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Entrepreneurship, Small Businesses' Innovation and Contexts

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Index

General Introduction

The need of a contextualized view of economic behavior has recently prompted scholars to study how external circumstances, situations, or environments determine and affect economic phenomena, including entrepreneurship and innovation practices. There is a growing recognition that, along with individuals-embedded and internal-to-the-firm factors, new ventures creation and businesses performance are strongly shaped by socio-economic external conditions. Context is important for understanding when, how, and why entrepreneurship and innovation happen (Welter, 2011). This holds true particularly for small enterprises. The liability of smallness makes them more vulnerable compare to large companies and strongly dependent on external resources, primarily knowledge and financing. However, despite this burden, small businesses have been recognized to be key players in innovation and entrepreneurship processes. In some industries small firms can be more innovative than large ones (Acs and Audretsch, 1988), and workers in small enterprises are more likely to leave their job to start a new venture (Parker, 2018). All this advocates an inextricable link between entrepreneurship, small businesses' innovation and contexts.

This Doctoral thesis aims to examine and deepen such connection, by studying the influence of new institutional and context-specific dimensions on both entrepreneurship and small businesses' innovation. Along with small- and medium-sized enterprises, we include in our analysis micro firms with fewer than 10 employees. Despite their large number and crucial contribution in terms of value added and employment for the worldwide economy, very small firms are still an under-studied category.

Grounded in the theories linking entrepreneurship and innovation to a multiplicity of socio-institutional contexts, and firms' innovativeness to external financing, this thesis is composed by three chapters addressing distinct research questions.

The first chapter is entitled "Exploring the contribution of micro firms to innovation: does competition matter?", published in *Small Business Economics*. The aim of this article is twofold. First, we examine whether and how micro enterprises contribute to innovation. Sec-

ond, we study the effect of perceived competition, the first context dimension we consider, on their innovative behavior. The focus on firms with fewer than 10 employees is the main novelty of this research, as they are often excluded in extant literature on small businesses' innovation due to scarcity of data. Moreover, prior to this study, the relationship between innovation and competition for micro firms was still unexplored. By using a large sample of European firms we find a non-negligible share of innovative micro businesses, challenging the view that these firms are marginal players in innovation. We also provide empirical evidence of an inverted U-shaped relationship between innovation and competition, whereby when the latter increases, the former goes along if the initial level of competition is low, while it slightly declines if the initial level is high. Ultimately, the first chapter documents that micro firms must be considered as active players in innovation processes, and that perceived competition is a key context-specific factor affecting their innovation behavior and strategy.

The following chapter "Bankruptcy recovery rate and small businesses' innovation", co-authored with Prof. Marcus Dejardin and Prof. Eric Toulemonde, examines the effect of a second institutional dimension, namely the bankruptcy system, on small businesses' innovation. Specifically, we investigate whether a bankruptcy system that guarantees a good recovery rate in case of firms' liquidation can stimulate micro-, small-, and medium-sized enterprises' (MSMEs) innovation investments by easing their access to credit conditions. Small businesses are particularly exposed to failure and they often face harsher financing conditions vis-à-vis large companies. Moreover, they are highly dependent on external credit to pursue innovative projects. We consider the decision to invest in innovation, a fundamental dimension of firms' entrepreneurial orientation and arguably the primary qualifying element of entrepreneurial firms. While prior research has mainly considered debtor-related factors of the bankruptcy systems or new ventures creation, we shift the focus on the creditor side and on small businesses' innovativeness. With the help of a simple borrower-lender model and several empirical specifications we derive three main findings. An increase in the bankruptcy recovery rate a) unleashes MSMEs' investment in innovation; b) reduces the share of MSMEs that are credit constrained because of too high cost of borrowing; c) lessens the borrowing rate dispersion for high profitable MSMEs. While prior research illustrates that, by fostering ventures creation, debtor-oriented systems

can boost the quantity of businesses, this article shows that, by unleashing investments in innovation, creditor-friendly systems can help promote their quality.

The third and final chapter, co-authored with Prof. David Audretsch and Prof. Marcus Dejardin, addresses the question stated by the title: "Does democracy foster entrepreneurship?". It is accepted for publication in *Small Business Economics*. Recent events challenging democratic institutions have motivated economic scholars to investigate the link between democracy and several socio-economic issues of our time. Yet, prior to this study, the relationship with entrepreneurship was still unexplored. As entrepreneurship scholars, we ask whether the documented decline in the level of democratization around the world is something entrepreneurs should worry about. If democracy is conducive to entrepreneurship, the contraction confronting democracy can potentially lead to a reduction in the number of businesses and, consequently, to lower economic growth. Thus, along with competition and bankruptcy systems, the level of democratization is the third institutional and contextual dimension we consider. The empirical analyses performed in this chapter rely on a country-level panel dataset over the 1972-2010 period. The longitudinal dimension of the sample allows to develop several panel-data techniques and a quasi-natural experiment. Our results show that democracy has a direct and positive effect on the business ownership rate, measured as the number of business owners over the labor force. Moreover, they also provide insights about the driving mechanisms of such effect. The promotion of freedom, of social and cultural interchange, and the direct involvement of civil society in political processes are key dimensions through which democracy can foster entrepreneurship. Ultimately, this chapter documents that democracy and entrepreneurship are inextricably connected. If we want entrepreneurship to prosper, there is a need to preserve and nurture democracy.

Overall, this thesis corroborates the growing evidence that contexts and institutions matter for both innovation and entrepreneurship. The activity and performance of businesses, particularly those of small ones, do not depend on internal factors only, but they are highly affected by the external environment as well. The thesis also contributes to advance knowledge in several ways. First, by including micro businesses with fewer than 10 employees, it provides

a more comprehensive understanding of the innovative behavior of the whole population of small businesses. Second, by unraveling the relationship between competition and micro firms' innovative behavior, it extends the analysis on competition and innovation from large companies to the smallest ones. Third, by considering the bankruptcy recovery rate and the level of democratization, our research adds two novel institutional and context-specific dimensions to those affecting innovation and entrepreneurship. We hope this thesis could open new horizons for other important and fruitful researches in the fields of innovation and entrepreneurship.

References

Acs, Z. J. and Audretsch, D. B. (1988). Innovation in large and small firms: an empirical analysis. *American Economic Review*, 78(4):678–690.

Parker, S. C. (2018). *The Economics of Entrepreneurship*. Cambridge University Press.

Welter, F. (2011). Contextualizing entrepreneurship–conceptual challenges and ways forward. *Entrepreneurship Theory and Practice*, 35(1):165–184.

Chapter 1

Exploring the contribution of micro firms to innovation: Does competition matter?*

Luca Farè†

Abstract

With a special focus on firms with fewer than 10 employees, we examine how small businesses participate in innovation and how perceived competition affects their innovative behavior. Statistics from a large sample of European micro-, small-, and medium-sized enterprises document a relevant share of innovative firms, including micro ones. We empirically explore the relationship between competition and the likelihood of being innovative, the degree of complexity of the innovation strategy, and its frequency. Estimates provide evidence of an inverted-U shaped relationship, whereby innovation initially increases with competition and then it slightly declines. The results hold for all firms, regardless of their size, but the negative effect seems to be more marked for smaller firms. Competition shows a stronger relationship with technical and external innovation. By including micro firms, this paper contributes to the understanding of innovative patterns and activities in firms of all size.

Keywords: Innovation, competition, micro firms, EU economy.

JEL codes: L10, L26, O30, O52.

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1 Introduction

Since Schumpeter (1942), the question on how firm size and market structure affect innovation has drawn the attention of many economists. The main Schumpeterian tenet states that large firms operating in a concentrated market are the main engine of technological progress. Initially such belief drove ever greater attention to the innovative behavior of large firms. Indeed, prior to the early 1970s, only a relatively low share of innovation activities was associated to small firms (Pavitt et al., 1987). A stronger interest on smaller businesses emerged after the influential works of Acs and Audretsch (1987, 1988) and Pavitt et al. (1987), who illustrate the significant role played by smaller enterprises in specific sectors of the UK and the US, respectively. Nevertheless, micro firms with fewer than 10 employees are still an under-studied category and are often assumed to be marginal businesses with no innovation capacity (Baumann and Kritikos, 2016). Very little is known about their innovative behavior and their innovation drivers (Tu et al., 2014; Roper and Hewitt-Dundas, 2017; Audretsch et al., 2020; Henley and Song, 2020). This is particularly true in Europe, due to the scarcity of comprehensive innovation data on micro firms.[1] For that reason, an overall outlook of the innovation activities of European micro, small, and medium enterprises (MSMEs) is still missing in the literature. Moreover, the literature regarding the relationship between market structures and firm innovation is mainly focused on large companies. To the best of our knowledge, studies about the effect of competition on microbusinesses' innovative behavior are completely missing. In this regard, we ask whether the evidence acknowledged for larger companies and SMEs are valid also for the substantial population of micro firms. Enterprises with less than 10 employees are considered to be the backbone of the EU-28 economy, being the 93 percent of all firms in the non-financial business sector (European Commission, 2019). Thus, having a deeper understanding of microbusinesses' innovative activity is crucial to test the generality of the findings confirmed for the population of larger companies. Moreover, this would help not only small businesses' owners to improve their performance, but also policy makers to promote the growth and the development of the whole economic system.

The aim of this paper is twofold. First, we want to investigate whether micro firms with fewer than 10 employees, together with larger SMEs, contribute to the creation of innovation within

[1] For instance, the Community Innovation Survey (CIS) excludes companies with fewer than 10 employees.

the EU economy and, if yes, how. Secondly, we want to explore how competition affects their innovative activity. To do this, we rely on the Survey on the Access to Finance of Enterprises (SAFE), a jointly run survey by the European Commission (EC) and the European Central Bank (ECB). It collects a large sample of firm-level data from all the EU countries, including a significant share of firms with fewer than 10 employees. Although innovation and competition are not the core issues of the survey, useful information is collected. To the best of our knowledge, SAFE is the only database that, together with small (10-49 employees) and medium (50-249 employees) ones, includes firm-level data on innovation and competition also on a large sample of micro (1-9 employees) enterprises across all the EU countries.

The first part of the paper provides descriptive statistics about the innovation activity of European small businesses, including micro firms. In the second part, we develop an empirical analysis to study how competition affects such activity. We do not limit based on the firms' innovation status (whether they innovate or not), rather we focus on the different categories of innovation (technical, non-technical, external, and internal), on the complexity of the innovation strategy (the number of innovation types introduced), and on the frequency of innovation (the number of years a firm has been innovative). The estimates show an inverted-U shape relationship, whereby European MSMEs' innovation activity initially increases and then declines slightly with competition. The results hold for all firms, regardless of their size.

The rest of the paper is organized as follows. The next section highlights the related literature and the main contributions of the paper. Section 3 describes the data and the constructions of our main variables of interest. Section 4 provides sample descriptive statistics aimed at exploring the main characteristics of the European MSMEs' innovation activity. Section 5 develops the empirical analysis to investigate the effect of competition on innovation and discusses the main results. Section 6 contains two complementary analyses on the complexity and the frequency of innovation. Section 7 concludes the paper.

2 Related literature and contributions

This paper contributes to two strands of the literature: the nascent one about the innovative activity of micro firms and the more advanced one about the relationship between market structure and innovation. In the 2010s, the availability of new data on microbusinesses is facilitating

progresses in the understanding of their innovative behavior. Baumann and Kritikos (2016), for instance, analyze the link between R&D, innovation and productivity in micro, small, and medium sized enterprises in the German manufacturing sector. They find that around 50% of German micro firms engage in innovation activities, below the share of larger SMEs as expected in theory, but far above zero. Similiarly, Audretsch et al. (2020) find that German micro firms in knowledge intensive sectors are willing to engage with similar probabilities in innovation activities as larger firms and that they have a similar ability of transforming innovation inputs into innovation output. Roper and Hewitt-Dundas (2017) add to this literature using data from a survey of 1000 microbusinesses in Northern Ireland. Their findings underline the significant role of these firms as sources of new-to-the-market innovation and the potential value of including them in future innovation studies. Finally, Henley and Song (2020) use British microbusinesses survey data to explore the link between innovation, productivity, and exporting activities in firms with fewer than 10 employees. Again, a non-negligible innovative activity of these firms emerges. Despite limitations, these works suggest that micro enterprises should not be considered marginal: although smaller than that of larger companies, their contribution to innovation might be significant. Nevertheless, the aforementioned studies focus on single countries and the samples of micro firms are consequently limited. Moreover, none explore the role of competition. Thus, our paper offers a primary and overall overview of the EU micro firms' innovation activity and the link with competition. In industries with many firms, small enterprises often seek the protection of a market niche of little or no interest to the larger companies (Cooper et al., 1986). This might lead to the belief that the pressure of competition and its impact on innovation are weak for small firms. In our sample, the existence of a potential "niche effect" is suggested by the fact that the average level of perceived competition increases with firm size. Nevertheless, we show that the relationship between competition and innovation also matters for very small businesses.

Studies on the relationship between market structure and innovation are more advanced. A great effort has been made to shed light on this issue, but a consensus is not yet reached. The three dominant theories are originally attributable to Schumpeter (1942), Arrow (1962) and Scherer (1967). The first theorizes a monotone negative relationship, whereby an increase in the level of competition diminishes the incentive to innovate: the higher the number of competitors,

the lower the appropriability of the innovation and, consequently, the incentive to innovate. On the contrary, Arrow proposes a monotone positive relationship by showing that the incentive to invest in innovation is lower under monopolistic conditions than under competitive ones: being innovative helps the enterprises to escape competition and gain competitive advantages. To Scherer can be attributed the first evidence of a non-linear and concave relationship between competition and innovation. Until the beginning of 2000s, the debate mainly played around the Schumpterian and Arrowian views, leaving Scherer as a marginal consideration. Indeed, the literature strongly focused on providing theoretical backgrounds and empirical evidence supporting the first (Dasgupta and Stiglitz, 1980; Spence, 1984; Kraft, 1989; Romer, 1990;, Aghion and Howitt, 1992; Vives, 2008; Hashmi, 2013) and the second (Porter, 1990; Geroski, 1990; Geroski et al., 1995; Nickell, 1996; Blundell et al., 1999; Galdon-Sanchez and Schmitz Jr, 2002) positions. Kamien and Schwartz (1976) were the only ones who followed Scherer by providing a theoretical model to address the empirical finding that innovative activity increases with the intensity of rivalry up to a point, then declines thereafter as the competitiveness of the industry further increases. The seminal paper of Aghion et al. (2005) returns the findings of Scherer to the fore. Building a step-by-step innovation model, they theorize an inverted-U relationship between product market competition and innovation, where the *escape competition* (or *Arrowian*) and the *Schumpeterian effects* coexist. Their main prediction is that rising competition has a positive impact on innovation effort when the initial degree of competition is low (i.e., when a larger equilibrium fraction of sectors involves neck-and-neck competing incumbents) and negative when the initial level is high (i.e., when a larger fraction of sectors in equilibrium counts a large share of laggard firms with low initial profits).

The findings of Aghion et al. (2005) led researchers to investigate the relationship between competition and innovation from a new perspective and empirical studies aimed at testing such inverted-U curve grew substantially. Askenazy et al. (2013) and Mulkay (2019), for instance, do this for French firms. The former finds clear evidence of an inverted-U for largest firms, but such evidence does not occur when the sample is extended to smaller ones. The latter, considering a sample of both large and small firms over the 2000-2013 period, does not find econometric evidence of the inverted-U shape relationship. Tingvall and Poldhal (2006), using a sample of manufacturing Swedish firms with a minimum of 50 employees, show that

the inverted-U curve is supported by the Herfindahl index and not by the price cost margin indicator, suggesting that the results are sensitive with respect to the choice of the measure of competition. Hashmi (2013), replicating Aghion et al. (2005) using a richer dataset from publicly listed manufacturing firms in the US, finds a mildly negative relationship among competition and innovation. He argues that such a result might be driven by the fact that US firms are less neck-and-neck, inducing the Schumpeterian effect to dominate the escape-competition one. Castellacci (2011) argues that competition may have different impacts on the various stages of the innovation chain, with the Schumpeterian effect prevailing in early innovation stages and the escape-competition effect in the late ones. An inverted-U relationship is instead detected by Peneder and Wörter (2014) and Halpern and Muraközy (2015), respectively, for Swiss and Hungarian firms. Friesenbichler and Peneder (2016) and Crowley and Jordan (2017) also find a quadratic effect using a sample of firms from Eastern Europe and Central Asia. Moen et al. (2018) do the same for Norwegian SMEs, but their results do not provide strong evidence of an inverted-U relationship. Subsequently, Cornett et al. (2019) find an overall U-shaped relation between industry concentration (inversely related with competition) and innovation for a large set of US firms.

A general consensus on the impact of competition on innovation is not yet reached. We contribute to the current debate by providing evidence of an inverted-U shape relationship for the surveyed firms. Our findings seem then to support the theories proposed by Scherer and Aghion. Moreover, while analyses on large companies are more common, those about smaller enterprises are rarer and, as far as we know, completely missing for micro firms. Our paper also extends the existing literature by developing a cross-country analysis, rather than single-country ones. In this regard, given the EU single-market structure, we find it valuable to focus on a sample including MSMEs of all the 28 EU countries. To the best of our knowledge, the only others linking competition and innovation in a cross-country framework are Ayyagari et al. (2011), who do not check for quadratic effects, Karaman and Lahiri (2014), Friesenbichler and Peneder (2016) and Crowley and Jordan (2017), who focus on developing countries in Eastern Europe and Central Asia. However, a large sample of European MSMEs is still unexplored. We also contribute by exploring the effect of competition not only on the innovation intensive and extensive margins, but also on the complexity and the different types of firms' innovation strategy.

Finally, we add to recent studies using perception-based measures of competition rather than structural indicators based on firms' financial statistics. The main traditional indices of competition normally refer to market concentration, like the Herfindahl-Hirschman Index (HHI), or to firms' market power, such as the Lerner Index (LI). The HHI has a sectoral dimension and it does not allow to measure competition at the firm level. In addition, the HHI normally stresses the importance of larger firms by assigning them a greater weight than smaller ones (OECD, 2021). Using this indicator in a sample of MSMEs might then be misleading. The LI, computed as the difference between price and marginal cost over price, can be firm's specific. However, the fact that marginal costs are not directly observable introduces some difficulties in the computation and the empirical estimation of the LI (OECD, 2021). Moreover, firms' innovation strategy, and particularly that of small businesses, is not always based on account data only (Acs and Audretsch, 2005). The critical role of managerial perceptions in organizational decision-making and strategy formulation processes has long been acknowledged (Anderson and Paine, 1975; Beyer et al., 1997). That is also why, along with these traditional indicators of competition, in recent years alternative and complementary measures based on survey data and self-perception have been proposed (Tang, 2006; Peneder and Wörter, 2014; Friesenbichler and Peneder, 2016; Crowley and Jordan, 2017; Moen et al., 2018). Although the subjective nature of these perception-based indicators might raise measurement issues, the main argument in favour of their use is that they allow to better capture firm-specific competition and to account for the fact that firms in the same sector may perceive competition differently. They also better include rivalry from both domestic and international competitors.

In light of these arguments, the use of a perception-based competition indicator looks particularly suitable for our context.

3 Data and variables definitions

We rely on the firm-level Survey on the Access to Finance of Enterprises (SAFE). It is an ongoing survey conducted jointly by the European Commission (EC) and the European Central Bank (ECB) every six months since 2009. As far as we know, it is the only database containing information on innovation and competition for a large number of micro (1-9 employees), small (10-49 employees), and medium-sized (50-249) enterprises across all the EU

countries. The survey waves conducted by the ECB (ECB round) cover a limited number of euro area countries, while the more comprehensive survey, run in cooperation with the EC (Common round), covers the all EU countries. The ECB round is conducted in April and the Common round in October of each year. The interviewed firms are randomly selected from the Dun and Bradstreet database and the sample is stratified by firm-size class, economic activity, and country. The replies are voluntary and the interviews are predominantly conducted by telephone, but respondents are given the opportunity to fill in the on-line questionnaire. A top-level executive (general manager, financial director or chief accountant) is interviewed from each company and the questionnaire is administered in the local language. Sample replies are anonymous and statistical disclosure procedure are applied to preserve the anonymity in the micro dataset. The sample is developed to offer comparable precision for micro, small, and medium-sized companies. Concerning the economic activity, firms are grouped into four main sectors: industry, construction, trade, and services. Enterprises in the financial, agricultural, and public administration sectors are not included in the sample.[2]

For our analysis, we select micro, small, and medium-sized enterprises of the 28 EU countries interviewed in the five Common round waves between 2014 and 2018.[3] The time horizon is driven by the fact that we want to keep the structure of the sample as stable as possible and because the questionnaire was significantly changed in 2014. The final repeated cross section sample includes 75,673 firm-level observations. Table A1 in the Appendix shows the total number of observations and the number of micro, small, and medium firms in each country. The most represented countries are Italy (6,994), France (6,509), Germany (6,375), Spain (5,959), and Poland (5,827). It is worth highlighting the remarkable share of micro firms included in the sample. The coverage of a large sample of MSMEs for all the 28 EU countries represents a relevant novelty of our dataset.

As the name suggests, the main objective of the SAFE is to collect detailed information about the conditions of access to finance for European small businesses. Therefore, as innovation and competition are not the core issues of the questionnaire and the number of questions on these topics are limited, we are somewhat constrained. However, to the best of our knowledge, we are

[2]For a deeper overview of the methodological information on the survey see `https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html`.

[3]Wave 11 (reference period April-September 2014), wave 13 (reference period April-September 2015), wave 15 (reference period April-September 2016), wave 17 (reference period April-September 2017), and wave 19 (reference period April-September 2018). We include UK since it was still part of the EU during this period.

not aware of other datasets including such a large sample of micro enterprises and firm-level information on innovation and competition for all EU countries. In this regard, expanding the SAFE with additional questions would be helpful to further investigations. Despite this limitation, we consider the available information a valuable starting point.

Measuring innovation

We use the following SAFE question to measure whether firms are innovative or not: "During the past 12 months have you introduced: a) a new or significantly improved product or service to the market; b) a new or significantly improved production process or method; c) a new organization of management; or d) a new way of selling goods or services?" Following a similar approach to Mairesse and Mohnen (2010), Ferrando et al. (2019), Ferrando et al. (2020) and Santos and Cincera (2021), we define as innovative those firms that answer "Yes" for at least one of the four options.[4] We also consider separate dummies to disentangle the four types of innovation (product, process, organization, and marketing innovation). This allows us to measure not only whether a firm innovates or not, but also how. Thus, we focus on the output side of the innovation process. Existing literature points out that smaller firms might often report innovation without formal R&D engagement or under-report R&D activities (Pavitt et al., 1987; Symeonidis, 1996; Baumann and Kritikos, 2016). Relying on R&D investments might then lead to under-estimate the number of innovative MSMEs (Acs and Audretsch, 2005). Another advantage is that the survey question under consideration allows to disentangle the different types of innovation. Along with these pros, our measure shows some limitations. First, it only provides information on the extensive margin (whether the firm innovates or not) but not on the intensive margin (how much the firm innovates). It is not then possible to measure the degree of innovation embedded in products or processes that firms have developed. Second, the decision to report an innovation stays completely with the surveyed firms, which can intentionally misreport their answers (Siepel and Dejardin, 2020). This caveat should be taken into account, even though, given the anonymity of respondents, there are no reason to think that firms might falsely respond to the question either to overstate or to downstate their innovation capacity. For the sake of comparison, we select from the CIS 2018 results reported in Eurostat

[4]These options correspond to the four types of innovations defined by the Oslo Manual (OECD, 2018).

the country percentages of firms with innovation activities.[5] In Figure 1, we plot the differences between the SAFE country percentages of innovative firms and the CIS ones.[6] Overall, SAFE seems to over-estimate firms' innovative activity, particularly for Romania. However, Table A2 in Appendix, reporting the correlations coefficients between the SAFE and CIS percentages, shows that, despite the over-estimation, the two measures are positively and significantly correlated.[7]

[Insert Figure 1 about here]

Measuring Competition

To measure the level of competition, we rely on the following question: "How important has the problem of competition been for your enterprise in the past six months?" Surveyed firms can answer on a scale of 1-10, where 1 means "not at all important" and 10 means "it is extremely important." This is the only information about competition that we can access and, as before, it implies pros and cons. First, competition here is very broadly defined, with no distinction among *ex-ante*/*ex-post* or product/credit market competition. Firms might then interpret the question differently and refer to different types of competition. Moreover, we do not have information on the number of competitors, even though we find it reasonable to assume that the pressing problem of competition increases with the number of competitors. On the one hand, we are then aware that our continuous variable is only an imperfect proxy for the intensity of competition and that its subjective nature may add some noise to the data. On the other hand, as anticipated in section 2, using subjective measures rather than industry indicators provides some advantages (Tang, 2006; Peneder and Wörter, 2014; Friesenbichler and Peneder, 2016; Crowley and Jordan, 2017). First, perception-based measures can more properly capture firm-specific competition. This accounts for the fact that firms in the same industry might

[5]In CIS, an innovation-active enterprise is one that has had innovation activities during the period under review. Innovation activities are all scientific, technological, organizational, financial, and commercial steps that actually, or are intended to, lead to the implementation of innovations. An innovation is defined as a new or significantly improved product (good or service) introduced to the market, or the introduction within an enterprise of a new or significantly improved process. For more details we refer to `https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210115-2`.

[6]Given the reference period of CIS 2018 (2016-2018), to make things comparable we compute the SAFE country percentages of innovative firms considering the 2016-2018 period only. Moreover, since the CIS excludes enterprises with fewer than 10 employees, we compute the SAFE country averages excluding micro firms.

[7]See Table A2 in Appendix for further details.

actually produce different products and compete in different markets. Even considering narrow industry classifications, relevant markets are typically further segmented. In this case, firm-specific competition may not be correctly detected by the traditional industry measure. Second, despite being in the same sector, firms may have different perceptions regarding the degree of competition they face. In this respect, survey respondents are top-level executives, whose decision significantly affect firms' performance, particularly in small businesses: their activity is strongly influenced by a single person's decisions and the top-executive's perception is a key determinant of their strategy. Finally, the perception-based measure captures rivalry from both domestic and international competitors. Given the broad sectors classification (firms are divided into only four sectors), the size of the surveyed firms, and the cross country nature of our analysis, accounting for these issues appears crucial.

4 An overview of European MSMEs' innovative activity

The first objective of the paper is to investigate whether and how European small businesses, including those with fewer than 10 employees, participate in innovation. In this section, we report several descriptive statistics aimed at providing an overview of the innovative activity and the perceived level of competition of the surveyed firms. Table A3 in Appendix reports descriptive statistics for the main variables of interest. More than half of the surveyed MSMEs (57%) declared to have introduced at least one type of innovation over the 2014-2018 period. The average EU percentage of innovative firms in the 2018 Community Innovation Survey (CIS) is around 50%, slightly below, but close to, our value. Looking at the four different typologies, product innovation prevails with 34%, while process, organization, and marketing innovations show similar and still not negligible values. These numbers show an overall active contribution of European MSMEs to innovation. Panel (a) of Figure 2 shows that the percentage of innovative enterprises increases with firms' size, as expected from the literature, and a remarkable share of innovative micro firms. Around half of these micro firms declared having introduced at least one innovation. Moreover, the firms' percentage introducing a product, process, or organizational innovation increases with size, while that for marketing innovation declines. Micro firms seem to be more marketing innovative than small and medium firms. As panel (b) illustrates, the industry sector has the highest percentage of innovative firms, followed by trade, services, and

construction. A similar trend characterizes product innovation, which is the most introduced type in the industry, trade, and services sectors. In construction, organizational innovations dominate. In panel (c), we disentangle firms' size and industries. In all sectors, the share of innovative enterprises increases with firms' size. Overall, Figure 2 confirms the fact that innovation grows with companies' size, but it also shows that the innovative activity of smaller SMEs, including micro firms with fewer than 10 employees, is far from negligible.

[Insert Figure 2 about here]

Panel (a) of Figure 3 reports the percentage of innovative MSMEs in each country of the survey. The values go from a minimum of 42% (Hungary) to a maximum of 73% (Finland), with a gap of around 30 points. If we exclude these two countries, the distance between the second worst (Estonia) and the second best (Cyprus) is of 20 points. Such range suggests a certain level of heterogeneity in the MSMEs innovative activity across EU countries. This is further highlighted by the geographical distribution in the right panel. The quantile distribution distinguishes four different country-groups: 42-53% (Hungary, Estonia, Poland, Germany, UK, Bulgaria), 54-57% (Latvia, Netherlands, Belgium, Sweden, France, Czech Rep., Denmark, Spain, Ireland, Austria, Croatia, Slovakia), 58-61% (Luxembourg, Italy, Lithuania), and 62-73% (Slovenia, Malta, Portugal, Greece, Romania, Cyprus, Finland). The low position of Germany might be surprising. However, recent studies signal a slowdown of German SMEs' innovativeness rate.[8] Figure 3 also reports the percentage of surveyed MSMEs that introduced a product (panel b), process (panel c), organization (panel d), or marketing innovation (panel e) in each country. This allows us to collect more details on the between country innovation heterogeneity and also to investigate which types of innovation are more developed than others in each country. The largest gap between the worst and the best performing country is observed for organization innovation (36%), followed by marketing (28%), process (26%), and product (22%). Looking at the maps, Eastern Europe seems to be more innovative than Western Europe in terms of product innovation, while the opposite is true for organization and marketing types. For process innovation, there is not a clear trend. Focusing on the within countries patterns, we highlight

[8]See, for instance, Rammer and Schubert (2018), the KfW SME Innovation Report (2019), and the Germany-SBA Fact Sheet 2019 (European Commission). The OECD (2019) SME and Entrepreneurship Outlook states that German SMEs with fewer than 250 employees spend less on R&D than the OECD median.

some interesting findings. France, for instance, is in the lowest group for product innovation and in the highest for organizational. Germany is last for marketing innovation and among the last for product and process, gaining some position for organizational innovation. Finland is supreme for all types except type 3. Italy has a stable position for the four types. Belgium is very low in terms of product innovation and higher in terms of organizational.

[Insert Figure 3 about here]

In Figure 4, we replicate the same exercise focusing only on micro firms. Except for Hungary, in all the countries the percentage of innovative enterprises exceeds 40 percent, suggesting active participation in innovation. The gap between the maximum (Romania) and the minimum (Hungary) value is around 30 points, still indicating a certain heterogeneity among countries.[9] Organization and marketing innovations show the largest ranges, while the geographical distribution seem to confirm a stronger activity of Easter Europe for product and weaker for organizational and marketing innovations than Western Europe. Overall, Figure 4 documents the active participation of microbusinesses in innovation.[10]

[Insert Figure 4 about here]

Figure 5 reports descriptive statistics related to our measure of competition. As panel (a) illustrates, almost 18% of the interviewed MSMEs over the 2014-2018 period declared a low level of competition (values 1,2,3), 47% medium (values 4,5,6,7), and 35% high (values 8,9,10). Looking at the distribution by firm size category, the percentage of firms declaring medium and high values of competition increases with firms size, while it decreases for low values. This suggests that competition is seen as a pressing problem more by larger SMEs. It might also be a signal of a "niche effect", whereby small businesses often enter niche markets that protect them from competition. Such findings seem to be confirmed by panel (e), where the weighted perceived average competition increases with firms' size. This value does not differ markedly

[9] Again, the penultimate place of Germany might seem unusual. In this regard, Baumann and Kritikos (2016) shows that around 50 percent of German micro firms engaged in innovative activities between 2005 and 2012. If we combine this information with the reported decline in the innovativeness rate of German SMEs, our value (43%) looks less astonishing. See also note 8.

[10] Figures A1, A2, and A3 in Appendix provide more details in terms of MSMEs innovative behavior according to the size and sector of activity for each of the 28 countries.

across sectors (panel f), with trade showing the highest level and services the lowest in almost all the categories (panel g). Looking at single countries (panel h), the average perceived competitive pressure shows a quite small range, varying from 4.93 (Croatia) to 6.81 (Cyprus). These quite homogeneous values can be partly explained by the fact that EU countries are subject to a common legislation on competition implemented at the European Union level. The map in panel (i) distinguishes four country groups: those with values from 4.9 to 5,7 (Croatia, Slovenia, Sweden, Czech Rep., Hungary, UK, Netherlands), 5.78-6.13 (France, Finland, Belgium, Estonia, Poland, Germany, Slovenia), 6.14-6.47 (Denmark, Bulgaria, Latvia, Luxembourg, Ireland, Austria, Italy), and 6.48-6.81 (Greece, Spain, Romania, Portugal, Malta, Lithuania, Cyprus). Overall, Southern European countries seem to perceive a higher (even though slightly) level of competitive pressure than Continental and Northern European ones.

[Insert Figure 5 about here]

5 The relationship between innovation and competition

Statistics in section 4 document an active participation of MSMEs in innovation and show the non-negligible contribution of micro firms. We now want to address our second question about the relationship between MSMEs' innovation and competition. In 2018, there were slightly more than 25 million of MSMEs in the EU-28, of which 93% were micro firms, and they accounted for 99.8% of all enterprises in the non-financial business sector (European Commission, 2019). Given the large number, the issue of competition should be relevant for this type of firm. To our best knowledge, evidence is ambiguous for SMEs, while completely missing for microbusinesses. Figure 6 reports preliminary evidence about the relationship between competition and innovation in our sample. Panel (a) shows the percentage of innovative firms for different level of competition: low (values 1,2,3), medium (values 4,5,6,7), and high (values 8,9,10). Panel (b) does the same for the three firms' categories subsamples. The overall percentage of innovative firms initially increases and then it slightly declines, following an inverted-U curve. This trend seems to be confirmed for all the categories (panel b). Comparing the three curves, the turning point comes earlier for micro and small firms, where we also observe a steeper negative side. This suggests that, although the patterns look similar, the negative effect of competition

on innovation arrives earlier and it is more marked for smaller enterprises. This preliminary evidence suggests the existence of an inverted-U shaped relationship.

[Insert Figure 6 about here]

5.1 Benchmark Specifications

Equation (1) describes our baseline regression. The dependent variable is the dummy for innovative firms, equal to 1 if the firm has introduced at least one type of innovation. Following Askenazy et al. (2013), Peneder and Wörter (2014), Karaman and Lahiri (2014), Friesenbichler and Peneder (2016), Crowley and Jordan (2017) and Cornett et al. (2019), to detect non-linearities, we include both the linear and the quadratic terms of competition. The basic specification looks as follows:

$$Innov_{i,c,s,t} = \alpha + \beta_1 Comp_{i,c,s,t} + \beta_2 Comp^2_{i,c,s,t} + \beta_j X_{i,c,s,t} + \eta_c + \theta_s + \gamma_t + \epsilon_{i,c,s,t} \qquad (1)$$

Vector $X_{i,c,s,t}$ contains a set of characteristics of firm i, in country c, sector s, at time t. It includes size, age, turnover, ownership type, legal status, and past growth.[11] We include sector dummies (θ_s) to control for technological opportunities, as long as they are crucial determinants of firms' innovative behavior and they can differ substantially across industries (Nickell, 1996). Country (η_c) and time (γ_t) dummies are also considered to eliminate unobserved heterogeneity across countries and time periods. Standard errors are clustered at the country level. Following Ayyagari et al. (2011), we estimate regression (1) using a logit model and a linear probability model (LPM) as validation test.[12] Table 1 provides preliminary estimates. Panel (a) reports the logit average partial effects (APEs); panel (b), the odds ratios; and panel (c), the LPM estimates. Columns from (1) to (3) consider the full sample, including neither firms controls nor fixed effects (col.1), firms' controls only (col.2), as well as both firms controls and fixed effects (col.3).[13] Columns (4), (5), and (6) consider separately the subsamples of micro, small,

[11] See Table A3 in Appendix for descriptive statistics.

[12] We also compared the logit and probit estimates of the full sample model with all regressors including time, country, and sector fixed effects. Since the former shows a lightly higher log-pseudolikelihood, we preferred to use logit. Results are available in Table OA1 in the Online Appendix.

[13] Including a wide set of individual controls and dummies should mitigate potential omitted variable bias. Nevertheless, they can act as bad controls if they are determined simultaneously with our measure of innova-

and medium firms, respectively. All the specifications show a quadratic effect of competition on the likelihood of being innovative. The positive linear term and the negative quadratic one, both statistically significant, suggest an inverted-U relationship. The odds ratios go in the same direction. These findings hold for all the three firm category subsamples, including firms with fewer than 10 employees. For an initial low level of competition, the likelihood of being innovative increases with competition, while it slightly declines if the initial level is high.

[Insert Table 1 about here]

Thus, this preliminary evidence seems to support the findings of Scherer (1967) and Aghion et al. (2005). However, though necessary, a statistically significant coefficient of the squared term is not sufficient alone to establish a quadratic relationship (Haans et al., 2016), since it does not allow for reasonably rejecting the hypothesis that the true relationship is monotone. Lind and Mehlum (2010) propose a four-steps procedure to test for quadratic relationships. In order to be reasonably sure that an inverted-U relationship exists, the following conditions must hold: a) the squared coefficient must be negative and statistically significant; b) the curve turning point needs to be located well within the data range; c) the slopes at the lower and upper bound need to be significant and of the expected sign; and d) the confidence interval of the turning point must be within the data range. Performing this test, we find that all the specifications satisfy these conditions. The turning point in the full sample is around 7 and it increases with firm size. This means that the negative effect dominates for high levels of competition and it arrives earlier for smaller firms. The lower and upper bound slopes suggest that the increasing side of the curves are steeper than the decreasing one.

5.2 Econometric issue: dealing with reverse causality

Our empirical approach involves methodological issues that might produce inconsistent estimates of the true relationship between innovation and competition or could affect the interpretation of the estimates. Competition and innovation are, indeed, mutually endogenous and dependent (Aghion et al., 2005; Hall and Harhoff, 2012). Reverse causality might then be a potential driver of endogeneity, with the perceived competition affecting innovation and

tiveness (see Angrist and Pischke, 2008). Thus, we estimate regression (1) with and without those controls.

vice-versa. Moreover, there is a period discrepancy between the two survey questions defining innovation and competition that might increase the overlap risk between the two variables: the former considers a 12-month period while the latter a 6-month period. Such simultaneity might introduce some bias in the estimation of the contemporaneous effect of competition on innovation. Removing this bias would have been possible through a suitable instrumental variable (IV) or exogenous shock, such as a policy change. Unfortunately, the dataset does not provide adequate firm-level instruments and we found no shocks affecting all the countries at the same time. Another strategy we can pursue to deal with reverse causality is to use past values of competition (Askenazy et al., 2013; Mulkay, 2019). Lagged values may not eliminate the simultaneity bias, but they allow to lessen it by estimating the impact of past exogenous values rather than the endogenous contemporaneous one (Reed, 2015). To do this, we isolate the panel component of the SAFE dataset and we restrict the sample to those firms interviewed at least twice over the period 2014-2018.[14] The result is an unbalanced panel of 43,961 observations, 16,524 (37.59%) for micro, 13,939 (31.71%) for small, and 13,498 (30.70%) for medium firms.[15] We then amend the baseline regression (1) by replacing the current values of competition with one-period lags:

$$Innov_{i,c,s,t} = \alpha + \beta_1 Comp_{i,c,s,t-1} + \beta_2 Comp^2_{i,c,s,t-1} + \beta_j X_{i,c,s,t} + \eta_c + \theta_s + \gamma_t + \epsilon_{i,c,s,t} \qquad (2)$$

Table 2 reports the logit APEs (panel a), the odds ratios (panel b), and the LPM estimates (panel c) of regression (2). It considers the full sample (col.1) and the separate subsamples of micro (col. 2), small (col.3), and medium (col.4) enterprises. Sectors, time, and country dummies are always included. Overall, Table 2 confirms previous findings. From the Lind and Mehlum test, we observe a general lowering of the turning points, mostly for micro and small firms, for which an increase in the slope of the negative side of the curve also occurs. As anticipated in panel (b) of Figure 6, the negative effect of competition on innovation seems to come earlier and to be more marked for smaller firms.

