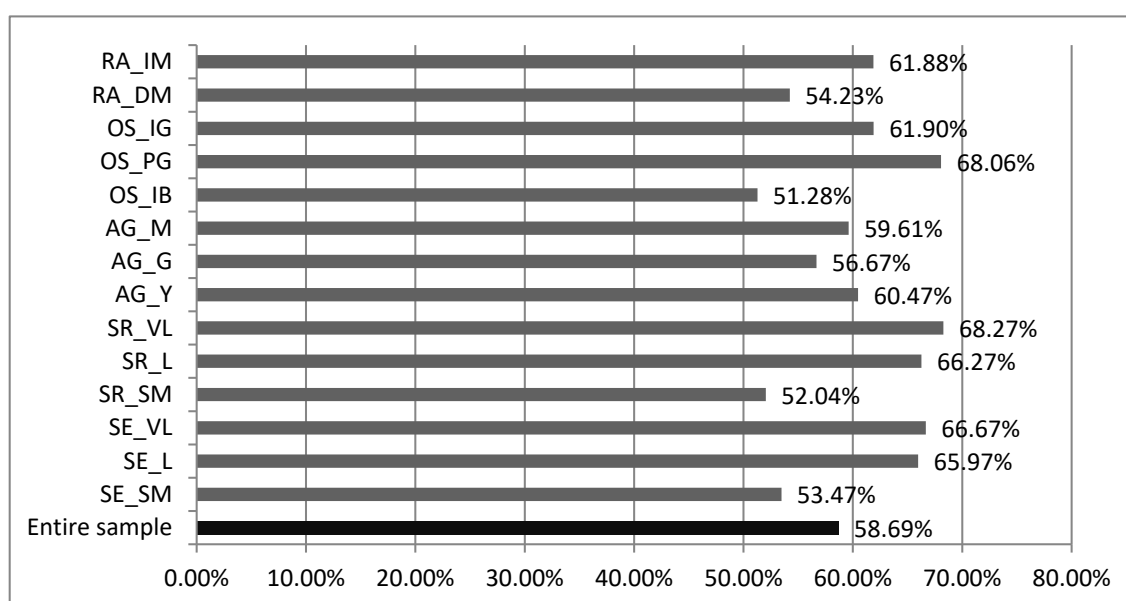


Figure 5. The results of the exogenous barriers ratio (mean).

Analysis of the results for the entire sample proved that the average exogenous barriers ratio (R_EXB) measured as the arithmetic mean is close to 59% (median 60%), which means the predominance of exogenous barriers (EXB). Therefore, the surveyed firms perceive restrictions on the use of financial innovations in their business environment and the situation in the financial system rather than in their activities, employees' attitudes, or their own needs resulting from the financial situation and the development strategy. A detailed assessment of the results indicated that the exogenous barriers (EXB) are more often pointed out by firms classified as: Very large (SE_VL, SR_VL), young (AG_Y), operating as part of the national capital group (OS_PG), and those that carry out operations on the international market (RA_IM). Meanwhile, the endogenous barriers (ENB) are more important in the opinion of the small (SE_SM, SR_SM), medium-age (AG_G), independent (OS_IB), and operating only in the domestic market firms (RA_DM).

Subsequently, the results for the Kruskal–Wallis test indicated that the differences in the perception of the importance of exogenous barriers between the analyzed subcategories of firms are statistically significant for several groups (see Table 4). It was revealed that the differences in the level of exogenous barriers ratio (R_EXB) are linked to the firm's size measured by the value of revenues (SR) and the organization structure (OS).

Table 4. The results for the Kruskal–Wallis test: Firm characteristics and exogenous barriers ratio (R_EXB).

Firm Characteristics	R_EXB
SE	4.121; <i>p</i> -value 0.127
SR	6.812; <i>p</i> -value 0.033 **
AG	0.12; <i>p</i> -value 0.942
OS	6.071; <i>p</i> -value 0.047 **
RA	1.733; <i>p</i> -value 0.188

** $\alpha = 0.05$.

4.3. The Main Types of Barriers to Financial Innovations—Experts' Opinion

At the second stage of research, the questions were addressed to the experts involved in the process of creation of financial innovations offered to firms. The original questionnaire aimed at experts included seven questions concerning their opinion on the application of financial innovations in firms (Appendix A).

Concerning the identification of the barriers, the experts were asked to provide three crucial factors limiting the efficient application of financial innovations in the firms. The received answers have been classified as endogenous (ENB) and exogenous (EXB) factors and according to further subcategories—see Table 5.

