An empirical analysis of the influence of financialization on the innovative activity of the firms' managers in Italy

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This paper contributes to the discussion about the impact of financialization on the innovative activity of firms. The initial hypothesis was whether financialization has negative impact on the innovative activity of a company as a consequence of investment short-termism of managers who are not motivated to invest in risky innovative initiatives with a long payback period. Assumptions are made through analyzing the relationship between financial indicators (financial expenses and incomes) and investments in research and development on the sample of Italian publicly listed non-financial corporations. The article tests whether financialization leads to short-termism of company managers forcing them not to invest in risky innovative initiatives with a long payback period. Econometric analysis reveals that financial income of Italian non-financial companies was found to be positively associated with their R&D expenses. This finding may support the economic theory of the mainstream literature, which argues for the beneficial effects of financialization on the economic growth and is inconsistent with many empirical results received by the Post Keynesian authors. The possible reason for it is that the motivation of the Italian managers may be different from the Anglo-Saxon managers' one and not characterized by the shareholder value orientation and short-termism.

Эмпирический анализ влияния финансиализации на инновационную активность менеджеров фирм Италии

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Эта статья вносит вклад в дискуссию по поводу влияния финансиализации на инновационную деятельность фирм. Важнейший вопрос – следующий: оказывает ли финансиализация негативное воздействие на инновационную активность компании вследствие ориентации на краткосрочные результаты менеджеров, не мотивированных вкладывать средства в рискованные инновационные проекты с длительным сроком окупаемости. Авторы анализируют взаимосвязь между финансовыми показателями (финансовыми расходами и доходами) и инвестициями в исследования и разработки на примере итальянских публично котируемых нефинансовых корпораций. В статье проверяется, приводит ли финансиализация к ориентации на краткосрочные результаты менеджеров компаний, заставляя их не вкладывать средства в рискованные инновационные проекты с длительным сроком окупаемости. Эконометрический анализ показывает, что финансовые доходы итальянских нефинансовых компаний положительно связаны с их расходами на НИОКР. Этот вывод согласуется с экономической теорией мейнстрима, которая отстаивает идею о благотворном влиянии финансиализации на экономический рост, и не соответствует многим эмпирическим результатам, полученным посткейнсианскими авторами. Возможная причина состоит в том, что мотивация итальянских менеджеров может отличаться от мотивации англосаксонских менеджеров и не характеризуется ориентацией на рыночную ценность акций и краткосрочные результаты.

Ключевые слова: *финансиализация; инновации; инвестиции; НИОКР; корпоративное управление; Италия*

1. Introduction

Financialization can be defined as the growing and systemic power of finance (Osik, 2014) which is not new. Yet no explanation of modern capitalist development can ignore the scale of the ever-increasing expansion of the financial sector in comparison to the real one. The discrepancy between these segments of the economy was especially pronounced in countries with a developed market infrastructure. In the world, over the past 20 years, the share of manufacturing in gross domestic product has decreased by 30 percent, while the share of the financial sector has grown by 80 percent. According to Bukvić and Ocić (2013), modern recessions are not so much caused by the phenomenon of "creative destruction" according to Schumpeter and fluctuations in investments in the real sphere, but by the processes of separation of the financial sector from the real one, that is, financialization.

Studies of the implications of financialization mainly concern its impact on corporations' investment behavior, and many have already been carried out in some countries of the developed world, such as the US (Orhangazi, 2008; Lin and Tomaskovic-Devey, 2013), peripheral countries (Cibils and Allami, 2013; Rodrigues et al., 2016), some European countries (Stockhammer, 2004; Álvarez, 2012; Barradas et al., 2018; Alvarez, 2015; Tori and Onaran, 2018; Kuzmina and Rozmainsky, 2020) and Russia (Tretyakov and Rozmainsky, 2021). For Italy, such an analysis has been carried out as well due to the actuality of the issue for this country. The paper by Davanzati et al. (2019) considers links between financialization and inequality of income distribution in Italy, but does not cover firms' investment decisions.

There is an undeniable importance of innovations for modern companies. According to the Nobel Prize winner Stiglitz (2019), innovation is the only real source of increasing wealth for the modern world as a whole. Financialization leads to short-termism of company managers, who refuse to invest in risky or innovative projects with a long payback period, such as R&D projects (we believe that most R&D projects are long-term). Rising popularity of the ideology based on the principle of "maximizing shareholder value" (Lazonick, 2013) can be harmful for the innovative activity. All these considerations together determine the relevance of studying the consequences of corporate financialization in Italy in terms of innovation environment.

The purpose of this article is to analyze the relationship between financialization – its indicators in the form of financial payments and financial income – and investment in research and development as the determinant of innovation activity using the example of non-financial Italian firms. As a data source, the Thomson Reuters database is used for constructing a dataset based on the balance sheets of publicly listed non-financial companies collected for the period from 1995 to 2020.

The rest of this study is organized as follows. First, we talk about what the consequences of financialization can be and why it is important to analyze it, at the same time reviewing previous studies that describe the impact of financialization on innovation. Then, the Italian market features are analyzed. Finally, we present our own empirical analysis of the financial factors influencing the innovative activity of non-financial Italian firms listed on the Milan stock market (Borsa Italiana) and generalize the results.

2. Theoretical aspects
2.1. Financialization and its aftermath

The process of financialization has been carefully studied since the early 2000s. The term itself has been used by various theoretical disciplines such as political economy, sociology, economics, and even geography (e.g. Sokol, 2017) to determine the causes and consequences of the increase in the share of finance in recent decades. In economics, the debate about financialization is rooted in unconventional approaches strongly influenced by post-Keynesian theory. The global financial crisis has generated increased interest in the issue of household financialization among economists (e.g. Stockhammer, 2012), while sociologists have responded by including the non-financial corporate sector more broadly in their analysis (Tomaskovic-Devey and Lin, 2013). Karwowski et al. (2017) provide a classification defining three categories of financialization theories: macroeconomic (financialization as part of the market-based financial system), mesoeconomic (firm-oriented approach) and microeconomic (individual-oriented approach). Similarly, Van der Zwan (2014) proposes the same groups of financialization theories, distinguishing between approaches that are, first, concerned with changing modes of financial accumulation, second, based on the concept of shareholder value, and third, focused on people's everyday life.