[14] A firm is classified as a panel if it participated in the survey at least twice, though not necessarily in consecutive waves. A one period lag may not then correspond to a one year lag.

[15] See Table A5 in Appendix for details of the distribution among countries for the observations.

[Insert Table 2 about here]

5.3 Further robustness

In Table 3 we provide further robustness.[16] Following Haans et al. (2016), we first add the cube term of competition to test whether the relationship is S-shaped rather than U-shaped (col.1). Second, we run two linear regressions on the sample before and after the turning point of the curve (col.2 and 3). As expected, we obtain a positive relationship between competition and innovation in the former, while negative in the latter. To check that the results are not driven by the most represented countries, we run model (2) excluding Italy, Germany, France, Spain, and Poland (col. 4). We also want to consider the fact that the rigorous policy interventions and the international financial aids addressed to Cyprus and Greece during and after the sovereign debt crisis might have altered firms' innovative activity in these countries.[17] Finally, we want to be sure that the over-reported innovation activity in Romania does not affect our results. Thus, we exclude Greece, Cyprus, and Romania from the sample (col. 5). Overall, estimates in Table 3 confirm the evidence of an inverted-U relationship.

[Insert Table 3 about here]

We are aware that the proposed specifications, with the Lind and Mehlum test and the aforementioned robustness checks, do not guarantee a causal interpretation of the results. Nevertheless, our findings provide a first helpful contribution to assess the link between competition and innovation for MSMEs, including micro firms. Indeed, estimates suggest that the initial level of competition might determine the direction of the effect on small businesses' innovation. Competition fosters innovation, but excessive competition might also hamper it. This is valid for all firms, regardless of the size, but the negative effect seems to come earlier for smaller firms.

[16] We run these checks considering the full sample unbalanced panel.

[17] Cyprus received financial assistance from the European Stability Mechanism (ESM) of €6.3 billion over the 2013-2015 period. Greece obtained a total of €245.7 billion over the 2010-2018 period from three different programs: €52.9 billion from bilateral EU and IMF loans (2010-2012), €130.9 billion from the European Financial Stability Facility (EFSF) (2012-2015), and €61.9 billion from the ESM (2015-2018). See `https://www.esm.europa.eu/financial-assistance` for further details about the ESM-EFSF financial assistance programs.Figure A5 in Appendix shows that the introduction of the assistance programs (2013 in Cyprus and 2010 in Greece) corresponds to the beginning of an upward trend in R&D expenditures in both countries.

6 Complementary analyses: innovation strategy and frequency of innovation

Thus far, we investigate the relationship between competition and firms' innovation status, which is the likelihood to introduce at least one innovation. As a complementary analysis, we reproduced the same exercise for innovation strategy and frequency of innovation.

6.1 Innovation strategy

The four listed innovation types (product, process, organization, and marketing) have different characteristics and they emanate from distinct sources of knowledge (Demircioglu et al., 2019). As the Oslo Manual states in its 2005 edition, "It is not enough to know whether firms are innovative or not; it is necessary to know how firms innovate and what types of innovations they implement" (OECD, 2005; page 13). The literature normally proposes two ways to distinguish innovation: on the one hand, between technical and non-technical as well as, on the other, between internal and external. Table 4 reports the pairwise correlation for the four types.

[Insert Table 4 about here]

All the coefficients are positive and significant at the 1% level. The highest correlations occur between product and process (technical innovations) and between organization and marketing (non-technical innovation). A non-negligible correlation also emerges between product and marketing (external innovation) and between process and organization (internal innovation). Past literature documents the existence of complementarities between innovation strategies, particularly for product and process innovations (Cabagnols and Le Bas, 2002; Martínez-Ros and Labeaga, 2002; Miravete and Pernias, 2006; Mulkay, 2019). Our results appear to confirm this.[18] Following Santos and Cincera (2021), we also distinguish between simple innovation (firms introduce only one type of innovation among the four listed) and complex innovation (firms introduce more than one type). As a measure of innovation complexity, we build a normalized firm-level indicator by summing the number of types introduced by the firm and dividing it by four (the total number). According to Table 5, the 23% of the surveyed firms developed a simple innovation strategy (one type only) and the 34% a complex one (more than

[18]Tang (2006) finds a similar correlation coefficient (0.40) between product and process innovation using a sample of Canadian firms.

one type). Concerning technical/non-technical and external/internal innovation, the percentages are quite similar. Figure A4 in Appendix illustrates the average level of complexity by firm sector, size, sector and size, and country. Industry is the sector with the highest complexity index, followed by trade, services, and construction. Firms with fewer than 10 employees have an average index below, but close to, that of small and medium sized firms, or even equal in services sector. This suggests that the innovation divergence between micro firms and larger SMEs is limited not only in terms of being innovative, but also in terms of innovation strategy.

[Insert Table 5 about here]

Here, we want to explore whether the way competition affects innovation is unique or some differences occur depending on the class of innovation. As long as technical and external innovation are more visible and accessible, thus more imitable by competitors, we expect to find some differences. This should strengthen both the escape (positive) and the Schumpeterian (negative) effect. On the one hand, neck-and-neck firms must introduce more of these innovations to escape competition; on the other, laggard firms can more easily replicate the innovations of the leaders and, therefore, be less motivated to innovate by themselves. Thus, we expect to observe a steeper curve for these two innovation categories. We also want to see the impact on firms' innovation complexity. Thus, in Table 6 we reproduce regression (2) by innovation class and complexity. Given the correlation between the four types of innovation (Table 4), the error terms of the regressions could also be somewhat correlated, introducing potential bias in the estimates. Following Demircioglu et al. (2019), we then estimate a seemingly unrelated regressions (SUR) model (panel b). Given the continuous nature, for the complexity index (col.5), we use OLS. Panel (a) of Table 6 seems to confirm our prediction. The size and significance of the coefficients suggest a stronger relationship between competition, technical, and external innovations. For these typologies, the lower and upper bound slopes of the curve look steeper than those of non-technical and internal ones. Innovation complexity (col.5) also increases initially with competition, then it declines slightly. The stronger relationship with technical and external innovations is also confirmed by the SUR model in panel (b), where the correlation matrix of residuals does not show worryingly high correlation values.

[Insert Table 6 about here]

We replicate the same exercise focusing only on micro firms. Panel (a) of Table 7 shows that the inverted-U curve is there for all the innovation types and for the complexity index.[19] We also observe a general increase in the coefficient significance. Again, looking at the lower and upper bound slopes, technical and external innovations have a steeper positive and negative side of the curve comparing to non-technical and internal innovations. The size and significance of the coefficients are confirmed by the SUR model in panel (b). Overall, these findings suggest that the intensity of the effect of competition is not unique, but it varies based on the type of innovation.

[Insert Table 7 about here]

6.2 Frequency of innovation

We develop a second complementary analysis to study how perceived competition affects the frequency of MSMEs' innovative activity. To do this, we further restrict our sample to those panel firms interviewed in at least three waves. After selecting three periods for those companies present more than trice, we obtain a weakly balanced panel with 19,970 observations. Firms appear the same number of times but not necessarily in the same years. With this restricted sample, we can observe the innovation status for a certain number of firms over time (at least three periods). We build a normalized index for the frequency of innovation by dividing the number of years in which the firm declared to be innovative by three (the total number of years in which the firm was interviewed).[20] Since this measure is an average value, to make things comparable we also compute the firm-average perceived competition level over the three years. Table 8 reports the number of enterprises that, at the end of the three-years period, have been innovative in zero, one, two, or three years. Although they are observed over a limited

[19] For innovation complexity, since the normalized index has values between 0 and 1, we replicate the estimation using a fractional logistic regression model. We also develop a Poisson regression with a count dependent variable indicating the number of types of innovation a firm has introduced. The inverted-U relationship is confirmed both for the full sample and for micro firms. Results are available in Table OA2 in the Online Appendix.

[20] See Table A4 in Appendix for a more detailed definition.

number of years and not necessarily in the same years, a certain heterogeneity in the frequency of innovation emerges.

[Insert Table 8 about here]

Figure 7 provides preliminary evidence about the relationship between the frequency of innovation and the average perceived level of competition. As it emerges, the frequency initially increases with competition and then it slightly declines.

[Insert Figure 7 about here]

We specify the new regression as follows:

$$\begin{aligned} Innov\_freq_{i,c,s,t} = \alpha + \beta_1 Comp\_mean_{i,c,,s,t} + \beta_2 Comp\_mean^2_{i,c,s,t} + \\ + \beta_j X_{i,c,s,t} + \eta_c + \theta_s + \epsilon_{i,c,s,t}, \end{aligned} \tag{3}$$

Where $X_{i,c,s,t}$ is the usual firms' controls vector, including the same variable of regressions (1) and (2). To account for unobserved heterogeneity, not only do we include country and sector fixed effects, we also cluster the standard errors at country level. Given the average dimension of the dependent and the main independent variable of interest, we only consider the end-period year and, thus, we do not include time dummies. We estimate regression (3) for the full sample (col.1) and for micro firms only (col.2) using OLS. Table 9 shows that, considering the full sample, for low starting level of competition, an increase in the perceived level of competition is positively associated to the frequency of innovation, while negatively when the starting level is high.[21] This specification is robust to the Lind and Mehlum test. Looking at the coefficients for micro firms, although they have the same signs as column 1, they are not statistically significant. This might be due by the limited number of observations and it suggests that the results for the full sample are mainly driven by larger firms.[22] Thus, at least for the overall sample of MSMEs, the estimates show that, together with innovation

[21] As for innovation complexity, we replicate the estimation using both fractional and Poisson regressions. For the latter, the count dependent variable is used. The findings reported in Table 9 are confirmed. Results are available in Table OA3 in the Online Appendix.

[22] We check this hypothesis by doing regressions considering small and medium firms only. Statistically significant quadratic estimates emerge indeed for medium firms only. Results are available in Table OA4 in the Online Appendix.

status and complexity, a non-monotone relationship in the form of an inverted-U curve occurs also between competition and frequency of innovation.

[Insert Table 9 about here]

7 Conclusion

Micro businesses are often considered to be marginal players in innovation. Due to the greater interest in large companies and the scarcity of comprehensive data, several aspects of their innovative behavior are still unexplored. This fact is surprising, as micro enterprises represent the largest share of firms in the non-financial business sector.

With this paper, we contribute to filling this gap by examining whether and how these companies innovate and by empirically investigating how competition affects their innovative activity. Exploring a large sample of small businesses across 28 European Union member states, we find that a non-negligible share of innovative firms have fewer than 10 employees. We also find evidence of an inverted-U shaped relationship between innovation and competition, whereby when the latter increases, the former goes along if the initial level of competition is low, while it slightly declines if the initial level is high. The results hold for all firms regardless of their size, while some differences in the size of the effects emerge when we consider different typologies of innovation. Indeed, competition has a stronger relationship with technical and external innovation. In this regard, we contribute to reducing the knowledge gap between large and very small companies in terms of innovation by providing a first empirical exploration of the innovation-competition nexus for microbusinesses. By including them, we provide elements to the understanding of innovative patterns and activities in firms of all size.

We also know that the self-reported nature of the dataset we rely on, despite being unique in terms of micro firms coverage, raises some measurement concerns and that some important characteristics of innovation and competition are not considered. For instance, the survey does not allow for distinguishing between radical and incremental innovation or between *ex-ante*/*ex-post* and product/credit market competition, which would be interesting to include in future research. Moreover, the small panel component of the survey prevents us from developing a rigorous longitudinal analysis that establishes causation. A larger and strongly balanced panel

would have also allowed to explore the effect of different lags of competition on current innovation. However, we are not aware of other dataset including such a large number of micro firms with explicit questions on firm-level innovation and perceived competition. Thus, although more details about innovation and competition for micro firms would be helpful to develop further analyses, we consider this paper to be a starting point for exploiting the available information. Indeed, our findings suggest that firms with fewer than 10 employees should be considered as relevant players in innovation and, therefore, included in innovation research. They could also provide interesting policy implications. As long as competition fosters innovation by small businesses, but excessive competition can hamper it, promoting well-balanced competitive markets appear crucial for enabling smaller firms to exploit their full innovation potential. Another implication is that small firms seeking the protection of a market niche to avoid competition and to have better chance of survival, could see their innovative activity reduced. A strong protection from competition, when its starting level is not excessively high, can increase MSMEs lifetime, but also limit their innovation potential. This implies that a right balance between survival needs and innovation growth should be pursued by small businesses' entrepreneurs and promoted by policy makers. Moreover, our findings imply that policies aimed at supporting microbusinesses' innovation should take into account that the intensity of the effect of competition is not unique, but it varies according to the different types of innovation. Deepening how the competition-innovation relationship varies with innovation types might represent a further stimulating goal for future research. Finally, our analysis is limited to the EU economy. It could be explored whether similar or different findings emerge for other regions or countries.

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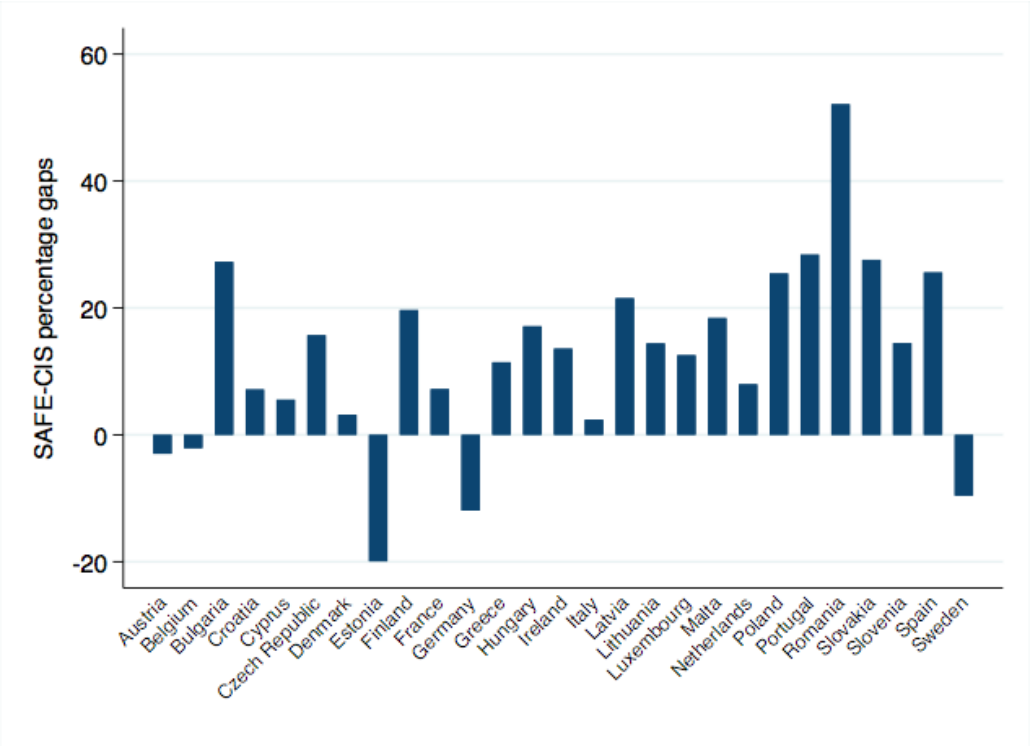
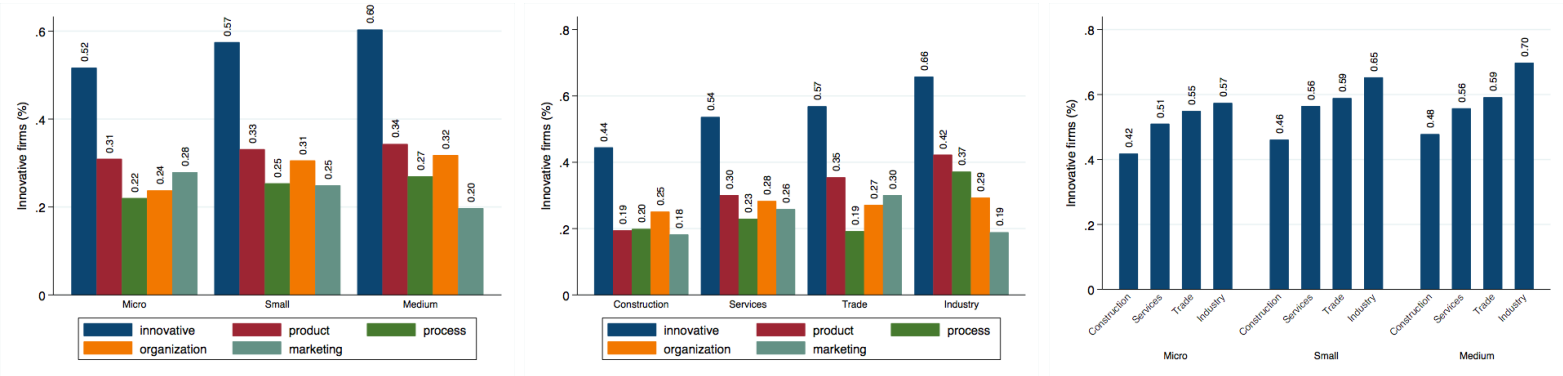
Figures and Tables

Figure 1: SAFE - CIS percentage gaps.



Notes: Authors' calculations on SAFE (2016-2018) and CIS (2018). The figure reports the differences between the countries percentage of innovative firms resulting from the two survey. Only firms with at least 10 employees are considered.

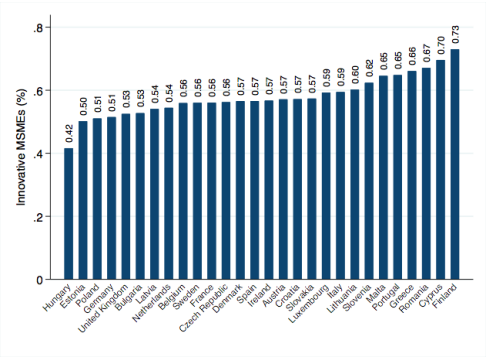
Figure 2: Innovative firms by size and sector.

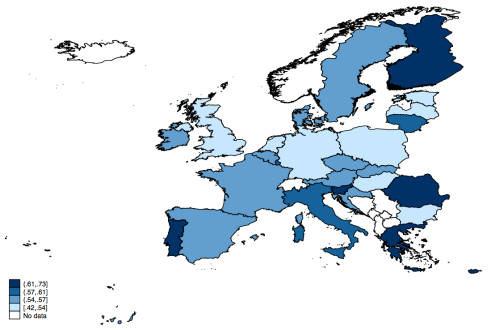


(a) By size **(b)** By sector **(c)** By sector and size

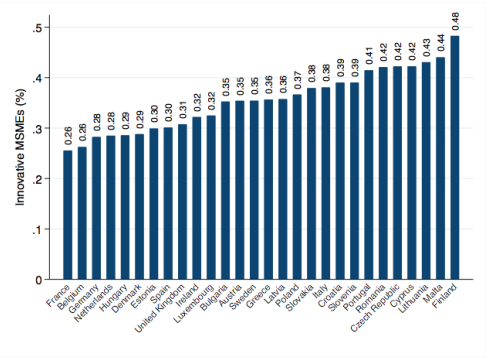
Notes: Authors' calculations on SAFE data. The figure reports the weighted percentage of firms that introduced at least one type of innovation (innovative) and product, process, organization, or marketing innovation. It does so by size (a), sector (b), and both sector and size (c). The statistics refer to the five Common round waves from 2014-2018.

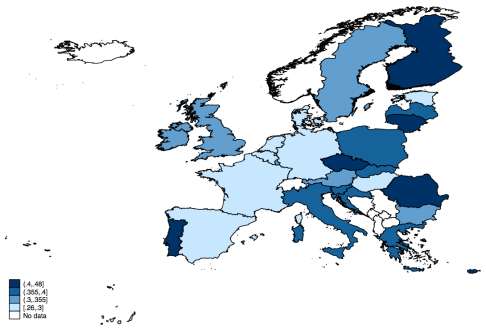
Figure 3: Innovation activity by country.



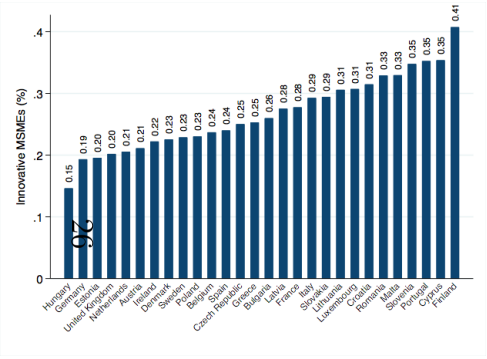


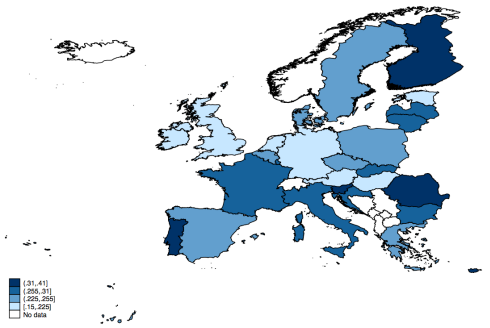
(a) overall



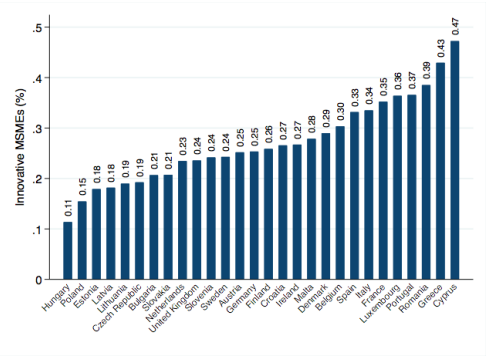


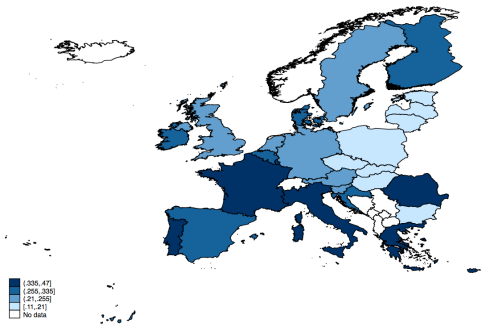
(b) product



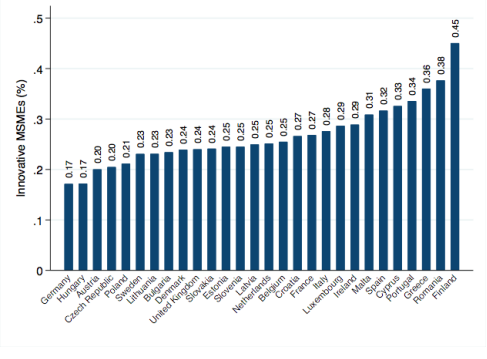


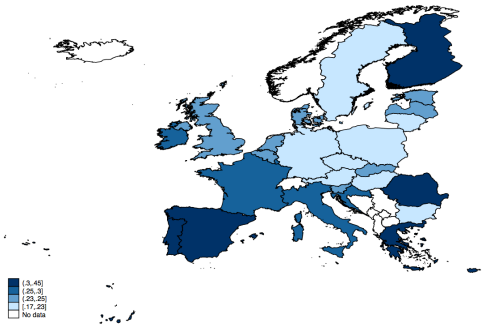
(c) process





(d) organizational

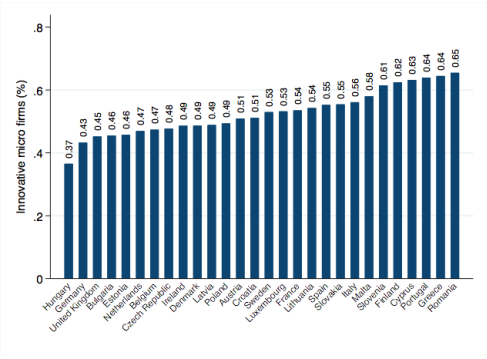


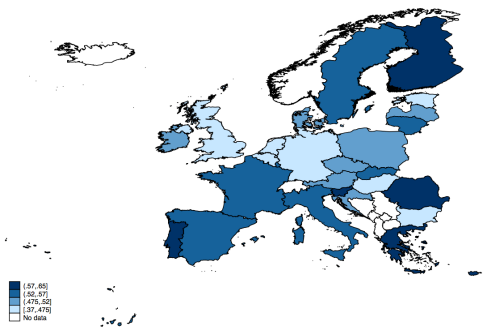


(e) marketing

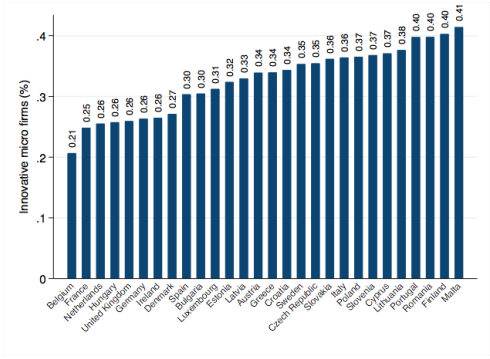
Notes: Authors' calculations on SAFE data. The figure reports the weighted percentages of MSMEs that introduced at least one innovation (a) and that introduced a product (b), process (c), organization (d), and marketing (e) type in each country. The statistics refer to the five Common round waves from 2014-2018.

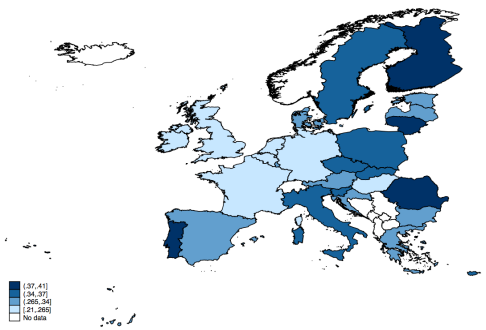
Figure 4: Innovation activity by country - micro firms.



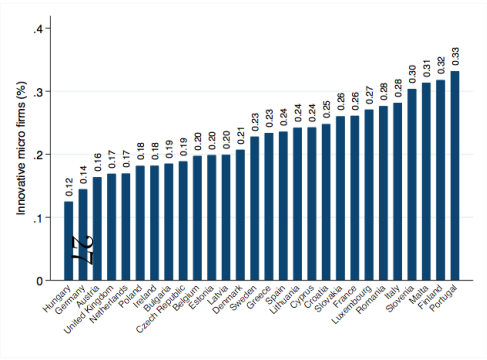


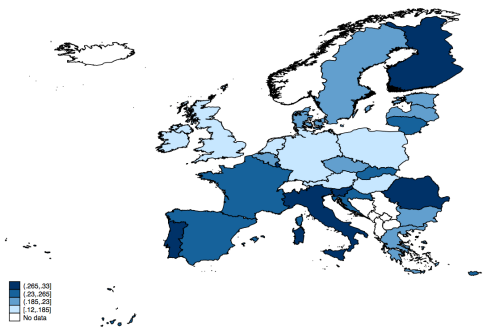
(a) overall



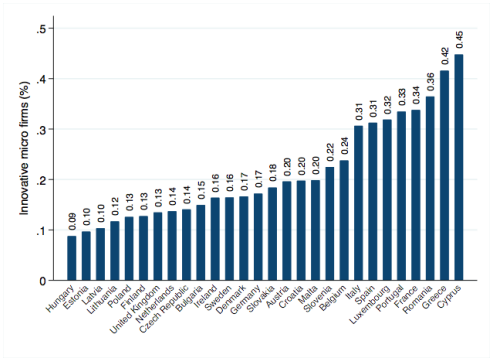


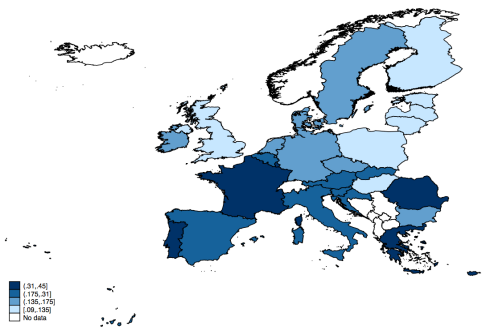
(b) product



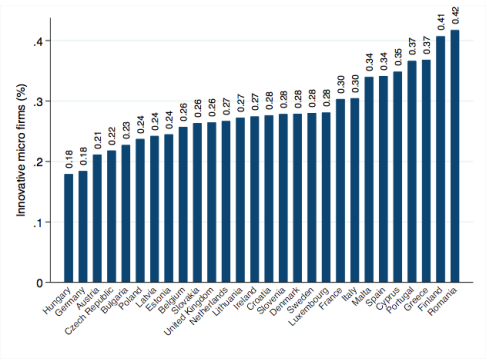


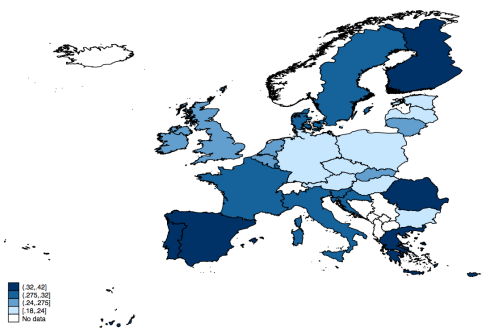
(c) process





(d) organizational

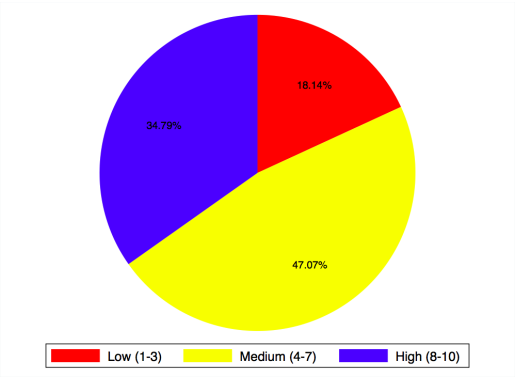




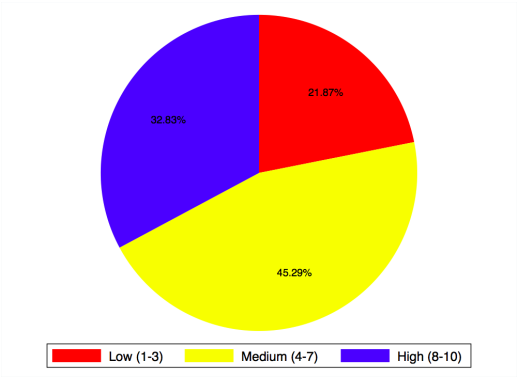
(e) marketing

Notes: Authors' calculations on SAFE data. The figure reports the weighted percentages of firms with fewer than 10 employees that introduced at least one innovation (a) and that introduced a product (b), process (c), organizational (d) and marketing (e) type in each country. The statistics refer to the five Common round waves from 2014-2018.

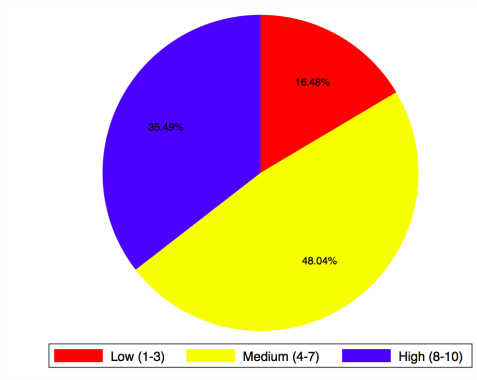
Figure 5: Perceived competition.



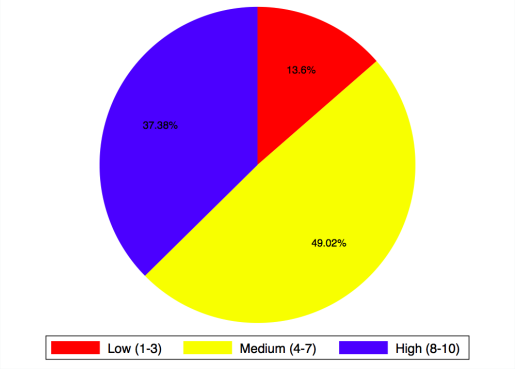
(a) Distribution - full sample



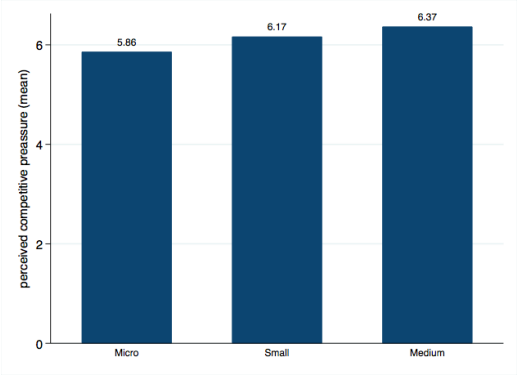
(b) Distribution - micro



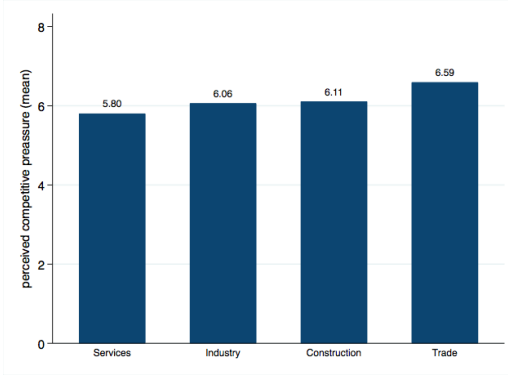
(c) Distribution - small



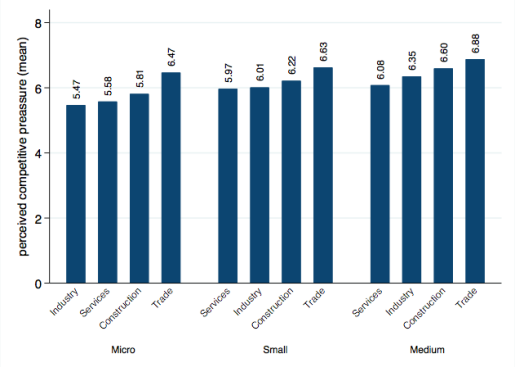
(d) Distribution - medium



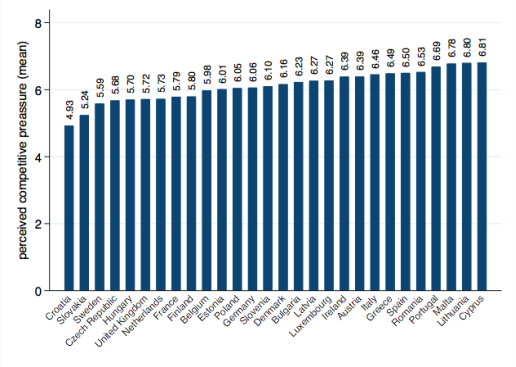
(e) By size



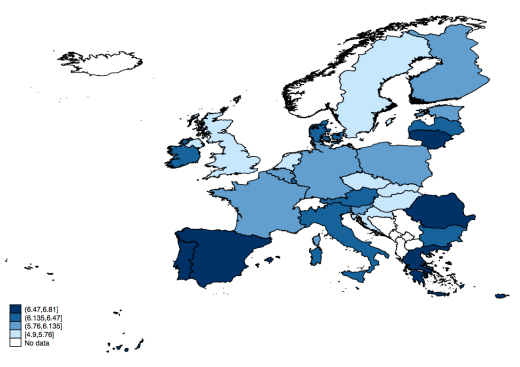
(f) By sector



(g) By sector and size



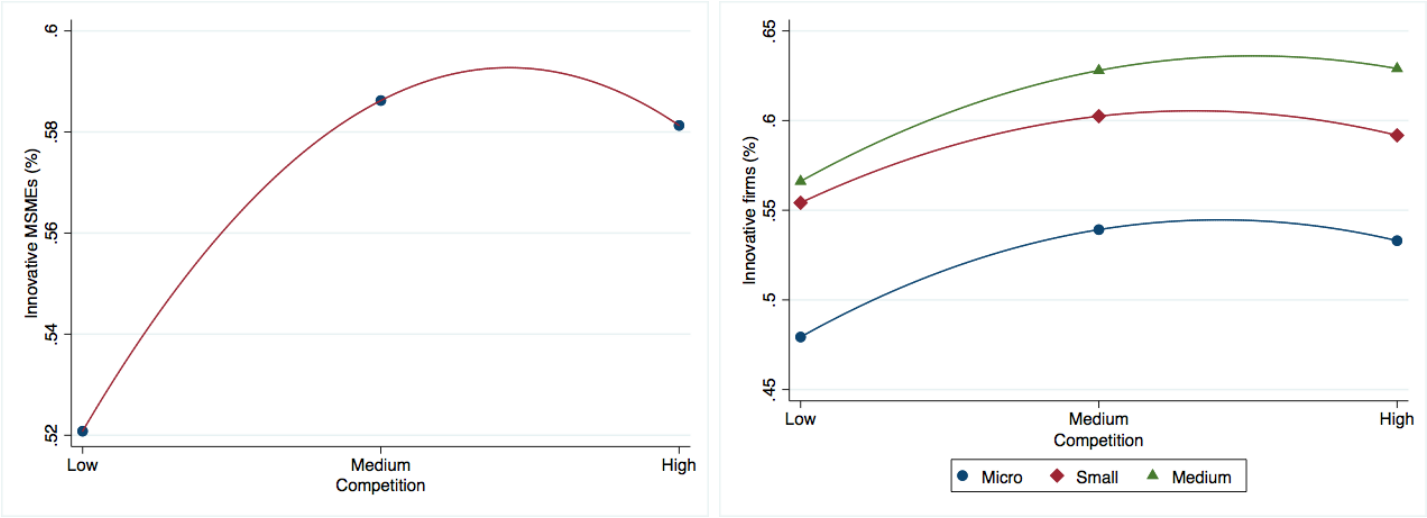
(h) By country



(i) Geography

Notes: Authors' calculations on SAFE data. The figure reports weighted statistics about firms' perceived level of competition: the full sample and subsamples distributions (a-d), the weighted mean by size (e), sector (f), by sector and size (g) and by country (h and i). The statistics refer to the five Common round waves from 2014-2018.

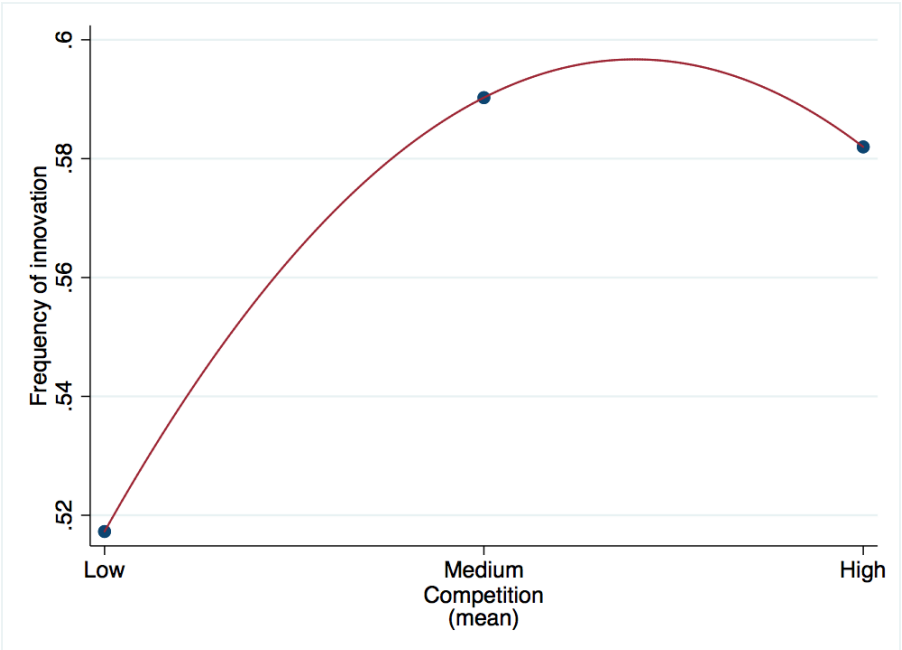
Figure 6: Competition and innovation.