Experts have frequently pointed out both endo- and exogenous barriers, but factors relating to the characteristics of the firm—mainly the (1) lack of knowledge of financial innovation and (2) reluctance to change, were the most important. However, there, the dependency relationships between the indicated barriers may be noticed and analyzed as follows:

- (1) lack of proper sources of information, as well as lack of an adequate promotional campaign on financial innovations, leads to a knowledge gap on the potential application of financial innovation, which results in limited trust related to the reluctance of firms to use unknown solutions;
- (2) unclear legal regulations are connected with the fear of the negative consequences, resulting from the application of financial innovations, which combined with the reluctance to take risks, results in a preference for well-known, traditional solutions.

For the second question, there was a list of eight factors provided with the request to determine whether a given item can stimulate the application of financial innovations in firms. These factors referred both to the supply-side (the development of market offer of financial institutions, facilitating access to financial innovations) and demand for financial innovations (searching for competitive

advantage by firms, the need to adapt to market conditions). The mean results for listed items calculated based on the five-point Likert scale answers provided by experts illustrate the relative importance (strength) of particular factors, which may stimulate the use of financial innovations (see Figure 6).

Table 5. Barriers to financial innovations indicated by experts.

Endogenous Factors (ENB)	Exogenous Factors (EXB)
Organization barriers lack of sufficient knowledge in firms about the possibilities of applying financial innovations lack of professional staff with adequate skills and knowledge of the current market offer of the financial products and services available in the financial system	Market barriers the complex construction of financial innovation difficult access to new financial services and products due to the requirements imposed on customers of financial institutions lack of good sources of information on the market offer lack of appropriate advertising from the suppliers (creators) of financial innovation mismatch of the market offer of the new financial products and services to the specificity and needs of the firms lack of competent experts, employees of financial institutions supporting companies in the selection of appropriate financial innovations
Psychological barriers reluctance to introduce innovation coupled with the habit and convenience of using traditional financial solutions lack of trust in the financial institutions offering innovations (both traditional and new financial service providers) fear of the risk resulting from the application of financial innovations reluctance to change	Legal barriers unclear and complicated legal regulations related to financial innovation (in this: Tax and accounting regulations)
	Financial barriers high transaction costs and fees associated with the application of financial innovations

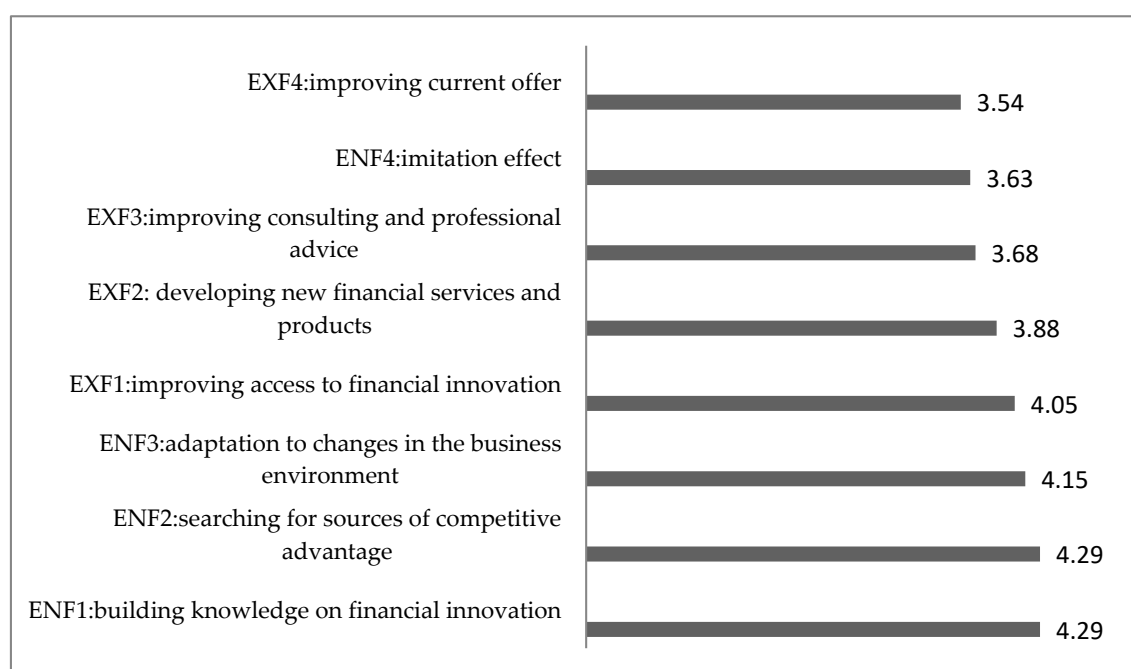


Figure 6. Factors enhancing the application of financial innovations according to experts (relative strength based on five-point Likert scale answers).