In this paper, we refer to the corporate financialization and concentrate on mesoeconomic approach. There are mainly two aspects in defining corporate financialization: the way profits are accumulated and the degree of participation in financial markets. Arrighi (1994) and Krippner (2005) explain corporate financialization as gradual transition of enterprises from production and trading activities towards financial ones. Epstein (2005) defines financialization as referring to the increasing importance of financial markets, incentives, institutions and elites in the functioning of the economy and its institutions of power, both nationally and internationally. Tori and Onaran (2018: 1394-1395) simply describe this phenomenon as "a self-reinforcing socioeconomic process, which manifests itself in the growing prominence of behaviors derived from the functioning of the finan-

cial sector". Thus, financialization is a form of the economy' functioning, characterized by the predominance of financial transactions in the overall structure of the internal operations.

Fligstein (1990) argued that two "eras" of an enterprise' financialization can be distinguished. Within the framework of the first, until the early 1980s, companies were viewed as portfolios of investments and represented a set of production lines generating cash flow. In Italy, this concept was maintained until the early 1990s by a generation of financially trained managers. In the second era of financialization that began in the United States, the idea of maximizing shareholder value emerged as a new way of thinking about and managing a business enterprise. Shareholder value researchers suggest a non-linear relationship between financialization and corporate behavior, exploring shareholder value through more complex mechanisms and indirect paths. At the same time, scientists in this area of work analyze the extent to which financialization has changed corporate practices, including in terms of regulatory aspects (Van der Zwan, 2014).

Talking about the reasons for the emergence, or rather the transition to financialization, they are well analyzed by Wang (2019), describing several categories, some of which are particularly relevant. Mainly, in the face of increasing competition, the high profitability of financial markets forces enterprises to increase financial investments. Orhangazi (2008) and Krippner (2005) also discussed this concluding that declining rates of return in the real economy are a direct cause of the financialization of non-financial firms.

Empirical research on financialization has largely focused either on changes in individual countries over time, with a focus on the US as an archetypal financialized economy, or on specific sectors among a small number of countries. Findings by such early researcher on the topic as Arrighi and Krippner complements the research of Marxist and post-Keynesian economists who analyzed the centrality of the financial industry to the US economy. Researchers not only suggest that non-financial corporations are increasingly profiting from financial activities, but also suggest that the reverse process is taking place: non-financial companies have increased payments to the financial sector through interest and dividend payments. While most of the research is focused on the USA, there are other studies that show the presence of similar processes in the European economy (Stockhammer, 2004; Álvarez, 2012; Barradas et al., 2018, Alvarez, 2015; Tori and Onaran, 2018) as well as in Russia (Tretyakov and Rozmainsky, 2021).

Economic environment and academic findings bring us to the understanding that financialization is a controversial process, as it has both positive and negative aspects that provoke a number of problems for an economy. While the term "financialization" is rare in mainstream economic or financial literature, finance growth, financial development, and financial deepening have been discussed from early times. This seemingly mainstream literature has been positive about the growth of finance and the financial sector (which falls under Epstein's definition of financialization). A growing body of empirical analysis demonstrates a strong positive relationship between an expansion of financial markets and the efficient allocation of investment (Tori and Onaran, 2018: 1394). Here, the positive effects of the financialization of the economy include expanding opportunities for financing the real sector of the economy, stimulating consumption, increasing the availability of goods and increasing capital mobility.

The negative influence of financial sector enlargement in the literature is illustrated on the economic systems (Cecchetti and Kharroubi, 2012), on income distribution (Davanzati et al., 2019) and demand as well as on investment. Bukvić and Ocić (2013) argue that it is already too late to regulate the situation, since the processes of financialization have prepared the emergence of the crisis, and the regulatory measures of the state are only able to redirect large financial flows and determine the timing of the onset of the crisis. Tridico and Pariboni (2018) identify increased financialization as one of the explanatory factors for low productivity.

Financialization can also be viewed from a behavioral perspective, as it can change some norms of economic behavior of economic entities, norms that affect the assessment of the future time. Some authors find financialization to be encouraging people to focus on high short-term economic outcomes (Kuzmina and Rozmainsky, 2020; Tretyakov and Rozmainsky, 2021). At the same time, this is found to be especially applicable to managers of firms who seek to raise the market value of the financial assets of these firms as high as possible in exchange for some "bonuses" from shareholders. In this regard, financialization leads to investor myopia (Rozmainsky, 2014) when the future is cut off from consideration or discounted at an increasing discount rate, the consequence of which is

that economic entities are increasingly refusing to invest in risky or innovative projects with a long payback period.

One of the most important issues of financialization is related to its impact on investment, an impact that is mostly interpreted as unfavorable. Barradas et al. (2018) conduct an empirical analysis of the relationship between financialization and real investment in Portuguese non-financial companies. They conclude that indicators of financialization, such as financial receipts and financial payments, discourage investment in Portuguese companies, yet mainly through the financial payments channel. However, the authors do not assess statistical significance by dividing corporations by sector, industry, and size, as in Orhangazi (2008).

Stockhammer (2004), using macro data, analyzes the dual nature of financialization and evaluates the impact of financial payments and company earnings on investment. According to the researcher, the growing importance of the financial markets forces managers to take the short-term horizon of the financial markets as a guideline for decision-making, because financial markets only value short-term success. In addition, financialization distorts economic investment and reduces the interdependence of labor and capital. Real investments are being squeezed out due to the growing importance of financial assets. Consequently, there is less free cash for investment in fixed capital such as equipment or buildings (Lin and Tomaskovic-Devey, 2013; Orhangazi, 2008).