(a) **(b)**

Notes: Authors' calculations on SAFE data. The binned scatterplot in panel (a) reports the percentage of innovative firms for different level of competition: *Low* (values 1,2,3), *Medium* (values 4,5,6,7), and *High* (values 8,9,10). Panel (b) does the same for the separate subsamples of micro, small, and medium firms. The statistics refer to the five Common round waves from 2014-2018.

Figure 7: Competition and frequency of innovation.



Notes: Authors' calculations on SAFE data. The figure plots the frequency of innovation over competition. The statistics refer to the five Common round waves from 2014-2018.

Table 1: Innovation status.

Dependent variable: Innovative	(1) Full sample	(2) Full sample	(3) Full sample	(4) Micro	(5) Small	(6) Medium
Firms controls	No	Yes	Yes	Yes	Yes	Yes
Time, country, sector FE	No	No	Yes	Yes	Yes	Yes
Panel (a): APEs						
Competition	0.044***	0.036***	0.033***	0.031***	0.028***	0.036***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.008)	(0.005)
Competition^2	-0.003***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Observations	75673	71833	71833	28033	22414	21386
Pseudo R^2	0.02	0.04	0.04	0.04	0.03	0.04
Wald test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Panel (b): Odds ratios						
Competition			1.150***	1.141***	1.128***	1.169***
			(0.027)	(0.030)	(0.040)	(0.026)
Competition^2			0.990***	0.990***	0.992***	0.990***
			(0.002)	(0.002)	(0.003)	(0.002)
Observations			71833	28033	22414	21386
Pseudo R^2			0.04	0.04	0.03	0.04
Wald test - H0: all coefficients = 0			0.0000	0.0000	0.0000	0.0000
Panel (c): LPM						
Competition			0.033***	0.031***	0.028***	0.036***
			(0.005)	(0.006)	(0.008)	(0.005)
Competition^2			-0.002***	-0.002***	-0.002**	-0.002**
			(0.000)	(0.000)	(0.001)	(0.000)
Observations			71833	28033	22414	21386
Adj. R^2			0.05	0.06	0.04	0.05
F test - H0: all coefficients = 0			0.0000	0.0000	0.0000	0.0000
Lind-Mehlum test						
Extreme point			7.26	6.83	7.22	7.76
Lower bound - slope			0.12	0.11	0.10	0.14
			[6.24; 0.000]	[5.02; 0.000]	[3.51; 0.000]	[7.31; 0.000]
Upper bound - slope			-0.05	-0.06	-0.05	-0.04
			[-3.07; 0.001]	[-4.34; 0.000]	[-1.72; 0.043]	[-2.80; 0.002]
Overall test			[3.07; 0.001]	[4.34; 0.000]	[1.72; 0.043]	[2.80; 0.002]
90% Fieller CI			[6.80;8.11]	[6.34;7.38]	[6.48;9.70]	[7.20; 8.71]

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. T-values, and p-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1. Panel (a) reports the logit average partial effects (APEs); panel (b) the odds ratios; panel (c) the LPM estimates. All the regressions use sampling weights. The dependent variable is *innovative* dummy. Columns from (1) to (3) consider the full sample, while Column (4), (5), and (6) the subsamples of micro (1 to 9 employees), small (10 to 49 employees), and medium (50 to 249 employees) firms, respectively. The set of firms' controls includes size (only in col. 1,2,3), turnover, age, legal status, ownership types, and past growth. Each column estimates regression (1) by including neither firms' controls nor FE (col.1), firms' controls only (col.2), both firms' controls and time, country, sector FE (col. 3,4,5,6). The Lind and Mehlum test uses logistic regressions.

Table 2: Innovation status - panel component.

Dependent variable: Innovative	(1) Full sample	(2) Micro	(3) Small	(4) Medium
Firms controls	Yes	Yes	Yes	Yes
Time, country, sector FE	Yes	Yes	Yes	Yes
Panel (a): APEs				
Competition(t-1)	0.034***	0.034***	0.029**	0.036***
	(0.009)	(0.012)	(0.013)	(0.007)
Competition^2(t-1)	-0.003***	-0.003***	-0.003**	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	25428	9261	8176	7991
Pseudo R^2	0.04	0.04	0.04	0.04
Wald test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000
Panel (b): Odds ratios				
Competition(t-1)	1.155***	1.154***	1.131**	1.174***
	(0.044)	(0.057)	(0.061)	(0.034)
Competition^2(t-1)	0.989***	0.988***	0.989**	0.989***
	(0.003)	(0.004)	(0.004)	(0.002)
Observations	25428	9261	8176	7991
Pseudo R^2	0.04	0.04	0.04	0.04
Wald test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000
Panel (c): LPM				
Competition(t-1)	0.034***	0.033***	0.029**	0.037***
	(0.009)	(0.012)	(0.013)	(0.007)
Competition^2(t-1)	-0.003***	-0.003***	-0.003**	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	25428	9261	8176	7991
Adj. R^2	0.05	0.05	0.05	0.05
F test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000
Lind-Mehlum test				
Extreme point	6.24	5.98	5.49	7.43
Lower bound - slope	0.12	0.12	0.10	0.14
	[3.57: 0.000]	[2.81; 0.002]	[2.21; 0.013]	[5.63; 0.000]
Upper bound - slope	-0.09	-0.10	-0.10	-0.06
	[-3.56; 0.000]	[-3.41; 0.000]	[-2.68; 0.004]	[-2.67; 0.004]
Overall test	[3.57; 0.000]	[2.81; 0.002]	[2.21; 0.013]	[2.64; 0.004]
90% Fieller CI	[5.85;6.68]	[4.78,6.82]	[4.03,6.26]	[6.72,8.58]

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. T-values and p-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1. Panel (a) reports the logit average partial effects (APEs); panel (b) the odds ratios; panel (c) the LPM estimates. All the regressions use sampling weights. The dependent variable is *innovative* dummy. Columns (1) considers the full sample, while column (2), (3), and (4) the subsamples of micro (1 to 9 employees), small(10 to 49 employees), and medium (50 to 249 employees) firms, respectively. The set of firms' controls includes size (only in col.1), turnover, age, legal status, ownership types, and past growth. Each column includes firms' controls and time, country, sector FE. The Lind and Mehlum test uses logistic regressions.

Table 3: Further robustness.

Dependent variable: Innovative	(1) Full sample	(2) *comp* < 7	(3) *comp* >= 7	(4) Excluding Italy, Germany, France Spain and Poland	(5) Excluding Greece, Cyprus and Romania
Competition(t-1)	0.055***	0.004***	-0.005**	0.028***	0.035***
	(0.021)	(0.002)	(0.002)	(0.009)	(0.009)
Competition^2(t-1)	-0.007**			-0.002***	-0.003***
	(0.004)			(0.001)	(0.001)
Competition^3(t-1)	0.000				
	(0.000)				
Firms controls	Yes	Yes	Yes	Yes	Yes
Time, country, sector FE	Yes	Yes	Yes	Yes	Yes
Observations	25428	12279	13149	14043	23798
Pseudo R^2	0.04	0.05	0.04	0.05	0.04
Wald test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000	0.0000
Lind-Mehlum test					
Extreme point	3.85			6.10	6.20
Lower bound - slope	0.17			0.10	0.13
	[2.96; 0.001]			[3.10; 0.000]	[3.84; 0.000]
Upper bound - slope	-0.38			-0.08	-0.09
	[-1.68; 0.05]			[-2.71; 0.003]	[-3.74; 0.000]
Overall test	[1.68; 0.05]			[2.71; 0.003]	[3.74; 0.000]
90% Fieller CI	[3.19; 9.33]			[5.56; 6.90]	[5.81; 6.60]

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. T-values and p-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The table reports the logit average partial effects (APEs). All the regressions use sampling weights and consider all the MSMEs together. The dependent variable is *innovative* dummy. The set of firms' controls includes size, turnover, age, legal status, ownership types, and past growth. Each column estimates equation (2) by including both firms' controls and time, country, sector FE.

Table 4: Pairwise correlation - innovation types.

	type 1	*type 2*	*type 3*	*type 4*
Product (type 1)	1.00			
Production process (type 2)	0.42*	1.00		
Organization (type 3)	0.18*	0.25*	1.00	
Marketing (type 4)	0.29*	0.24*	0.31*	1.00

Notes: Authors' calculations on SAFE data. Significance level: 1%.

Table 5: Innovation strategy.

One type	23%	Technical	43%
Two types	19%	Non-technical	40%
Three types	10%	External	45%
Four types	5%	Internal	42%

Notes: Authors' calculation on SAFE data.

Table 6: Innovation typology and complexity - full sample.

Firms controls	Yes	Yes	Yes	Yes	Yes
Time, country, sector FE	Yes	Yes	Yes	Yes	Yes
	(1)	(2)	(3)	(4)	(5)
	Technical	Non-technical	External	Internal	Complexity
Panel (a): logit model					(OLS)
Competition(t-1)	0.028***	0.015*	0.034***	0.012**	0.010***
	(0.004)	(0.008)	(0.009)	(0.006)	(0.004)
Competition^2(t-1)	-0.003***	-0.001	-0.003***	-0.001**	-0.001**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Observations	25204	25340	25381	25254	23,298
Pseudo (Adj.) R^2	0.05	0.03	0.04	0.05	(0.06)
Wald (F) test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000	(0.0000)
Lind-Melhum test					
Extreme point	5.44	8.24	6.43	5.66	6.43
Lower bound - slope	0.10	0.06	0.13	0.04	0.009
	[6.42; 0.000]	[2.02; 0.02]	[3.76; 0.000]	[2.04; 0.02]	[2.86; 0.004]
Upper bound - slope	-0.10	-0.01	-0.08	-0.04	-0.006
	[-9.97; 0.000]	[-0.65; 0.25]	[-3.51; 0.000]	[-2.04; 0.02]	[-2.33; 0.014]
Overall test	[6.42; 0.000]	[0.65; 0.25]	[3.51; 0.000]	[2.04; 0.02]	[2.33; 0.014]
90% Fieller CI	[4.96; 5.83]	[-Inf; +Inf]	[6.11; 6.81]	[4.37; 6.87]	[5.67; 7.73]
Panel (b): SUR model					
Competition(t-1)	0.025***	0.015***	0.033***	0.008	
	(0.005)	(0.005)	(0.005)	(0.005)	
Competition^2(t-1)	-0.002***	-0.001**	-0.003***	-0.001**	
	(0.000)	(0.000)	(0.000)	(0.000)	
Observations	25116	25116	25207	25207	
R^2	0.08	0.04	0.06	0.07	
F test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000	
Correlation matrix of residuals					
Technical	1.00				
Non-technical	0.30	1.00			
External			1.00		
Internal			0.37	1.00	

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. T-values and p-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The dependent variables are technical (col.1), non-technical (col.2), external (col.3), internal (col.4), innovation dummies and innovation complexity (col.5). The set of firms' controls includes size, turnover, age, legal status, ownership types, and past growth. Each column includes firms' controls and time, country, sector FE.

Table 7: Innovation typology and complexity - micro firms.

Firms controls	Yes	Yes	Yes	Yes	Yes
Time, country, sector FE	Yes	Yes	Yes	Yes	Yes
	(1)	(2)	(3)	(4)	(5)
	Technical	Non-technical	External	Internal	Complexity
Panel (a): logit model					(OLS)
Competition(t-1)	0.027***	0.022**	0.031***	0.020***	0.015***
	(0.005)	(0.009)	(0.008)	(0.007)	(0.003)
Competition^2(t-1)	-0.003***	-0.002**	-0.002***	-0.001**	-0.001***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Observations	9161	9221	9252	9164	8271
Pseudo (Adj.) R^2	0.04	0.04	0.05	0.06	(0.07)
Wald (F) test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000	(0.0000)
Lind-Melhum test					
Extreme point	5.34	7.04	6.33	5.93	6.49
Lower bound - slope	0.10	0.06	0.11	0.08	0.013
	[5.61; 0.000]	[2.38; 0.008]	[3.64; 0.000]	[2.65; 0.004]	[4.48; 0.000]
Upper bound - slope	-0.11	-0.04	-0.07	-0.067	-0.008
	[-4.08; 0.000]	[-1.65; 0.04]	[-3.89; 0.000]	[-3.23; 0.000]	[-2.90; 0.004]
Overall test	[4.08; 0.000]	[1.65; 0.04]	[3.64; 0.000]	[2.65; 0.004]	[2.90; 0.004]
90% Fieller CI	[4.47; 6.04]	[5.71; 9.95]	[5.27; 7.24]	[4.42; 6.99]	[5.36; 7.96]
Panel (b): SUR model					
Competition(t-1)	0.024***	0.021***	0.030***	0.017**	
	(0.008)	(0.008)	(0.008)	(0.008)	
Competition^2(t-1)	-0.002***	-0.001**	-0.002***	-0.001**	
	(0.001)	(0.001)	(0.001)	(0.001)	
Observations	9121	9121	9155	9155	
R^2	0.06	0.06	0.06	0.07	
F test - H0: all coefficients = 0	0.0000	0.0000	0.0000	0.0000	
Correlation matrix of residuals					
Technical	1.00				
Non-technical	0.36	1.00			
External			1.00		
Internal			0.43	1.00	

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. T-values and p-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The dependent variables are, technical (col.1), non-technical (col.2), external (col.3), internal (col.4), innovation dummies and innovation complexity (col.5). The set of firms' controls includes size, turnover, age, legal status, ownership types, and past growth. Each column includes firms' controls and time, country, sector FE.

Table 8: Frequency of innovation.

	Freq.	*Percent*
No innovation (0/3)	1,305	19.96
Low frequency (1/3)	1,331	20.36
Medium frequency (2/3)	1,620	24.78
High frequency (3/3)	2,281	34.89

Notes: Authors' calculations on SAFE data.

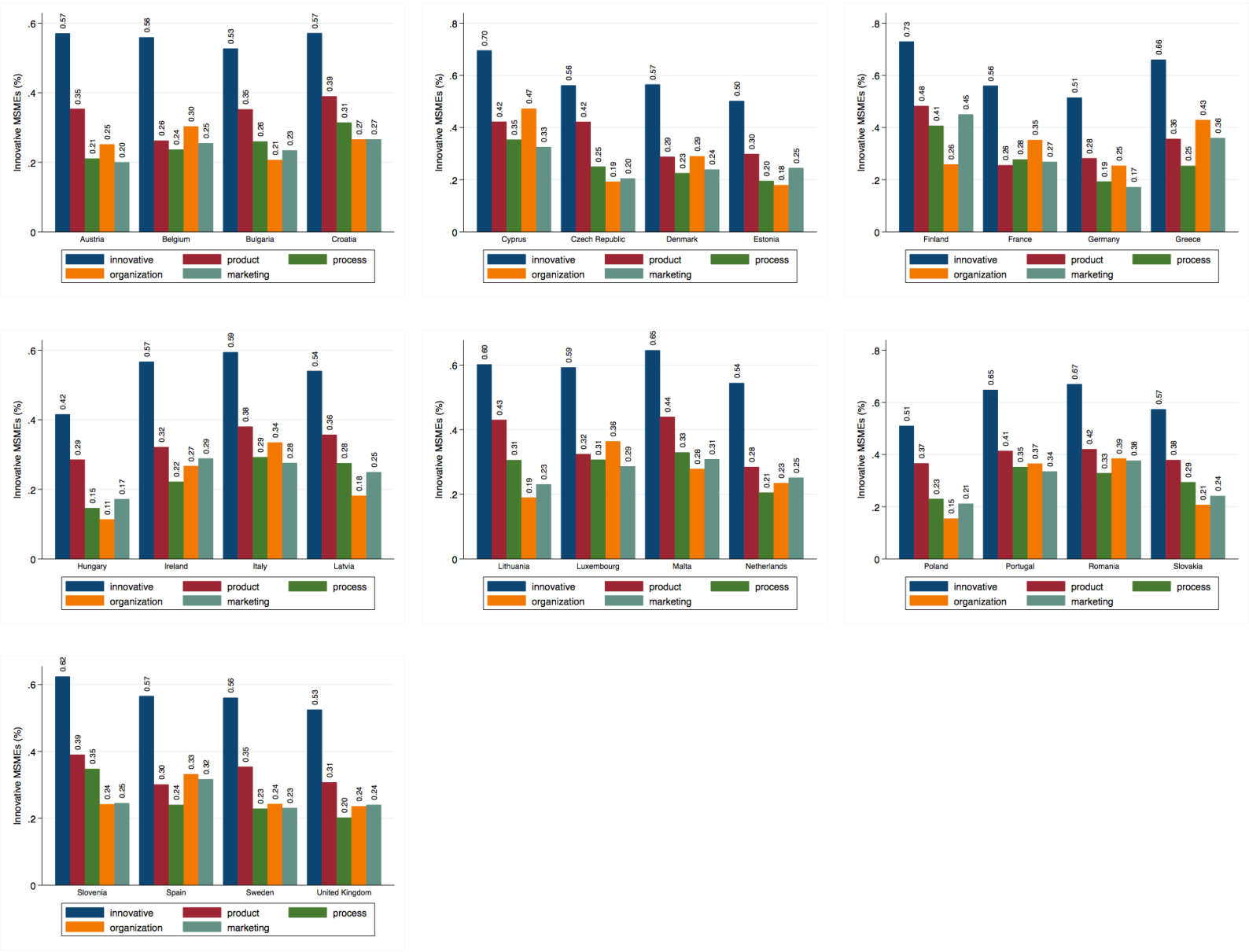
Table 9: Frequency of innovation.

	(1) Full sample	(2) Micro firms
Competition(mean)	0.043***	0.014
	(0.010)	(0.019)
Competition(mean)^2	-0.003***	-0.001
	(0.001)	(0.002)
Firms controls	Yes	Yes
Country, sector FE	Yes	Yes
Observations	6,376	2160
Adj. R^2	0.08	0.08
F test - H0: all coefficients = 0	0.0000	0.0000
Lind-Mehlum test		
Extreme point	6,95	9.57
Lower bound - slope	0.04	0.01
	[4.33, 0.000]	[0.82, 0.21]
Upper bound - slope	-0.02	-0.00
	[-2.69; 0.006]	[-0.03, 0.48]
Overall test	[2.69; 0.006]	[0.03, 0.48]
90% Fieller CI	[5.89; 8.36]	[-inf; +inf]

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. T-values and p-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The table reports the OLS estimates using sampling weights. The dependent variable is *frequency of innovation.*. The set of firms' controls includes size, turnover, age, legal status, ownership types, and past growth. Country and sector FE are included.

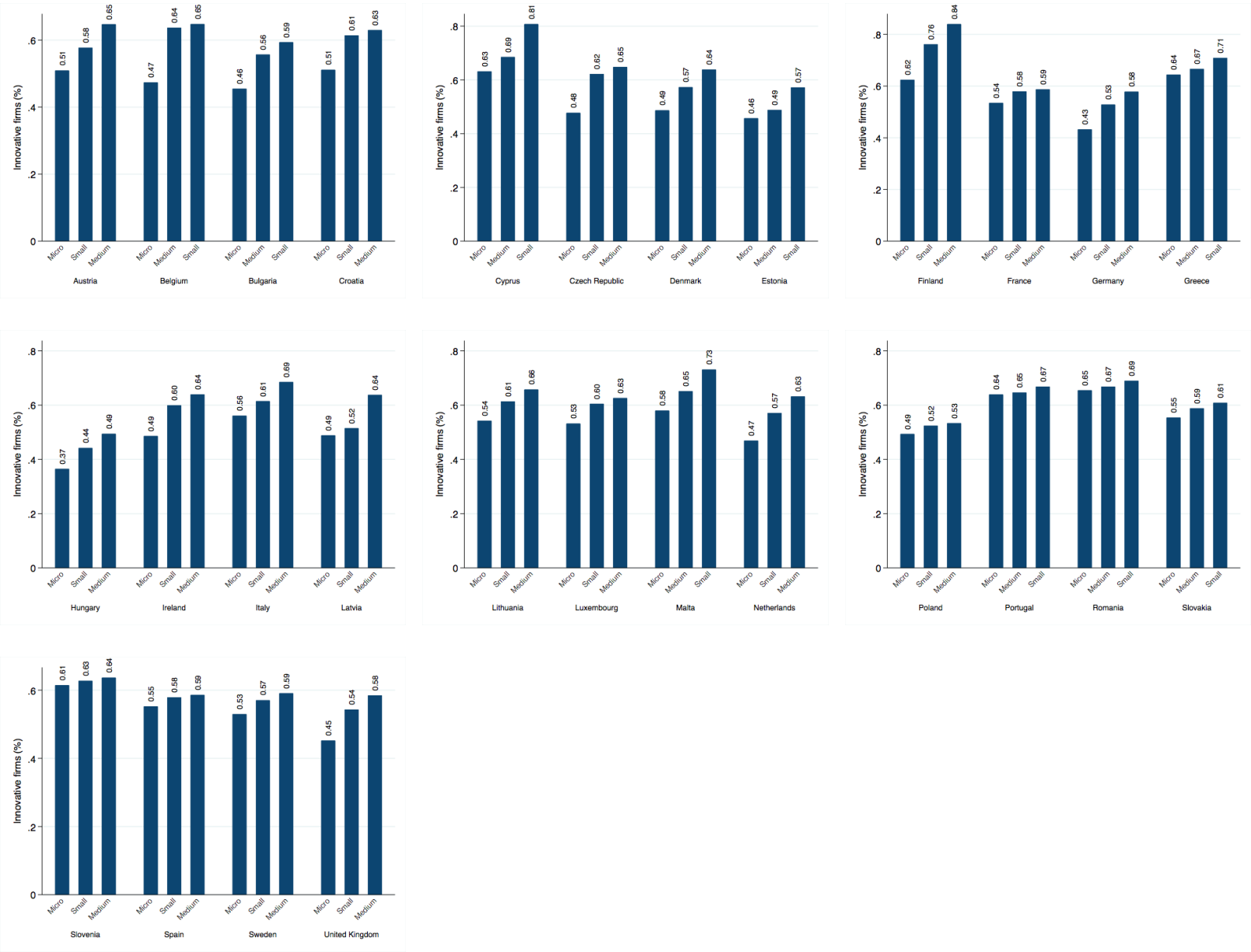
Appendix: additional Figures and Tables

Figure A1: Innovative firms by country.



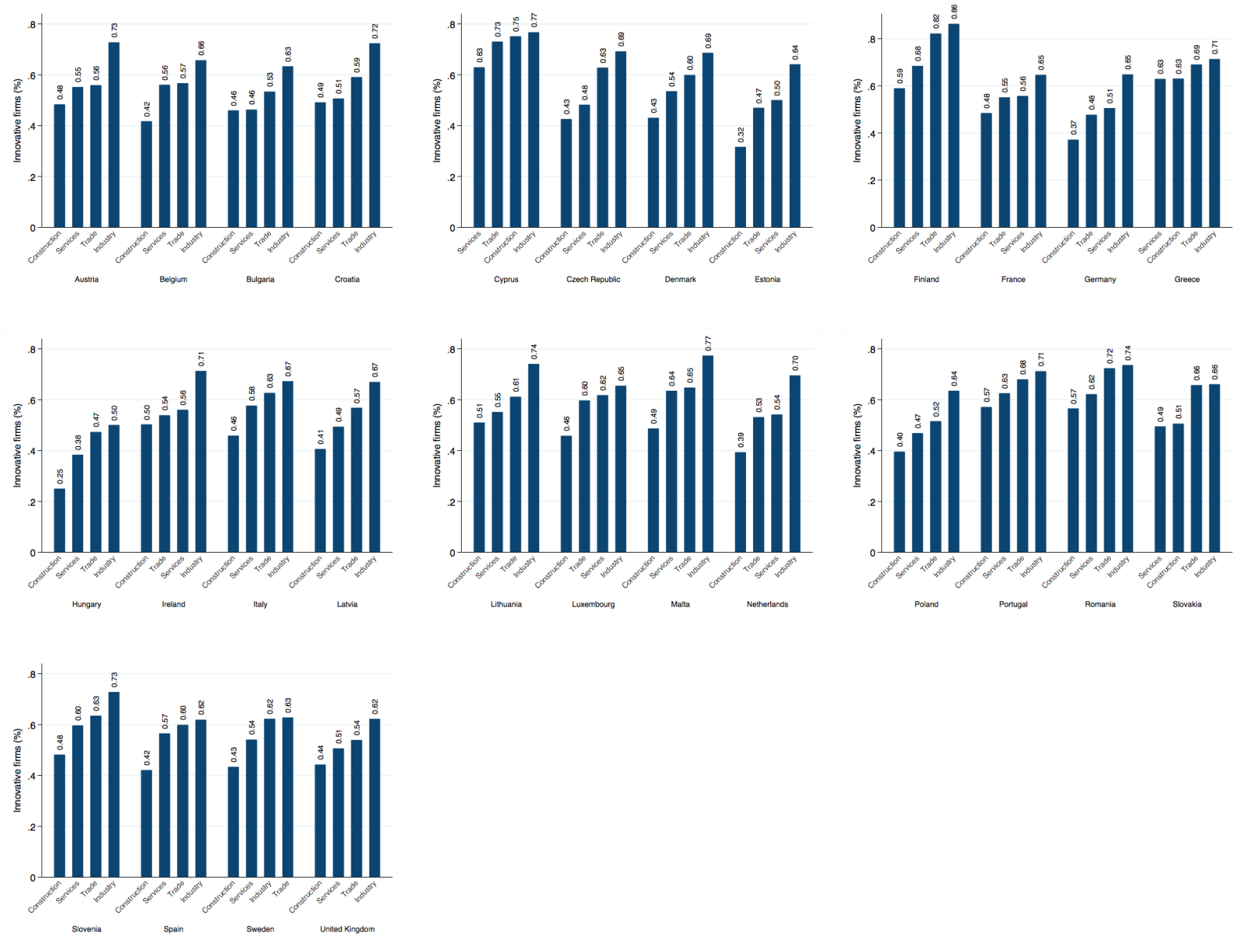
Notes: Authors' calculations on SAFE data. The figure reports the weighted percentage of firms that introduced at least one types of innovation (innovative) and product, process, organization, marketing innovation in each country. The statistics refer to the five Common round waves from 2014-2018.

Figure A2: Innovative firms by country and size.



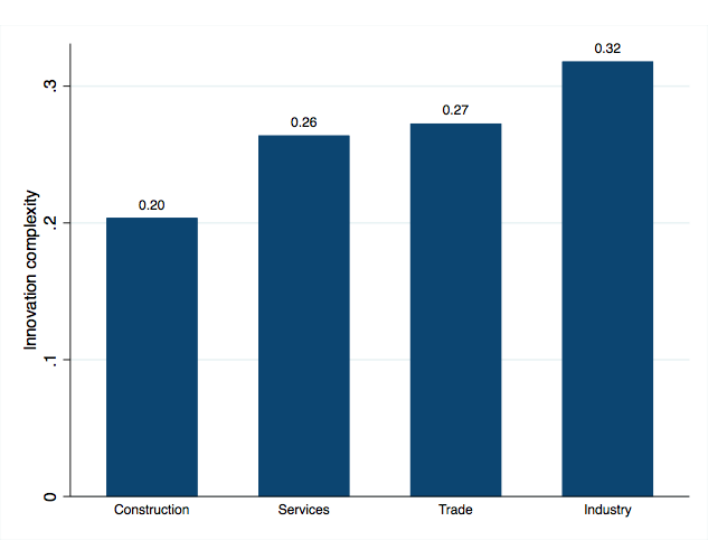
Notes: Authors' calculations on SAFE data. The figure reports the weighted percentage of innovative firms by size in each country. The statistics refer to the five Common round waves from 2014-2018.

Figure A3: Innovative firms by country and sector.

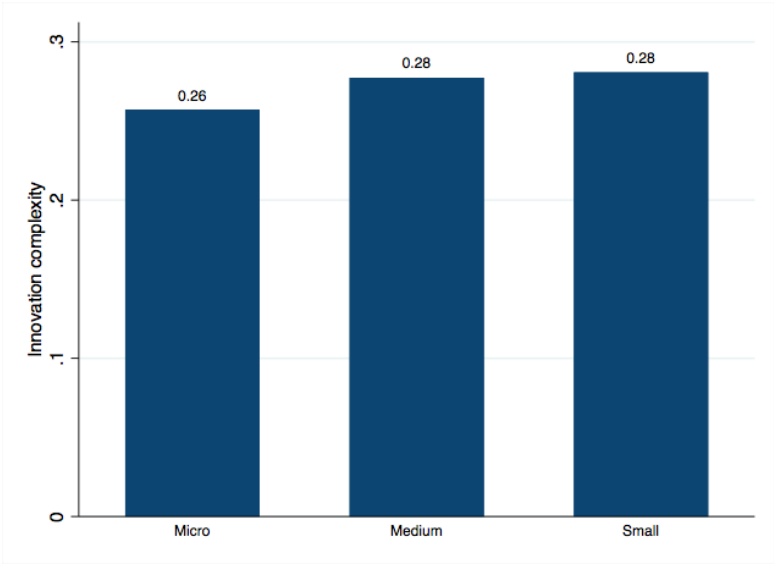


Notes: Authors' calculations on SAFE data. The figure reports the weighted percentage of innovative firms by sector in each country. The statistics refer to the five Common round waves from 2014-2018.

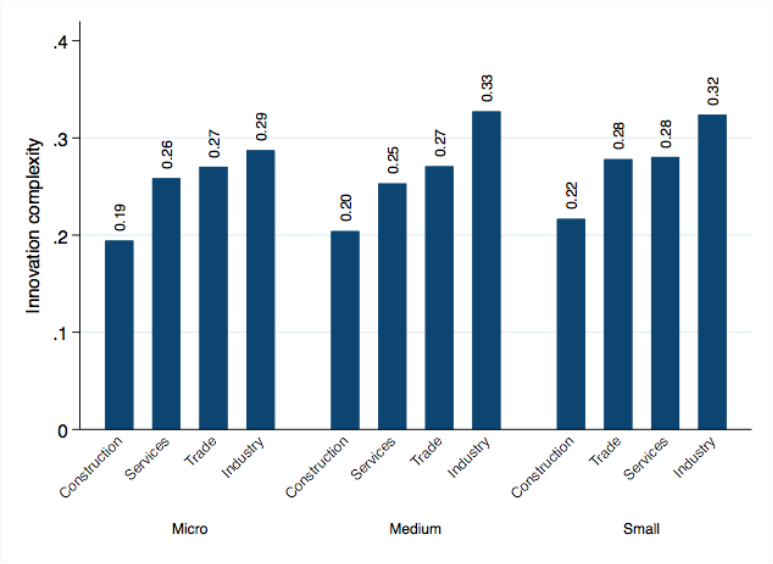
Figure A4: Innovation complexity by firm size, sector, and country.



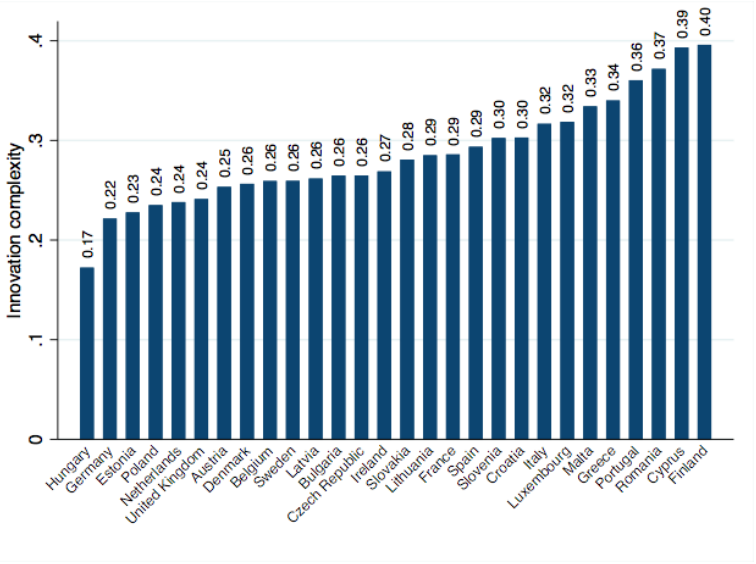
(a)



(b)



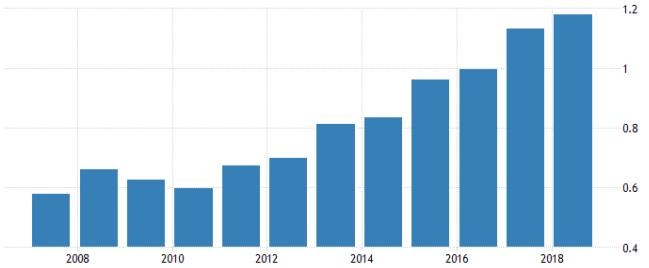
(c)



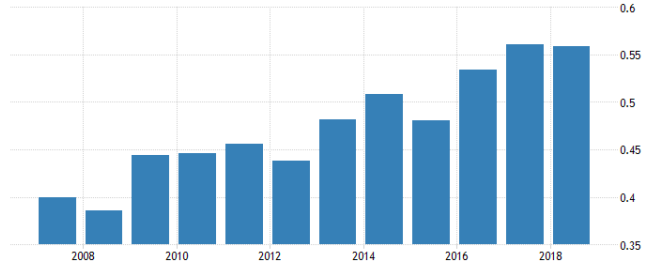
(d)

Notes: Authors' calculations on SAFE data. The figure reports the weighted average level of innovation complexity by sector (a), size (b), sector and size, (c) and country (d). The statistics refer to the five Common round waves from 2014-2018.

Figure A5: R&D expenditures (% of GDP).



(a) Cyprus



(b) Greece

Source: World Bank.

Table A1: Observations by country - Full sample.

Country	*Freq.*	*Percent*	*Micro*	*Small*	*Medium*
Austria	2,282	3.02	770	823	689
Belgium	2,239	2.96	983	692	594
Bulgaria	2,280	3.01	746	746	788
Croatia	1,291	1.71	463	388	440
Cyprus	476	0.63	176	147	153
Czech Rep.	1,990	2.63	715	593	682
Denmark	2,174	2,87	595	811	768
Estonia	473	0.63	151	150	172
Finland	2,248	2.97	824	753	671
France	6,509	8.60	2,586	2,061	1,859
Germany	6,375	8.42	1,701	2,337	2,337
Greece	2,384	3.15	1,489	549	346
Hungary	2,214	2.93	927	643	644
Ireland	2,296	3.03	797	775	724
Italy	6,994	9.24	3,719	1,983	1,292
Latvia	900	1.19	266	315	319
Lithuania	1,363	1.80	371	474	518
Luxembourg	447	0.59	123	150	174
Malta	472	0.62	173	148	151
Netherlands	3,618	4.78	1,388	1,111	1,119
Poland	5,827	7.70	2,817	1,180	1,830
Portugal	2,355	3.11	1,161	669	525
Romania	2,167	2.86	639	714	814
Slovakia	1,983	2.62	849	573	561
Slovenia	890	1.18	323	245	322
Spain	5,959	7.87	2,834	1,807	1,318
Sweden	2,096	2.77	676	720	700
UK	5,374	7.10	1,692	1,961	1,721
Total	75,673	100.00	29,954 (39%)	23,518 (31%)	22,201 (30%)

Notes: The table reports the number of observations for each of the 28 EU countries considered in the sample over the 2014-2018 period.

Correlation between innovation indicators

In Table A2, we correlate the SAFE country percentages of innovative firms with three alternative measures derived from the Community Innovation Survey (CIS), covering all the EU27 countries (excluding the UK). From the CIS 2018, as reported in Eurostat, we select results for the country percentages during 2016 and 2018 of (i) firms with innovation activities; (ii) firms with research and development (R&D) activities; and (iii) firm turnover from new or significantly improved products. Columns (1) to (3) in panel (a) show positive and statistically significant correlations between our measure of innovation and the CIS measures. In panel (b) we do the same exercise, but excluding Romania (where the SAFE over-estimation of innovative firms is higher); we find that the correlations look stronger with higher significance levels. Overall, despite overestimating firms' innovative activity in some countries, our measure moves in the same direction as the considered alternative indicators.

Table A2: Innovation measures correlations.

	(1) Firms with innovation activities (CIS)	(2) Firms with R&D (CIS)	(3) Turnover from new products (CIS)
Panel (a)			
Innovative (SAFE) 10-249 employees	0.3353* (0.0873)	0.3264* (0.0966)	0.3827* (0.0537)
Countries	27	27	26
Panel (b): excluding Romania			
Innovative (SAFE) 10-249 employees	0.4515** (0.0206)	0.3931** (0.0470)	0.4153** (0.0390)
Countries	26	26	25

Notes: The table reports the correlation between the SAFE country percentages of innovative firms and the CIS 2018 country percentages of (1) firms with innovation activities; (2) firms with R&D activities; and (3) firms turnover from new or significantly improved products. *** p<0.01, ** p<0.05, * p<0.1. P-values in parentheses.

Table A3: Descriptive statistics.

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Innovative (*innov*)	75,673	0.57	0.49	0	1
Product innovation	74,552	0.34	0.47	0	1
Process innovation	70,507	0.26	0.44	0	1
Organization innovation	75,029	0.28	0.45	0	1
Marketing innovation	75,025	0.25	0.43	0	1
Competition (*comp*)	75,673	6.11	2.57	1	10
Firms size					
Micro (1-9 empl.)	75,673	0.39	0.49	0	1
Small (10-49 empl.)	75,673	0.31	0.46	0	1
Medium (50-249 empl.)	75,673	0.30	0.45	0	1
Sector					
Industry	75,673	0.23	0.42	0	1
Construction	75,673	0.12	0.32	0	1
Trade	75,673	0.26	0.44	0	1
Services	75,673	0.39	0.49	0	1
Age					
Years < 2	75,578	0.01	0.11	0	1
$2 <=$ years < 5	75,578	0.05	0.22	0	1
$5 <=$ years < 10	75,578	0.13	0.34	0	1
Years $>= 10$	75,578	0.81	0.39	0	1
Turnover (t)					
Up to 500th	73,424	0.29	0.45	0	1
500th $<$ t $<=$ 1mln	73,424	0.14	0.34	0	1
1mln $<$ t $<=$ 2mln	73,424	0.13	0.33	0	1
2mln $<$ t $<=$ 10mln	73,424	0.25	0.43	0	1
10mln $<$ t $<=$ 50mln	73,424	0.16	0.33	0	1
t $>$ 50mln	73,424	0.03	0.18	0	1
Ownership type					
Public shareholders	75,475	0.03	0.33	0	1
Family or entrepreneurs	75,475	0.41	0.49	0	1
Other firms or business associate	75,475	0.13	0.33	0	1
Venture capital or business angel	75,475	0.01	0.09	0	1
Single owner	75,475	0.39	0.49	0	1
Others	75,475	0.04	0.19	0	1
Legal form					
Autonomous	75,673	0.86	0.35	0	1
Turnover past growth					
Over 20%	73,696	0.16	0.36	0	1
Less than 20%	73,696	0.46	0.50	0	1
No growth	73,696	0.21	0.41	0	1
Got smaller	73,696	0.16	0.37	0	1

Notes: This table reports the unweighted descriptive statistics for the variables used in the empirical tests. It covers the five Common round waves over the 2014-2018 period.