According to the experts' opinion, the dominant role was assigned to the endogenous factors (ENF1–ENF3), as well as one of the market factors (EXF1: Improving access to financial innovation). The effect of imitation and market follow-up (ENF4) achieved a low score, which may indicate the relatively lower importance of behavioral factors. The last factor was related to the current market offer and its potential improvement (EXF4), which in turn, may indicate that experts assessed the current

offer of financial products and services positively and saw no need to change it. Thus, once again, the importance of financial knowledge as the major determinant of the decision to apply financial innovations was indicated.

5. Conclusions

The purpose of the paper is to identify and prioritize the main types of barriers to the implementation of the financial innovations in nonfinancial firms on the example of the selected Polish companies. The detailed literature review and empirical investigation give the possibility to answer four research questions. Questions RQ1 and RQ2 were related to the first stage of investigation addressed to firms (financial managers), while questions RQ3 and RQ4 were directed to experts from financial institutions.

The first question aimed to find the main types of barriers to financial innovations in firms based on the opinion of the financial managers. According to them, exogenous barriers are more significant than endogenous ones. The highest significance was assigned to the following barriers: (1) Unclear tax and accounting regulations related to financial innovations, (2) complex construction of financial innovations, and (3) relatively high transaction costs and fees. Endogenous barriers, related to the firm financial situation, employees' attitude, or business strategy, were less important. Thus, the higher strength of exogenous barriers (in the opinion of the managers) indicates the necessity to undertake actions addressing these issues.

The second question was posed to find the link between the type of barriers and the firm characteristics. Detailed analysis of the answers was conducted to find the link between the type of the dominant barriers (measured by the exogenous barriers ratio) and firm characteristics (size, age, organization structure, and range of activity). Based on the rho-Spearman correlation and Kruskal–Wallis test, it was found that the differences in the level of exogenous barriers ratio (R_EXB) could be linked only to the firm size measured by the value of total revenues (SR) and to the organization structure (OS). Other firm characteristics factors are not directly linked to the dominant type of barriers to financial innovations.

The third research question was formulated to identify the main barriers to financial innovations in the opinion of experts from financial institutions. According to them, endogenous barriers are more significant than exogenous ones, limiting the use of financial innovations in the firms. The most important barriers pointed out by experts are (by their priority): (1) The lack of sufficient knowledge about financial innovations (potential application, requirements, mechanisms, and consequences of usage) and (2) reluctance to change, observed in many firms. In this regard, the experts' opinions differ from those indicated by the firms. These differences may be explained by the different perspective of creators and end-users of financial innovations.

The last question aimed to identify the main factors that may stimulate the application of financial innovations, based on the opinion of experts. According to their answers, factors related to the demand for financial innovations rather than supply factors have a higher significance for the scale of application of financial innovations in the firms. In this regard, factors related to building knowledge, searching for competitive advantage, and adapting to changing business conditions are the most crucial. These findings are consistent with the demand side theory of innovation.

By this study, we attempt to bridge the research gap that is related to the application of financial innovations in corporate finance and the barriers to financial innovation in firms in particular. This study contributes to the debate on financial innovations by adding the perspective of nonfinancial firms and the ability of the firm to create value. It also offers insights into the potential actions aiming to reduce the barriers and support the implementation of financial innovations.

The main limitation of the study comes from the subjectivity of the respondents' answers. However, the survey method is widely used in the innovation-related studies aiming to find opinions of different actors (creators, users of innovation). Although the sample is limited to selected Polish companies, the results may be used as a basis for further research, as the proper recognition of the barriers to

financial innovation and their relative strength are crucial for the development of all types of economies. Thus, similar research may be conducted in other countries to make cross-country comparisons and detect similarities or differences in the assessment of barriers to the implementation of financial innovations in nonfinancial firms. The list of presented financial innovations and barriers to their effective application may be modified, taking into account the evolution of the financial system (new financial solutions and developments) and the specificity of particular markets and economies (access to particular types of financial innovations, legal and general macroenvironment, level of financial literacy). Further research may analyze in detail the specific factors (endo- and exogenous ones) that determine the decisions of firms to apply financial innovations by using more advanced statistical methods and econometric models.