Orhangazi (2008) investigated the impact of financialization on firms' actual investment decisions in a large sample of US non-financial organizations. He argues that an increase in financial investment crowds out real investment by changing the incentives of firm managers and by reducing available internal funds, shortening the planning horizon, and increasing uncertainty (see also Davis, 2017). These two channels help explain the negative relationship that the author of the article found between investment and financialization, using specifications various sectors, industries and sizes. The presented results support the view that financialization has negative consequences for the investment behavior of firms. Nevertheless, the results are not necessarily final. More research is needed to better understand developed countries specifics and better assess the impact of financialization there.

Davis (2018) explores the relationship between financialization and investment in terms of changes in financial behavior at the level of US companies and argues that changes in investment are linked to financial decisions and changes in financial behavior, and such changes are concerned with an emergence of new corporate governance norms. The analysis also highlights differences by firm size: shareholder value influences the investment behavior of large firms, while rising volatility affects smaller firms more significantly.

Similarly, Tori and Onaran (2018) examine the impact of financialization on physical investment using panel data based on the balance sheets of publicly traded non-financial UK companies. Following the previously mentioned scientists, the authors find the orientation of the non-financial sector towards financial activities for physical investments through the influence of financial payments (interest and dividends) and financial income on the rate of accumulation unfavorable. This influence is said to be particularly strong in the pre-crisis period due to increasing sales and retained earnings. To analyze the effects of financialization, the authors started with a basic investment model based on Fazzari and Mott (1986). The authors also believe that there is a relationship between past and future levels of investment, so "lag investments" and lags of other variables as predefined indicators are included in all the evaluation models. The results partly confirm previous findings by Stockhammer (2004) and Orhangazi (2008). These papers serve fundamental to the current study of the impact of financialization on investments in innovations in Italian firms.

2.2. Evaluating innovations

The question of how to evaluate innovations arises from scientists (e.g., Becheikh et al., 2006), managers and politicians constantly. An innovative activity of the organization and its innovative competitiveness in domestic and foreign practice is assessed with indicators of the innovative activity of the organization. These indicators are indispensable for the management and control of many innovative ideas and concepts in companies. Traditionally, innovation is often measured using two

metrics: research and development (R&D) and patent data. R&D is an input to the innovation process that does not necessarily lead to technologically new or improved products or processes (Flor and Oltra, 2004). For patent data, they measure invention rather than innovation (OECD, 1997; Flor and Oltra, 2004). The current study uses investment in R&D (or R&D expenses) as a proxy for R&D activity. Since innovation is the transformation of an invention into a marketable new or improved product or process, measuring it using patent data runs the risk of overestimating the results of innovation by including in the measurement those inventions that have not been transformed into marketable products or processes.

In addition to the indirect measurement of innovation, obviously, there are methods that are more direct: innovation counts and firm surveys (Archibugi and Pianta, 1996). The first approach is to collect information about innovations from various open sources, such as announcements, specialized magazines, etc. The second dimension consists of surveys conducted with companies according to a certain methodology. However, these approaches are accompanied by significant difficulties. First, a non-technological researcher needs to recruit experts to evaluate the innovations being studied, which carries human bias and makes research difficult. Additionally, in case of surveys, the representativeness of the results strongly depends on a sufficient number of responses, which is not always possible to provide (Amara and Landry, 2005).

Becheikh et al. (2006) as well as Dziallas and Blind (2019) point out that regression analysis is the most commonly used research method compared to other publication methods studying innovation activity. This paper follows common trends, and applies the most widely used analytical approach to study innovative activity.

2.3. Financialization and innovative activity

Despite the seemingly abundant research on financialization, very few researchers look at the relationship between financialization and innovative activity. There may be several reasons for this. First, in the balance sheets of companies, investment by itself already contains some share of investment in innovation and the acquisition of patents. Secondly, and more significantly, innovation activity is empirically difficult to measure due to the ambiguity of indicators and the lack of sufficient data on indicators. However, there are some notable findings in this direction.

Recent research on the relationship between financialization and innovation (Dosi et al., 2016, Battiston et al., 2018) has shown that financial markets have had a negative rather than positive impact on innovation activity and economic growth. These findings build on research on the relationship between financialization and investment in intangible assets, including investment in research and development.

Dosi et al. (2016) note that financialization is not conducive to technological research, especially for small firms. This is because value-seeking behavior in the stock markets does not leave time to explore new technological solutions and even to search within known solutions. Here, the short-term behavior of firm managers exacerbates the situation, because the innovation process itself implies a time lag between risk taking and obtaining economic benefits.

Battiston et al. (2018), analyzing macro empirical data on the growth patterns of financialization in the EU, have shown that excessive financialization not only suppresses economic growth, but also has a negative impact on innovation due to decreased share of reinvested profits. In order to curb excessive financialization, the authors propose several countermeasures, such as stimulating demand in the real sector, rewarding top managers with long-term profits and corporate social responsibility goals, or setting a minimum standard for banks to lend to the real sector of the economy.

Lee et al. (2020) analyze how financialization has changed the technology innovation strategy based on macro data from thirty-one countries of the Organization for Economic Co-operation and Development from 1990 to 2006 using a generalized moment estimation method, fixed effects model and Poisson regression model. They argue that as the condition of managerial myopia worsens, businesses are turning away from radical innovations that involve high risk and uncertain returns on long-term huge. An interesting result is that when valuing patents as the dependent variable, the valuation gives

different results depending on the quantity and quality of patents. It turned out that as financialization increases, the number of patents increases, and the radicalness of innovations decreases. This suggests that the increase in the number of patents reflects the recent trend of companies to improve investment attractiveness by filing and registering patents to create a false technological image, meanwhile making only minor improvements to existing technologies. This conclusion is called into question the correctness of using the number of patents to analyze the innovativeness of companies.

To summarize, research shows that financialization can negatively affect technological innovation in three ways. First, companies are increasingly investing in financial assets that bring high returns in the short term, which leads to a fall in investments in intangible assets and technological development. Second, strengthening shareholder value generates increased dividends and share repurchases; it decreases the share of reinvested profits (Lazonick, 2013). Third, capital market pressures and shareholder impatience are forcing managers to focus on short-term outcomes and shift their innovation strategies toward lower R&D costs that require large investments over a long period of time. However, the need for firm-level microeconomic research approaches remains to explore the differences and similarities between financialization and technological innovation strategies across different types of corporate governance, industries, and company sizes. Apart from that, there are not any articles about the impact of financialization processes on innovative activity of companies in Italy.