Table A4: Main variables definitions.

Variable	*Definition*
Innovative (*innov*)	Dummy equal to 1 if the firm declared to have introduce in the last 12 months at least one of the following: a) a new or significantly improved product or service to the market; b) a new or significantly improved production process or method; c) a new organization of management; d) a new way of selling goods or services.
Product innovation	Dummy equal to 1 if the firm introduced (a)
Process innovation	Dummy equal to 1 if the firm introduced (b)
Organization innovation	Dummy equal to 1 if the firm introduced (c)
Marketing innovation	Dummy equal to 1 if the firm introduced (d)
Technical innovation	Dummy equal to 1 if the firm introduced (a) or (b)
Non-technical innovation	Dummy equal to 1 if the firm introduced (c) or (d)
External innovation	Dummy equal to 1 if the firm introduced (a) or (d)
Internal innovation	Dummy equal to 1 if the firm introduced (b) or (c)
Competition (*comp*)	Continuous variable with values from 1 to 10. Firms are asked how important have been the competition problem in the past six months from 1 (not at all) to 10 (extremely important).
Micro (1-9 empl.)	Dummy equal to 1 if the firms declared to have from 1 to 9 employees.
Small (10-49 empl.)	Dummy equal to 1 if the firms declared to have from 10 to 49 employees.
Medium (50-249 empl.)	Dummy equal to 1 if the firms declared to have from 50 to 249 employees.
Innovation complexity	Continuous (normalized) variable indicating the number of types of innovation introduced by the firm. It is equal to 0 if the firm introduces 0 types, 0,25 if 1, 0,50 if 2, 0,75 if 3, and 1 if 4.
Frequency of innovation	Continuous (normalized) variable indicating the number of years in which the firm introduced at least one type of innovation. It is derived from a 3 year weakly balanced panel. It can take values 0 (never innovative over the three years), 0.33 (innovative in one of the three years, 0.66 (innovative in two of the three years), and 1 (innovative in all the three years).

Notes: The table provides detailed definitions of the dependent and main independent variables used in the empirical analysis.

Table A5: Observations by country - Panel component.

Country	*Freq.*	*Percent*	*Micro*	*Small*	*Medium*
Austria	1,287	2,95	382	492	413
Belgium	1,187	2.72	500	368	319
Bulgaria	1,232	2.82	387	376	469
Croatia	676	1.55	222	214	240
Cyprus	245	0.56	108	62	75
Czech Rep.	1,046	2.39	325	306	415
Denmark	1,394	3,19	367	524	504
Estonia	207	0.47	64	59	84
Finland	1,311	3.00	464	465	382
France	3,930	9.00	1,446	1,283	1,201
Germany	3,503	8.02	812	1,314	1,377
Greece	1,379	3.15	857	297	222
Hungary	1,287	2.95	546	367	374
Ireland	1,267	2.90	410	466	391
Italy	4,616	10.57	2,266	1,394	956
Latvia	442	1.01	118	148	176
Lithuania	754	1.73	191	259	304
Luxembourg	280	0.64	70	99	111
Malta	301	0.69	109	92	100
Netherlands	2,051	4.69	692	674	685
Poland	3,512	8.04	1,638	674	1,200
Portugal	1,303	2.98	594	392	317
Romania	1,201	2.75	347	282	472
Slovakia	1,016	2.33	383	309	324
Slovenia	496	1.14	185	129	182
Spain	3,763	8.61	1,675	1,244	844
Sweden	1,187	2.49	355	399	333
UK	2,918	6.68	914	1,070	934
Total	43,688	100.00			

Notes: This table reports the number of observations for each of the 28 EU countries when panel components only are included in the sample. It covers the five Common round waves over the 2014-2018 period.

References

Acs, Z. J. and Audretsch, D. B. (1987). Innovation, market structure, and firm size. *The Review of Economics and Statistics*, 69(4):567–574.

Acs, Z. J. and Audretsch, D. B. (1988). Innovation in large and small firms: an empirical analysis. *American Economic Review*, 78(4):678–690.

Acs, Z. J. and Audretsch, D. B. (2005). Entrepreneurship, innovation, and technological change. Foundations and Trends in Entrepreneurship. 1(4):1–65.

Aghion, P., Bloom, N., Blundell, R., Griffith, R., and Howitt, P. (2005). Competition and innovation: An inverted-U relationship. *The Quarterly Journal of Economics*, 120(2):701–728.

Aghion, P. and Howitt, P. (1992). A model of growth through creative destruction. *Econometrica*, 60(2):323–351.

Anderson, C. R. and Paine, F. T. (1975). Managerial perceptions and strategic behavior. *Academy of Management Journal*, 18(4):811–823.

Angrist, J. D. and Pischke, J.-S. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Arrow, K. J. (1962). Economic welfare and the allocation of resources for invention. In *Readings in Industrial Economics*, pages 219–236. Springer.

Askenazy, P., Cahn, C., and Irac, D. (2013). Competition, R&D, and the cost of innovation: evidence for France. *Oxford Economic Papers*, 65(2):293–311.

Audretsch, D. B., Kritikos, A. S., and Schiersch, A. (2020). Microfirms and innovation in the service sector. *Small Business Economics*, 55(4):997–1018.

Ayyagari, M., Demirgüç-Kunt, A., and Maksimovic, V. (2011). Firm innovation in emerging markets: The role of finance, governance, and competition. *Journal of Financial and Quantitative Analysis*, 46(6):1545–1580.

Baumann, J. and Kritikos, A. S. (2016). The link between R&D, innovation and productivity: Are micro firms different? *Research Policy*, 45(6):1263–1274.

Beyer, J. M., Chattopadhyay, P., George, E., Glick, W. H., Ogilvie, D., and Pugliese, D. (1997). The selective perception of managers revisited. *Academy of Management Journal*, 40(3):716–737.

Blundell, R., Griffith, R., and Van Reenen, J. (1999). Market share, market value and innovation in a panel of British manufacturing firms. *The Review of Economic Studies*, 66(3):529–554.

Cabagnols, A. and Le Bas, C. (2002). Differences in the determinants of product and process innovations: the French case. In *Innovation and firm performance*, pages 112–149. Springer.

Castellacci, F. (2011). How does competition affect the relationship between innovation and productivity? Estimation of a CDM model for Norway. *Economics of Innovation and New Technology*, 20(7):637–658.

Cooper, A. C., Willard, G. E., and Woo, C. Y. (1986). Strategies of high performing new and small firms: A reexamination of the niche concept. *Journal of Business Venturing*, 1(3):247–260.

Cornett, M. M., Erhemjamts, O., and Tehranian, H. (2019). Competitive environment and innovation intensity. *Global Finance Journal*, 41:44–59.

Crowley, F. and Jordan, D. (2017). Does more competition increase business-level innovation? Evidence from domestically focused firms in emerging economies. *Economics of Innovation and New Technology*, 26(5):477–488.

Dasgupta, P. and Stiglitz, J. (1980). Industrial structure and the nature of innovative activity. *The Economic Journal*, 90(358):266–293.

Demircioglu, M. A., Audretsch, D. B., and Slaper, T. F. (2019). Sources of innovation and innovation type: firm-level evidence from the United States. *Industrial and Corporate Change*, 28(6):1365–1379.

European Commission (2019). *SME Annual Report 2018-2019*. EC.

Ferrando, A., Popov, A., and Udell, G. F. (2019). Do SMEs benefit from unconventional monetary policy and how? Microevidence from the Eurozone. *Journal of Money, Credit and Banking*, 51(4):895–928.

Ferrando, A., Rossi, S. P., Bonanno, G., et al. (2020). Determinants of firms' efficiency: do innovations and finance constraints matter? The case of European SMEs. Working Paper Series No. 2419, European Central Bank.

Friesenbichler, K. and Peneder, M. (2016). Innovation, competition and productivity: Firm-level evidence for Eastern Europe and Central Asia. *Economics of Transition*, 24(3):535–580.

Galdon-Sanchez, J. E. and Schmitz Jr, J. A. (2002). Competitive pressure and labor productivity: World iron-ore markets in the 1980's. *American Economic Review*, 92(4):1222–1235.

Geroski, P. A. (1990). Innovation, technological opportunity, and market structure. *Oxford Economic Papers*, 42(3):586–602.

Geroski, P. A. et al. (1995). *Market structure, corporate performance, and innovative activity*. Oxford University Press.

Haans, R. F., Pieters, C., and He, Z.-L. (2016). Thinking about U: Theorizing and testing U-and inverted U-shaped relationships in strategy research. *Strategic Management Journal*, 37(7):1177–1195.

Hall, B. H. and Harhoff, D. (2012). Recent research on the economics of patents. *Annual Review of Economics*, 4(1):541–565.

Halpern, L. and Muraközy, B. (2015). The relationship between competition and R&D: Theoretical approaches and quantitative results. Hungarian Institute of Economics, Centre for Economic and Regional Studies.

Hashmi, A. R. (2013). Competition and innovation: The inverted-U relationship revisited. *Review of Economics and Statistics*, 95(5):1653–1668.

Henley, A. and Song, M. (2020). Innovation, internationalisation and the performance of microbusinesses. *International Small Business Journal*, 38(4):337–364.

Kamien, M. I. and Schwartz, N. L. (1976). On the degree of rivalry for maximum innovative activity. *The Quarterly Journal of Economics*, 90(2):245–260.

Karaman, F. N. and Lahiri, S. (2014). Competition and innovation in product quality: Theory and evidence from Eastern Europe and Central Asia. *The BE Journal of Economic Analysis & Policy*, 14(3):979–1014.

Kraft, K. (1989). Market structure, firm characteristics and innovative activity. *The Journal of Industrial Economics*, pages 329–336.

Lind, J. T. and Mehlum, H. (2010). With or without U? The appropriate test for a U-shaped relationship. *Oxford Bulletin of Economics and Statistics*, 72(1):109–118.

Mairesse, J. and Mohnen, P. (2010). Using innovation surveys for econometric analysis. In *Handbook of the Economics of Innovation*, volume 2, pages 1129–1155. Elsevier.

Martínez-Ros, E. and Labeaga, J. M. (2002). Modelling innovation activities using discrete choice panel data models. In *Innovation and Firm Performance*, pages 150–171. Springer.

Miravete, E. J. and Pernias, J. C. (2006). Innovation complementarity and scale of production. *The Journal of Industrial Economics*, 54(1):1–29.

Moen, Ø., Tvedten, T., and Wold, A. (2018). Exploring the relationship between competition and innovation in Norwegian SMEs. *Cogent Business & Management*, 5(1):1564167.

Mulkay, B. (2019). How does competition affect innovation behaviour in French firms? *Structural Change and Economic Dynamics*, 51(C):237–251.

Nickell, S. J. (1996). Competition and corporate performance. *Journal of Political Economy*, 104(4):724–746.

OECD (2005). *Oslo manual 2005: Guidelines for collecting and interpreting innovation data*. Organisation for Economic Co-operation and Development (OECD).

OECD (2018). *Oslo Manual 2018: Guidelines for collecting, reporting and using data on innovation*. Organisation for Economic Co-operation and Development (OECD).

OECD (2019). *SME and Entrepreneurship Outlook 2019*. Organisation for Economic Co-operation and Development (OECD).

OECD (2021). *Methodologies to Measure Market Competition*. Organisation for Economic Co-operation and Development (OECD).

Pavitt, K., Robson, M., and Townsend, J. (1987). The size distribution of innovating firms in the UK: 1945-1983. *The Journal of Industrial Economics*, 35(3):297–316.

Peneder, M. and Wörter, M. (2014). Competition, R&D and innovation: testing the inverted-U in a simultaneous system. *Journal of Evolutionary Economics*, 24(3):653–687.

Porter, M. E. (1990). The competitive advantage of nations. *Harvard Business Review*, 68(2):73–93.

Rammer, C. and Schubert, T. (2018). Concentration on the few: mechanisms behind a falling share of innovative firms in Germany. *Research Policy*, 47(2):379–389.

Reed, W. R. (2015). On the practice of lagging variables to avoid simultaneity. *Oxford Bulletin of Economics and Statistics*, 77(6):897–905.

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, 98(5, Part 2):S71–S102.

Roper, S. and Hewitt-Dundas, N. (2017). Investigating a neglected part of Schumpeter's creative army: what drives new-to-the-market innovation in micro-enterprises? *Small Business Economics*, 49(3):559–577.

Santos, A. and Cincera, M. (2021). Determinants of financing constraints. *Small Business Economics*, 3(2):1–13.

Scherer, F. M. (1967). Market structure and the employment of scientists and engineers. *The American Economic Review*, 57(3):524–531.

Schumpeter, J. (1942). *Capitalism, socialism and democracy*. New York.

Siepel, J. and Dejardin, M. (2020). How do we measure firm performance? A review of issues facing entrepreneurship researchers. In *Handbook of Quantitative Research Methods in Entrepreneurship*, pages 4–20. Edward Elgar Publishing.

Spence, A. M. (1984). Industrial organization and competitive advantage in multinational industries. *American Economic Review*, 74(2):356–360.

Symeonidis, G. (1996). Innovation, firm size and market structure: Schumpeterian hypotheses and some new themes. *OECD*.

Tang, J. (2006). Competition and innovation behaviour. *Research Policy*, 35(1):68–82.

Tingvall, P. and Poldhal, A. (2006). Is there really an inverted U-shaped relation between competition and R&D? *Economics of Innovation and New Technology*, 15(2):101–118.

Tu, C., Hwang, S.-N., and Wong, J.-Y. (2014). How does cooperation affect innovation in micro-enterprises? *Management Decision*, 52(8):1390–1409.

Vives, X. (2008). Innovation and competitive pressure. *Journal of Industrial Economics*, 56(3):419–469.

Online Appendix

Table OA1: Logit and probit - comparison.

	(1) Logit	(2) Probit
Firms controls	Yes	Yes
Time, country, sector FE	Yes	Yes
Panel (a): Baseline model		
Competition	0.033***	0.033***
	(0.005)	(0.005)
Competition^2	-0.002***	-0.002***
	(0.000)	(0.000)
Observations	71,833	71,833
Pseudo R^2	0.04	0.04
Log-pseudolikelihood	**-34432.513**	**-34434.001**
Panel (b): Model with lag values		
Competition(t-1)	0.034***	0.034***
	(0.009)	(0.009)
Competition^2(t-1)	-0.003***	-0.003***
	(0.001)	(0.001)
Observations	25,428	25,428
Pseudo R^2	0.04	0.04
Log-pseudolikelihood	**-11924.762**	**-11925.447**

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The Table reports logit (col.1) and probit estimates (col.2) of model (1) (Panel a) and model (2) (Panel b), comparing the Log-pseudolikelihoods. It refers to the full sample model with all regressors including time, country, and sector fixed effects.

Table OA2: Innovation complexity - Fractional and Poisson regressions.

	(1) Full sample	(2) Micro firms
Firms controls	Yes	Yes
Time, Country, sector FE	Yes	Yes
Panel (a): Fractional		
Competition(t-1)	0.011***	0.015**
	(0.004)	(0.006)
Competition(t-1)^2	-0.001**	-0.001**
	(0.000)	(0.001)
Observations	23,298	8,271
Pseudo R^2	0.03	0.04
Wald test - H0: all coefficients = 0	0.0000	0.0000
Panel (b): Poisson		
Competition(t-1)	0.041***	0.063***
	(0.013)	(0.013)
Competition(t-1)^2	-0.003***	-0.005***
	(0.001)	(0.001)
Observations	23,298	8,271
Wald test - H0: all coefficients = 0	0.0000	0.0000

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses (not clustered in panel (a) because the option is not available). Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports the estimates of fractional (panel (a)) and Poisson (panel (b)) regressions, using sampling weights. The dependent variable is *innovation complexity*. The set of firms' controls includes size, turnover, age, legal status, ownership types, and past growth. Time, country and sector FE are included.

Table OA3: Frequency of innovation - Fractional and Poisson regressions.

	(1) Full sample	(2) Micro firms
Firms controls	Yes	Yes
Country, sector FE	Yes	Yes
Panel (a): Fractional		
Competition(mean)	0.042***	0.014
	(0.013)	(0.022)
Competition(mean)^2	-0.003***	-0.001
	(0.001)	(0.002)
Observations	6,376	2160
Pseudo R^2	0.04	0.05
Wald test - H0: all coefficients = 0	0.0000	0.0000
Panel (b): Poisson		
Competition(mean)	0.080***	0.029
	(0.019)	(0.038)
Competition(mean)^2	-0.006***	-0.002
	(0.001)	(0.004)
Observations	6,376	2160
Wald test - H0: all coefficients = 0	0.0000	0.0000

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses (not clustered in panel (a) because the option is not available). Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports the estimates of fractional (panel (a)) and Poisson (panel (b)) regressions, using sampling weights. The dependent variable is *frequency of innovation*. The set of firms' controls includes size, turnover, age, legal status, ownership types, and past growth. Country and sector FE are included.

Table OA4: Frequency of innovation - Small and medium firms.

	(1) Small firms	(2) Medium firms
Competition(mean)	0.032	0.096***
	(0.022)	(0.018)
Competition(mean)^2	-0.003	-0.007***
	(0.002)	(0.001)
Firms controls	Yes	Yes
Country, sector FE	Yes	Yes
Observations	2125	2091
Adj. R^2	0.06	0.10
F test - H0: all coefficients = 0	0.0000	0.0000
Lind-Mehlum test		
Extreme point	5.73	7.07
Lower bound - slope	0.03	0.08
	[1.51, 0.07]	[5.18, 0.00]
Upper bound - slope	-0.02	-0.04
	[-1.20; 0.12]	[-3.59, 0.00]
Overall test	[1.20; 0.12]	[3.59, 0.00]
90% Fieller CI	[-inf; +inf]	[6.25; 8.02]

Notes: Authors' calculations on SAFE data. Cluster robust standard errors in parentheses. Cluster level: country. T-values and p-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The table reports the OLS estimates using sampling weights. The dependent variable is *frequency of innovation.*. The set of firms' controls includes size, turnover, age, legal status, ownership types, and past growth. Country and sector FE are included.

Chapter 2

Bankruptcy recovery rate and small businesses' innovation

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Abstract

Small businesses often face a high risk of bankruptcy and harsh financing conditions, which can hamper them to engage in innovation. This paper investigates whether a bankruptcy system that guarantees a good recovery rate for creditors in case of firms' liquidation stimulates small businesses' innovation investments by easing their access to credit. With the help of a borrower-lender model we derive insights about the interactions between bankruptcy recovery rate, access to credit and firms' investments in innovation. The model gives theoretical underpinnings for a subsequent empirical analysis. By using a cross-country sample of micro (1-9 employees)-, small (10-49 employees)-, and medium (50-249 employees)-sized enterprises (MSMEs), our study provides three main results. It shows that an increase in the bankruptcy recovery rate a) unleashes MSMEs' investments in innovation (*investment effect*); b) reduces the share of MSMEs that are credit constrained because the cost of borrowing is too high (*constraint effect*); c) reduces the interest rates dispersion for high profitable MSMEs (*dispersion effect*). Overall, our findings suggest that improving creditors recovery rate can help promoting the innovative behaviour of small businesses.

Keywords: Innovation, bankruptcy, financing, recovery rate, MSMEs.

JEL codes: G20, G33, L25, O30.

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1 Introduction

Starting with the seminal work of Acs and Audretsch (1988), economics scholars have devoted a growing attention to the relevant role of small businesses in the innovative processes. Compelling evidence challenges the widespread view that large companies are the real engine of technological progress. Not only small and medium firms, but also micro enterprises have been recently found to be a non-negligible source of innovation, especially in Europe (Audretsch et al., 2020; Farè, 2022). Concomitantly, the growing flow of research on small businesses has revealed remarkable difference vis-à-vis large firms. Micro, small, and medium enterprises (MSMEs) usually face scarcity of internal resources, lower access to knowledge, harsher financing conditions and higher risks of bankruptcy (White, 2016; Banerjee and Blickle, 2021). As such, MSMEs are highly sensitive to bankruptcy systems (White, 2016; Traczynski, 2019) and substantially dependent on external credit to pursue innovative projects (Hall, 2002; 2010; Czarnitzki and Hottenrott, 2011).

Yet, despite the acknowledged influence that bankruptcy systems and external financing exercise on small businesses, understanding how they jointly affect MSMEs' innovative behaviour is still an unchartered territory. While the extant literature examines primarily the impact of debtor-related factors, such as assets exemption or debtor protection, on the creation of new ventures, very little is known on the links between the creditor-side of the bankruptcy system and the innovativeness of established firms, including microbusinesses. MSMEs dispose of little internal resources and they often seek for external funds to finance innovation projects. This makes them highly sensitive to credit supply, which motivate to deeply investigate the creditor rather than the debtor-side of bankruptcy systems. In this study, we focus on the bankruptcy recovery rate, that is the amount of money that creditors manage to recover after the liquidation of the debtor firm. Creditors' recovery expectations are indeed a key element affecting borrowing interest rates and access to credit. Those who expect to recover a good amount of their credits should indeed be more oriented to charge lower borrowing rates, facilitating access to credit and investments. To the best of our knowledge, the recovery rate has not yet procured attention from prior research.

Specifically, we ask whether a bankruptcy system where creditors have a good recovery rate in case of firms' liquidation can stimulate MSMEs' innovation investments by easing their access

to credit. To answer this question we first develop a simple borrower-lender model, aimed at providing theoretical insights for a subsequent empirical analysis. The model links firms' decision to invest in innovation with the level of bankruptcy recovery rate and the borrowing interest rate, which is firm's specific and endogenously determined. It derives three propositions that we test empirically by using firm-level data for small businesses. Along with small (10-49 employees) and medium firms (50-249 employees), we also include in the analysis micro enterprises with fewer than 10 employees.[1] Microbusinesses are still an under-studied category in the extant literature and very little is known about their innovative behaviour (Roper and Hewitt-Dundas, 2017; Henley and Song, 2020). Given their economic relevance, high risk of failure, and precarious financing conditions we find it crucial to include them in the population of small businesses. We assemble a multi-source and multi-level dataset by collecting firm-level data from the Survey on the Access to Finance of Enterprises (SAFE) and country-level indicators from the World Bank/Doing Business database.

By performing alternative empirical specifications, including a quasi-natural experiment where we exploit an important reform of the bankruptcy system implemented in Slovenia, we derive three main results. First, we show that an increase in the bankruptcy recovery rate is positively associated with MSMEs' investments in innovation (*investment effect*). Where creditors expect to recover a good amount of their credits, we observe more innovation investments by small businesses. Second, our findings suggest that this larger amount of investments can be explained by easier access to credit, as an increase in bankruptcy recovery rate is negatively associated with MSMEs' likelihood to be credit constrained because of too high interest rates (*contraint effect*). Finally, we find that where recovery rates are higher, profitable MSMEs face lower interest rates dispersion, which further facilitates access to credit (*dispersion effect*). The beneficial effect on innovation investments and access to credit is also observable for micro firms.

The remaining of the paper is organized as follows. In section 2, we present the related literature and we highlight the main contributions of the study. Section 3 illustrates the theoretical model and states propositions. In section 4, we develop the empirical analysis, where we illustrate data, methodologies, and main results. Section 5 reports robustness checks of baselines

[1]We refer to the European Commission definition of micro, small, and medium enterprises in the Recommendation of 6 May 2003.

specifications. In section 6, we discuss the main implications of the research and conclude.

2 Related literature and contributions

This study adds and contributes to two strands of the literature, one focusing on the nexus between bankruptcy systems and business activity, with the other on the link between firms' innovation and financing.

The extant literature distinguishes between pro-creditor ("harsh") and pro-debtor ("lenient" or "forgiving") bankruptcy systems. The level of assets exemption and the time that business owners dispose to become discharged of their debt-related obligations are the main elements distinguishing the two systems (Parker, 2018). On the one hand, a more forgiving bankruptcy regime offers to business owners a partial wealth insurance against the consequences of failure (Fan and White, 2003; Armour and Cumming, 2008). On the other, by limiting the amount of assets that creditors can seize in bankruptcy, a lenient system can reduce credit supply and worsen borrowing conditions (Gropp et al., 1997; Mankart and Rodano, 2015; Cerqueiro and Penas, 2017; Cerqueiro et al., 2019). Larger exemptions are also correlated with greater incidence of credit rationing to small businesses (Berkowitz and White, 2004; Fu et al., 2020). Thus, prior research highlights a trade-off between the "insurance" and the "credit supply" effects, which also influences business activity. Evidence shows that a pro-debtor bankruptcy regime positively affects business ownership, measured as the probability of owning a business (Fan and White, 2003), self-employment (Armour and Cumming, 2008) or firm-formation rate (Lee et al., 2011). However, while the quantity of business seems to be favoured by pro-debtor systems, understanding which system is more conducive to innovativeness is still an open question. On the one hand, generous assets exemptions can also facilitate business ownerships that are ultimately successful (Rohlin and Ross, 2016); on the other, they are more likely to unleash business creation by risk-averse rather than risk-taking individuals (White, 2016), who are usually more innovative and more sensitive to credit supply (Koellinger, 2008; Estrin et al., 2017). Recent studies also point out that higher exemptions are associated with a greater entry of low quality firms, as they encourage excess entry of unproductive enterprises (Cerqueiro et al., 2019; Fu et al., 2020). Similarly, where debtor protection is stronger, the quantity and quality of firms' patents seems to be lower (Cerqueiro and Penas, 2017).

We add to this compelling debate by offering three main contributions. First, while prior literature mainly considers assets exemption or other debtor-related factors, we rather focus on the creditor side of the bankruptcy system. We do that by considering the recovery rate, which has not yet procured attention from the literature on bankruptcy law and business activity. Second, while the connection between bankruptcy regimes and new ventures creation has been largely studied, very little is known about the links with the innovative behaviour of existing small businesses. By asking how the recovery rate affects firms' innovativeness, arguably one of the primary determinants of high-quality firms (Covin and Wales, 2012; Dai et al., 2014), we shift the focus from the quantity to the quality of small businesses. To this regard, prior research has mainly considered the output-side and the last-stage of the innovation process by looking at patents or other outputs (Cerqueiro and Penas, 2017). In this study, we rather focus on firms' decision to invest in innovation, which concerns the input-side and the early-stage of the process. This is our third contribution. Small businesses, due to their limited access to knowledge and financial resources, usually find more problematic the input-side of the innovation process than the output-side (Tang, 2006; Conte and Vivarelli, 2014; Baumann and Kritikos, 2016).

Our research also expands the literature on firms' innovation and financing. According to the Schumpeterian paradigm, being innovative is vital for firms to be resilient and to grow. Investing in innovation creates new skills and knowledge spillovers (Block et al., 2013), which in turn promote the development of innovative firms (Hall, 2010). Although finance is considered as a crucial part of innovation processes (O'Sullivan, 2005; Mazzucato, 2013), financing constraints and credit rationing often hamper firms' innovation propensity (Gorodnichenko and Schnitzer, 2013; Chiu et al., 2017). Two main reasons explain difficulties in the supply of finance for innovative firms. First, innovation is an inherently risky activity. The return to investments in innovation might be uncertain and only a fraction of innovative projects succeed. Such uncertainty in the final outcome makes investing in innovation costly and riskier to finance (Hall, 2002; Block, 2012). Second, information asymmetries may hinder banks from valuing innovation investments (O'Sullivan, 2005). An innovative product or process is by definition new and therefore the embedded information is limited. This makes it costly to evaluate innovative investments. Information asymmetries are also exacerbated by the fact that firms may have

more information on the potential outcome of the innovation project than the financier. As the seminal work of Stiglitz and Weiss (1981) documents, imperfect information is arguably the most relevant reason of credit rationing.

The problems of uncertainty and information asymmetries are particularly acute for small businesses (Cowling et al., 2012; Lee et al., 2015), due to their more fragile conditions vis-à-vis large firms (Beck and Demirguc-Kunt, 2006; Beck, 2013; Cowling et al., 2018; Ughetto et al., 2019; Banerjee and Blickle, 2021). Small firms have less resources to invest and therefore less chance to diversify their portfolios. They are likely to condense resources in few, if not in one, investments on which depend their success (Freel, 2007). Thus, lack of alternative projects increases the risk and likelihood of failure. Information on smaller companies is usually harder to access and therefore more expensive to collect, which amplifies asymmetric and imperfect information (Akerlof, 1970; Spence, 1978, and Stiglitz and Weiss, 1981). Moreover, transaction costs of investing in small businesses may be higher than larger firms, due to the fixed cost element of the due diligence process (Titman and Wessels, 1988; Wald, 1999). Further, innovative small businesses are often more reliant on intangible assets, rather than physical property, which are difficult to value and thus hard to use as collateral for lending (Lee et al., 2015). For these reasons, smaller firms are likely to be charged higher loan rates or even absolutely rationed for any external finance (Cowling et al., 2012). This is known as "the liability of smallness". Evidence that smaller enterprises are usually more financially constrained is also confirmed by the fact that they are more sensitive to improvements in access to credit conditions than larger firms (Czarnitzki and Hottenrott, 2011).

Our study advances knowledge in this field in two ways. First, we unravel the so far unexplored link between bankruptcy systems and small businesses' innovation investments. Specifically, we show that MSMEs' decisions to engage in innovation are connected with creditors' recovery expectations in case of bankruptcy. In this regard, our findings also suggest that such engagement might be partly explained by a lower fraction of financially constrained firms. Second, by including firms with fewer than 10 employees we contribute to have a more comprehensive understanding of the innovative behaviour of the whole small business' population. Very little is still known about microbusinesses and we do not find research that jointly studies and compares micro, small, and medium enterprises. We believe that including micro firms is of primary

importance. Despite their large number and relevant economic function, they still dispose of highly limited resources to invest in innovation (Baumann and Kritikos, 2016; Audretsch and Belitski, 2020).

In sum, we link the two aforementioned strands of literature by investigating the interaction between bankruptcy recovery rate, access to credit and MSMEs' investment in innovation. We do that in a cross-country framework, which represents a further novelty of our analysis.

3 The model

We first develop a borrower-lender model linking firms' decision to invest in innovation with the bankruptcy recovery rate and the cost of borrowing. The aim is providing theoretical insights for empirically testable propositions. To do so, we build a simple partial equilibrium static model in which firm i makes a non-negative operating profit π_i, which is considered to be given and observable.[2] The firm's owner also faces a fixed cost f_i that must be financed by capital. In particular, the owner is able to finance e_i with his/her own funds, which are assumed to be insufficient to cover the entire fixed cost. Accordingly, s/he must borrow the remaining part ($k_i = f_i - e_i$) from external creditors at interest rate r_i, which is firm's specific and endogenously determined.[3]

3.1 The non-innovative firm

Assuming that everything is observable and that the firm decides not to invest in innovation, we can write the firm's profit as

$$\Pi_i = \pi_i - e_i - k_i(1 + r_i).$$

As long as the firm's operating profit exceeds the borrowed amount ($\pi_i > k_i$) and everything is observable, there is no reason for an external creditor to be compensated for the risk of

[2]Developing a more complex dynamic model in a general equilibrium framework would be an interesting theoretical contribution. However, our static model is in itself sufficient to derive valuable testable results.

[3]As shown in section 3.2, parameters e_i and k_i are introduced to account for the fact that firms not investing in innovation may need external resources regardless. In this case, being charged a risk free rate depends on the values of these parameters.

potential losses. Therefore, the creditor charges the risk free interest rate ($r_i = 0$).[4] On the contrary, if $\pi_i < k_i$ the firm could not pay back what it borrowed. If this is the case, there is no chance for the firm to receive external funding.

At the zero interest rate, the equilibrium profit is

$$\Pi_i^N = \pi_i - (e_i + k_i)\,, \tag{1}$$

where superscript N means "no investment". Note that agents who are only interested in maximizing profit would agree to continue to invest their own capital in this firm only if $\pi_i > e_i + k_i$.

3.2 The innovative firm

We now consider the case where the firm decides to invest in innovation an amount z_i, which is assumed to be exogenous. Moreover, since we consider that the firm's own funds are insufficient to finance fixed costs, we also assume that z_i is financed by external capital. The outcome of the investment is uncertain: if it succeeds, the operating profit increases by factor Δ_i; if it fails, the operating profit is unchanged. We denote p_i the probability of success of the investment and $(1 - p_i)$ the probability of failure.[5] Both Δ_i and p_i are firm-specific and they can vary according to firm's characteristics, including the size.

In case of success of the investment, the equilibrium profit is

$$\Pi_i^{\text{success}} = (1 + \Delta_i)\,\pi_i - e_i - (k_i + z_i)(1 + r_i),$$

while in case of failure it is

$$\Pi_i^{\text{failure}} = \pi_i - e_i - (k_i + z_i)(1 + r_i).$$

In the scenario illustrated in section 3.1, where the firm does not invest in innovation, there is no risk and the interest rate is equal to zero. Now, when the firm decides to invest in

[4] The risk free interest rate is normalized to zero for modelling purposes. In the empirical analysis, this rate will be associated with low values of borrowing rates.

[5] We follow a similar approach to Manso (2011) concerning the probability setting.

innovation, risk is potentially present because the outcome of the investment is uncertain. If the investment in innovation fails and if the firm cannot pay back the capital and the interest, because $\pi_i < (k_i + z_i)(1 + r_i)$, then the firm goes bankrupt. It is thus legitimate for the creditor to hedge against this risk by demanding a positive interest rate. By contrast, if the firm can reimburse the capital and the interest, the firm survives from its failure of innovation and the creditor does not face any risk. There is then no reason for the interest rate to be positive, which implies $r_i = 0$.

Suppose first that $\pi_i > k_i + z_i$. Then the creditor could accept a zero interest rate because the full amount granted can be recovered.[6] For instance, a firm makes a profit $\pi_i = 105$ and decides to invest in innovation. With a probability $p_i = 0.5$, this investment is successful and it increases the profit to $(1 + \Delta_i)\,\pi_i = (1 + \Delta_i) * 105 = 120$; while it fails with a probability of 0.5. The creditors lend $k_i + z_i = 100$. If they are convinced that the firm will not go bankrupt if the investment fails, they know that they will get their entire loan back in any case. As there is no risk, they accept a zero interest rate. The solid line in Figure 1 illustrates this condition. In this case, with $\pi_i > k_i + z_i$ and $r_i = 0$, the firm's expected profit is

$$E(\Pi_i) = p_i \left[(1 + \Delta_i)\,\pi_i - e_i - k_i - z_i\right] + (1 - p_i)\left[\pi_i - e_i - k_i - z_i\right]. \tag{2}$$

The first and the second terms represent the profit the firm will have if the investment succeeds and if it fails, respectively.

Suppose now that the firm goes bankrupt if the investment in innovation fails. We assume that, during the liquidation procedure, part of the firm's value is deteriorated, such that only a fraction of it is recovered. We define this restored value as $\delta_i \pi_i$ (where $0 < \delta_i < 1$).[7] We also assume that the amount recovered by creditors is proportional to the firm's restored value, so that δ_i reflects the recovery rate for creditors. From lenders' perspective, δ_i indicates the efficiency of the bankruptcy system in guaranteeing the recovery of firms' value and therefore of their credit. The higher it is, the more they are refunded. Along with bankruptcy system efficiency, the degree of debtor protection may also determine the amount recovered by creditor. Here, we assume that no changes in debtor protection occur, thus associating variations in the

[6] The firm would not get back its own capital e_i if $0 < \pi_i - (k_i + z_i) < e_i$.

[7] Though determined mainly at country level, parameter δ_i might be affected by firm-specific characteristics as well. Thus, we keep the subscript i.

recovery rate to changes in the bankruptcy system efficiency only.

Given that $0 < \delta_i < 1$ (i.e. $\delta_i \pi_i < \pi_i$), lenders are always at least partially reimbursed in the event of bankruptcy, but they will not recover the entire amount granted. In case of bankruptcy, the firm is not able to pay back the full debt. Specifically, creditors will be fully reimbursed if the investment in innovation succeeds, while only partially if it fails. Such possibility of partial repayment introduces a degree of uncertainty, which leads them to charge a positive interest rate to be compensated for the potential losses in case of failure by higher revenues in case of success.

On the one hand, the configuration of the parameters ensuring that the principal and interest will be fully repaid in case of success is given by

$$(1 + \Delta_i)\, \pi_i > (k_i + z_i)(1 + r_i) \iff \pi_i > (k_i + z_i)\, \frac{1 + r_i}{1 + \Delta_i}. \tag{3}$$

On the other hand, the condition for partial repayment of the principal and interest in the event of failure is

$$\pi_i < (k_i + z_i)(1 + r_i). \tag{4}$$

Any situation where the operating profit π_i is above the limit in (4) would imply that the capital and interest are fully repaid even if the investment fails. In this case, there is no reason to have a positive equilibrium interest rate.[8]

Assuming a risk-neutral creditor and a perfectly competitive credit supply, the creditor will lend money to the firm only if the expected profit is at least equal to the granted amount. Moreover, given that creditors' recovery is proportional to the firm's profit, the equilibrium interest rate is firm's specific. In case of success (with probability p_i), creditors receive the principal and interest $(k_i + z_i)(1 + r_i)$, while in case of failure (with probability $(1 - p_i)$) they recover $\delta_i \pi_i$ (the amount of operating benefits recovered after the liquidation). Accordingly, the capital market equilibrium condition for firm i is given by

$$p_i(k_i + z_i)(1 + r_i) + (1 - p_i)\, \delta_i \pi_i = k_i + z_i,$$

[8]In our framework, there cannot be an equilibrium in which creditors would not be fully repaid if the investment in innovation is successful. If this was not the case, creditors would be sure to never recover part of their credit and, consequently, they would refuse to grant credit.

which gives the equilibrium interest rate:

$$1 + r_i = \frac{1}{p_i}\left[1 - (1 - p_i)\,\frac{\delta_i \pi_i}{k_i + z_i}\right]. \tag{5}$$

We obtain an endogenous interest rate, which is a function of the main parameters of the model. Specifically, it increases with the amount of credit $(k_i + z_i)$, while it decreases with the recovery rate (δ_i), the probability of success (p_i) and the firm's operating profit (π_i). Equation (5) shows that an increase in the recovery rate for creditors (δ_i) leads to lower interest rates, meaning more favourable borrowing conditions.

Plugging (5) into (3), we get

$$\pi_i > \frac{k_i + z_i}{p_i\,(1 + \Delta_i) + \delta_i\,(1 - p_i)} \tag{6}$$

which is represented by the dot line in Figure 1. Any π_i below this limit implies that firm i is not in a position to repay the principal and interest of the loan incurred to finance innovation, even if the investment succeeds. Thus, there is no equilibrium with a positive interest rate.

Plugging (5) into (4), we get

$$\pi_i < \frac{k_i + z_i}{p_i + \delta_i\,(1 - p_i)} \tag{7}$$

which is represented by the dash line in Figure 1. Any π_i above this limit implies that firm i is always able to repay the principal and interest even if the investment fails. In this case, the equilibrium interest rate must be equal to zero.[9]

In the region between the dot and the dash lines, the final repayment is uncertain: the firm will pay back the entire debt if the investment in innovation succeeds and only a part if it fails. Given the uncertainty, this region has the strictly positive equilibrium interest rates $r_i > 0$ defined by equation (5). Consequently, in the area between the solid and the dash curves we observe either $r_i > 0$ or $r_i = 0$, meaning that multiple equilibria interest rates are possible. Which of the two is charged depends on creditors' expectations about firms' bankruptcy. If all the creditors are convinced that the firm will not go bankrupt when the investment in innovation fails, they accept a zero interest rate because they know they will get their entire

[9]See Appendix A for the analytical derivations of the relationships between the three functions represented in Figure 1.

loan back. On the contrary, if they believe that the firm will go bankrupt, which would mean recovering only part of the credit, they will charge a positive interest rate satisfying equation (5).