The financial system is evolving all the time. The scale and pace of creation, diffusion, and implementation of financial innovation are constantly accelerating due to the rapid development of IT solutions, open innovation, FinTech, and Alternative Finance. Some firms are searching for new financial solutions to increase their competitive advantage and enhance the ability to create value. Other firms decide to use new financial solutions forced by customers, business partners, or competitors. By assuming the positive consequences, the entire economy may benefit from the proper implementation of financial innovations. However, there are crucial barriers that may hinder the process of financial innovation. Individual firms cannot eliminate the exogenous barriers, which is why the institutional solutions are required to enhance the creation and implementation of financial innovations, to provide a clear regulatory framework, to build knowledge and trust, as well as to promote innovative financial solutions. In these actions, aiming to improve financial knowledge and financial literacy may play the most important part. Another way to improve the situation may use the concept of open innovation. If nonfinancial firms are more involved in the process of financial innovation creation, they may be willing to use these new financial developments and be better-prepared to deal with potential challenges resulting from them.

As the current pandemic situation demonstrates, the entire global economy and all types of businesses (even traditional ones) had to turn to internet-based and remote solutions. As part of this, we observe the increasing scale of application of financial innovations based on IT solutions. This situation also proves that other factors, not included so far in the theoretical models (such as the coronavirus pandemic), may influence both the demand and supply side of financial innovation. Thus, further research in this field is required, taking into account such unforeseen factors.

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Appendix A

Part A: Questions addressed to financial managers (users of financial innovations)—selection

List 5 financial motives for the application of financial innovations in your company
List 5 non-financial motives for the application of financial innovations in your company
List 5 main effects of the application of financial innovations in your company
What are the effects of the application of financial innovations in your company (past experience)?
- Negative
- Rather negative
- Difficult to assess
- Rather positive
- Positive

<p>Are you planning to use financial innovations in your company in future (future plans)?</p> <ul style="list-style-type: none"> - No - Yes, in financing decisions - Yes, in investment decisions - Yes, in risk management - Yes, in working capital management
<p>Indicate the types of financial innovations applied in your company (now or/and in the past):</p> <ul style="list-style-type: none"> - Mobile and on-line banking platforms - E-invoicing systems - Financial and commodity derivatives - On-line trading platforms - Cash pooling and reverse factoring - Eurobonds and euroequity - Hybrid bonds and convertibles - Structured products - PE/VC funds - Crowdfunding - Contingent capital - Hedge funds and ETFs - Cryptocurrency - Catbonds and weather derivatives
<p>Indicate 6 the most important barriers to the application of financial innovations in your company:</p> <ul style="list-style-type: none"> - unclear tax law and accounting regulations related to financial innovations - complex construction of financial innovations - high transaction costs and fees related to the application of financial innovations - difficulties in assessing the efficiency of application of financial innovations - no need to search for new solutions - mismatched market offer - limited understanding of financial innovation - high costs of implementation of financial innovation - inadequate knowledge of current market offer of financial innovation - lack of trust in financial innovations

Part B: Questions addressed to financial experts (creators of financial innovations)

Part I	Very low	Low	Moderate	High	Very high
In your opinion what is the level of knowledge about financial innovations in Polish firms?					
In your opinion what is the level of interest in financial innovations in Polish firms?					
In your opinion what is the level of access to financial innovations by Polish firms?					
In your opinion what is the level of application of financial innovations in Polish firms: <ul style="list-style-type: none"> - in financing decisions - in investment decisions - in working capital management - in risk management 					

In your opinion what is the level of access to financial innovations by Polish firms?					
- in financing decisions					
- in investment decisions					
- in working capital management					
- in risk management					
In your opinion what is the relative importance (strength) of the factors stimulating the application of financial innovations in Polish firms?					
- Building knowledge on financial innovation					
- Searching for sources of competitive advantage					
- Adaptation to changes in business environment					
- Improving access to financial innovation					
- Developing new financial services and products					
- Improving consulting and professional advice					
- Imitation effect (following sector leaders)					
- Improving current offer of financial institutions					
Part II					
List 3 crucial factors hampering the effective application of financial innovations by Polish firms					

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