2.4. Italian milieu

In terms of cutting-edge (advanced) manufacturing with innovative solutions, the latest available data for Italy is from before the pandemic. According to a recent survey conducted by the Polytechnic University of Milan (2022), in a sample of 102 large Italian companies, 94 percent of large companies are aware of Industrial Internet of Things solutions, but 68 percent have started at least one project. While only 120 small and medium-sized enterprises out of 295 have an understanding of Industrial Internet of Things and only 29 percent of them have launched some initiatives.

Since the Italian business environment is dominated by the desire for the security of corporate control, companies have tended to avoid listing on the stock exchange. However, in recent years the capitalization of Borsa Italiana has risen from only 27 percent in 2014 to 43 percent in 2021 of national GDP (according to the World Bank, CEIC). The upper echelon of the Italian corporate structure is characterized by a high degree of concentration of ownership, predominantly of a "family" type. The majority shareholding owns about 60 percent of the value of network securities circulating on the capital market, the top five (for each company) holders own about 90 percent (for comparison: in the US this figure is 25 percent), in Germany – about 40 percent). Smallholders account for only a small percentage of registered shares; they practically do not influence the management of companies and are deprived of the possibility of control over decision-making.

Italian financial and industrial groups usually have a pyramidal form (holding) and unite about one third of firms under their control. Within the group, shareholding relations are organized from top to bottom: a financial holding is usually at the head, from which there are vertical chains of participation in the capital of legally independent firms, and at each stage, higher firms exercise control over lower ones. Total consolidated assets of domestic banking groups as a share of nominal GDP in Italy have risen significantly in the next two years after a low point of 136.6 percent in 2018. As of 2020, this percentage has reached 173.7 percent (Source: Statista).

There is very little behavioral research on Italian corporate governance, but there are some notable ideas about Italian management style among academics. According to House et al. (2004) in the GLOBE studies, which are empirical studies of culture-specific aspects of leadership, leadership in Italy, as in other Latin European cultures, demonstrates a more command/collective, value-based and charismatic type of leadership. Tavanti (2012) discusses that Italian leaders tend to avoid uncertainty meaning that strange phenomena and ambiguity create anxiety.

Thus, Italy is characterized by the predominance of family business models and pyramids, as well as the presence of well-known shareholders with a predominance of individuals among them. All

this, plus the presence of interconnected directors, means that large Italian companies are controlled by shareholders and limited coalitions, which theoretically hinders the development of a market for corporate control (Rossi, 2013) and the penetration of short-term investors into the stock market (Salento, 2014). Yet, opinions regarding the degree of financialization of companies in Italy vary between different scholars. Ficcadenti (2020) finds that grants (also a kind of financial income) offered by foundations to non-profit organizations normalize financial relations in the Italian social security system. Salento (2014: 3) writes that financialization of companies in Italy "is a long-term process and should not be conceived as an abrupt historic shift". By the same token, starting from 1970s–1980s, large Italian companies undergone a process of financialization: the abandonment of the gold standard (1971), together with the production difficulties that arose from the oil crisis (1973), prompted large companies to reduce investment in fixed assets and move into the world of finance (Salento, 2014: 5). Regarding these events, De Luca (2002) mentioned that Italian elite gets more and more involved in finance (rather than production). Salento called the functional distinction between industry and banks eroding from 1990s and noted that "since the early 1970s, blockholders of large Italian companies have systematically and increasingly pursued financial accumulation" (Salerno, 2014: 5). It is consistent with the conclusions from (Davanzati et al., 2019: 934); this paper notes that financializaton in Italy occurred "in the form of increasing financial accumulation on the part of firms".

To summarize the views of academics, the financialization of firms in Italy cannot be characterized by the predominance of short-term investors, in contrast to the Anglo-Saxon context (Salento, 2014; Simoni, 2020). Rather, Italian entrepreneurs gradually adopted a new, financially oriented management style that had dramatic consequences for production and organizational performance. The trend towards a long-term production, financial accumulation strategies, and reforms of the 1980s and 90s contributed to the transition of traditional coalitions of capitalism to the financial management of companies in Italy, which affected the strength of the industrial system. The aim of the current study is to assess whether those reforms led Italian non-financial corporations to orient on financial incomes rather than innovations through an empirical analysis.

3. Data and methodology

For the purpose of the current study, 48 Italian multinational companies are chosen to assess and report the impact of financialization on their innovative activity. Standardized data on financial payments and financial income is not easy to find, especially because many companies do not publish comprehensive information. As the most accessible source, the Thomson Reuters database is used for constructing a dataset based on the balance sheets of large non-financial companies listed in Borsa Italiana (Italian Stock Exchange) for the period from 1995 to 2020. It was decided to choose publicly listed companies as the required information on their financial activities (financial summary, income statement, and balance sheet) is free-for-all. Respectively, regression analysis is chosen as the most commonly used research method (Dziallas and Blind, 2019). However, it is worth noting that the sample consists of unbalanced panel data, and the number of data gaps is quite large, which greatly complicates the study. The use of a balanced sample is not advisable, as estimates may be biased due to the exclusion of a large number of companies just because they did not provide complete information.