Consider a numerical example involving the preceding firm making a profit $\pi_i = 105$. Assume that, if the investment fails and it is forced to bankrupt, the restored value is 90 (suppose $90 = \delta_i * 105$). This means that creditors receives back only 90 of the 100 they granted. Thus, they would receive 90 if the investment fails and $100 * (1 + r_i)$ if it succeeds. They therefore expect to recover $0.5 * 90 + 0.5 * 100 * (1 + r_i) = 95 + 50r_i$. As creditors are risk neutral, this value must be equal to their initial stake (100). This is the case if $95 + 50r_i = 100$, i.e., if the interest rate is $r_i = 0.10$. Along with the risk free rate, we have a second equilibrium interest rate equal to 10%. Whether $r_i = 0$ or $r_i = 0.10$ is charged depends on what creditors expect if the investment in innovation fails. They will choose $r_i = 0$ if they expect the firm does not go bankrupt, while $r_i = 0.10$ if they expect it does. This second rate is due to the fact that, in case of bankruptcy, the firm cannot restore the entire operating profit (because of $\delta_i < 1$). If δ_i was equal to 1 the value of the firm would stay at 105 even in the event of bankruptcy. Creditors would then always recover the entire amount and therefore only the risk free interest rate would be observed.

[Insert Figure 1 about here]

When both (6) and (7) hold, such that $r_i > 0$, the expected profit for the firm i investing in innovation is

$$E(\Pi_i) = (1 - p_i)(-e_i) + p_i[(1 + \Delta_i)\pi_i - e_i - (k_i + z_i)(1 + r_i)]. \quad (8)$$

Equation (8) is composed by the sum of the loss the firm will face in case of failure (i.e. the share of fixed costs internally financed) and the profit in case of success. Equation (8) would coincide with equation (2) if δ_i was equal to 1.

3.3 To be or not to be innovative

In section 3.1 we present the firm's equilibrium profit with no investment in innovation (equation 1), while section 3.2 reports the expected equilibrium profit when the firm invests in innovation

and there is certainty about the full debt repayment (equation 2) or uncertainty (equation 8). Once these profits defined, we can derive the conditions such that firm i finds it profitable (and therefore decides) to invest in innovation.

When the entire debt repayment is certain (i.e. $r_i = 0$), the firm decides to invest in innovation if and only if the expected profit in case of investment (equation 2) is higher than the equilibrium profit without investment (equation 1). Thus, if $p_i\Delta_i\pi_i > z_i$, which means that the expected increase in profits is larger than the cost of the investment in innovation. Accordingly, the firm invests if the following condition is satisfied:

$$\pi_i > \tilde{\pi}_i \equiv \frac{z_i}{p_i\Delta_i}, \tag{IPC$_c$}$$

where IPC$_c$ stays for "investment profitability condition with certainty". It shows the profit cut-off value whereby the firm decides to invest in innovation. The firm will be more prone to invest (i.e. $\tilde{\pi}_i$ is lower) the lower the cost of the investment (z_i) and the higher the probability of success (p_i) and the profit gain (Δ_i).

When the entire debt repayment is uncertain (i.e. $r_i > 0$), the firm decides to invest in innovation if and only if the expected profit in case of investment (now defined by equation 8) is higher than the equilibrium profit without investment (equation 1). Thus, if the following condition is satisfied:

$$\pi_i > \hat{\pi}_i \equiv \frac{z_i}{p_i\Delta_i - (1-p_i)(1-\delta_i)}, \tag{IPC$_u$}$$

where IPC$_u$ stays for "investment profitability condition with uncertainty".[10] This defines a new profit cut-off value. As before, a firm will be more prone to invest in innovation (i.e. $\hat{\pi}_i$ is lower) the lower the cost of the investment (z_i) and the higher the probability of success (p_i) and the profit gain (Δ_i). In addition, an increment in the recovery rate (δ_i) contributes as well to reduce $\hat{\pi}_i$, increasing the likelihood of investing in innovation.

Figure 2 adds to Figure 1 the two thresholds $\tilde{\pi}_i$ and $\hat{\pi}_i$, with $\hat{\pi}_i > \tilde{\pi}_i$. The white area describes the region where firms never find it profitable (i.e decide) to invest in innovation, regardless of the interest rate. The light grey area identifies the region where firms always find it profitable (i.e decide) to invest in innovation, regardless of the interest rate. We name it "IPS" (investment profitability space). The dark grey area defines the region where firms find it profitable (i.e

[10] We refer to Appendix A for the analytical derivations of IPC$_c$ and IPC$_u$.

decide) to invest only if $r_i = 0$, while they do not if $r_i > 0$. Firms in this space are constrained by high borrowing rates, which prevent them from investing in innovation. We name this space "CIPS" (constrained investment profitability space). The hatched area can be neglected, as here no creditor lends money to firms.

[Insert Figure 2 about here]

3.4 The role of the bankruptcy recovery rate

We now examine how changes in the bankruptcy recovery rate (δ_i) affects firms' decision to invest in innovation. The IPC_u provides analytical evidence that an increase in δ_i reduces the cut-off value $\hat{\pi}_i$, making investing in innovation easier. Figure 3 helps to delve deeper into this mechanism.

[Insert Figure 3 about here]

When δ_i increases, the threshold $\hat{\pi}_i$ moves downwards to $\hat{\pi}_i'$, while $\tilde{\pi}_i$ does not change. We observe three main effects. First, the IPS increases by the light grey dotted area 1 and the dark grey dotted area 2. This means that the number of firms investing in innovation regardless of the rate increases. Enterprises with $\pi_i < \hat{\pi}_i$, which did not find it profitable to invest, now do if $\hat{\pi}_i' < \pi_i < \hat{\pi}_i$. We call this the *investment effect*. Secondly, the CIPS decreases by the dark grey dotted area 2. Prior to the rise in δ_i, firms in this area only invested in innovation with $r_i = 0$. Now, they do also with $r_i > 0$. Thus, the number of firms constrained by high interest rates declines. We call this the *constraint effect*.

Figure 3 also shows that, following an increase in δ_i, the slopes of the dotted and dashed lines flatten. The shift of the dotted curve simply reduces the hatched area, where no equilibrium with $r_i > 0$ exists, while the lowering of the dashed curve produces more intriguing consequences. On the one hand, prior to the increase in δ_i, firms in the black area 3 of the IPS could pay back the entire debt only in case of success of the investment, which made them facing either $r_i = 0$ or $r_i > 0$. Afterwards, they satisfy the condition such that they can always repay entirely the creditor, whereby the only equilibrium rate is $r_i = 0$. Accordingly, we have less interest rates dispersion. Firms in the black areas $4'$ and $4''$ as well are able to always repay

their debt after the change in δ_i, which implies $r_i = 0$. However, the null interest rate was the only one observed also before, as they only invested with this rate. As such, there is no impact on interest rates dispersion in these two regions. On the other hand, firms in the dark grey dotted area 2 of the IPS only invested with $r_i = 0$ before, while now they do with both $r_i = 0$ and $r_i > 0$. Their profit is not high enough to guarantee full repayment if the investment fails and uncertainty is still present. Thus, interest rates dispersion increases in this region. In sum, among the firms investing in innovation, an increase in the recovery rate leads borrowing rates dispersion to decline for highly profitable firms (those in the black area 3 of the IPS) and to increase for less profitable ones (those in dark grey dotted area 2 of the IPS). We call this third effect the *dispersion effect*.

In light of this findings, we formulate the following concluding propositions:

Proposition 1 *An increase in the bankruptcy recovery rate unleashes firms' investments in innovation (investment effect - areas 1 and 2).*

Proposition 2 *An increase in the bankruptcy recovery rate reduces the number of firms constrained by a high cost of borrowing (constraint effect - area 2).*

Proposition 3 *An increase in the bankruptcy recovery rate reduces (enlarges) the interest rates dispersion for high (low) profitable firms investing in innovation (dispersion effect - areas 3 and 2).*

4 Empirical analysis

In this section we perform a set of empirical analyses to test the validity of propositions 1,2, and 3 for small businesses. Where it is possible, we separate the subsamples of micro, small, and medium enterprises to study whether differences emerge. We assemble a multi-source dataset by combining firm-level data from the Survey on the Access to Finance of Enterprises (SAFE) and country-level indicators from the World Bank/Doing Business database.

4.1 Data and variables construction

4.1.1 The Survey on the Access to Finance of Enterprises (SAFE)

SAFE is the main data source for our analysis. Started in 2009, it is run every six months in two different rounds, one by the European Central Bank (ECB round), covering a limited number of the euro area countries, and one by the European Commission (Common round), including all EU countries plus some neighbouring ones. Firms are selected randomly from the DUN & Bradstreet business register and their number is adjusted by weights to restore the proportions of the economic weight of each size class, economic activity, and country.[11] The sample provides comparable precision for micro (1-9 employees), small (10-49), and medium (50-249) enterprises, guaranteeing a well representativeness of the whole small businesses' population. This makes SAFE particularly suitable for our analysis. Surveyed firms are grouped into four main sectors (industry, construction, trade, and other services) and only non-financial enterprises outside agriculture, public administration, or financial services are included. Respondents are top-level executives (general manager, financial director, or chief accountant), who reply voluntarily and anonymously by telephone or, to a less extent, by on-line questionnaires.[12] The quality and reliability of this database are supported by several studies that refer to it.[13]

We select the five sample waves of the Common rounds conducted between 2014 and 2018.[14] The reason is threefold. First, Common rounds waves include a larger set of countries than the ECB round, which also omits some key variables. Secondly, the SAFE questionnaire has substantially been amended in 2014. As such, we want to consider as similar as possible questionnaires. Finally, by referring to this period we can leave out distortions due to the financial crisis and the recent pandemic. After maintaining the countries included in all the

[11] According to official statistics, 92% of enterprises in the euro area are micro enterprises, 7% small, 1% medium, and 0.2% large. However, in terms of economic weight, as measured by the number of persons employed, micro firms represent the 31% of all enterprises, small firms the 22%, medium firms the 16%, and large firms the 30%.

[12] SAFE methodology and results are published on the ECB website every 6 months. For more information on the survey and its individual waves we refer to
`https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html`.

[13] See, for instance, Casey and O'Toole (2014), Holton et al. (2014), Roux and Savignac (2017), Ferrando et al. (2019), Gómez (2019), Banerjee and Blickle (2021), Ferrando and Mulier (2022), Ferrando et al. (2022) and Santos and Cincera (2022).

[14] Wave 11 (reference period April-September 2014), wave 13 (reference period April-September 2015), wave 15 (reference period April-September 2016), wave 17 (reference period April-September 2017), and wave 19 (reference period April-September 2018).

five waves, we obtain a cross-section sample of 77,709 observations in 30 countries.[15]

4.1.2 Measuring innovation investments

The model presented in section 3 examines how bankruptcy recovery rate affects firm's decision to invest in innovation. Thus, we need a measure to identify those firms that invest in innovation and those that do not. We consider the following survey question: *"For what purpose was financing used by your enterprise during the past six months?"*. We define a dummy (*innovation*) equal to one if the firm answers *"Developing and launching of new products or services"*. Whether these products or services are new to the market or to the firm, along with the amount of the investment, are not specified. Thus, we consider the extensive margin of the investments in innovation, whether it is to the firm or to the market.

As Table B3 in Appendix B illustrates, almost 19% of the MSMEs in our sample declare to use financing to develop and launch new products or services.[16] Looking at the country percentages reported in Figure 4, France, Hungary, Estonia, and the Czech Republic have the lowest percentage of firms investing in innovation; while Finland, Austria, Greece, and Cyprus the highest. It is worth noting that the high level of Greece and Cyprus might be driven by the financial assistance they received during and after the sovereign debt crises.[17] We will account for this in the empirical specifications.

[Insert Figure 4 about here]

4.1.3 Measuring firms constrained by high interest rates

To test proposition 2, we need to identify constrained firms that cannot invest in innovation because the borrowing interest rate is too high (those in the dark grey area of Figure 2). The survey does not allow to know whether a firm decides to invest or not in innovation according to the borrowing rate. However, we can detect those firms that do not access to credit (i.e.

[15]Table B1 in Appendix B shows the number of observations by country in the final dataset.

[16]Tables B2 and B3 in Appendix B report the definitions and summary statistics of the variables used in the empirical analysis.

[17]Cyprus received financial assistance from the European Stability Mechanism (ESM) comprising €6.3 billion between 2013 and 2015. Greece obtained a total of €245.7 billion over the 2010-2018 period from three different programs: €52.9 billion from bilateral EU and IMF loans (2010-2012), €130.9 billion from the European Financial Stability Facility (EFSF) (2012-2015), and €61.9 billion from the ESM (2015-2018). See `https://www.esm.europa.eu/financial-assistance` for further details about the ESM-EFSF programs.

that are credit constrained) because the borrowing rates are too high. We do so with the help of the following question: *"You mentioned that bank loans are not relevant for your enterprise. What is the main reason for this?"*.[18] We build a dummy (*hcost*) equal to one if the answer is *"interest rate or price too high."*. The question focuses on bank loans, which is the chief form of financing available to European MSMEs (Holton et al., 2014 OECD, 2015; European Commission, 2017).

Figure 5 illustrates the percentage of constrained MSMEs because of a high cost of borrowing. Sweden, Finland, and Luxembourg show the lowest percentage; Greece, Romania, and Montenegro the highest. As the geographical distribution suggests, Eastern-European countries have on average more constrained firms than Western-European ones.

[Insert Figure 5 about here]

4.1.4 Measuring interest rates dispersion

To assess the interest rates dispersion claimed in proposition 3, we rely on the following question: *"What interest rate was charged for the credit line or bank overdraft for which you applied?"*. This gives the values of firms' specific rates. We also compute the average rate observed in each country and in each wave. To measure the interest rates dispersion for firm i, we do the difference between the rate declared by firm i and the average rate observed in the firm's country in the respective year. By doing so, we obtain a firm-level variable (*dispersion*) measuring the spread between the individual rate and the country average rate. An increment in this spread reflects an increase in the interest rates dispersion.

Figure 6 reports the average country interest rate dispersion over the 2014-2018 period. Malta, Finland, and Austria show the lowest dispersion levels; while Germany, the UK, and Latvia the highest. The short values range suggests that there are not substantial differences among countries.

[Insert Figure 6 about here]

[18] "Relevant" means the firm have used them in the past or is considering using them in the future.

4.1.5 Measuring the bankruptcy recovery rate

Parameter δ_i reflects the bankruptcy recovery rate, that is the amount of credit recovered by lenders in case of firm's liquidation. In the model, we used subscript i to signal that this parameter may be sensitive to firm-level characteristics. However, since it mainly reflects the efficiency of the national bankruptcy system in guaranteeing creditor recovery, we assess it empirically with country-level measures. Specifically, We rely on three indicators from the World Bank/Doing Business database. As primary measure, we use the *recovery rate* (or *recovery*), which records the cents on the dollar recovered by secured creditors through judicial reorganisation, liquidation, or debt enforcement proceedings. It is a function of the time, cost, and outcome of insolvency proceedings and it ranges from 0 to 100, where 0 is the lowest and 100 the best performance. In our framework, the level of recovery rate is associated to the efficiency of the bankruptcy system. Thus, we do not consider other factors that can potentially affect the recovery rate, such as the level of debtor protection. We are conscious that the World Bank indicator may also capture the effect of this element. However, the fact that it is a function of the time and cost to resolve insolvency procedures may suggest that the efficiency of bankruptcy system is a prominent component.

The Doing Business database also includes a broader indicator, the *resolving insolvency score* (or *score*), which is a function of two sub-indices: the *recovery rate* itself and the *strength of the insolvency framework*. We use it as a validation measure and not as the main one because the *strength of the insolvency framework* does not exactly reflect what we measure in the model, which is more properly assessed by the *recovery rate*. The *resolving insolvency score* is a relative indicator, measuring the gaps of each economy from the best performance observed across all economies in the Doing Business sample. It ranges from 0 to 100, where a score of 75, for instance, means an economy is 25 percentage points away from the best performance constructed across all economies and across time. The second alternative to *recovery* we use is the *time to resolve insolvency* (or *time*), which indicates the country average time (in years) needed to resolve an insolvency procedure. This index is a component of the *recovery rate*, but we isolate it to have a narrower validation measure that may reflect more directly the efficiency of the bankruptcy system. The longer the time is (i.e. the less efficient the system), the more the firm's value is deteriorated (Djankov et al., 2008) and therefore the smaller the amount

recovered by creditors.

To summarize, we use variable *recovery* as primary proxy of parameter δ_i, while variables *score* and *time* as validation measures, being the former broader and the latter narrower. An increase in *recovery* and *score* means an increment in the recovery rate for lenders, while an increase in *time* a reduction.[19] Figure 7 reports the country average values of these three indicators over the 2014-2018 period and the geographical distribution. Continental and North-European countries seem to have higher recovery rates than South-East ones.

[Insert Figure 7 about here]

4.2 Stylized facts

Table 1 provides preliminary stylized facts about propositions 1,2, and 3. By considering the three variables measuring the bankruptcy recovery rate (*recovery*, *score* and *time*) we divide the sample countries into two groups ("High recovery rate") and ("Low recovery rate"). A country is assigned to the high recovery group if the value of the indicator is higher (lower for *time*) than the sample median. The reported values suggest that the high recovery group has a larger percentage of firms investing in innovation and a lower percentage of credit constrained firms because of high borrowing rates. Table 1 also shows that the interest rates dispersion in the high recovery group is larger for firms in the lowest turnover category (turnover $\leq$ €500 thousands) and smaller for those in the highest category (turnover $>$ €50 million). Being turnover a proxy of firms' profit, this might suggest that, as proposition 3 states, an increase in the recovery rate is associated to an increment in the interest rates dispersion for low profitable firms and to a reduction for high profitable ones.

Though preliminary, these insights seem to support our propositions and they motivate us to proceed to test them with systematic empirical specifications.

[Insert Table 1 about here]

[19] We refer to `https://archive.doingbusiness.org/en/methodology/resolving-insolvency` for an extended explanation of the methodology used to build these indicators.

4.3 Empirical methodology and results

We now illustrate the methodology and the main results of the empirical models. To conduct our analysis we both consider the whole sample of MSMEs and, where it is possible, the subsamples of micro, small, and medium enterprises separately for comparisons.

4.3.1 Proposition 1 - Investment effect

Firstly, we want to verify whether an improvement in the bankruptcy recovery rate can stimulate MSMEs to invest in innovation. To do that, we specify the following probit model:

$$innovation_{i,c,s,t} = \beta_0 + \beta_1 RR_{c,t} + \beta_j X_{i,c,s,t} + \beta_z Z_{c,t} + \eta_s + \gamma_t + \epsilon_{i,c,s,t} \quad (1)$$

Where i denotes firm, c country, s sector, and t time. The dependent variable $innovation_{i,c,s,t}$ is the dummy equal to one if the firm uses financing for developing and launching of new products and services. Variable $RR_{c,t}$ (recovery rate) is alternatively expressed by variables *recovery*, *score*, or *time*. Vector $X_{i,c,s,t}$ collects a set of firm controls that may influence the decision to invest in innovation: firm size (number of employees), age, turnover (both the level and the growth rate), ownership type, legal form, and subsidies.[20] To account for potential unobserved heterogeneity at the industry and time levels, both sector (η_s) and time (γ_t) dummies are included. Considering the country nature of our measures of $RR_{c,t}$ and the fact that their values are quite stable within countries and over time, we exclude country dummies from the present specification.[21] However, we include additional indicators (vector $Z_{c,t}$) to control for country-dimensions that might affect firms' investment in innovation. Specifically, we include the level of GDP and the GDP growth rate to account for the country macroeconomic performance (Claessens and Klapper, 2005; Lee et al., 2011); the domestic credit provided by banks to the private sector to control for the level of financial development (La Porta et al., 2002; Chowdhury et al., 2019); the general government final consumption expenditure (as a % of GDP) to capture the government expenditure (Chowdhury et al., 2019), and inflation.[22] Finally, we cluster the

[20] We refer to Table B2 in Appendix B for detailed variables definitions.

[21] The inclusion of country dummies would cancel out the between countries variation, which represents the largest share of the total variation.

[22] All these indicators are collected from the World Bank-World Development Indicators (WDI) database.

standard errors at the country level to account for heteroscedasticity and spatial correlation in the error term.

Figure 8 plots country percentages of MSMEs investing in innovation over the three recovery rate indicators. Cyprus, Greece, and, to some extent, Montenegro appear to be outliers in the distribution. As mentioned in section 4.1.2, investments in Cyprus and Greece might have been boosted by the considerable international financial aid they received after the financial and the sovereign debt crises.[23] To this regard, Figure B1 in Appendix B shows that to the introduction of the assistance programs (2013 in Cyprus and 2010 in Greece) corresponds the beginning of an upward trend in research and development expenditures in both countries. Concerning Montenegro, we are not aware of possible events that could have affected innovation investments. This outlier value might be driven by the small number of observations in this country. Accordingly, to limit these potential confounding effects, we also estimate model (1) by excluding Greece and Cyprus first, and then Montenegro.[24]

[Insert Figure 8 about here]

Table 2 reports the average partial effects (APEs) of an increase in the recovery rate ($RR_{c,t}$) on MSME's likelihood to invest in innovation ($innovation_{i,c,s,t}$). We consider all MSMEs together (col.1) and the subsamples of micro, small, and medium firms separately (cols.2, 3, 4). In panel A, which includes all countries, the coefficients have the expected sign: positive for *recovery* and *score*, negative for *time*. For *recovery* and *time*, coefficients are statistically significant for medium firms only (col.4), both at the 1% level. For *score*, coefficients are also statistically significant for the full sample of MSMEs (col.1) and for small firms (col.3). In panel B, we report the APEs by excluding Cyprus and Greece. All the coefficients (except for *time* for micro firms) become statistically significant. This suggests that part of the effects might have previously been hidden by the biased investments observed in Cyprus and Greece.[25] Concerning the size of the effects, it looks quite similar for micro, small and medium firms, suggesting that the effect is observable regardless of the firm's size. As panel B suggests, an increment in the recovery rate also unleashes investment in innovation of micro firms. Overall, these findings

[23] See note 17.

[24] Spain, Portugal, and Ireland also received ESM funding, but only before and not during the sample period (2014-2018). In the robustness section, we also estimate regression (1) by excluding these countries.

[25] We also exclude Montenegro, but the results are similar to those reported in panel B.

provide evidence supporting proposition 1. An increase in the recovery rate for creditors is associated positively to MSMEs' investments in innovation.

[Insert Table 2 about here]

4.3.2 Proposition 2 - Constraint effect

According to proposition 2, the increment in innovation investments associated to an increase in the recovery rate can be explained by the lower amount of firms that are credit constrained because of high cost of borrowing. To test this prediction we develop the following probit model:

$$hcost_{i,c,s,t} = \beta_0 + \beta_1 RR_{c,t} + \beta_j X_{i,c,s,t} + \beta_z Z_{c,t} + \eta_s + \gamma_t + \epsilon_{i,c,s,t} \quad (2)$$

Model (2) follows the same specification of model (1) except for the new dependent variable ($hcost_{i,c,s,t}$), which is a dummy equal to 1 if the firm declares not to use bank loans because the associated interest rates are too high. We expect $RR_{c,t}$ to be negatively associated with the dependent variable.

Figure 9 plots country percentages of constrained firms over the three recovery rate indicators. Montenegro appears to be an outlier in the distribution. We then re-estimate regression (2) by excluding this country. Moreover, since the financial assistance received by Cyprus and Greece could have also influenced the level of interest rates and the cost of borrowing, we exclude also these two countries.

[Insert Figure 9 about here]

Table 3 reports the average partial effects (APEs) of an increase in the recovery rate on MSME's likelihood to be credit constrained by excessive cost of borrowing. In panel A, which includes all countries, coefficients have the expected signs and all of them are statistically significant. An increase in the recovery rate (i.e., a rise in *recovery* and *score* and a decrease in *time*) is negatively associated with firms' borrowing constraints. The likelihood of not having access to bank loans because of too high interest rate is reduced. Stated differently, MSMEs are more likely to access bank loans when the recovery rate improves. As for proposition 1, the effect occurs regardless of the firm's size: no marked differences emerge between micro, small, and

medium firms. Estimates in panel B (excluding Montenegro) and panel C (excluding Montenegro, Cyprus, and Greece) confirm results of panel A and further enhance evidence supporting proposition 2. On the whole, model (2) suggests that easier access to credit conditions are a potential mechanism driving the increase in MSMEs' innovation investments claimed in proposition 1.

[Insert Table 3 about here]

4.3.3 A quasi-natural experiment - The Slovenian reform

In 2015, Slovenia implemented a substantial reform concerning the bankruptcy system. This reform made resolving insolvency easier by introducing a simplified reorganisation procedure for small companies and a preventive restructuring procedure for medium- and large-sized firms. It also allowed creditors greater participation in the management of the debtor.[26] Following this reform, the three bankruptcy recovery rate indicators for Slovenia improved sharply: from 2015 to 2016, the *recovery rate* jumped from 50.1 to 88.2, the *resolving insolvency score* from 62.9 to 83.4, and the *time to resolve insolvency* dropped from 2 to 0.8 years. All of these breaks reflect a marked increase in δ_i.

We exploit this reform as a quasi-natural experiment to further test propositions 1 and 2. To do so, we restrict our sample to Slovenia and we build a dummy (*post*) equal to one in the period after the policy (i.e. from 2016 onwards) and to zero before. Since the reform affected all the firms in the sample, the period indicator (*post*) acts as a treatment variable (Greene, 2003). Its coefficient will measure the change in the outcome pre- to post-intervention.

Being sure that the effect on the outcome is attributable to the reform of interest would require that no other events potentially affecting the same outcome occurred over the same period. According to the World Bank/Doing Business archive, the considered resolving insolvency reform was the most relevant policy change affecting the business sector over the period of interest. The two only other reforms implemented over the sample period regarding doing business concerned construction permits (in 2014) and getting credit (in 2018). We assume that the first policy, given the specific sector of application, should not have influenced firms'

[26] We refer to `https://archive.doingbusiness.org/en/reforms/overview/economy/slovenia` for more details.

innovation investments and their access to finance conditions. On the contrary, the 2018 reform impacting access to credit is more likely to have affected the outcomes of interest. We address this issue by excluding observations of the 2018 wave.

To test propositions 1 and 2 with this alternative approach, we perform the following probit model:

$$Y_{i,s} = \beta_0 + \beta_1 Post + \beta_j X_{i,s} + \beta_z Z_c + \eta_s + \epsilon_{i,s} \tag{3}$$

Where $Y_{i,s}$ is either *innovation* or *hcost* dummies for firm i in sector s. *Post* is the treatment variable, $X_{i,s}$ the vector of firm controls, Z_c the vector of country controls including the GDP growth and the level of government expenditure to control whether the change in the outcome is driven by the country economic growth or by an increase in the public expenditures; η_s includes sector dummies. According to propositions 1 and 2, we expect the coefficient β_1 to be positive with *innovation* and negative with *hcost*. Given the limited number of observations, we estimate model (3) by jointly considering micro, small, and medium firms. Estimates reported in Table 4 confirm our expectations: after the reform (i.e. after the improvement in the recovery rate), MSMEs are more likely to invest in innovation and less likely to be constrained because of high borrowing rates.

[Insert Table 4 about here]

4.3.4 Proposition 3 - Dispersion effect

The model illustrated in section 3 assumes that, in case of firm's bankruptcy, lenders cannot recover the whole credit ($\delta_i < 1$). Due to the uncertainty about the final repayment, some firms (those in the region between the solid and the dash curves in Figure 1) face either $r_i = 0$ or $r_i > 0$. This leads to multiple equilibria interest rates and interest rates dispersion. Figure 3 shows that, among firms investing in innovation, an increase in the recovery rate (δ_i) makes such dispersion larger for low profitable firms (in area 2) and lower for high profitable firms (in area 3). This effect is stated in proposition 3.

To test this, we develop the following OLS regression with a triple interaction term involving

turnover (which is used as a proxy of firm's profit), recovery rate, and innovation variables:

$$dispersion_{i,c,s,t} = \beta_0 + \beta_1 RR_{c,t} + \beta_2 innovation_{i,c,s,t} + \beta_a turnover_{i,c,s,t} + \quad (4)$$
$$\beta_b RR_{c,t} * turnover_{i,c,s,t} + \beta_c RR_{c,t} * innovation_{i,c,s,t} + \beta_d innovation_{i,c,s,t} * turnover_{i,c,s,t} +$$
$$\beta_e RR_{c,t} * turnover_{i,c,s,t} * innovation_{i,c,s,t} + \beta_i X_{i,c,s,t} + \beta_z Z_c + \eta_s + \gamma_t + \epsilon_{i,c,s,t}$$

Where $turnover_{i,c,s,t}$ is the vector including six turnover categories.[27] The other variables and vectors follow the same specification of models (1) and (2). With this model we aim to assess the impact on interest rates dispersion (*dispersion*) of an increase in the bankruptcy recovery rate (*RR*) for those MSMEs' that invest in innovation (*innovation* = 1), for each profit category (*turnover*). According to proposition 3, we expect this effect to be positive for the lowest categories and negative for the highest. We initially report Table 5, which illustrates the estimates of model (4). Then, we derive from it the overall effect on investing firms for each turnover category. Table 6 illustrates these effects. Given the reduced number of observations, we jointly consider MSMEs. The first line of Table 6 ("Turn1, innovation") shows that, in the lowest turnover category (turnover $\leq$ €500 thousands), an increase in the recovery rate (i.e., a rise in *recovery* and *score* and a decrease in *time*) is positively associated to an increment in the interest rates dispersion for those firms that invest in innovation. For two out of three indicators, including the primary variable *recovery*, the coefficient is statistically significant. From the second line on ("Turn[2-6], innovation"), that is for higher turnover categories, coefficients become negative and they increase (in absolute value) with turnover size. Coefficients are statistically significant from the fourth category on (i.e. if turnover $>$ €2mln). This confirms that, for high profitable enterprises investing in innovation, an increase in the bankruptcy recovery rate reduces rates dispersion.

Overall, these findings support what proposition 3 states: an increase in the bankruptcy recovery rate is associated to interest rates dispersion positively for low profitable investing firms and negatively for high profitable ones. Not only does a high recovery rate lead more MSMEs to investment in innovation (proposition 1) and to be less credit constrained (proposition 2), but it also allows most productive investing MSMEs to benefit of lower borrowing rates dispersion (proposition 3).

[27] We refer to Table B2 in Appendix B for a definition of the six turnover categories.

[Insert Tables 5 and 6 about here]

5 Robustness checks

In this section, we address a number of concerns regarding the empirical specifications presented in section 4.3. In panels A and B of Table 7, we estimate models (1) and (2) by excluding Ireland, Spain, and Portugal, which also received ESM assistance during and after the financial and sovereign debt crises. Unlike Cyprus and Greece, these three countries did not obtain funds during our sample period (2014-2018) but only prior to 2014. Yet, such financial aids may have influenced investments in innovation and the cost of borrowing even after. Estimates in panel A of Table 7 are similar to those reported in panel B of Table 2. Similarly, results in panel B confirms what Table 3 shows.

A second issue concerning propositions 1 and 2 is sample selection. The likelihood of observing variables *innovation* (i.e. whether the firm invest in innovation) and *hcost* (i.e. whether the firm does not consider bank loans because of too high interest rates) might be driven by unobserved factors that make a firm more likely to ask for and to receive loans. To control for sample selection bias we perform a Heckman maximum likelihood probit model. Following a similar approach as Ferrando et al. (2019), we use as selection variable a dummy (*outlook*) equal to one if the firm's own outlook has improved in the past six months.[28] As the authors argue, not only does this variable satisfy the relevance condition, because a better outlook should increase both demand funding and credit, but it also respects the exclusion restriction condition as it is unlikely for banks to observe such improvement in firm's outlook so quickly. To measure the demand for credit, we build a dummy (*apply*) equal to one if the firm applied for one of the following external source of financing in the past six months: a) credit line, bank overdraft, or credit card overdraft; b) bank loans; c) trade credit; and d) other external financing.[29] Panels A and B of Table 8 report estimates of the Heckman selection model related to propositions

[28] We refer to the following survey question: *"For each of the following factors, would you say that they have improved, remained unchanged or deteriorated over the past six months?"* The dummy is equal to one if firm answers *"improved"* for the option *"general economic outlook"*.

[29] We refer to the following survey question: *"Have you applied for the following types of financing in the past six months?"*. We also build a specific dummy (*applied_bank_loans*) measuring demand for bank loans only, which equals one in case of an affirmative response for (b). The selection variable *outlook* has a positive and statistically significant effect on both variables *apply* and *applied_bank_loans*. Results are available upon request.

1 and 2, respectively.[30] Results in panel A of Table 8 do not change substantially from those in panel B of Table 2. Comparing panel B of Table 8 with results in Table 3, *recovery* and *time* have similar coefficients, while those related to *score* are no longer significant but of the expected sign. In panel B of Table 8, coefficients for the medium sized firms subsample are no longer statistically significant. This might suggest that, after controlling for selection, the impact of recovery rate on the borrowing costs is driven primarily by smaller firms, which are usually more constrained.

In Table 9, we include in the country controls vector three additional indicators related to business activity. These are collected from the World Bank/Doing Business database. The first indicator (*starting a business*) assesses the ease of starting a business by considering the time, cost, paid-in minimum capital, and number of procedures needed to get a company started. The second (*getting credit*) considers the level of credit information the lenders have on entrepreneurs seeking credit and the extent to which the law is favourable to credit. The third (*protecting minority investors*) focuses on the protection of minority investors.[31] We add these variables to the country controls vector, to verify that the estimated effects of bankruptcy recovery rate do not incorporate information that are rather attributable to other dimensions of the business environment. Estimates in Table 9 are in line with the baseline results reported in section 4.3.

Concerning model (4), which is related to proposition 3, we want to verify that baseline estimates are not driven by the highest interest rates that might have exceptionally been charged to few firms. These rates can indeed bias the countries average rate and, consequently, our measure of interest rates dispersion. To address this concern, we recompute the interaction effects shown in Table 6 by excluding rates higher than 25 percent. New estimates are reported in panel A of Table 10 and they are similar to those illustrated in Table 6. In panel B of Table 10 we do the same exercise by excluding Cyprus and Greece, to eliminate confounding effects due to financial aids. Finally, in panel C we add in the country controls vector the three aforementioned business activity indicators (*starting a business*, *getting credit*, *protecting minority investors*). Columns (1) and (2) of panels B and C confirm the baseline results reported in Table 6. Coefficients in column (3) are of the expected sign but no longer statistically signifi-

[30] Cyprus and Greece are excluded in panel A, Montenegro in panel B.

[31] For more detailed information about the three additional indicators we refer to `https://archive.doingbusiness.org/en/methodology`.

cant. Two out of three indicators, including the primary variable *recovery*, confirm the validity of proposition 3.

[Insert Tables 7, 8, 9 and 10 about here]

6 Conclusion

This study examines the interaction between bankruptcy systems, access to credit and small businesses' investments in innovation. Specifically, it investigates whether a bankruptcy system that guarantees a good recovery rate for creditors in case of firms' liquidation can help small businesses to engage in innovation, and if it does so by easing their access to credit. With the help of a simple borrower-lender model, we develop three propositions that we test by performing a set of alternative empirical specifications. We do so by using a cross-country sample of micro, small, and medium enterprises (MSMEs).

We provide three main results. First, we find evidence that an increase in the bankruptcy recovery rate is positively associated with MSMEs' decision to invest in innovation (*investment effect*). The higher the recovery rate the more these firms engage in innovation. This is true also for micro firms with fewer than 10 employees, which is still an under-studied category in the extant literature. Secondly, we show that the increase in MSMEs' investments in innovation can be explained by easier access to credit conditions. Where creditors can recover a good amount of their loans, MSMEs are less likely to be credit constrained because of too high interest rates (*constraint effect*). Lenders who expect to recover a large share of their credit are more prone to charge lower borrowing rates, which facilitates MSMEs' access to credit and investments. Again, this occurs for micro firms also. Thirdly, our findings suggest that where the recovery rate is high, profitable MSMEs investing in innovation benefit of a lower borrowing interest rates dispersion, which can further stimulates access to credit and the engagement in innovative projects (*dispersion effect*).

These findings have valuable implications, which contribute to advance knowledge on the links between bankruptcy systems, financing and MSMEs' innovativeness. First, by looking at the bankruptcy recovery rate we shift the focus from debtor to creditor. Prior research agrees that a debtor-friendly system with large exemptions is conducive to firms' creation, boosting the

quantity of enterprises. What this study shows is that a creditor-friendly system as well can generate positive effect for small businesses. By stimulating their investments in innovation, it can contribute to promote their quality. Thus, we challenge the view that only debtor-oriented systems are beneficial for business: when we look at firms' innovative behaviour, the creditor side also matters and plays a positive role. Second, we move the attention from the quantity to the quality of small businesses. While the extant literature mainly examines the impact of bankruptcy laws on firms' creation, we rather investigate the link with the propensity to engage in innovation, arguably the most qualifying characteristic of high-quality businesses. Not only having more firms matters, but in particular having more innovative firms. Third, this study provides first evidence that the bankruptcy system, and particularly creditors' recovery rate, is connected with MSMEs' decision to invest in innovation. We focus on the input-side and early-stage of the innovation process rather than on the output-side and final-stage. The former looks more problematic for small businesses due to the scarcity of internal resources and their limited access to external finance. Further, our research advances knowledge on firms' innovation and financing by including firms with fewer than 10 employees, which is an under-studied category in this field. By doing so, we help developing a more comprehensive understanding of the innovation behaviour of the whole small businesses' population.

From policy perspective, we join the ongoing debate on to promotion of firms' innovation. This is particularly pressing for MSMEs, which are more likely to face financial constraints and limited access to knowledge. Our findings suggest that policies aimed at improving creditors recovery rate can contribute to ease MSMEs' access to finance and to stimulate their investments in innovation. The quasi-natural experiment exploiting the Slovenian reform presented in section 4.3.3 is a supporting example. Moreover, it is often question for policy makers as to whether one-size-fits-all or rather size-specific policies are more conducive to innovation. To this regard, our estimates show that the beneficial effects of an improvement in the recovery rate occur for the whole population of MSMEs, regardless of their size.

We are also conscious of some limitations of our study that can offer intriguing venues for future research. First, the binary variable *innovation* allows us to assess the extensive margin of innovation investments but not the intensive one. Information about the level of innovation expenditures are not reported by the survey we consider. Examining the impact of bankruptcy

recovery rate on the intensity of investments might be an interesting extension of this research. Second, our measure of interest rates dispersion only relies on borrowing rates for credit line and bank overdraft. No other rates are provided by SAFE. Having a wider array of borrowing rates should contribute to delve deeper into the link between bankruptcy laws and interest rates dispersion. Concerning these two shortcomings, an extension of SAFE by asking additional questions on the level of innovation expenditures and on alternative borrowing interest rates would definitely offer useful insights to inspire new research. Third, we acknowledge that the three measures of recovery rate (*recovery*, *score*, and *time*) might embed information related to other institutional dimensions, such as the rule of law, the level of bureaucracy, or the capital markets' efficiency. The effectiveness of insolvency procedures should indeed be favoured by well-functioning institutions. However, the high interdependence among the several components of public institutions makes it difficult to disentangle each of them. Simultaneously controlling for all of them would rise multicollinearity problems. We try to limit this issue by using alternative measures of recovery rate and by including country indicators to control for several economic and institutional dimensions. Moreover, while in the model we associate the level of recovery rate primarily to the efficiency of the bankruptcy system, the World Bank *recovery rate* indicator used in the empirical analysis may reflect other components as well, like debtor protection. This might create a tension between our model and the empirical analysis. While we try to lessen this tension by including a narrower indicator (*time to resolve insolvency*) linked to bankruptcy system efficiency, future research may try to consider and disentangle variations in the recovery rate from both system efficiency and debtor protection. We hope that the compelling results we provide, together with the aforementioned limitations, could open new horizons for other important and fruitful research in this field.

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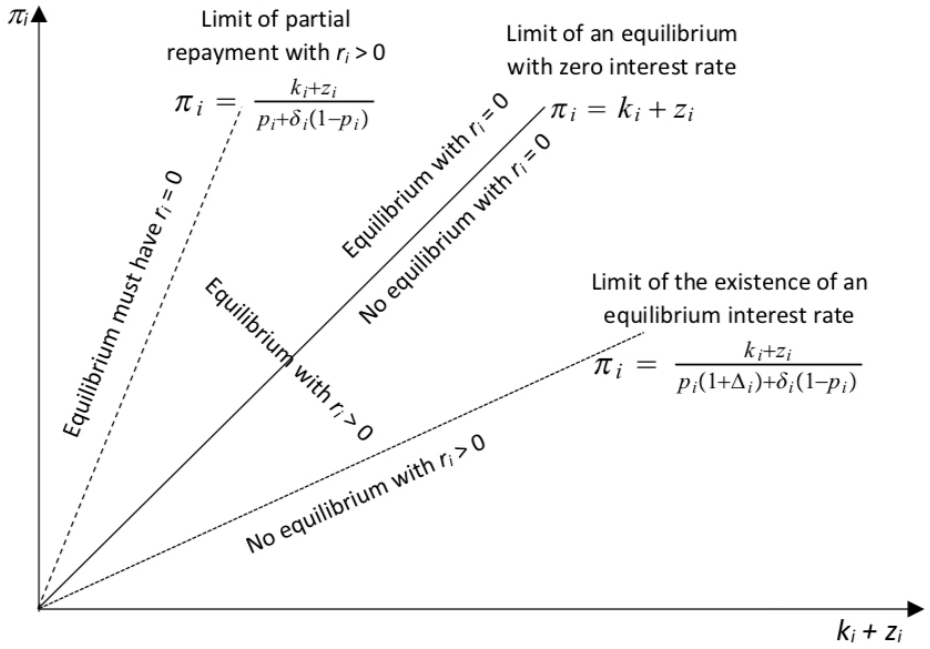
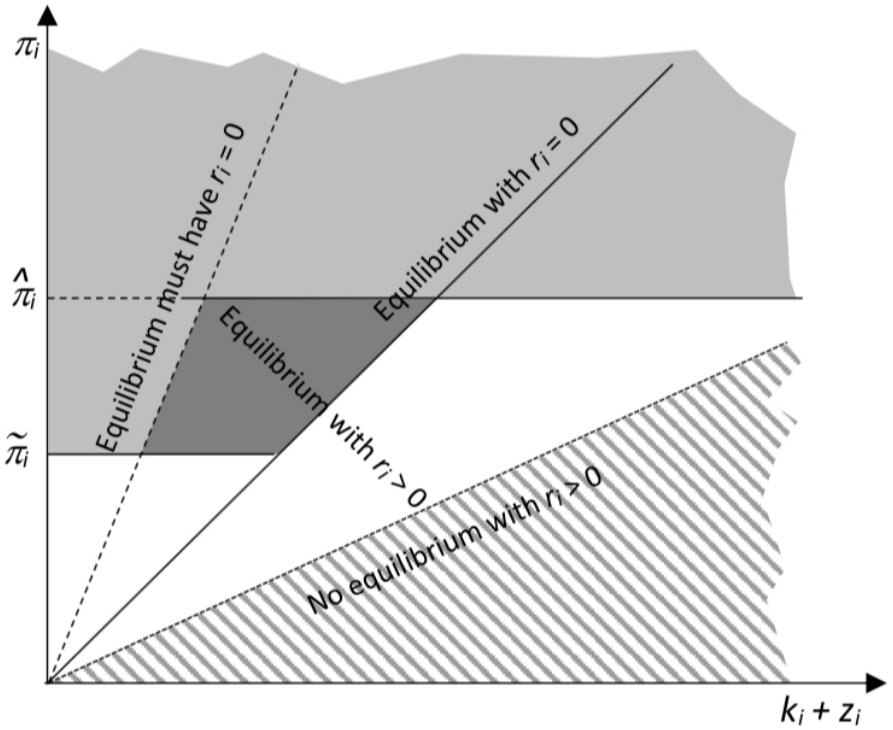
Figures and Tables

Figure 1: Equilibrium interest rates.



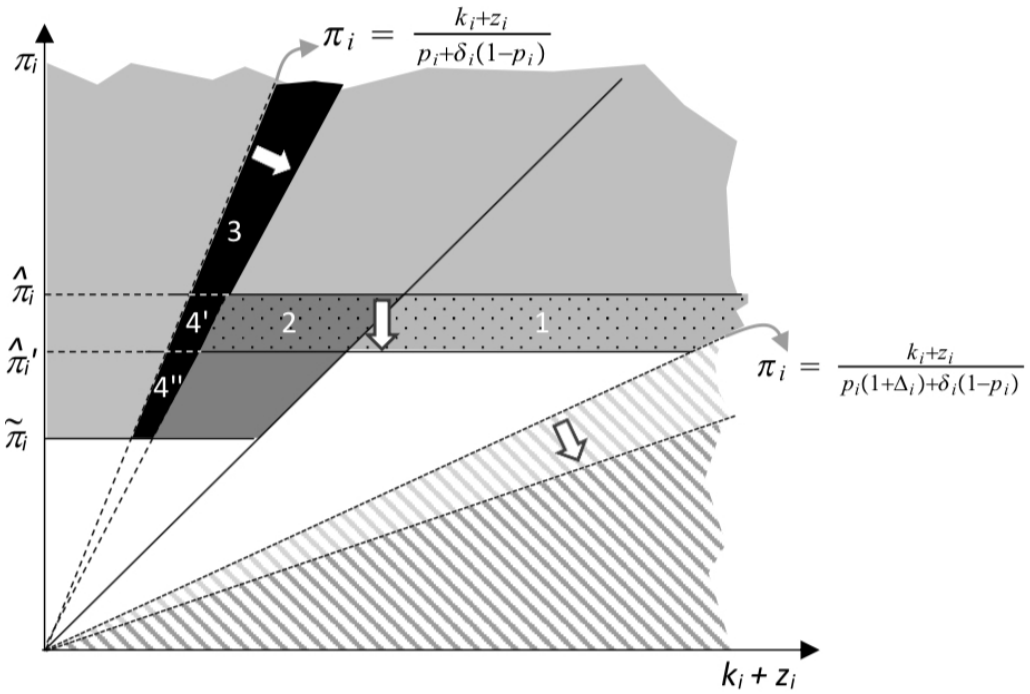
Notes: The figure reports the equilibrium interest rates according to the conditions illustrated in section 3.2.

Figure 2: Investment in innovation (light grey area + dark grey area only if $r_i = 0$).



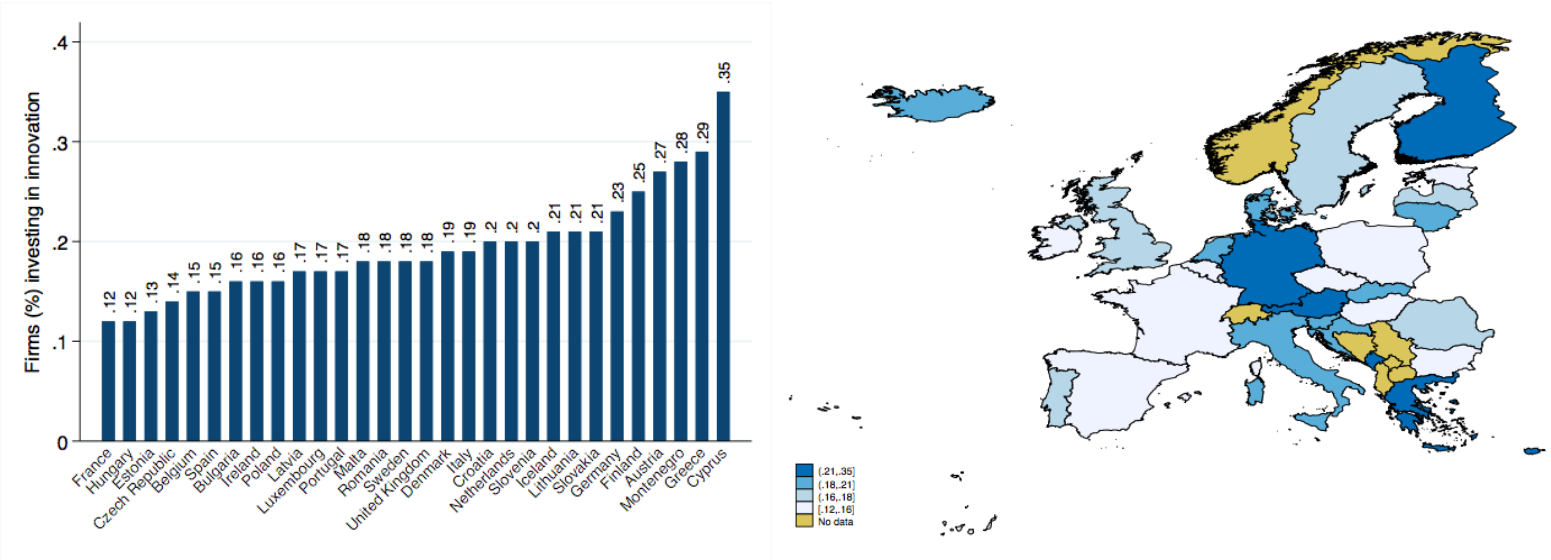
Notes: The figure reports the profit cut-off values defined by the IPC$_c$ ($\tilde{\pi}_i$) and by the IPC$_u$ ($\hat{\pi}_i$), along with the four regions defining firm's decision to invest in innovation illustrated in section 3.3.

Figure 3: Effects of an increase in the recovery rate (δ_i).



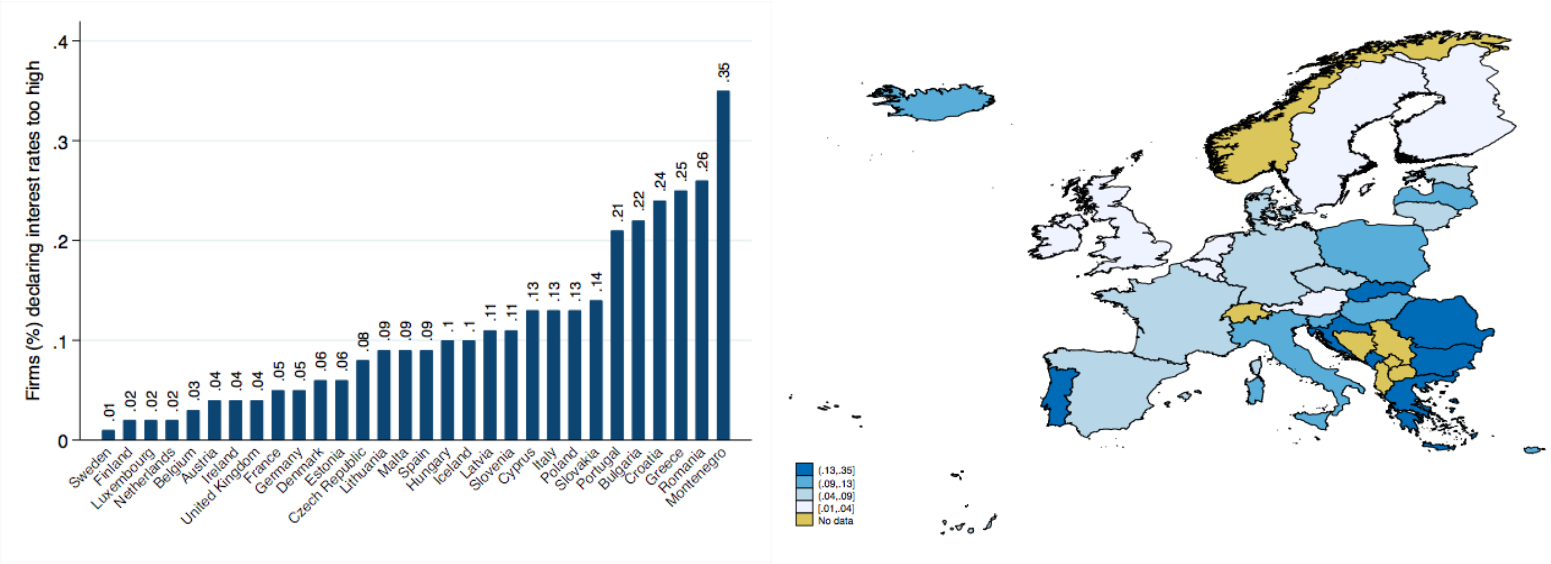
Notes: The figure illustrates the effects of an increase in the bankruptcy recovery rate (δ_i) explained in section 3.4.

Figure 4: Firms (%) investing in innovation.



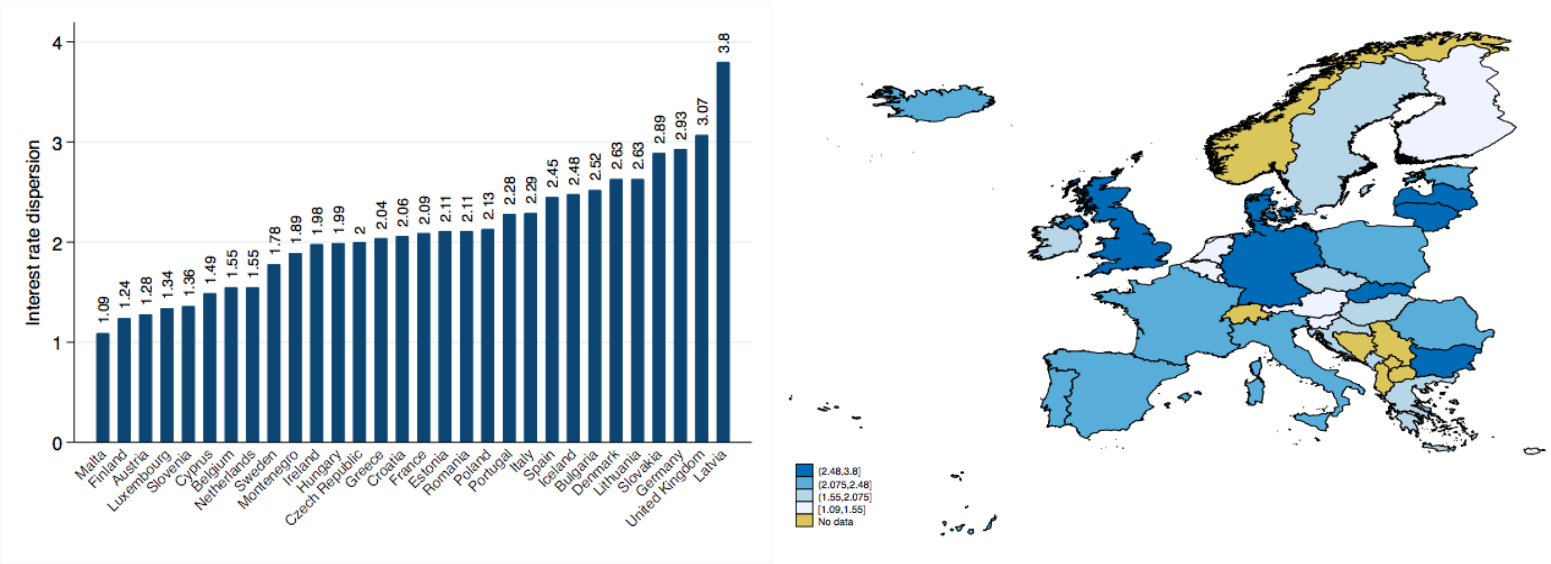
Notes: Authors' calculations on SAFE data. The figure reports the weighted percentage of firms that invest in innovation over the 2014-2018 period.

Figure 5: Firms (%) constrained because of too high interest rates.



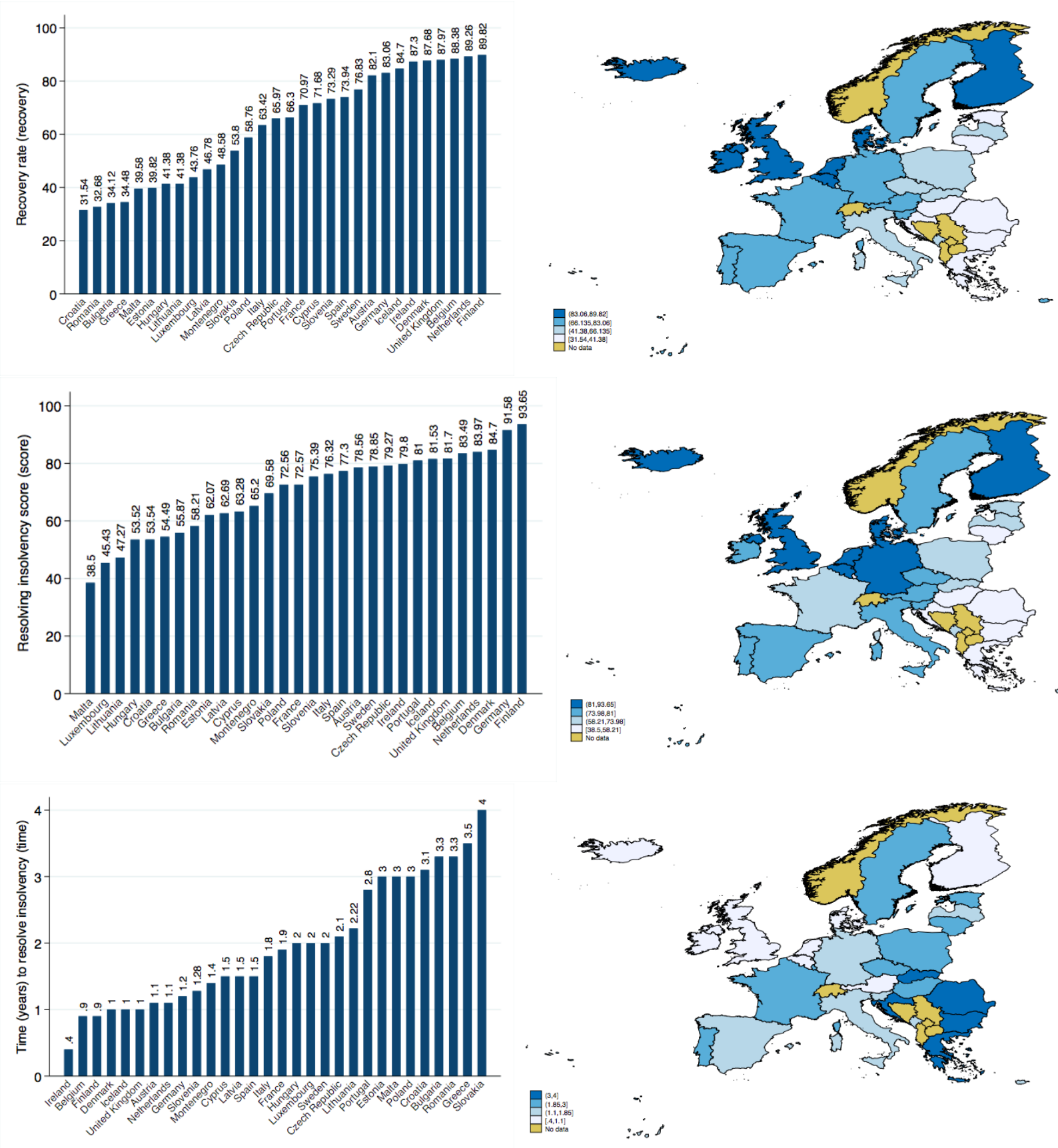
Notes: Authors' calculations on SAFE data. The figure reports the weighted percentage of firms that do not consider bank loans because interest rates are too high over the 2014-2018 period.

Figure 6: Interest rate dispersion.



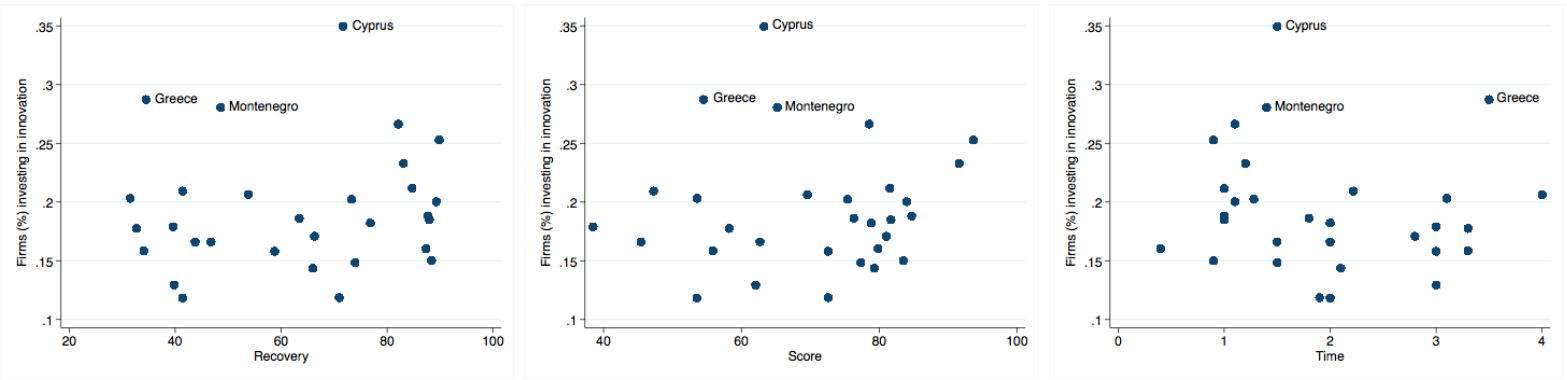
Notes: Authors' calculations on SAFE data. The figure reports the weighted average interest rate dispersion over the 2014-2018 period.

Figure 7: Bankruptcy recovery rate.



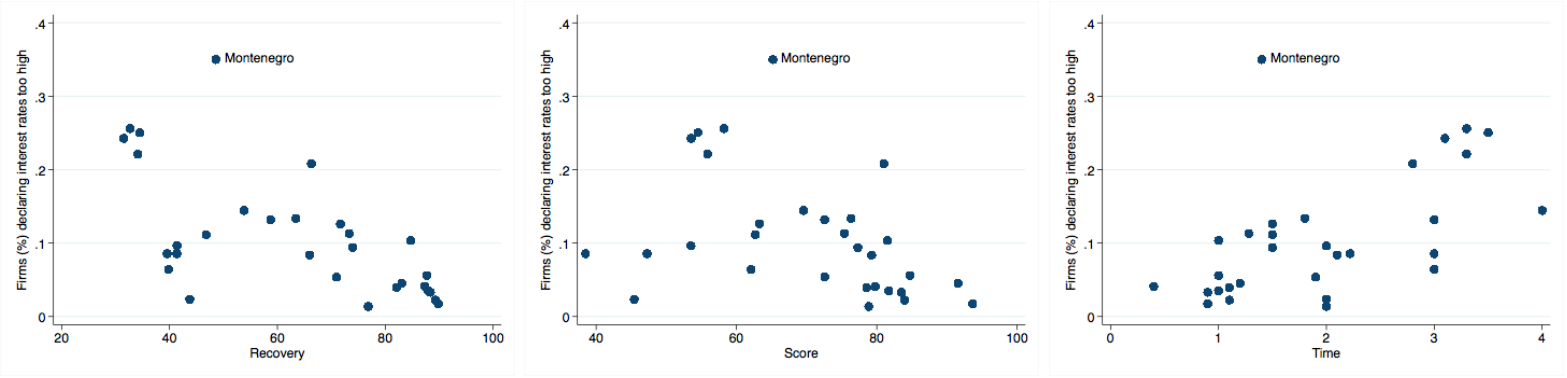
Notes: Authors' calculations on World Bank/Doing Business data. The figure reports the country average values of the bankruptcy recovery rate indicators over the 2014-2018 period.

Figure 8: Innovation investments and bankruptcy recovery rate.



Notes: Authors' calculations over the 2014-2018 period. The figure plots the country percentages of firms investing in innovation over the recovery rate indicators.

Figure 9: Constrained firms and bankruptcy recovery rate.



Notes: Authors' calculations over the 2014-2018 period. The figure plots the country percentages of firms that do not access to bank loans for high interest rates over the recovery rate indicators.

Table 1: Stylized facts.

Panel A	High recovery rate (recovery $\geq$ 71)	Low recovery rate (recovery $<$ 71)
Country	Austria, Belgium, Cyprus, Denmark, Finland, France, Iceland, Ireland, Germany, Netherlands, Slovenia, Spain, Sweden, UK	Bulgaria, Croatia, Cz. Rep., Estonia, Greece, Hungary, Italy Latvia, Lithuania, Luxembourg, Malta, Montenegro, Poland, Portugal, Romania, Slovakia
Innovation (%)	20.15	17.36
Hcost (%)	4.49	13.80
Dispersion (mean)		
Low profit	3.16	2.77
High profit	2.11	2.45
Panel B	**High recovery rate (score $>$ 77)**	**Low recovery rate (score $\leq$ 77)**
Country	Austria, Belgium, Cz. Rep., Denmark, Finland, Germany, Iceland, Ireland, Netherlands, Portugal, Spain, Sweden, UK	Bulgaria, Cyprus, Croatia, Estonia, France, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Poland, Romania, Slovakia, Slovenia
Innovation (%)	19.50	17.84
Hcost (%)	5.22	13.72
Dispersion (mean)		
Low profit	3.18	2.73
High profit	2.13	2.39
Panel C	**High recovery rate (time $<$ 1.8 years)**	**Low recovery rate (time $\geq$ 1.8 years)**
Country	Austria, Belgium, Cyprus, Germany, Denmark, Finland, Iceland, Ireland, Latvia, Montenegro, Netherlands, Slovenia, Spain, UK	Bulgaria, Czech Rep., Estonia, France, Greece, Croatia, Hungary, Italy, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Sweden, Slovakia
Innovation (%)	20.16	16.79
Hcost (%)	6.36	12.91
Dispersion (mean)		
Low profit	3.08	2.72
High profit	2.20	2.29

Notes: Authors' calculations. Countries are divided in two groups according to the level of recovery rate. Panel A refers to *recovery*, panel B to *score*, and panel C to *time*. "High recovery rate" group collects countries where the respective indicators are above the median (below for *time*), while "Low recovery rate" those below (above for *time*). The table shows, for the two groups, the percentage of firms investing in innovation ("innovation"), the percentage of firms that do not consider bank loans because interest rates are too high ("hcost"), and the average interest rates dispersion ("dispersion"). Being turnover a proxy of firms' profit, categories "low profit" includes firms in the lowest turnover category (turnover $\leq$ €500 thousands) and "high profit" those in the highest (turnover $>$ €50 million).

Table 2: Investment effect.

Dependent variable: Innovation	(1) Full sample	(2) Micro	(3) Small	(4) Medium
<u>Panel A: all countries</u>				
Recovery	0.001	0.001	0.001	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	57511	20785	18261	18465
Pseudo-R^2	0.02	0.02	0.02	0.04
Score	0.002**	0.002	0.002**	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	57511	20785	18261	18465
Pseudo-R^2	0.02	0.03	0.03	0.04
Time	-0.018	-0.009	-0.024	-0.029***
	(0.015)	(0.016)	(0.017)	(0.010)
Observations	57511	20785	18261	18465
Pseudo-R^2	0.02	0.02	0.02	0.03
<u>Panel B: excluding Greece and Cyprus</u>				
Recovery	0.002***	0.001**	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	55189	19472	17695	18022
Pseudo-R^2	0.03	0.03	0.03	0.04
Score	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	55189	19472	17695	18022
Pseudo-R^2	0.03	0.03	0.03	0.04
Time	-0.028**	-0.022	-0.034**	-0.032***
	(0.014)	(0.016)	(0.015)	(0.010)
Observations	55189	19472	17695	18022
Pseudo-R^2	0.03	0.03	0.03	0.04
Firms controls	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes
Time, sector FE	Yes	Yes	Yes	Yes

Notes: Authors' calculations. Cluster robust standard errors in parentheses. Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports probit average partial effects (APEs) and all the specifications use sampling weights. Column (1) considers the full sample, while columns (2), (3), and (4) consider the subsamples of micro (1 to 9 employees), small (10 to 49 employees), and medium (50 to 249 employees) firms, respectively. Panel A includes all countries, while panel B excludes Greece and Cyprus. The size and the signs of the coefficients do not change with respect to panel B if we also exclude Montenegro. The set of firm controls include size (only in col.1), turnover (levels and past growth), age, legal status, ownership type, and subsidies. The country indicators are GDP (log, constant 2010 USD), GDP growth (annual %), domestic credit to private sector (% of GDP), general government final consumption expenditure (% of GDP), and inflation. Each column estimates regression (1) by including both sector and time FE.

Table 3: Constraint effect.

Dependent variable: hcost	(1) Full sample	(2) Micro	(3) Small	(4) Medium
Panel A: all countries				
Recovery	-0.002***	-0.003***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	33876	14877	10054	8945
Pseudo-R^2	0.1	0.07	0.09	0.13
Score	-0.001**	-0.002**	-0.001*	-0.001**
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	33876	14877	10054	8945
Pseudo-R^2	0.09	0.07	0.08	0.12
Time	0.033***	0.039***	0.031***	0.022***
	(0.007)	(0.008)	(0.006)	(0.006)
Observations	33876	14877	10054	8945
Pseudo-R^2	0.1	0.07	0.09	0.13
Panel B: excluding Montenegro				
Recovery	-0.002***	-0.003***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	33732	14804	10018	8910
Pseudo-R^2	0.1	0.07	0.09	0.13
Score	-0.002**	-0.002**	-0.001*	-0.001***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	33732	14804	10018	8910
Pseudo-R^2	0.09	0.07	0.08	0.12
Time	0.034***	0.041***	0.032***	0.023***
	(0.007)	(0.008)	(0.006)	(0.006)
Observations	33732	14804	10018	8910
Pseudo-R^2	0.1	0.07	0.09	0.13
Panel C: excluding Montenegro, Cyprus, Greece				
Recovery	-0.002***	-0.003***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	32564	14027	9759	8778
Pseudo-R^2	0.1	0.07	0.09	0.13
Score	-0.001*	-0.002*	-0.001	-0.001**
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	32564	14027	9759	8778
Pseudo-R^2	0.09	0.06	0.08	0.12

Table 3 - Continued

Time	0.032***	0.039***	0.029***	0.022***
	(0.007)	(0.009)	(0.006)	(0.006)
Observations	32564	14027	9759	8778
Pseudo-R^2	0.1	0.07	0.08	0.13
Firms controls	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes
Time, sector FE	Yes	Yes	Yes	Yes

Notes: Authors' calculations. Cluster robust standard errors in parentheses. Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports probit average partial effects (APEs) and all specifications use sampling weights. Column (1) considers the full sample, while columns (2), (3) and (4) the subsamples of micro (1 to 9 employees), small (10 to 49 employees), and medium (50 to 249 employees) firms, respectively. The set of firm controls includes size (only in col.1), turnover (levels and past growth), age, legal status, ownership type, and subsidies. The country indicators are GDP (log, constant 2010 USD), GDP growth (annual %), domestic credit to private sector (% of GDP), general government final consumption expenditure (% of GDP), and inflation. Each column estimates regression (2) by including both sector and time FE.

Table 4: Slovenian reform.

	(1)	(2)
	Innovation	hcost
Post	0.280**	-0.274**
	[0.0073]	[-0.0071]
	(0.113)	(0.111)
Observations	552	255
Pseudo-R^2	0.08	0.17
Firms controls	Yes	Yes
Country indicators	Yes	Yes
Sector FE	Yes	Yes
Time FE	No	No

Notes: Authors' calculations. Scaled coefficients in square brackets and robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table reports probit average partial effects (APEs) of model (3) and all specifications use sampling weights. Columns (1) and (2) consider *innovation* and *hcost* as dependent variable, respectively. The set of firms' controls includes size, turnover (levels and past growth), age, legal status, ownership type, and subsidies. The country indicators include GDP growth (annual %) and general government final consumption expenditure (% of GDP). For scaling, we divided the coefficients by the difference in the *recovery rate* values after and before the reform (38.1). By doing so, we obtain the effects associated to a unit increase.

Table 5: Dispersion effect.

Dependent variable: Dispersion	(1) Recovery	(2) Score	(3) Time
RR (a)	0.005	0.011	-0.009
	(0.008)	(0.012)	(0.172)
Innovation	-1.450*	-2.851**	1.092*
	(0.776)	(1.038)	(0.580)
RR*Innovation (b)	0.026**	0.041***	-0.403
	(0.011)	(0.012)	(0.286)
Turn2	0.000	-0.732	-0.747
	(0.736)	(1.259)	(0.562)
Turn2*RR (c)	-0.006	0.004	0.169
	(0.011)	(0.016)	(0.247)
Turn2*Innovation	0.156	2.125	-0.458
	(1.313)	(2.019)	(0.773)
Turn2*RR*Innovation (d)	-0.008	-0.032	0.034
	(0.019)	(0.024)	(0.353)
Turn3	-0.467	-0.975	-0.055
	(0.516)	(1.129)	(0.429)
Turn3*RR (e)	0.000	0.007	-0.203
	(0.008)	(0.015)	(0.169)
Turn3*Innovation	1.431	2.843	-1.312
	(1.248)	(1.897)	(0.921)
Turn3*RR*Innovation (f)	-0.030	-0.044*	0.381
	(0.018)	(0.023)	(0.398)
Turn4	-0.755*	-0.973	-0.511*
	(0.389)	(0.735)	(0.256)
Turn4*RR (g)	-0.000	0.003	-0.127
	(0.005)	(0.009)	(0.103)
Turn4*Innovation	1.673*	3.417**	-1.585**
	(0.876)	(1.283)	(0.716)
Turn4*RR*Innovation (h)	-0.031**	-0.050***	0.579*
	(0.014)	(0.016)	(0.309)
Turn5	0.169	-0.416	-0.793***
	(0.425)	(0.780)	(0.282)
Turn5*RR (i)	-0.010*	-0.002	0.144
	(0.005)	(0.009)	(0.106)
Turn5*Innovation	1.280	3.384**	-1.250*
	(0.852)	(1.342)	(0.679)
Turn5*RR*Innovation (l)	-0.026**	-0.050***	0.387
	(0.012)	(0.016)	(0.315)
Turn6	-0.721	-1.570*	0.255
	(0.961)	(0.815)	(0.566)
Turn6*RR (m)	0.008	0.018*	-0.227
	(0.014)	(0.010)	(0.264)
Turn6*Innovation	3.357*	6.690***	-2.557*
	(1.948)	(1.962)	(1.269)
Turn6*RR*Innovation (n)	-0.059*	-0.095***	1.031
	(0.029)	(0.025)	(0.639)

Table 5 - Continued

Observations	6412	6412	6412
Adjusted-R^2	0.05	0.06	0.05
Firms controls	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes
Time, sector FE	Yes	Yes	Yes

Notes: Authors' calculations. Cluster robust standard errors in parentheses. Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports OLS estimates by using sampling weights. Column (1) considers *recovery* as measure for *RR*, while columns (2) and (3) *score* and *time*, respectively. The set of firms controls includes size, turnover (levels and past growth), age, legal status, ownership type, and subsidies. The country indicators are GDP (log, constant 2010 USD), GDP growth (annual %), domestic credit to private sector (% of GDP), general government final consumption expenditure (% of GDP), and inflation. Turn1 indicates turnover (T) ≤ €500k; Turn2 €500k < T ≤ €1mln; Turn3 €1mln < T ≤ €2mln; Turn4 €2mln < T ≤ €10mln; Turn5 €10mln < T ≤ €50mln; Turn6 T > €50mln. Sector and time FE are included.

Table 6: Dispersion effect - interactions.

Effect of RR on:	(1) Recovery	(2) Score	(3) Time
Turn1, innovation (a+b)	0.031** [4.72; 0.0381]	0.052*** [14.51; 0.0007]	-0.412 [1.50; 0.2313]
Turn2, innovation (a+c+d)	-0.009 [0.25; 0.6211]	-0.017 [0.44; 0.5103]	0.194 [0.41; 0.5287]
Turn3, innovation (a+e+f)	-0.025 [2.35; 0.1359]	-0.026 [1.24; 0.2754]	0.169 [0.19; 0.6630]
Turn4, innovation (a+g+h)	-0.026** [4.83; 0.0361]	-0.036** [6.77; 0.0145]	0.443 [2.33; 0.1379]
Turn5, innovation (a+i+l)	-0.031** [6.41; 0.0171]	-0.041*** [8.08; 0.0081]	0.522* [2.99; 0.0946]
Turn6, innovation (a+m+n)	-0.046** [6.21; 0.0186]	-0.066** [5.86; 0.0220]	0.795* [3.09; 0.0891]

Notes: Authors' calculations. The table shows the overall effects of *RR* on *dispersion* for firms that invest in innovation in each turnover category. Effects are derived from table 5 (as letters in round brackets shows). Column (1) considers *recovery* as measure for *RR*, while columns (2) and (3) *score* and *time*, respectively. Turn1 indicates turnover (T) ≤ €500k; Turn2 €500k < T ≤ €1mln; Turn3 €1mln < T ≤ €2mln; Turn4 €2mln < T ≤ €10mln; Turn5 €10mln < T ≤ €50mln; Turn6 T > €50mln. "Turn[1-6], innovation" refers to firms in the respective turnover category that invest in innovation. F-values and p-values in squared brackets.

Table 7: Excluding financially assisted countries.

	(1) Full sample	(2) Micro	(3) Small	(4) Medium
Panel A: investment effect				
(Dependent variable: innovation)				
Recovery	0.002***	0.002**	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	47040	16099	15104	15837
Pseudo-R^2	0.03	0.03	0.03	0.04
Score	0.003***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	47040	16099	15104	15837
Pseudo-R^2	0.03	0.03	0.03	0.04
Time	-0.039**	-0.034	-0.047***	-0.037***
	(0.017)	(0.021)	(0.018)	(0.012)
Observations	47040	16099	15104	15837
Pseudo-R^2	0.03	0.03	0.03	0.04
Panel B: constraint effect				
(Dependent variable: hcost)				
Recovery	-0.002***	-0.002***	-0.002***	-0.001***
	(0.000)	(0.001)	(0.000)	(0.000)
Observations	28785	12071	8712	8002
Pseudo-R^2	0.1	0.08	0.09	0.13
Score	-0.001**	-0.002**	-0.001**	-0.001**
	(0.001)	(0.001)	(0.000)	(0.000)
Observations	28785	12071	8712	8002
Pseudo-R^2	0.09	0.07	0.08	0.13
Time	0.031***	0.036***	0.031***	0.020***
	(0.009)	(0.010)	(0.007)	(0.007)
Observations	28785	12071	8712	8002
Pseudo-R^2	0.1	0.07	0.09	0.13
Firms controls	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes
Time, sector FE	Yes	Yes	Yes	Yes

Notes: Authors' calculations. Cluster robust standard errors in parentheses. Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports probit average partial effects (APEs) and all the specifications use sampling weights. Column (1) considers the full sample, while columns (2), (3), and (4) the subsamples of micro (1 to 9 employees), small (10 to 49 employees), and medium (50 to 249 employees) firms, respectively. Panel A considers "innovation" as dependent variable, while panel B "hcost". The set of firms' controls includes size (only in col.1), turnover (levels and past growth), age, legal status, ownership type, and subsidies. The country indicators are GDP (log, constant 2010 USD), GDP growth (annual %), domestic credit to private sector (% of GDP), general government final consumption expenditure (% of GDP), and inflation. Time and sector FE are included.