As mentioned above, in the scope of the current research the model by Tori and Onaran (2018) modified serves as a starting point for econometric modeling, since it incorporates both real and financial determinants of investment. The principal difference is that the dependent variable is investment in R&D (i.e. R&D expenses). The main factors influencing investments include revenue, total capital, financial income (i.e. interest and dividend income), financial payments (i.e. interest and dividend payments), and retained earnings. Revenue is a key factor influencing the further decision to invest in fixed assets. A positive correlation is assumed between revenue and investment in R&D, since the more money is available the more space for investments is there. Capital is used to regulate the size of the firm. It is assumed that the financial return of large companies has a negative correlation with investments (Orhangazi, 2008). With regard to retained earnings, the presence of excess funds may mean that the company has free funds that it can invest in real investments. An

indicator of the company's solvency and ability to provide high profitability in the financial market is ability to pay high interest or dividend payments. However, this indicator can have both positive and negative effects. The increase in financial payments in the short term makes it difficult to finance real investments, which, in turn, provide a return on funds only in the long term and require constant financing. Thus, the general equation for analyzing the impact of financial indicators on investment in R&D looks as follows:

$$ln(\tfrac{RnD}{K})_{it} = \beta_0 + \beta_1 \ln(\tfrac{RnD}{K})_{it-1} + \beta_2 \ln(\tfrac{Rev}{K})_{it-1} + \beta_3 \ln(\tfrac{R}{K})_{it-1} +$$

$$\beta_4 \ln(\tfrac{FI}{K})_{it-1} + \beta_4 \ln(\tfrac{FP}{K})_{it-1} + \beta_t + \varepsilon_{it},$$

where K is the capital of the company; RnD represents the R&D investments; R – retained earnings; Rev – revenue; FI – financial income of a company (interest + dividend income); FP – financial payments (interest + dividend expenses); β_t is the annual dummy variable; i is the company index and t – the time period. All variables are used in logarithmic form to account for non-linear effects between the dependent and explanatory variables and normalize them, as in Tori and Onaran (2018). In order to control the size of a company, all indicators are divided by the total capital (K) of a company, and a dummy variable (β_t) for each year is included to control for unobservable time effects. Variables' definitions are presented in Table 1, summary statistics and correlation matrix – in Appendices section. The chosen equation is aimed at evaluating firm-level R&D investment, which is consistent with the tradition of investment analysis and considers financial outflows and inflows as the fundamental determinants of investment.

Table 1

Variables definition

Symbol	Variable	Definition	Measure	FCC code[1]
K	Capital	Total Capital	US Dollar, thousands	STCAP
RnD	R&D investments	Research & Development Expense – Expensed & Capitalized	US Dollar, thousands	SXRD
R	Retained income	Retained Earnings – Total	US Dollar, thousands	SRED
Rev	Revenue	Revenue from Business Activities – Total	US Dollar, thousands	STLR
FI	Financial income	Interest Income & Dividend Income	US Dollar, thousands	SINI, SIDN
FP	Financial payments	Interest Expense & Dividends Payable	US Dollar, thousands	SIEN, SDPT

Source: Thomson Reuters Datastream

Current analysis includes the use of the fixed, random and dynamic models for panel data that involve the R&D investment lag as an explanatory variable and time dummy for each year. Fixed effects regression is helpful to eliminate unobservable individual effects from the model. To analyze this model, the ordinary least squares method can be used, but in order for the estimates to be consistent, the model must satisfy the condition of uncorrelated errors (ε) and regressors. Random effects regression differs in that the random variable is not correlated with the error. However, these models have a disadvantage – they cannot solve the potential problem of endogeneity of lags in the dependent variable. In this regard, another dynamic model by Arellano and Bond (1991) is used, which is a particular modelling approach

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[1] Federal Communications Commission's Financial Reporting Requirements codes.

that deals with endogeneity. The use of three models makes it possible to compare the results of all estimates. The latter model is a powerful tool for analyzing firm-level data for samples in which the number of firms outnumbers time intervals. Compared to other evaluation models, this model not only controls for potential endogeneity of lags in the dependent variable, but also is not sensitive to bias in estimates due to missing observations. Following Fazzari and Mott (1986), lag of dependent variable as well as lags of other variables as predefined indicators are included in all the evaluation models to account for a relationship between past and future levels of R&D spending.

4. Results and discussion

Before summarizing the results, some indicators dynamics from the financial statements of Italian companies are considered. The manufacturing sector is somewhat more sensitive to changes in the economic situation than all sectors as a whole. As seen in Figure 1, the growth rate of R&D spending of Italian non-financial companies has declined significantly in three time points. The first refers to 2004, which is difficult to attribute to any significant event. The second refers to post-crisis times after the global financial crisis of 2008. The sharp decline in innovation activity from 2019 to 2020 can be explained by the outbreak of the COVID-19 pandemic, during which many companies worldwide had to stop their business and Italy had been one of the most affected countries (Ricci et al., 2020).
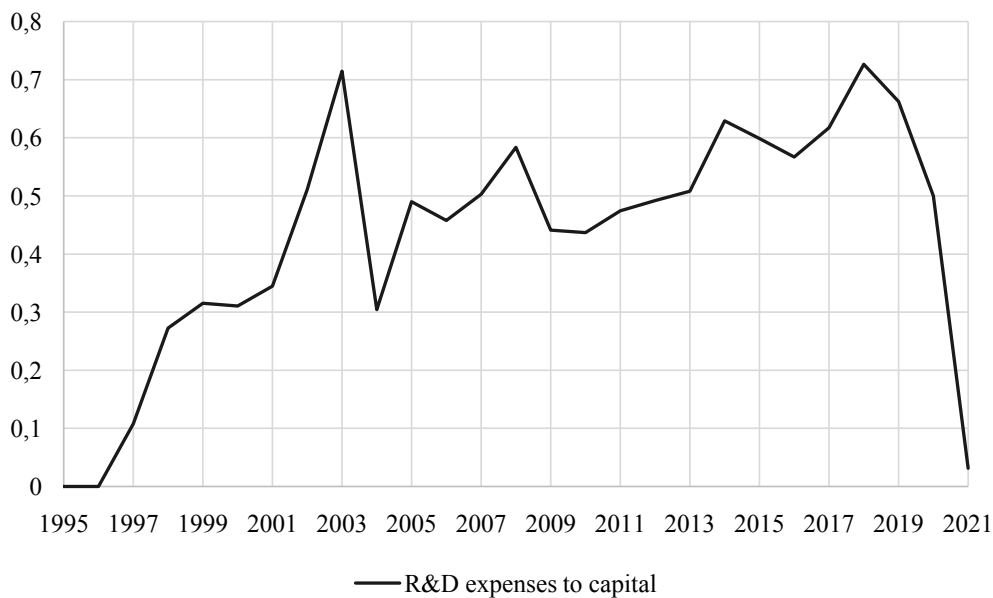