Table 8: Probit model with sample selection.

	(1) Full sample	(2) Micro	(3) Small	(4) Medium
Panel A: investment effect				
(Dependent variable: innovation)				
Recovery	0.002***	0.001*	0.002**	0.002***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	63825	24097	20130	19598
Wald χ^2	[859.04; p < 0.00]	[291.92; p < 0.00]	[262.20; p < 0.00]	[494,50; p < 0.00]
Score	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	63825	24097	20130	19598
Wald χ^2	[891.52; p < 0.00]	[316.24; p < 0.00]	[267.68; p < 0.00]	[530,41; p < 0.00]
Time	-0.028**	-0.023	-0.032**	-0.030***
	(0.013)	(0.015)	(0.013)	(0.010)
Observations	63825	24097	20130	19598
Wald χ^2	[853.44; p < 0.00]	[289.72; p < 0.00]	[275.44; p < 0.00]	[442.99; p < 0.00]
Panel B: constraint effect				
(Dependent variable: hcost)				
Recovery	-0.003**	-0.004***	-0.001***	-0.001
	(0.001)	(0.001)	(0.000)	(0.002)
Observations	66051	25472	20627	19952
Wald χ^2	[1201.86; p < 0.00]	[524.83; p < 0.00]	[408.66; p < 0.00]	[318.94; p < 0.00]
Score	-0.003	-0.004	-0.000	-0.001
	(0.002)	(0.002)	(0.000)	(0.002)
Observations	66051	25472	20627	19952
Wald χ^2	[1110.81; p < 0.00]	[507.67; p < 0.00]	[386.20; p < 0.00]	[304.95; p < 0.00]
Time	0.056**	0.069***	0.013***	0.023
	(0.025)	(0.018)	(0.004)	(0.027)
Observations	66051	25472	20627	19952
Wald χ^2	[1249.39; p < 0.00]	[539.65; p < 0.00]	[400.23; p < 0.00]	[300.34; p < 0.00]
Firms controls	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes
Time, sector FE	Yes	Yes	Yes	Yes

Notes: authors' calculations. Cluster robust standard errors in parentheses. Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports probit average partial effects (APEs) and all the specifications use sampling weights. Column (1) considers the full sample, while columns (2), (3), and (4) the subsamples of micro (1 to 9 employees), small (10 to 49 employees), and medium (50 to 249 employees) firms, respectively. The table shows the APEs of the probit model with sample selection. Panel A considers "innovation" as dependent variable and excludes Greece and Cyprus; panel B considers "hcost" as dependent variable and excludes Montenegro. The set of firms' controls includes size (only in col.1), turnover (levels and past growth), age, legal status, ownership type, and subsidies. The country indicators are GDP (log, constant 2010 USD), GDP growth (annual %), domestic credit to private sector (% of GDP), general government final consumption expenditure (% of GDP), and inflation. Time and sector FE are included.

Table 9: Adding doing business scores.

	(1) Full sample	(2) Micro	(3) Small	(4) Medium
Panel A: investment effect				
(Dependent variable: innovation)				
Recovery	0.002***	0.001**	0.002***	0.002***
	(0.000)	(0.000)	(0.001)	(0.000)
Observations	55189	19472	17695	18022
Pseudo-R^2	0.03	0.03	0.03	0.04
Score	0.003***	0.002***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	55189	19472	17695	18022
Pseudo-R^2	0.03	0.03	0.03	0.04
Time	-0.030***	-0.027***	-0.034***	-0.033***
	(0.009)	(0.010)	(0.010)	(0.008)
Observations	55189	19472	17695	18022
Pseudo-R^2	0.03	0.03	0.03	0.04
Panel B: constraint effect				
(Dependent variable: hcost)				
Recovery	-0.002***	-0.003***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	33732	14804	10018	8910
Pseudo-R^2	0.1	0.07	0.09	0.13
Score	-0.002**	-0.002**	-0.001**	-0.001***
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	33732	14804	10018	8910
Pseudo-R^2	0.09	0.07	0.08	0.12
Time	0.034***	0.041***	0.031***	0.023***
	(0.006)	(0.007)	(0.006)	(0.005)
Observations	33732	14804	10018	8910
Pseudo-R^2	0.1	0.07	0.09	0.13
Firms controls	Yes	Yes	Yes	Yes
Country indicators	Yes	Yes	Yes	Yes
Time, sector FE	Yes	Yes	Yes	Yes

Notes: Authors' calculations. Cluster robust standard errors in parentheses. Cluster level: country. *** p<0.01, ** p<0.05, * p<0.1. The table reports probit average partial effects (APEs) and all the specifications use sampling weights. Greece and Cyprus are excluded. Column (1) considers the full sample, while columns (2), (3), and (4) the subsamples of micro (1 to 9 employees), small (10 to 49 employees), and medium (50 to 249 employees) firms, respectively. Panel A considers "innovation" as dependent variable and excludes Greece and Cyprus; panel B considers "hcost" as dependent variable and excludes Montenegro. The set of firms' controls includes size (only in col.1), turnover (levels and past growth), age, legal status, ownership type, and subsidies. The country indicators are GDP (log, constant 2010 USD), GDP growth (annual %), domestic credit to private sector (% of GDP), general government final consumption expenditure (% of GDP), and inflation. Three additional indicators from the Doing Business database are considered: "starting a business", "getting credit", and "protecting minority investors". Time and sector FE are included.

Table 10: Dispersion effect - interactions.

Effect of RR on:	(1) Recovery	(2) Score	(3) Time
Panel A: considering rates > 25 as missing			
Turn1, innovation	0.028* [4.16; 0.0505]	0.055*** [16.01; 0.0004]	-0.335 [1.09; 0.3057]
Turn2, innovation	-0.006 [0.16; 0.6961]	-0.018 [0.59; 0.4468]	0.128 [0.28; 0.6019]
Turn3, innovation	-0.0021 [2.34; 0.1370]	-0.025 [1.20; 0.2828]	0.094 [0.07; 0.7966]
Turn4, innovation	-0.024** [5.54; 0.0256]	-0.035** [6.45; 0.0167]	0.412 [2.48; 0.1260]
Turn5, innovation	-0.030** [6.82; 0.0141]	-0.042*** [8.73; 0.0062]	0.506* [2.90; 0.0993]
Turn6, innovation	-0.043*** [8.20; 0.0077]	-0.064** [6.17; 0.0190]	0.723* [3.35; 0.0774]
Panel B: excluding Cyprus and Greece			
Turn1, innovation	0.029*[3.16; 0.0866]	0.05*** [9.66; 0.0044]	-0.368 [1.00; 0.3273]
Turn2, innovation	-0.007[0.10; 0.7552]	-0.015 [0.28; 0.6020]	0.132 [0.16; 0.6893]
Turn3, innovation	-0.025 [1.64; 0.2116]	-0.026 [0.80; 0.3789]	0.098 [0.05; 0.8222]
Turn4, innovation	-0.028* [3.88; 0.0592]	-0.038** [5.61; 0.0253]	0.44[1.91; 0.1783]
Turn5, innovation	-0.028* [4.08; 0.0535]	-0.037** [5.15; 0.0314]	0.442 [2.00; 0.1686]
Turn6, innovation	-0.045** [5.09; 0.0323]	-0.066** [5.26; 0.0299]	0.76 [2.53; 0.1233]
Panel C: adding doing business scores			
Turn1, innovation	0.027** [5.16; 0.0307]	0.045*** [17.32; 0.000]	-0.447 [2.32; 0.1381]
Turn2, innovation	-0.011 [0.32; 0.5742]	-0.02 [0.79; 0.3803]	0,132 [0.19; 0.6667]
Turn3, innovation	-0.02 [1.56; 0.2215]	-0.023 [1.13; 0.2956]	0.012 [0.00; 0.9750]
Turn4, innovation	-0.026* [3.75; 0.0626]	-0.039** [5.42; 0.0271]	0.342 [1.22; 0.2791]
Turn5, innovation	-0.034** [5.95; 0.0211]	-0.049*** [8.62; 0.0064]	0.489 [2.24; 0.1454]
Turn6, innovation	-0.049** [7.00; 0.0130]	-0.069*** [8.12; 0.0080]	0.764 [2.52; 0,1229]

Notes: Authors' calculations. The table shows the overall effects of *RR* on *dispersion* for firms that invest in innovation in each turnover category. Column (1) considers *recovery* as measure for *RR*, while columns (2) and (3) *score* and *time*, respectively. Turn1 indicates turnover (T) $\leq$ €500k; Turn2 €500k $<$ T $\leq$ €1mln; Turn3 €1mln $<$ T $\leq$ €2mln; Turn4 €2mln $<$ T $\leq$ €10mln; Turn5 €10mln $<$ T $\leq$ €50mln; Turn6 T $>$ €50mln. "Turn[1-6], innovation" refers to firms in the respective turnover category that invest in innovation. Panel A includes rates $\leq$ 25; panel B excludes Greece and Cyprus; panel C includes the three additional doing business indicators ("starting a business", "getting credit", and "protecting minority investors"). F-values and p-values in squared brackets.

Appendix

A Analytical appendix

A.1 Analytical relationship of the functions reported in Figure 1

$$\text{Dash line}: \pi_i = \frac{k_i + z_i}{p_i + \delta_i (1 - p_i)} \qquad \text{Solid line}: \pi_i = k_i + z_i \qquad \text{dot line}: \pi_i = \frac{k_i + z_i}{p_i (1 + \Delta_i) + \delta_i (1 - p_i)}$$

▷ The slope of the dash line is always greater than that of the solid line if $\delta_i < 1$.

$$\text{if} \quad \delta_i < 1 \Longrightarrow p_i + \delta_i (1 - p_i) < 1 \Longrightarrow \text{(dash line slope)} \quad \frac{1}{p_i + \delta_i (1 - p_i)} > 1 \quad \text{(solid line slope)}$$

The wedge between the dash and the solid line, due to $\delta_i < 1$, explains the multiple equilibria interest rates.

▷ The intercept of the dash line is always greater than that of the dot line.

$$\text{Since} \quad \Delta_i > 0 \Longrightarrow (1 + \Delta_i) > 1 \Longrightarrow p_i (1 + \Delta_i) + \delta_i (1 - p_i) > p_i + \delta_i (1 - p_i) \Longrightarrow$$
$$\Longrightarrow \text{(dash line intercept)} \quad \frac{1}{p_i + \delta_i (1 - p_i)} > \frac{1}{p_i (1 + \Delta_i) + \delta_i (1 - p_i)} \quad \text{(dot line intercept)}$$

▷ The intercept of the dot line is $\lessgtr$ than that of the solid line if $\delta_i \gtrless 1 - \frac{p_i \Delta_i}{(1 - p_i)}$

$$\text{if} \quad \delta_i \gtrless 1 - \frac{p_i \Delta_i}{(1 - p_i)} \Longrightarrow p_i (1 + \Delta_i) + \delta_i (1 - p_i) \gtrless 1 \Longrightarrow$$
$$\Longrightarrow \text{(dot line intercept)} \quad \frac{1}{p_i (1 + \Delta_i) + \delta_i (1 - p_i)} \lessgtr 1 \quad \text{(solid line intercept)}$$

The underlying intuition is the following. The higher (lower) the bankruptcy recovery rate (i.e. the higher δ_i), the lower (higher) the limit defined by condition (6) under which the firm is not able to pay back the full borrowed amount even if the investment in innovation succeeds (i.e. where no equilibrium with $r_i > 0$ exists). Intuitively, the higher (lower) the probability of success (p_i) and the profit gain (Δ_i), the lower (higher) this limit. Note that multiple equilibria interest rates would emerge even if the dotted curve was over the solid one.

A.2 Proof of IPC$_c$ (investment profitability condition with certainty) with $r_i = 0$

$$E(\Pi_i) > \Pi_i^N \qquad \text{if} \qquad (2) > (1)$$

that is

$$p_i \left[(1 + \Delta_i)\, \pi_i - e_i - k_i - z_i\right] + (1 - p_i) \left[\pi_i - e_i - k_i - z_i\right] > \pi_i - (e_i + k_i)$$

We can simplify the left-hand side to find

$$(1 + p_i \Delta_i)\, \pi_i - (e_i + k_i + z_i) > \pi_i - (e_i + k_i)$$

By isolating and collecting π_i we get

$$\pi_i (p_i \Delta_i) > z_i \Longrightarrow \pi_i > \frac{z_i}{p_i \Delta_i} \qquad \blacksquare$$

A.3 Proof of IPC$_u$ (investment profitability condition with uncertainty) with $r_i > 0$

$$E(\Pi_i) > \Pi_i^N \qquad \text{if} \qquad (8) > (1)$$

that is

$$(1 - p_i)\, (-e_i) + p_i \left[(1 + \Delta_i)\, \pi_i - e_i - (k_i + z_i)\, (1 + r_i)\right] > \pi_i - (e_i + k_i)$$

We can simplify the left-hand side to find

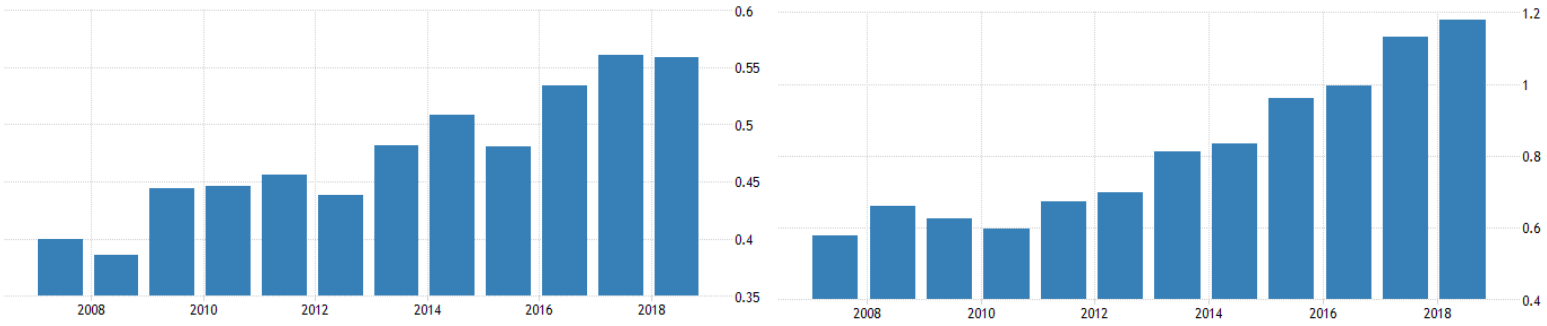
$$\left[p_i\, (1 + \Delta_i) + \delta_i\, (1 - p_i)\right] \pi_i - (e_i + k_i + z_i) > \pi_i - (e_i + k_i)$$

By isolating and collecting π_i we obtain

$$\pi_i \left[p_i \Delta_i - (1 - p_i)(1 - \delta_i)\right] > z_i \Longrightarrow \pi_i > \frac{z_i}{\left[p_i \Delta_i - (1 - p_i)(1 - \delta_i)\right]} \qquad \blacksquare$$

B Additional Figures and Tables

Figure B1: Research and development expenditures in Cyprus and Greece.



(a) Cyprus **(b)** Greece

Notes: The figure reports the annual expenditures in research and development (% of GDP) in Cyprus (panel a) and Greece (panel b). Source: World Bank.

Table B1: Observations by country.

Country	Freq.	Percent	Micro	Small	Medium
Austria	2,305	2.97	778	829	698
Belgium	2,278	2.93	1,002	702	574
Bulgaria	2,306	2.97	752	752	802
Croatia	1,332	1.71	476	403	453
Cyprus	481	0.62	177	151	153
Czech Rep.	2,015	2.59	724	597	694
Denmark	2,213	2.85	605	830	778
Estonia	477	0.61	151	151	175
Finland	2,255	2.90	827	753	675
France	6,564	8.45	2,604	2,083	1,877
Germany	6,444	8.29	1,731	2,357	2,356
Greece	2,408	3.10	1,503	552	353
Hungary	2,261	2.92	958	651	652
Iceland	501	0.64	191	167	143
Ireland	2,310	2.97	807	777	726
Italy	7,056	9.08	3,751	2,002	1,303
Latvia	926	1.19	275	325	326
Lithuania	1,377	1.77	375	475	527
Luxembourg	455	0.59	125	152	178
Malta	477	0.61	175	151	151
Montenegro	504	0.65	187	172	145
Netherlands	3,660	4.71	1,406	1,128	1,126
Poland	5,968	7.68	2,886	1,204	1,878
Portugal	2,388	3.07	1,178	678	532
Romania	2,211	2.85	653	727	831
Slovakia	2,019	2.60	861	578	580
Slovenia	902	1.16	325	252	325
Spain	6,012	7.74	2,855	1,825	1,332
Sweden	2,158	2.78	697	736	725
UK	5,446	7.01	1,720	1,984	1,742
Total	77,709	100.00	30,755	24,144	22,810

Notes: This table presents the number of observations by each sample country. It refers to the five SAFE common round waves over the 2014-2018 period. "Micro" indicates firms with 1-9 employees, "Small" those with 10-49, and "Medium" those with 50-249.

Table B2: Variables definitions and sources.

Variable	Definition	Source
Dependent variables		
Innovation	Dummy equal to 1 if the firm used financing to develop or launch new products or services.	SAFE
Hcost	Dummy equal to 1 if the main reason why the firm does not use bank loans is interest rates or price too high.	SAFE
Dispersion	Difference between the individual and the country average interest rates. It refers to the rate charged for credit line or bank overdraft. Continuous variable.	SAFE
Bankruptcy recovery rate (RR)		
Recovery rate (recovery)	Cents per dollar recovered by secured creditors through judicial reorganisation, liquidation, or debt enforcement proceedings. Continuous variable (0-100 scale).	World Bank/Doing Business
Resolving insolvency score (score)	Gap of each economy from the best performance observed in terms of resolving insolvency. Continuous variable (0-100 scale).	World Bank/Doing Business
Time to resolve insolvency (time)	Average number of years needed to resolve an insolvency procedure. Continuous variable.	World Bank/Doing Business
Firm dummies		
Size	Micro (from 1 to 9 employees); Small (from 10 to 49); Medium (from 50 to 249).	SAFE
Sector	Industry (if *industry* is the main activity); Construction (if *construction* is the main activity); Trade (if *trade* is the main activity); Services (if *services* is the firm's main activity).	SAFE
Age	Age < 2; $2 \leq$ Age < 5; $5 \leq$ Age < 10; Age ≥ 10.	SAFE
Annual turnover (T)	T $\leq$ €500k (Turn1); €500k $<$ T $\leq$ €1mln (Turn2); €1mln $<$ T $\leq$ €2mln (Turn3); €2mln $<$ T $\leq$ €10mln (Turn4); €10mln $<$ T $\leq$ €50mln (Turn5); T $>$ €50mln (Turn6).	SAFE
Turnover past growth (TG)	TG < 0; TG $= 0$; $0 <$ TG $< 20\%$; TG $\geq 20\%$; (over the past 3 years).	SAFE
Ownership type	Public shareholders; family; business associate; venture capital (VC) or business angel (BA); single owner; others.	SAFE
Legal status	Autonomous (if the firm is an autonomous profit-oriented enterprise).	SAFE
Subsidised	Subsidies (if in the past six months the firm received grants or subsidised bank loans).	SAFE
Country controls	GDP (log, constant 2010 USD); GDP growth (annual %); Domestic credit provided by banks to private sector (% of GDP); General government final consumption expenditure (% of GDP); Inflation (CPI, annual %).	World Bank
Post-hoc variables		
Apply	Dummy variable equal to 1 if the firm applied for one of the following types of financing: credit line, bank overdraft or credit card overdraft, bank loans, trade credit, others.	SAFE
Apply_bank_loans	Dummy variable equal to 1 if the firm applied for bank loans.	SAFE
Outlook	Dummy variable equal to 1 if the firm's general economic outlook improved.	SAFE
Starting a business	It records all procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business, as well as the time and cost to complete these procedures and the paid-in minimum capital requirement. Continuous variable (0-100 scale).	World Bank/Doing Business
Getting credit	It measures the extent to which lenders have credit information on entrepreneurs seeking credit and to which the law is favourable to borrowers and lenders movable assets as collateral. Continuous variable (0-100 scale).	World Bank/Doing Business
Protecting minority investors	It measures the extent to which minority shareholders are protected from conflicts of interest. Continuous variable (0-100 scale).	World Bank/Doing Business

Notes: This table presents the definitions of the variables used in the empirical analysis.

Table B3: Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Innovation	62,047	0.1871	0.3900	0	1
Hcost	36,287	0.0930	0.2904	0	1
Dispersion	6,838	2.1830	2.3707	0	42.29
Recovery	77,709	68.1919	18.5327	30	90.3
Score	77,709	74.8704	11.8987	38.07	93.89
Time	77,709	1.8743	0.8989	0.4	4
Micro	77,709	0.3958	0.4890	0	1
Small	77,709	0.3107	0.4628	0	1
Medium	77,709	0.2935	0.4554	0	1
Industry	77,709	0.2340	0.4234	0	1
Construction	77,709	0.1191	0.3239	0	1
Trade	77,709	0.2590	0.4381	0	1
Services	77,709	0.3879	0.4873	0	1
Age < 2	77,607	0.0133	0.1145	0	1
$2 \leq$ Age < 5	77,607	0.0492	0.2163	0	1
$5 \leq$ Age < 10	77,607	0.1312	0.3376	0	1
Age ≥ 10	77,607	0.8063	0.3952	0	1
T $\leq$ €500k	75,317	0.2918	0.4546	0	1
€500k $<$ T $\leq$ €1mln	75,317	0.1359	0.3427	0	1
€1mln $<$ T $\leq$ €2mln	75,317	0.1300	0.3363	0	1
€2mln $<$ T $\leq$ €10mln	75,317	0.2500	0.4327	0	1
€10mln $<$ T $\leq$ €50mln	75,317	0.1583	0.3650	0	1
T $>$ €50mln	75,317	0.0346	0.1827	0	1
TG < 0	75,553	0.1630	0.3693	0	1
TG $= 0$	75,553	0.2143	0.4104	0	1
$0 <$ TG $< 20\%$	75,553	0.4627	0.4986	0	1
TG $\geq 20\%$	75,553	0.1600	0.3666	0	1
Public shareholders	77,488	0.0262	0.1597	0	1
Family	77,488	0.4098	0.4918	0	1
Business Associate	77,488	0.1270	0.3329	0	1
VC or BA	77,488	0.0074	0.0858	0	1
Single owner	77,488	0.3928	0.4884	0	1
Others	77,488	0.0369	0.1885	0	1
Autonomous	77,709	0.8570	0.3501	0	1
Subsidised	75,028	0.0801	0.2715	0	1
Apply	67,519	0.4264	0.494	0	1
Apply_bank_loans	45,512	.2719	.4449	0	1
Outlook	71,807	0.2302	0.4209	0	1
GDP (log)	77,709	27.0871	1.4779	22.20	29.00
GDP growth	77,709	2.6956	2.3532	-1.86	25.16
Domestic credit	77,709	86.1142	33.9267	25.70	252.78
Government expenditures	77,709	19.9098	2.9893	11.9003	26.3653
Inflation	77,709	.7727	1.0428	-2.09	4.6254
Starting a business	77,709	88.20	4.79	75.20	95.15
Getting credit	77,709	60.06	13.22	10	85
Protecting minority investors	77,709	66.96	7.17	50	84

Notes: This table presents unweighted summary statistics for the variables used in the empirical analysis. It refers to the five SAFE common round waves over the 2014-2018 period.

References

Acs, Z. J. and Audretsch, D. B. (1988). Innovation in large and small firms: an empirical analysis. *American Economic Review*, 78(4):678–690.

Akerlof, G. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, 84(3):488–500.

Armour, J. and Cumming, D. (2008). Bankruptcy law and entrepreneurship. *American Law and Economics Review*, 10(2):303–350.

Audretsch, D. B. and Belitski, M. (2020). The role of R&D and knowledge spillovers in innovation and productivity. *European Economic Review*, 123:103391.

Audretsch, D. B., Kritikos, A. S., and Schiersch, A. (2020). Microfirms and innovation in the service sector. *Small Business Economics*, 55(4):997–1018.

Banerjee, R. and Blickle, K. (2021). Financial frictions, real estate collateral and small firm activity in Europe. *European Economic Review*, 138:103823.

Baumann, J. and Kritikos, A. S. (2016). The link between R&D, innovation and productivity: Are micro firms different? *Research Policy*, 45(6):1263–1274.

Beck, T. (2013). Bank financing for SMEs–lessons from the literature. *National Institute Economic Review*, 225(1):R23–R38.

Beck, T. and Demirguc-Kunt, A. (2006). Small and medium-size enterprises: Access to finance as a growth constraint. *Journal of Banking & Finance*, 30(11):2931–2943.

Berkowitz, J. and White, M. J. (2004). Bankruptcy and small firms' access to credit. *RAND Journal of Economics*, 35:69–84.

Block, J. H. (2012). R&D investments in family and founder firms: An agency perspective. *Journal of Business Venturing*, 27(2):248–265.

Block, J. H., Thurik, R., and Zhou, H. (2013). What turns knowledge into innovative products? The role of entrepreneurship and knowledge spillovers. *Journal of Evolutionary Economics*, 23(4):693–718.

Casey, E. and O'Toole, C. M. (2014). Bank lending constraints, trade credit and alternative financing during the financial crisis: Evidence from European SMEs. *Journal of Corporate Finance*, 27:173–193.

Cerqueiro, G. and Penas, M. F. (2017). How does personal bankruptcy law affect startups? *The Review of Financial Studies*, 30(7):2523–2554.

Cerqueiro, G., Penas, M. F., and Seamans, R. (2019). Debtor protection and business dynamism. *The Journal of Law and Economics*, 62(3):521–549.

Chiu, J., Meh, C., and Wright, R. (2017). Innovation and growth with financial, and other, frictions. *International Economic Review*, 58(1):95–125.

Chowdhury, F., Audretsch, D. B., and Belitski, M. (2019). Institutions and entrepreneurship quality. *Entrepreneurship Theory and Practice*, 43(1):51–81.

Claessens, S. and Klapper, L. F. (2005). Bankruptcy around the world: explanations of its relative use. *American Law and Economics Review*, 7(1):253–283.

Conte, A. and Vivarelli, M. (2014). Succeeding in innovation: key insights on the role of R&D and technological acquisition drawn from company data. *Empirical Economics*, 47(4):1317–1340.

Covin, J. G. and Wales, W. J. (2012). The measurement of entrepreneurial orientation. *Entrepreneurship Theory and Practice*, 36(4):677–702.

Cowling, M., Liu, W., and Ledger, A. (2012). Small business financing in the UK before and during the current financial crisis. *International Small Business Journal*, 30(7):778–800.

Cowling, M., Robson, P., Stone, I., and Allinson, G. (2018). Loan guarantee schemes in the UK: the natural experiment of the enterprise finance guarantee and the 5 year rule. *Applied Economics*, 50(20):2210–2218.

Czarnitzki, D. and Hottenrott, H. (2011). R&D investment and financing constraints of small and medium-sized firms. *Small Business Economics*, 36(1):65–83.

Dai, L., Maksimov, V., Gilbert, B. A., and Fernhaber, S. A. (2014). Entrepreneurial orientation and international scope: The differential roles of innovativeness, proactiveness, and risk-taking. *Journal of Business Venturing*, 29(4):511–524.

Djankov, S., Hart, O., McLiesh, C., and Shleifer, A. (2008). Debt enforcement around the world. *Journal of Political Economy*, 116(6):1105–1149.

Estrin, S., Mickiewicz, T., and Rebmann, A. (2017). Prospect theory and the effects of bankruptcy laws on entrepreneurial aspirations. *Small Business Economics*, 48(4):977–997.

European Commission (2017). *Small and medium-sized enterprises' access to finance*. European Commission.

Fan, W. and White, M. J. (2003). Personal bankruptcy and the level of entrepreneurial activity. *The Journal of Law and Economics*, 46(2):543–567.

Farè, L. (2022). Exploring the contribution of micro firms to innovation: does competition matter? *Small Business Economics*, 59:1081–1113.

Ferrando, A. and Mulier, K. (2022). The real effects of credit constraints: Evidence from discouraged borrowers. *Journal of Corporate Finance*, 73:102171.

Ferrando, A., Popov, A., and Udell, G. F. (2019). Do SMEs benefit from unconventional monetary policy and how? Microevidence from the Eurozone. *Journal of Money, Credit and Banking*, 51(4):895–928.

Ferrando, A., Popov, A., and Udell, G. F. (2022). Unconventional monetary policy, funding expectations, and firm decisions. *European Economic Review*, 149:104268.

Freel, M. S. (2007). Are small innovators credit rationed? *Small Business Economics*, 28(1):23–35.

Fu, K., Wennberg, K., and Falkenhall, B. (2020). Productive entrepreneurship and the effectiveness of insolvency legislation: a cross-country study. *Small Business Economics*, 54(2):383–404.

Gómez, M. G.-P. (2019). Credit constraints, firm investment and employment: Evidence from survey data. *Journal of Banking & Finance*, 99:121–141.

Gorodnichenko, Y. and Schnitzer, M. (2013). Financial constraints and innovation: Why poor countries don't catch up. *Journal of the European Economic Association*, 11(5):1115–1152.

Greene, W. H. (2003). *Econometric analysis*. Pearson Education India.

Gropp, R., Scholz, J. K., and White, M. J. (1997). Personal bankruptcy and credit supply and demand. *The Quarterly Journal of Economics*, 112(1):217–251.

Hall, B. H. (2002). The financing of research and development. *Oxford Review of Economic Policy*, 18(1):35–51.

Hall, B. H. (2010). The financing of innovative firms. *Review of Economics and Institutions*, 1(1).

Henley, A. and Song, M. (2020). Innovation, internationalisation and the performance of microbusinesses. *International Small Business Journal*, 38(4):337–364.

Holton, S., Lawless, M., and McCann, F. (2014). Firm credit in the euro area: a tale of three crises. *Applied Economics*, 46(2):190–211.

Koellinger, P. (2008). Why are some entrepreneurs more innovative than others? *Small Business Economics*, 31(1):21–37.

La Porta, R., Lopez-de Silanes, F., and Shleifer, A. (2002). Government ownership of banks. *The Journal of Finance*, 57(1):265–301.

Lee, N., Sameen, H., and Cowling, M. (2015). Access to finance for innovative SMEs since the financial crisis. *Research Policy*, 44(2):370–380.

Lee, S.-H., Yamakawa, Y., Peng, M. W., and Barney, J. B. (2011). How do bankruptcy laws affect entrepreneurship development around the world? *Journal of Business Venturing*, 26(5):505–520.

Mankart, J. and Rodano, G. (2015). Personal bankruptcy law, debt portfolios, and entrepreneurship. *Journal of Monetary Economics*, 76:157–172.

Manso, G. (2011). Motivating innovation. *The Journal of Finance*, 66(5):1823–1860.

Mazzucato, M. (2013). Financing innovation: creative destruction vs. destructive creation. *Industrial and Corporate Change*, 22(4):851–867.

OECD (2015). *New Approaches to SME and Entrepreneurship Financing: Broadening the Range of Instruments*. OECD.

O'Sullivan, M. (2005). Finance and Innovation. In *The Oxford Handbook of Innovation*, pages 240–265. Oxford University Press.

Parker, S. C. (2018). *The Economics of Entrepreneurship*. Cambridge University Press.

Rohlin, S. M. and Ross, A. (2016). Does bankruptcy law affect business turnover? evidence from new and existing business. *Economic Inquiry*, 54(1):361–374.

Roper, S. and Hewitt-Dundas, N. (2017). Investigating a neglected part of Schumpeter's creative army: what drives new-to-the-market innovation in micro-enterprises? *Small Business Economics*, 49(3):559–577.

Roux, S. and Savignac, F. (2017). SMEs' financing: Divergence across euro area countries? Working Paper Series No. 654, Banque de France.

Santos, A. and Cincera, M. (2022). Determinants of financing constraints. *Small Business Economics*, 58(3):1427–1439.

Spence, M. (1978). Job market signaling. In *Uncertainty in Economics*, pages 281–306. Elsevier.

Stiglitz, J. E. and Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review*, 71(3):393–410.

Tang, J. (2006). Competition and innovation behaviour. *Research Policy*, 35(1):68–82.

Titman, S. and Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, 43(1):1–19.

Traczynski, J. (2019). Personal bankruptcy, asset risk, and entrepreneurship: Evidence from tenancy-by-the-entirety laws. *The Journal of Law and Economics*, 62(1):151–179.

Ughetto, E., Cowling, M., and Lee, N. (2019). Regional and spatial issues in the financing of small and medium-sized enterprises and new ventures. *Regional Studies*, 53(5):617–619.

Wald, J. K. (1999). How firm characteristics affect capital structure: an international comparison. *Journal of Financial Research*, 22(2):161–187.

White, M. J. (2016). Small business bankruptcy. *Annual Review of Financial Economics*, 8:317–336.

Chapter 3

Does democracy foster entrepreneurship?*

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Abstract

Entrepreneurship has been connected to several socio-economic issues. However, despite the growing conjectures, the links with democracy have yet to be substantiated. By using a country-level panel dataset over the 1972-2010 period, we find evidence that democracy is conducive to entrepreneurship. We shed light on the intensity and multidimensionality of democracy by showing that the promotion of free social interchange and the direct involvement of civil society in political processes are two dimensions of democracy driving such effect. We additionally observe that entrepreneurship is sensitive to both contemporaneous and historical values of democracy. By providing the first systematic empirical evidence that entrepreneurship and democracy are directly connected, this study suggests to consider their ongoing concomitant retreats as two related phenomena.

Keywords:
Entrepreneurship, democracy, knowledge, freedom, institutional trust.

JEL codes:
L26, H11, P16, O10.

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1 Introduction

Democracy has come back to the center of a heated debate. Though democratic institutions had been cemented as unshakable and unassailable for a long period, especially in Western developed economies, recent events challenge this belief. "Democracy in retreat"[1]; "Democracy under siege"[2]; "Authoritarian regimes gain ground"[3]; "We are deeply concerned with the decline in democracy over the past decade"[4]. These are just some of the worrisome growing warnings about the deteriorating health of democracy, which is not a single-country phenomenon but rather a global event (Diamond, 2015, 2020; Plattner, 2015; Lührmann et al., 2019). There is a growing recognition that the logic of democracy can be eroded in small steps, notably in the most established democratic societies (Adler et al., 2023).

Does this matter for entrepreneurship? Past research suggests it does. Over the last two decades, scholars have documented that contextual and institutional changes shape entrepreneurial activity (Baumol, 1990; Hwang and Powell, 2005; Sobel, 2008; Estrin and Mickiewicz, 2011; Welter 2011; Dorado and Ventresca, 2013; Autio et al., 2014; Aparicio et al., 2016; Chowdhury et al., 2019; Urbano et al., 2019, Bennett et al., 2022). Specifically, recent studies point out that entrepreneurship is connected to several issues that can be related to democratic systems, including economic and individual freedom (McMullen et al., 2008; Lehmann and Seitz, 2017), property rights and rule of law (Mickiewicz et al., 2021), distribution of power (Liñán, F., and Fernandez-Serrano, 2014), social networks (Batjargal et al., 2013), social norms (Meek et al., 2010), tolerance and trust (Audretsch et al., 2018). However, the direct link between entrepreneurship and democracy has received little consideration and it needs to be substantiated. Researchers have investigated the effects of democracy on several socio-economic outcomes, ranging from economic growth (Acemoglu et al., 2019; Colagrossi et al., 2020) to innovation (Wang 2021), health (Besley and

[1] "Democracy in retreat", *Freedom in the World 2019 - Freedom House Report*.
[2] "Democracy under Siege", *Freedom in the World 2021 - Freedom House Report*.
[3] "Democracy Index 2021: The China Challenge", *Economist Intelligence Unit*.
[4] "Autocratization Changing Nature?", *Varieties of Democracy Report 2022*.

Kudamatsu, 2006), human capital (Baum and Lake, 2003), access to credit (Osei-Tutu and Weill, 2022), and many others. Yet whether and how democracy *per se* affects entrepreneurship is still an open question.

The conversation around this relationship is gaining momentum in the public debate, as recent newspaper or magazine articles testify: "The world will see more business opening and startups when global democracy improves" [5]; "American business needs American democracy" [6]; "Democracy needs Business and Business needs Democracy"[7]; "Democracy is good for business"[8]. However, no attempts have been pursued so far to subject these conjectures to empirical scrutiny. Audretsch and Moog (2022) have fueled also the academic discussion by providing pioneering theoretical underpinnings to the entrepreneurship-democracy link. They report historical and contemporary contexts where similar trends in democracy and entrepreneurship have concomitantly been observed. Inspired by this important contribution, we aim to make a step further in the exploration of the relationship between democracy and entrepreneurship in two ways. First, we assess whether this so far only conceptually addressed connection is supported by quantitative evidence. Second, we start exploring potential mechanisms underlying the relationship between these two concepts.

We posit that discovering whether and how democracy and entrepreneurship, two pillars of most of developed societies, are inherently connected is of paramount importance. If this is the case, the aforementioned contraction confronting democracy might not come without cost for entrepreneurship. Threatening democracy would mean undermining entrepreneurship. Furthermore, being entrepreneurship a primary source for many socio-economic issues, the propagation of these negative consequences can be sizable and unpredictable. In this regard, our research also joins the compelling conversation on the decline in entrepreneurship in advanced economy. Along with the

[5] "The relationship between democracy and business", *CEO Today Magazine*, August 05, 2021.
[6] Rebecca Hendersen, "Business Can't Take Democracy for Granted", *Harvard Business Review*, January 08, 2021.
[7] Michael Carney, "Democracy Needs Business & Business Needs Democracy", *U.S. Chamber of Commerce Foundation*, January 12, 2021.
[8] Matthew Douglas, "Democracy is good for business", *TechCrunch*, March 12, 2019.

documented retreat of democracy, alarming signals similarly suggest a slowdown of entrepreneurship. Market concentration and market power have risen in several industries (De Loecker et al., 2020, Feldman et al., 2021), while business dynamism and the number of new firms fall in many of the most advanced economies (Decker et al., 2016; Naudé, 2022). This suggests that, as for democracy, taking entrepreneurship for granted would be a serious mistake. We argue that the same effort made to explain the cause of the impressive spread of entrepreneurship should now be devoted to understand its contraction. If the positive connection between democracy and entrepreneurship is proven, entrepreneurship scholars may have at least part of the answer.

Extant literature has mainly considered democracy as a general and dichotomous concept, by using primarily binary indicators to measure it. We find this approach limiting, as democracy is rather a nuanced and multifaceted phenomenon with different dimensions and intensities (Lindberg et al., 2014; Teorell, et al., 2019). Along with distinguishing between democratic and non-democratic countries we believe it is important to assess also different levels of intensity of democracy among democratic societies, where democratization evolves gradually (Berggren and Bjørnskov, 2022; Adler et al., 2023). In doing that, we follow the emerging literature on institutional changes (Davidsson, 2020, Mickiewicz et al., 2021; Acemoglu et al., 2021; Berggren and Bjørnskov, 2022) encouraging scholars to complement the established static view on institutions with a more dynamic perspective. Contexts and institutions evolve over time and even small changes may impact entrepreneurial activity (Mickiewicz et al., 2021). Democracy is not exception and democratic institutions may change both substantially and gradually. A contribution of our study is to shed light on the intensity and multidimensionality of democracy and to explore how they affect entrepreneurial activity. We are not only interested to know whether democracy matters for entrepreneurship, but also to consider more fine-grained aspects behind the democracy-entrepreneurship link by asking which dimensions of democracy are more likely to matter.