Fig. 1. Investments and R&D expenses dynamics of non-financial corporations in Italy, 1995–2020 (%)

Source: Thomson Reuters Datastream

Figure 2 shows how the ratio of financial incomes to revenue in Italian non-financial companies has changed over time. It can be seen from the graph that from 2004 to 2008 in step with the development of the global financial market through the Internet and the trend of acquiring shares of publicly listed companies, the financial income of these companies increased from 17% to around 63%. Then, financial crisis of 2007–2008 led to serious losses of financial income of organizations. It can be assumed that since 2010 Italian non-financial companies have decreased their financial activities. Figure 3 manifests the ratio of finance expenses to capital, including paid interests and dividends to capital. According to the European Central Bank[2], between 2001 and 2006, interest rates fell. Such a drop may be one of the reasons for the reduction in financial expenditures in 2004–2006. Other reasons may be related to the fact that the profits of companies were directed during this

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[2] https://tradingeconomics.com/italy/interest-rate

period mainly to investments, and not to the payment of dividends, and to the fact that before this period, companies had not taken on so many loans, and, accordingly, the burden of debt service was insignificant. Further, in 2007–2009, in connection with the approach of the crisis, and then its deployment, both the interest rate and the volume of loans, and hence the amount of financial expenses, grew, yet not sharply. Thus, it is difficult to observe superficial signs of the financialization process in Italian non-financial companies based on the dynamics of the given indicators.
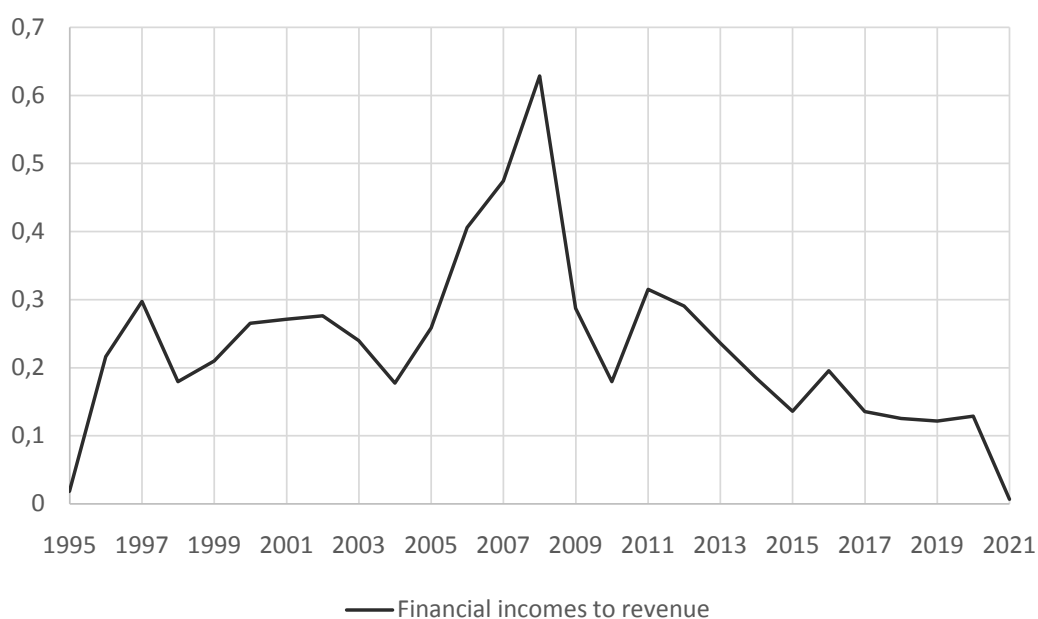

— Financial incomes to revenue

Fig. 2. The ratio of financial incomes to revenue dynamics
of non-financial corporations in Italy, 1999–2019 (%)
Source: Thomson Reuters Datastream

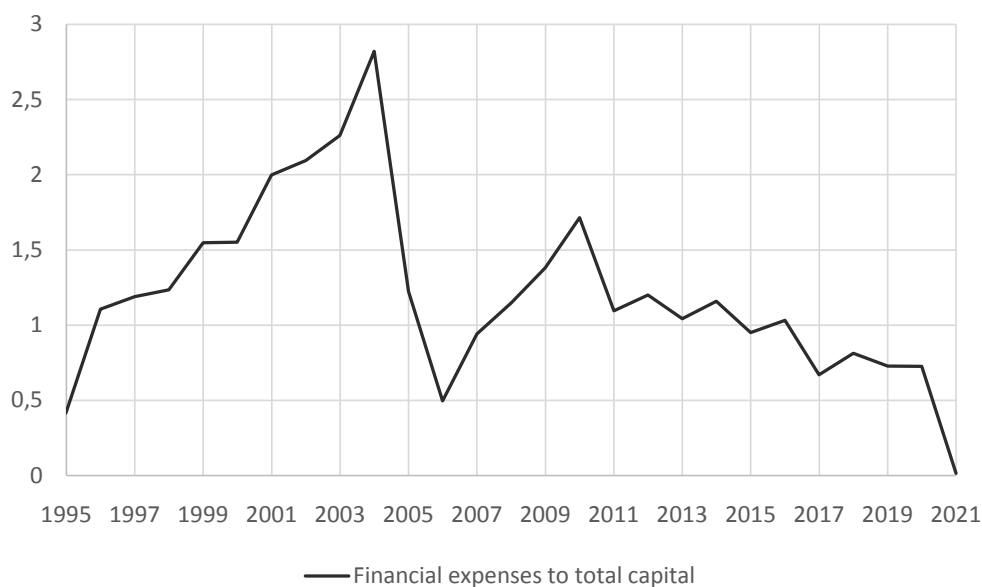— Financial expenses to total capital

Fig. 3. The ratio of financial expenses to capital dynamics
of non-financial corporations in Italy, 1999–2019 (%)
Source: Thomson Reuters Datastream

Results of empirical analysis are presented in Table 2. The lagged value of the R&D investment variable has a positive effect on the value of this variable in the next period. It can be assumed that it is advisable to break investments into several stages, i.e., part of the funds is invested in the current period, and the rest in the next period. Suppose if an innovation project started in period $t-1$, then in next period t additional investments may be required to continue its development. This result is consistent with the one obtained by Tori and Onaran (2018) for the United Kingdom.

Table 2

Econometric results

	(1)	(2)	(3)
	Random_effects	Fixed_effects	Arellano_Bond
L.ln_RnD	0.684***	0.300**	0.213***
	(7.89)	(3.18)	(3.77)
L.ln_R	-0.0218	-0.0614	0.0581
	(-0.27)	(-0.59)	(0.39)
L.ln_Rev	-0.170	0.121*	0.153
	(-1.71)	(1.64)	(0.39)
L.ln_FI	0.0330	0.143*	0.118*
	(0.82)	(2.59)	(1.69)
L.ln_FP	-0.0147	-0.115*	0.0816
	(-0.24)	(-1.65)	(0.73)
_cons	0.00138	1.496***	-0.193
	(0.01)	(3.95)	(-0.18)
N	539	539	445

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Authors' computations

As expected, the coefficient of the variable revenue of the previous period is significant (for the fixed effects model) and has a positive sign. According to (2) model, if revenue is changed by one percent, we would expect R&D expenses to increase by 0.12 percent. It was assumed that revenue growth is reflected in profits and, accordingly, in the availability of funds to finance investment and innovation. Despite the fact that further investments are financed from retained earnings, the corresponding variable is not significant in all regression models, moreover, it has a negative sign. This may be connected to the fact that non-financial companies sometimes accumulate funds and set aside for a more favorable time.

In terms of the main variables associated with financialization, i.e. financial payments and financial income, their statistical impact on R&D costs for Italian companies turned out to be two-sided. From model (2) we see that the financial payments variable has a statistically significant negative coefficient, which is consistent with the results of Orhangazi (2008), Tori and Onaran (2018). We can hazard a conjecture that financial payments crowd out investment in innovation, which may be due to the desire of company managers to narrow the horizon of management planning. Here, when financial payments increase by one percent, R&D expenses decrease by 0.115 percent, yet in other models the coefficient of financial payments remains insignificant which makes it difficult to be sure towards the

estimation. Contrary to previous patterns in the literature on financialization, for Italian companies financial income (from interest and dividends) has a statistically significant positive impact on R&D spending. Models (2) and (3) show, if financial income changes by one percent, we would expect R&D expenses to decrease by approximately 0.12-0.14 percent. This result supports the mainstream theory, that is, Italian companies receive financial income and perhaps invest it in innovations.

In the nutshell, results represent a new attempt to explore the firm-level relationship between financialization and investment, but in terms of R&D. Financial income occurred to be contributing to investments in R&D. This finding may support the economic theory of the mainstream literature, which argues for the beneficial effects of financialization on economic growth, and partly supports findings of Lee et al. (2020). Although, such a phenomenon may be an exclusively Italian feature due to the trend towards a long-term production strategy and a financial accumulation strategy of Italian managers. Assumptions made in the post-Keynesian literature have not been fully confirmed in this study. In addition, the results are not consistent with the findings of previous empirical studies by post-Keynesian authors for other countries, such as the USA (Orhangazi, 2008; Lin and Tomaskovic-Devey, 2013), some European countries (Stockhammer, 2004; Álvarez, 2012; Barradas et al, 2018, Alvarez, 2015; Tori and Onaran, 2018) and Russia (Tretyakov and Rozmainsky, 2021).

5. Concluding remarks

There has been much debate on the financialization effects for different phenomena. Current paper contributes to the discussion about the impact of financialization on the innovative activity of firms. The initial hypothesis was whether financialization has negative impact on the innovative activity of a company as a consequence of investment short-termism of managers who are not motivated to invest in risky innovative initiatives with a long payback period. Assumptions are made through analyzing the relationship between financial indicators (financial expenses and incomes) and investments in research and development on the sample of Italian publicly listed non-financial corporations. The conclusions drawn from the study of financialization are important for the analysis of modern capitalism.

Literature review revealed some specifics of Italian milieu that influenced financialization in a particular way, different from other countries such as USA, European countries and Russia. Predominance of family business models and the presence of interconnected directors theoretically hinders the penetration of short-term investors into the market. Aggregate data, based on the balance sheets of Italian large publicly listed companies, allows to confirm that empirically. Regression analysis shows that financial income of Italian non-financial companies was found to be positively associated with their R&D expenses. This finding may support the economic theory of the mainstream literature, which argues for the beneficial effects of financialization on economic growth.

The current study has a number of limitations as well as grounds for further improvements that need to be taken into account. The main problem is that there are often no appropriate indicators for evaluating the early stages of the innovation process, while such indicators are especially important for managers. Existing empirical methods are becoming less and less effective, since they assume the uniformity of innovations, which does not provide sufficient knowledge for decision-making. Easily accessible data do not always take into account some of the deeper aspects of the phenomena under study, such as the consequences of investing in innovative projects or the motivations for patenting. Therefore, it is important to refine this approach by introducing additional metrics beyond directly measuring whether firms invested in innovations or not.

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Appendices

Table A1

Variables summary statistics

Symbol	Variable	Obs	Mean	Std. dev.	Min	Max
K	Capital	956	7 039 589	1.88e+07	−26 785	1.61e+08
RnD	R&D investments	956	69 263.59	393 453.3	0	4 694 351
R	Retained income	932	1 296 045	3 619 329	−3 186 599	3.03e+07
Rev	Revenue	955	6 514 773	1.75e+07	236.4	1.30e+08
FI	Financial income	956	29 337.21	146 487.1	0	3 818 427
FP	Financial payments	956	239 077.3	795 768.5	−4 357.4	7 663 513

Source: Thomson Reuters Datastream

Table A2

Variables correlation matrix

Variables	RnD	Rev	FE	FI	R
RnD	1.0000				
Rev	0.4564	1.0000			
FE	0.4412	0.8293	1.0000		
FI	0.1952	0.5549	0.3647	1.0000	
R	0.1000	0.7614	0.6752	0.4050	1.0000

Source: Thomson Reuters Datastream

Table A3

Sargan test of overidentifying restrictions and Arellano–Bond test for zero autocorrelation in first-differenced errors results

Sargan test of overidentifying restrictions
H0: Overidentifying restrictions are valid
chi2(189) = 253.8321
Prob > chi2 = 0.0011

Arellano–Bond test for zero autocorrelation in first-differenced errors	
H0: No autocorrelation	
Order	z Prob > z
1	−2.821 0.0048
2	1.292 0.1962

* The output presents no significant evidence of serial correlation in the first-differenced errors at order 2, which means that the moment conditions are valid.

Source: Authors' computations

List of non-financial companies included in the sample

Company name (Stock market code)
A2A SpA (A2.MI)
Amplifon SpA (AMPF.MI)
Askoll Eva SpA (EVAS.MI)
Astaldi SpA (AST.MI^H21)
Atlantia SpA (ATL.MI)
Brembo SpA (BRBI.MI)
Buzzi Unicem SpA (BZU.MI)
Cairo Communication SpA (CAI.MI)
Caltagirone Editore SpA (CED.MI)
Cementir Holding NV (CEMI.MI)
CIR SpA - Compagnie Industriali Riunite (CIRI.MI)
CNH Industrial NV (CNHI.MI)
Danieli & C Officine Meccaniche SpA (DANI.MI)
Datalogic SpA (DAL.MI)
Davide Campari Milano NV (CPRI.MI)
De' Longhi SpA (DLG.MI)
DiaSorin SpA (DIAS.MI)
Enel SpA (ENEI.MI)
Energica Motor Company SpA (EMCC.MI)
Eurotech SpA (E5T.MI)
Fincantieri SpA (FCT.MI)
Geox SpA (GEO.MI)
Immobiliare Grande Distribuzione SIIQ SpA (IGD.MI)
Interpump Group SpA (ITPG.MI)
Maire Tecnimont SpA (MTCM.MI)
Moncler SpA (MONC.MI)
Mondo TV SpA (MTV.MI)
Piaggio & C SpA (PIA.MI)
Pininfarina SpA (PNNI.MI)
Piquadro SpA (PQ.MI)
Prysmian SpA (PRY.MI)
Rai Way SpA (RWAY.MI)
Saes Getters SpA (SAEI.MI)
Safilo Group SpA (SFLG.MI)
Saipem SpA (SPMI.MI)
Salvatore Ferragamo SpA (SFER.MI)
Saras SpA (SRS.MI)
Snam SpA (SRG.MI)
Softlab SpA (SOFT.MI)
SS Lazio SpA (LAZI.MI)
Stellantis NV (STLA.MI)
Tenaris SA (TENR.MI)
Tiscali SpA (TIS.MI)
Tod's SpA (TOD.MI)
Toscana Aeroporti SpA (TYA.MI)
Unipol Gruppo SpA (UNPI.MI)
UnipolSai Assicurazioni SpA (US.MI)
Webuild SpA (WBD.MI)

Source: authors' data

Additional descriptive statistics

Research & Development Expense		
Percentiles Smallest		
1%	0 0	
5%	0 0	
10%	0 0 Obs	956
25%	0 0 Sum of wgt.	956
50%	0 Mean	69263.59
Largest Std. dev.	393453.3	
75%	719.95 4273848	
90%	46788 4412900 Variance	1.55e+11
95%	89000 4449094 Skewness	8.35496
99%	1753420 4694351 Kurtosis	83.27276
Total Capital		
Percentiles Smallest		
1%	3954.7 -26785	
5%	44799 -25868	
10%	77876 -9503.4 Obs	956
25%	318388.5 118.8 Sum of wgt.	956
50%	1237449 Mean	7039589
Largest Std. dev.	1.88e+07	
75%	3689659 1.52e+08	
90%	1.80e+07 1.53e+08 Variance	3.52e+14
95%	3.73e+07 1.57e+08 Skewness	5.211171
99%	1.22e+08 1.61e+08 Kurtosis	34.8397
Revenue from Business Activities - Total		
Percentiles Smallest		
1%	4171.1 236.4	
5%	38558 266.9	
10%	93366 572.5 Obs	955
25%	246775 885.1 Sum of wgt.	955
50%	1266946 Mean	6514773
Largest Std. dev.	1.75e+07	
75%	3725620 1.21e+08	
90%	1.41e+07 1.23e+08 Variance	3.06e+14
95%	2.80e+07 1.24e+08 Skewness	4.628015
99%	1.06e+08 1.30e+08 Kurtosis	25.81859
Retained Earnings		
Percentiles Smallest		
1%	-4159851	
5%	-1880773	
10%	-17970 -1747738 Obs	932
25%	17372 -1586444 Sum of wgt.	932
50%	151566.6 Mean	1296045
Largest Std. dev.	3619329	

75%	676636 2.74e+07	
90%	3303830 2.80e+07 Variance	1.31e+13
95%	8390530 2.80e+07 Skewness	4.693607
99%	2.21e+07 3.03e+07 Kurtosis	28.8441
Financial Income		
Percentiles Smallest		
1%	0 0	
5%	0 0	
10%	0 0 Obs	956
25%	0 0 Sum of wgt.	956
50%	1152.11 Mean	29337.21
Largest Std. dev.	146487.1	
75%	12434.22 628309	
90%	51439.55 684746 Variance	2.15e+10
95%	127967.3 715009.7 Skewness	18.9513
99%	475496.8 3818427 Kurtosis	472.0871
Financial payments		
Percentiles Smallest		
1%	0 -4357.4	
5%	0 -488.7	
10%	169.5 0 Obs	956
25%	2308.4 0 Sum of wgt.	956
50%	17791.5 Mean	239077.3
Largest Std. dev.	795768.5	
75%	107520.5 5657420	
90%	405965 6737831 Variance	6.33e+11
95%	1224998 7078362 Skewness	5.510935
99%	4897752 7663513 Kurtosis	37.36107

Source: Thomson Reuters Datastream