Accordingly, we address two main research questions: Does democracy foster entrepreneurship? And, which dimensions of democracy matter for entrepreneurship? To answer these questions we

assemble a multisource country-level panel dataset of 23 countries over the period 1972-2010. By performing cross-countries longitudinal analyses and a quasi-natural experiment with three transitions from autocracy to democracy, we provide evidence that democracy fosters entrepreneurship. Further, we show that the promotion of free social interchange and civic involvement in political processes are two underlying dimensions of democracy driving this effect. We additionally qualify our analysis by showing that entrepreneurship is sensitive to both contemporaneous and historical levels of democracy. Our empirical findings are robust to alternative specifications, including test addressing possible endogeneity due to the mutual interplay between democracy and entrepreneurship. The relationship is likely to be two-sided, with democracy fostering entrepreneurship and entrepreneurship reinforcing democracy. As such, along with justifying our hypotheses with theoretical arguments, we also address the reverse causality issue empirically.

To our best knowledge, our research provides the first systematic empirical evidence that the conjectured link between entrepreneurship and democracy actually exists. In doing so, we advance institutional theory of entrepreneurship by unraveling that democracy, arguably the most qualifying institutional pillar of most of advanced economies, is conducive to entrepreneurship. We further contribute by showing that gradual changes in the intensity of democracy affect entrepreneurial activity and by exploring two underlying channels of this relationship. To the extent to which they promote free social interactions and the active engagement of civil society, political institutions can help to facilitate entrepreneurial activity.

Along with following the invitation of Audretsch and Moog (2022), who encourage research to "measuring, identifying and analyzing the links between entrepreneurship and democracy" (p.386), our study also heeds recent calls by entrepreneurship scholars to start investigating changes in context (Davidsson, 2020, Batjargal et al., 2023) and to develop more time-sensitive entrepreneurship research (Lévesque and Stephan, 2020). By exploiting longitudinal techniques and democratic transitions, we show that both gradual and substantial changes (Mickiewicz et al. 2021)

in democracy affect entrepreneurial activity. Thus, we draw attention not only on transitions from autocracy to democracy, but also on variations in the intensity of democracy occurring in democratic societies.

Our study also has theoretical implications for expanding knowledge on the role of democracy in shaping socio-economic environments. We add entrepreneurship to those outcomes that can be directly connected to democracy. In particular, this study provides evidence not just that democracy matters, but that it matters for entrepreneurship. We suggest to entrepreneurship scholars a new element to explain the ongoing downturn in entrepreneurship in developed countries (Naudé, 2022). The documented retreat in democracy might be part of the answer.

The remainder of the paper is organized as follows. In section 2, we frame the theoretical background and we formulate the hypotheses. Section 3 illustrates the analytical methodology, while section 4 reports empirical results. In section 5, we discuss the main theoretical and practical implications of the study. Section 6 outlines limitations and suggests avenues for future research. Section 7 concludes.

2 Theory and Hypotheses

Entrepreneurship has been connected to several economic and social factors of our time and it is considered to be an important mechanism for economic development (Carree and Thurik, 2003; Acs et al, 2008). The transition from the managed to the entrepreneurial economy that materialized in many developed countries over the last decades of the past century (Audretsch and Thurik, 2000) prompted scholars and policymakers to understand the determinants of entrepreneurial activity and the driving factors of its surge. Topics that have been linked to entrepreneurship are countless, ranging from economic growth (Wennekers and Thurik, 1999; Aghion, 2017) to job creation (Birch, 1981; Decker et al., 2014), knowledge spillovers (Acs et al., 2013; Ghio et al., 2015), innovation (Morris et al., 2010; Block et al., 2013), and digitalization (Calvino et al., 2019). However, though conjectured, the direct linkage between entrepreneurship and democracy remains

an unchartered territory. This is a non-negligible gap of knowledge in the entrepreneurship literature that needs to be addressed. Democracy and entrepreneurship are indeed two pillars of Western developed economies and key qualifying determinants of many social end economic cultures around the world. As the *CEO Today Magazine* recently stated, "The relationship between business and democracy is an interesting one and may be something you wish to discuss further, read about or write about."[9]

We build on the institutional theory of entrepreneurship (Baumol, 1990; North, 1990; Sobel, 2008; Estrin and Mickiewicz, 2011; Dorado and Ventresca, 2013; Autio et al., 2014; Aparicio et al., 2016; Chowdhury et al., 2019; Urbano et al., 2019; Bennett et al., 2022) and we draw on the established view that institutional and contextual conditions are key determinants of entrepreneurial activity (Welter, 2011; Schmutzler et al., 2019; Welter et al., 2019, Audretsch et al., 2022). Entrepreneurship requires a context to make free choices in both thought and action (Bradley and Klein, 2016). The need of a contextualized perspective on entrepreneurship has stimulated scholars to study how institutional- and context-specific factors affect entrepreneurial activity. A wide array of issues have been considered, including the level of economic and financial development (Black and Strahan, 2002; Wennekers et al., 2005), corruption (Anokhin and Schulze, 2009; Dutta and Sobel, 2016; Boudreaux et al., 2018), education and human capital (Davidsson and Honig, 2003; Korosteleva and Belitski, 2017), family context (Aldrich and Cliff, 2003; Bettinelli et al., 2014; Randerson et al., 2015), bankruptcy law (Fan and White, 2003; Armour and Cumming, 2008; Peng et al., 2010; Lee et al., 2011; Fu et al., 2020), tax policies and business regulation (Keuschnigg and Bo Nielsen, 2004; Van Stel et al., 2007; Belitski et al., 2016). However, evidence that democracy *per se* is conducive to entrepreneurship has not yet been provided. Being democracy arguably the most qualifying and distinguishable institutional dimension in developed countries, understanding whether it directly fosters entrepreneurship is not of secondary importance.

[9] See note 5.

We also ground in the acknowledged evidence that democracy shapes socio-economic outcomes. Scholars have shown the prominence of democracy for several issues, ranging from economic growth (Barro, 1996; Papaioannou and Siourounis, 2008; Acemoglu et al., 2019) to income inequality and redistribution (Rodrik, 1999; Lee 2005; Acemoglu et al., 2008; Acemoglu et al., 2015; Madsen et al., 2015; Scheve and Stasavage, 2017), tax revenues and government expenditures (Acemoglu and Robinson, 2000; Mulligan et al., 2004; Aidt et al. 2006; Acemoglu et al., 2015), education (Baum and Lake, 2003; Lindert, 2004; Acemoglu et al., 2005; Gallego, 2010; Harding and Stasavage, 2014; Aghion et al., 2019), health (Besley and Kudamatsu, 2006; Blaydes and Kayser, 2011; Kudamatsu, 2012; Gerring et al., 2012; Pieters et al., 2016; Cassan and Van Steenvoort, 2021), innovation (Gao et al., 2017; Wang 2021), access to credit (Osei-Tutu and Weill, 2022), economic reforms (Grosjean and Senik, 2011; Rode and Gwartney, 2012; Giuliano et al., 2013), and civil wars (Reynal-Querol, 2005). To date, entrepreneurship has not been considered among these outcomes.

Audretsch and Moog (2022) are the first who provide a *prima facia* case that entrepreneurship and democracy are connected. They do so by focusing on several historical and contemporary contexts where similar trends in entrepreneurship and democracy are observed. However, as the authors themselves point out, these are carefully selected historical examples that need to be subjected to systematic empirical scrutiny to identify formal channels of correlation and causality. Wolfe and Patel (2022) also explore the democracy-entrepreneurship nexus by considering the context of the Arab Spring in Tunisia. While their findings suggest that the transition to democracy enhanced certain individual attitudes that could promote future entrepreneurial endeavors, they do not find a significant change in actual entrepreneurial activity. This could be explained by the restricted case study and by the limited time period, which might not allow to observe the direct effect of democracy and entrepreneurship. Our research includes a larger number of countries and a longer period. As far as we know, our study is the first to investigate the link between democracy and entrepreneurship by using a large cross-country sample over a long time period. Moreover, we do

not limit our analysis to radical changes (transitions to democracy), but we also consider gradual changes in the intensity of democracy. Scholars have recently stressed the need to study the impact of institutional dimensions on entrepreneurial activity using cross-national data (Urbano and Alvarez, 2014), and to consider both gradual (limited) and radical (substantial) changes in the socio-institutional context (Mickiewicz et al., 2021).

2.1 Linking democracy to entrepreneurship

Several arguments motivate us to explore the direct link between democracy and entrepreneurship. First and foremost, democracy and entrepreneurship share the same underlying force of context. It is well accepted that individual and social freedom, together with decentralized decision-making systems, are pillars of democracy (Dahl, 1998) and also crucial conditions for developing successful entrepreneurial activities (Florida, 2004; Lazear, 2005, Bradley and Klein, 2016; Lehmann and Seitz, 2017; Vivona, 2023). Though direct evidence of the democracy-entrepreneurship link is still missing, prior contributions show that entrepreneurship, or some antecedents of entrepreneurship, can be affected by several factors qualifying democratic contexts. For instance, institutional environments with effective checks and balances and strong political rights can facilitate risk-taking decisions (Boubakri et al., 2013; Ashraf, 2017) and access to funding (Qi et al., 2010; Osei-Tutu and Weill, 2022), both essential components for running a business (Parker, 2018). Similarly, contexts where social interactions are not constrained can inspire new entrepreneurial ideas by promoting face-to-face contacts and social networks (Audretsch and Thurik, 2000; Batjargal et al., 2013). Other factors encouraging individuals to engage in entrepreneurial activity include social tolerance, which can boost creative entrepreneurship by promoting personal autonomy and diversity (Berggren and Elinder, 2012); equal distribution of power and low power distance (Liñán, F., and Fernandez-Serrano, 2014); as well as property rights and sound rule of law (Mickiewicz et al., 2021). Further, democratic processes can be consistent with higher levels of academic (Berggren and Bjørnskov, 2022) and economic freedom (Lawson et al., 2020), which are both positive for

ventures creation and growth (Aghion et al., 2008; McMullen et al., 2008; Bennett, 2021). Accordingly, there is a quite converging recognition that an entrepreneurial culture benefits from decentralized and autonomous socio-institutional systems (Bradley and Klein, 2016; Audretsch and Moog, 2022; Vivona, 2023). In line with this view, lower levels of entrepreneurship have been observed in formerly centrally planned countries (Aidis et al., 2008). We believe that the aforementioned factors (a decentralized decision-making system, stronger checks and balances and political rights, unconstrained social interactions, distribution of power, property rights, rule of law, high levels of social tolerance and freedom) are more likely to be safeguarded in democratic contexts, and therefore that democracy has intrinsic attributes that can unleash entrepreneurial initiatives.

A second underlying argument linking democracy to entrepreneurship is that both of them have been positively associated to economic development. On the one hand, there is sound evidence of the positive effect of democracy on economic growth (Acemoglu et al., 2019; Colagrossi et al., 2020). On the other, likewise robust evidence shows that entrepreneurship as well plays a relevant role in promoting economic growth (Wennekers and Thurik, 1999; Van Stel et al., 2005; Audretsch et al., 2006; Aghion, 2017). It does so mainly by creating new jobs (Audretsch and Thurik, 2000, Decker et al., 2014) and, as the knowledge spillovers theory of entrepreneurship suggests, by fostering innovation and transforming unexploited new knowledge in economic commercialized knowledge (Audretsch and Lehmann, 2005; Acs et al., 2013; Block et al., 2013; Ghio et al., 2015; Audretsch and Belitski, 2020). The fact that both democracy and entrepreneurship are considered to be important determinants of economic development is a further suggestion of their common attributes.

In sum, due to the intrinsic characteristics of democracy and the common foundation with entrepreneurship, we expect to observe a direct relationship between these phenomena and particularly that democracy is conducive to more entrepreneurship. Therefore, concerning our first research question, we hypothesize the following:

Hypothesis 1 (H1): *Democracy has a direct positive effect on entrepreneurship.*

Next, we investigate potential mechanisms through which democracy can foster entrepreneurship. Democracy is a multifaceted phenomenon, characterized by different nuances and several complementary dimensions. As such, as our second research question states, it is important to identify those dimensions through which democracy is likely to affect entrepreneurship.

The first dimension we examine refers to the promotion of freedom of thought, action, expression and association, arguably the main cornerstone of democracy (Dahl, 1998). These are not only qualifying components of democracy, but also crucial prerequisites for the creation and diffusion of knowledge (Ober, 2008). By promoting free social relationships, democracy should help to connect knowledge that is dispersed among institutions and individuals, which is a crucial requirement for problem solving and business creation (Hayek, 1945; Utterback, 1971), and facilitate face-to-face contacts, which are potent conduits for transmitting knowledge (von Hippel, 1994) and for developing creative entrepreneurial ideas (Audretsch and Thurik, 2000; Giannetti and Simonov, 2009; Andersson and Larsson, 2016). The link between knowledge diffusion and entrepreneurship is also well documented by the knowledge spillovers theory of entrepreneurship (Acs et al., 2013; Ghio et al., 2015; Audretsch and Belitski, 2020, Gu et al., 2022), which identifies in the creation and commercialization of knowledge a key element fostering entrepreneurial activity. Unconstrained social networks help entrepreneurs to access resources (Batjargal et al., 2013) and they feature social structures where knowledge and creativity can spillover (Hauser et al., 2007). Moreover, institutional support for interactions and the diffusion of knowledge about new ventures can aid firms to build the cognitive and sociopolitical legitimation needed for an enduring activity (Aldrich and Fiol, 1994). Akcigit and Ates (2021) similarly refer to the connection between knowledge diffusion and entrepreneurial activity by showing that the slowdown in knowledge diffusion is a prominent cause of the ongoing decline in business dynamism in the United States.

Grounded in these arguments, we expect that, to the extent to which it promotes free social interchange, democracy can foster entrepreneurship through the creation and diffusion of knowledge. We call this the *knowledge channel* and we hypothesize that:

Hypothesis 2 (H2): *Democracy fosters entrepreneurship by facilitating knowledge creation and diffusion. It does so by promoting social and cultural interchange through freedom of thought, action, expression and association (knowledge channel).*

The second dimension of democracy we look at is the direct involvement of civil society in political and decision-making processes. The participatory principle is a prominent one in democratic societies (Smith, 2009). This includes the active civic engagement in electoral and non-electoral processes, the direct popular vote and the interchange with local governments. Prior research suggests that the direct consultation of civil society is a way through which democratic institutions can build institutional trust (Rainer and Siedler, 2009; Ljunge, 2014; Freitag and Ackermann, 2016). Citizens feel more esteemed and respected if they are active part of social and political decision-making processes.

Along with the stock of knowledge, institutional trust is a key factor affecting entrepreneurial activity (Welter and Smallbone, 2006, Audretsch et al., 2018). While the creation and diffusion of knowledge can inspire new entrepreneurial ideas, mistrust in institutions may discourage individuals to implement these projects and to assume the burden of risk of owning a business. Trust is a necessary condition for cooperative behavior (Brunetto and Farr-Wharton, 2007) and for that reason, entrepreneurs are more likely to became successful if they can build on networks of trust that help them create legitimacy in the market or society (Aldrich, 2000). Interpersonal and institutional trust influences risk-taking decisions (McLain and Hackman, 1999), facilitates knowledge transfer and social capital creation (Lockett et al., 2008), encourages people to collaborate and share trustworthy knowledge (Audretsch et al., 2018). Therefore it is an important

ingredient for starting and growing a new business (Welter, 2012). Further, entrepreneurs would be more prone to assume the burden of risk of owning a business if they have the chance to be directly involved in those political processes that can potentially affect the performance of their businesses (Boubakri et al., 2013).

The *World Economic Forum* has recently advocated this link by referring to political entrepreneurs, defined as "People who build something from nothing to address societal problems": "To build the new generation of political entrepreneurs we must further encourage wider participation in politics. […] Global trust in political institution has decreased".[10]

In light of these arguments, we expect that, to the extent to which it promotes a direct involvement of civil society in political and decision-making processes, democracy can foster entrepreneurship through the enhancement of institutional trust. We call this the *trust channel* and we hypothesize that:

Hypothesis 3 (H3): *Democracy fosters entrepreneurship by enhancing institutional trust. It does so by promoting the direct involvement of civil society in political processes, electoral and non-electoral (trust channel).*

After positing the direction and exploring two driving mechanisms of the effect of democracy on entrepreneurship, we further qualify their relationship by examining the temporal dimension of the effect. In this regard, we expect to observe both a short-run and a long-run impact of democracy on entrepreneurship. On the one hand, an increase in democratization can unleash the implementation of those entrepreneurial ideas that are already defined, but still not realized because of the lack of a propitious context. Entrepreneurs are markedly now-oriented people, who can make quick decisions in order to adjust to the environment (Bird, 1988), and they are sensitive to short-term institutional

[10] Alvin Carpio, "The rise of the political entrepreneurs and why we need them", *World Economic Forum*, November 23, 2017.

changes (Mickiewicz et al., 2021). On the other hand, prior studies suggest that democracy can take time to produce socio-economic outcomes (Geddes, 1999; Rodrik and Wacziarg, 2005; Gao et al., 2017). Part of the effect of democracy on entrepreneurship through the knowledge and the trust channels may not materialize immediately. Accordingly, we expect entrepreneurship to be sensitive to both contemporaneous and historical values of democracy. In line with these arguments, prior research linking democracy to other factors has investigated both the short- and the longer-term relationship by considering also past values of democracy (Bhattacharyya and Hodler, 2010; Gerring et al., 2012; Giuliano et al., 2013; Gründler et al., 2016; Scheve and Stasavage, 2017). Therefore, we posit the following hypothesis:

Hypothesis 4 (H4): *Democracy fosters entrepreneurship in both the short- and long-run, with the current level of entrepreneurship being affected by both contemporaneous and historical values of democracy.*

3 Methods

3.1 Research design

To conduct our research we adopt a quantitative research design. The reason is twofold. First, the primary aim of this study is to provide systematic quantitative evidence showing that democracy and entrepreneurship are connected. While it has been conjectured or addressed conceptually (Audretsch and Moog, 2022), the relationship between these two concepts still needs to be subjected to quantitative scrutiny. Second, the choice to pursue a quantitative approach is driven by the research questions being asked, as they implicitly address issues of change. To prove that democracy fosters entrepreneurship, we need to show that changes in democracy produce positive effect on entrepreneurship. When questions involve change or causal association between variables, a quantitative approach including panel-data regressions or experimental designs is needed (Bono

and McNamara, 2011). This allows us to control for cross-country heterogeneity and appropriately model how changes in democracy within countries influence entrepreneurship. To do so, we need country-level measures of entrepreneurship and democracy covering a long time period, which would be difficult to obtain by adopting a qualitative approach. In light of these reasons, we consider the quantitative approach to be more appropriate to our study.

3.2 Measuring entrepreneurship

Entrepreneurship is a multifaceted phenomenon without a unique definition (Parker, 2018), which makes its measurement challenging (Acs et al., 2014). Hence, it is worth framing carefully the measure and the definition of entrepreneurship we consider.

To assess entrepreneurship we select the *COMPENDIA (COMParative ENtrepreneurship Data for International Analysis)* business ownership rate, constructed by the EIM Business and Policy Research (a *Panteia* company). It covers a set of OECD countries over the period 1972-2012 and it is defined as the total number of business owners as a fraction of total labor force. The COMPENDIA definition of business owners includes the total number of incorporated and unincorporated self-employed outside agriculture, hunting, forestry, and fishing industry, who carry out self-employment as their primary employment activity. The total number of business owners is scaled by the size of labor force.

Self-employment or business ownership is one of the most widely implemented measures of entrepreneurship, both at the individual and at the national level (Evans and Leighton, 1989; Gartner and Shane, 1995; Parker, 2018), and the COMPENDIA business ownership rate is a well-accepted indicator in the entrepreneurship literature.[11] Of course, there exist alternative measures of entrepreneurship that are pervasive in the empirical literature, like new venture creation or the share of small- and medium-sized enterprises in the economy. The application of several measures

[11] See Carree et al. (2002, 2007), Nyström (2008), Parker et al. (2012), Block et al. (2013), Stenholm et al. (2013), Fritsch and Storey (2014), Terjesen et al. (2016), Erken et al. (2018), and Queralto (2020) for examples of studies which use or refer to this COMPENDIA indicator as a measure of entrepreneurship.

confirms that there is not a common definition of entrepreneurship. All these indicators reflect different aspects of the same phenomenon, which make them complementary rather than substitutes.

Among the spectrum of possible measures, we select the COMPENDIA business ownership rate mostly for four reasons. First, by considering owners of both unincorporated and incorporated businesses, this indicator relies on the broadest definition of entrepreneurship, which includes all individuals who do not have an employer and own their own business. It is not limited to nascent entrepreneurs or small business owners, but it embraces the whole self-employment population. Such inclusivity is the main merit of this measure. Another important rationale for using self-employment or business ownership is that entrepreneurship is a risk-taking activity (Parker, 2018). Being self-employed or business owner surely implies the burden of risk.

The second reason is that we aim to consider entrepreneurship that is opportunity- rather than necessity-driven. Distinguishing between these two types of entrepreneurship is crucial, as country context influences entrepreneurship differently if this is motivated by opportunity or by necessity (McMullen, 2008; Amorós et al., 2019). While opportunity entrepreneurship plays a major role in developed countries (Poschke, 2013; Fairlie and Fossen, 2020), in developing countries individuals engage mostly in entrepreneurship out of economic necessity (Naudé, 2010; Sautet, 2013). Thus, having both types of countries in the same sample might be misleading. As we are more interested to capture the effect of democracy on opportunity entrepreneurship, we focus on developed countries. To our best knowledge, the COMPENDIA business ownership rate is the longest and the most backward series on entrepreneurship for developed countries. Moreover, it only considers non-rural self-employed, which is further helpful to isolate opportunity entrepreneurship. Rural self-employment is indeed hardly comparable to self-employment in other industries (Parker, 2018). Prior studies also suggest that, in developed and urbanized areas, self-employment and business ownership are more likely to include a good representative number of innovative entrepreneurs (Glaeser, 2009; Faggio and Silva, 2014; Florida et al., 2017).

Third, the COMPENDIA business ownership rate is harmonized across countries and over time. Self-employment statistics reported by the OECD are hardly comparable across countries, because each country supplies information according to its own self-employment definition (Van Stel, 2005; 2008). Particularly, the extent to which owner of incorporated businesses are included in the self-employment counts differs across countries. Sometimes, they are defined for tax purposes as employees of their own company rather than self-employed. However, as they resemble in all other respects the self-employed status, in cross-country comparisons it is important for consistency to count these individuals as self-employed (Van Stel, 2005; 2008; Parker, 2018). To deal with this issue, COMPENDIA harmonizes the business ownership rate by including in the self-employment definition owners of both incorporated and unincorporated businesses. To guarantee comparability, a correction is made for those countries that do not include incorporated entrepreneurs in the definition of self-employment. The number of incorporated entrepreneurs is estimated from alternative sources, such as Eurostat, *The European Observatory for SMEs* and other country-specific sources for non-European countries.[12] Such harmonization is necessary, given the plethora of measures of country-level entrepreneurship that often do not really speak to one another (Acs et al., 2014).

Finally, this indicator is based on administrative data collected from qualified sources including the OECD Labor Force Statistics, the ILO database, the European Observatory for SMEs, and other country-specific sources. Data from national registries are usually more reliable than self-employment information collected by surveys, as self-assessed answers might raise measurement and comparability issues.

In sum, we consider the most inclusive definition of entrepreneurship, which includes owners of both unincorporated and incorporated businesses. This specification depicts entrepreneurs as risk-taking individuals who decide to own an own business, regardless of the type of activity. By including the largest population of entrepreneurs, our measure aims to assess the total stock of

[12] We refer to Van Stel (2005; 2008) for a detailed explanation of the harmonizing procedure of COMPENDIA.

entrepreneurship rather than disentangle different categories. Moreover, by focusing on non-rural self-employment in developed countries, we are more likely to identify opportunity rather than necessity entrepreneurship.

3.3 Measuring democracy

Democracy is our primary explanatory variable of interest. Like entrepreneurship, it is a very broad and nuanced concept that requires a careful identification. Embracing several dimensions and components, democracy is hardly definable as a general and unique concept (Lindberg et al., 2014; Teorell et al., 2019). Accordingly, we are not only interested to know whether democracy fosters entrepreneurship (H1), but also to explore which dimensions of democracy are conducive to entrepreneurship. Specifically, we consider two dimensions underlying the knowledge channel (H2) and the trust channel (H3). The first dimension emphasizes the promotion of freedom of thought, speech, action and all those elements fostering social interchange. The second dimension stresses the civil society active participation in political processes.

To account for this multidimensional feature of democracy, we rely on the *Varieties of Democracy (V-Dem)* database, one of the largest social science data collection projects on democracy. Co-founded in 2014 by the University of Gothenburg and the Kellogg Institute for international Studies at the University of Notre Dame, this project includes more than 450 socio-economic annual indicators for almost all countries in the world. It reports both historical (1789-1900) and contemporary (1900-present) series. Data collection and aggregation is based on country-specific sources and on ratings provided by more than 3,700 worldwide experts. The multidimensional approach and the differentiation among several components of democracy represent the main novelties of this database (Lindberg et al., 2014; Coppedge et al., 2019). Instead of imposing a general definition that would necessarily omit features of democracy, V-Dem assesses multiple components of democracy to account for a broader range of attributes associated with this concept. This gives us the opportunity to disentangle the dimensions of democracy we propose as conduit for

entrepreneurship. Hence, we find such approach particularly suitable to our research. The growing consideration devoted by recent research to the V-Dem database confirms its quality and reliability.[13]

Specifically, to measure the dimension of democracy connected to the knowledge channel, we select the V-Dem *Electoral democracy index*. This indicator refers to the electoral principle of democracy as captured by Dahl's (1971, 1989) five main components: freedom of association, freedom of expression and alternative sources of information, suffrage, clean elections, elected executive. The V-Dem *Electoral democracy index* is a weighted average of the indices measuring these five components. It emphasizes the role of democracy in promoting free social interchange. Thus, we find this index the most appropriate to assess the dimension of democracy claimed in H2.

To measure the principle of democracy associated to the trust channel, we refer to a second V-Dem indicator called the *Participatory democracy index*. It refers to the participatory principle of democracy, which embodies the values of direct rule and active participation by citizens in all political processes. While participation in elections counts towards this principle, it also emphasizes non-electoral forms of political participation, such as engagement in civil society organizations and other forms of both electoral and non-electoral mechanisms of direct democracy. Specifically, it monitors the civil society involvement in decision-making processes, the direct popular vote and the presence of local governments directly elected. As it emphasizes the participatory principle underlying the trust channel, we select this indicator to test H3.[14]

Along with disentangling different dimensions of democracy, the V-Dem database has a second relevant advantage. By providing continuous measures, not only it distinguishes between democratic and non-democratic countries, but it also allows to assess the intensity of democracy,

[13] We refer to McMann (2018), Teorell et al. (2019), Brunkert et al. (2019), Zuazu (2019), Wang (2021), Bennett et al. (2022), Osei-Tutu and Weill (2022), and Berggren and Bjørnskov (2022) for examples of studies that use or refer to the V-Dem database.

[14] We refer to Table A1 in Appendix for detailed definitions of the *Electoral democracy index* and the *Participatory democracy index*, and to https://www.v-dem.net/project.html for more details about the construction of the indices.

which might vary among democratic societies. Accounting for that would not be possible by approaching democracy solely as a binary concept.

Pairwise correlation shows a strong positive correlation (of 0,88) between the *Electoral* and the *Participatory democracy indices*. This is not unexpected, being democracy a multifaceted phenomenon made of complementary dimensions. However, the fact that they are not perfectly collinear suggests that the information they provide is not exactly the same.

By using the *Electoral* and the *Participatory democracy index*, we are not only able to measure democracy, but also to disentangle the two dimensions of democracy we propose as drivers of the positive effect on entrepreneurship.

3.4 Additional controls

We consider additional controls to account for country-specific dimensions that might determine the country level of entrepreneurship. By doing so, we lessen the risk to use democracy as a catch-all variable for other social and economic factors without accounting for country-level differences. Since our sample starts in the early 70s, collecting country-level measures covering the whole reference period is not straightforward. Lack of data dating back to 1972 prevents us to include other potentially relevant variables. Hence, while relevant, the following controls may not be exhaustive. As rates of entrepreneurship vary with the level of development (Estrin et al., 2013), we consider the (log) GDP and (log) GDP per capita to control for the country level of wealth and economic development (Bjørnskov and Foss, 2008; Urbano et al., 2014). These variables come from *COMPENDIA*. Open markets and knowledge spillovers can also affect business ownership and self-employment (Mickiewicz et al, 2021; Acs et al., 2013). Thus, we control for these two elements by including the sum of exports and imports of goods and services as a percentage of GDP and the level of urbanization (defined as the percentage of total population living in urban areas). We also control for the population structure by considering the (log) total population and the share of female as a percentage of total population (Urbano et al., 2016). Self-employment may be

sensitive to the population gender distribution (Cowling and Taylor, 2001; Verheul et al., 2006). In OECD countries, the probability of being self-employed is higher among men than women (Blanchflower, 2000). These indicators are collected from the *World Bank Development Indicators*. Labor force is also considered, as the business ownership rate is scaled by total labor force. The number of entrepreneurs depends on the proportion of population that is economically active (Urbano et al., 2016). Human capital is another important aspect of entrepreneurship and evidence shows that the decision to become self-employed is influenced by education (Robinson and Sexton, 1994). We thus control for education and human capital with the primary and secondary school enrolment ratio from the Barro-Lee dataset (Acemoglu et al., 2019).[15]

3.5 Final sample

The final baseline sample includes country-level data for 23 OECD countries over the period 1972-2010, giving a balanced panel dataset with 897 total observations.[16] This is the largest sample we can consider in terms of number of countries and years according to data availability. When we investigate the lagged effect of democracy claimed by H4, we also include values of the *Electoral* and the *Participatory index* prior to 1972. This will allow to preserve the largest number of observations of the baseline balanced sample. One could argue that, by considering OECD countries only, our sample may lack of a proper counterfactual group of developing and non-democratic countries. Nevertheless, by assessing democracy with continuous rather than dichotomous measures we can exploit changes in the intensity of democracy, which affect also those countries with an already established democratic regime. Moreover, our sample offers a counterfactual by including three democratic transitions. Over the considered time period, Greece, Portugal and Spain experienced the change from the authoritarian regimes of the Colonels, Salazar, and Franco towards democracy.

[15] We refer to Table A1 in Appendix for detailed variable definitions.
[16] Countries included in the final dataset are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States. To have a balanced panel we consider the sample up to 2010.

Table 1 presents summary statistics for the balanced sample variables. On average, business owners count for the 10 per cent of labor force, ranging from a minimum of 4 to a maximum of 21 per cent. The standard deviation is 0.036. The *Electoral democracy index* and the *Participatory democracy index* take values between 0 and 1. The former has a mean value of 0.85 and it goes from a minimum of 0.074 to a maximum of 0.916 with a standard deviation of 0.091. The latter has a mean value of 0.62 and it ranges from a minimum of 0.02 to a maximum of 0.794 with a standard deviation of 0.088. We also report summary statistics of these two indicators including values from 1962, the most backward value we consider. The high average values of urbanization and education suggest that, within the sample, entrepreneurship should be more opportunity-driven than necessity-driven. Urban entrepreneurship is usually more opportunity-driven than rural entrepreneurship (Parker, 2018) and opportunity entrepreneurs are more educated on average than necessity entrepreneurs (Poschke, 2013). Moreover, according to the evidence on the positive relationship between business owners and innovation in urban areas (Glaeser, 2009; Faggio and Silva, 2014; Florida et al., 2017), the high level of urbanization suggests that business ownership rate is also likely to identify innovative entrepreneurs.

[Insert Table 1 about here]

In Figure 1, we plot the sample yearly average values of the *Business ownership rate* and of the *Electoral* (panel a) and *Participatory* (panel b) *democracy index*. The graphs document an increase in the ownership rate starting from the late 70s up to mid 90s. After a short stabilization, the rate starts decreasing, particularly after the Financial Crisis in 2007. Concerning democracy, for which we plot values from 1962, we register a marked increase in the indices from early 70s to 90s. This represents the "third wave" of democratization of the twentieth century (Huntington, 1991).

Even excluding Greece, Portugal and Spain (panels c and d), previous trends are confirmed. This suggests that the rise in our democracy indicators is not entirely driven by the three transitions.

[Insert Figure 1 about here]

As Figure 1 shows, both dimensions of democracy and the business ownership rate registered a net growth over the sample period. Such evidence motivates us to investigate whether a positive connection between these trends exists. Moreover, the rise in democracy seems to anticipate the increase in the business ownership rate. This might suggest that, if a relationship exists, this should move from democracy to entrepreneurship rather than the other way around. Figure 1 seems also to support what we claim in H4, that also historical values of democracy may matter for entrepreneurship.[17]

4 Hypotheses Testing and Results

In this section we perform several empirical specifications to test the validity of our hypotheses. We initially investigate H1-H3 by exploring the short-term relationship between entrepreneurship and democracy. To this aim, we follow two complementary approaches. We both develop a set of cross-countries longitudinal analyses and a quasi-natural experiment exploiting the three democratic transitions in Greece, Portugal and Spain. By doing so, we can examine how entrepreneurship is sensitive to both changes in the intensity of democracy and to the introduction of democratic regimes. Subsequently, we perform additional specifications to test the longer-term relationship stated in H4.

4.1 First approach: Cross-countries longitudinal analyses

We initially test H1-H3 by developing a set of cross-countries longitudinal analyses. This approach exploits within-country variation in the intensity of democracy to explain variation in entrepreneurship. It accounts for the fact that, even in democratic countries, the intensity of democracy may change.

[17] We also report single-country sample statistics in Figures A1-A6 in Appendix.

We first develop the following model:

$$Entrepreneurship_{c,t} = \beta Democracy_{c,t} + \sum_{j=1}^{n} \gamma_j (Controls_{c,t}) + \alpha_c + \delta_t + \varepsilon_{c,t} \quad (1)$$

$Entrepreneurship_{c,t}$ is measured by the *Business ownership rate* in country *c* at time *t*, while $Democracy_{c,t}$ by either the *Electoral democracy index* or the *Participatory democracy index* in country *c* at time *t*. The $Controls_{c,t}$ vector includes the country controls listed in previous section. The α_c's denote a full set of country fixed effects, which will absorb the impact of any time invariant country characteristics and the δ_t's denote a full set of year fixed effects. A positive and statistically significant value of β when the *Electoral democracy index* is considered, would suggest that democracy has a positive effect on entrepreneurship (H1) and that the promotion of freedom and social interchange is a driver dimension of such effect (H2). Similarly, a positive and statistically significant value of β when the *Participatory democracy index* is considered would further confirm H1 and prove the fact that the participatory principle of democracy is an additional driver dimension of the effect of democracy on entrepreneurship (H3).

Columns (1-4) of Table 2 report estimates of Model (1) estimated with the empirical specifications presented below. Panel A and B refer to the *Electoral democracy index* and the *Participatory democracy index*, respectively.

4.1.1 Fixed effect (within) estimator (Col.1)

First, we perform a fixed-effect (within) estimator, where standard errors $\varepsilon_{c,t}$ are clustered at country level to control for heteroscedasticity and autocorrelation.[18] Estimates of the within estimator are reported in column (1) of Table 2.

4.1.2 GLS and Panel corrected standard errors (Cols. 2 and 3)

[18] The Mundlak test suggests that the fixed-effects model is preferable to the random-effects model.

Given the structure of our panel dataset, where *T* is large and greater than *N*, applying cluster robust inference to account for serial correlation might rise some inference validity issues (Wooldrige, 2015). Thus, to verify the inference validity of the fixed effect estimator, we additionally estimate Model (1) by using alternative methods to control for serial correlation in the error term. In columns (2) and (3), we report estimates obtained by using the GLS estimator and Prais-Winsten panel corrected standard errors, respectively. These two alternative approaches allow to control for panel-specific first-order autocorrelation within panels and cross-sectional correlation and heteroscedasticity across panels.

4.1.3 Fixed effect (within) estimator with Driscoll-Kraay standard errors (Col.4)

To control for higher-order autocorrelation of the error-term, in column (4) we also estimate Model (1) by using the fixed-effect estimator with Driscoll-Kraay standard errors, including up to three-lags.

In all of these specifications, the coefficient of either dimensions of democracy is positive and statistically significant. This suggests that democracy has a positive effect on entrepreneurship (H1) and that the two dimensions of interest drive this effect (H2 and H3). Comparing the size of the effect, the participatory dimension of democracy (*Participatory democracy index*) seems to have a slightly larger impact than the electoral dimension (*Electoral democracy index*).

4.1.4 Dealing with (non-)stationarity: First-difference model

Along with serial correlation in the error term, another important issue we should care of is (non-) stationarity. In presence of unit root processes we might observe problem of spurious regressions. In this regard, the Levin-Lin-Chu unit-root test on our dependent variable of interest (*Business ownership rate*) does not reject the null hypothesis that panels contain unit-roots, meaning that we cannot assume our series to be stationary. To address this issue, we use a first-differencing approach

to turn an integrated (non-stationary) process into a weakly dependent (stationary) process. With first-differencing the central limit theorem is valid even in cases where *T* is larger than *N* (Wooldridge, 2015).[19] Thus, we develop the following first-difference model:

$$\Delta Entrepreneurship_{c,t} = \beta \Delta Democracy_{c,t} + \sum_{j=1}^{n} \gamma_j \, \Delta(Controls_{c,t}) + \delta_t + \Delta\varepsilon_{c,t} \qquad (2)$$

Where Δ indicates the *t – (t-1)* difference for each variable. Since first differencing eliminates time invariant unobserved country effects, we do not include country fixed effect in Model (2). We include year dummies to account for secular changes that are not being modeled (Wooldridge, 2015).[20] Standard errors are estimated with clustering at country level.

Estimates of Model (2) are reported in column (5) of Table 2. The positive and statistically significant coefficient of $\Delta Democracy_{c,t}$ suggests that the yearly change in the democracy index has a positive impact on the yearly change in entrepreneurship. Thus, Model (2) further confirms the positive effect of democracy on entrepreneurship and the relevant role of the knowledge and trust channels. Again, the effect of participatory democracy looks slightly higher than electoral democracy.

[Insert Table 2 about here]

4.2 Robustness checks

We perform additional tests to further check the validity of H1-H3 assessed in Models (1) and (2). As the first-difference approach allows to deal with both serial-correlation and non-stationarity, we choose Model (2) as reference to conduct our robustness evaluations.

[19] The Levin-Lin-Chu unit-root test on the first-differenced dependent variable rejects the hypothesis of unit-roots existence, suggesting the process is integrated or order I(1). Figure A7 in Appendix plots first-difference yearly averages for business ownership rate and democracy (electoral and participatory).

[20] Results hold also by excluding year dummies.

4.2.1 Controlling for endogeneity

The first issue we should account for is endogeneity arising from possible reverse causality, as the relationship between entrepreneurship and institutions is likely to be bidirectional (Elert and Henrekson, 2017). If the effect runs in both directions, with democracy affecting entrepreneurship and vice-versa, the simultaneous relationship will be biased. According to H2, democracy stimulates entrepreneurship by favoring social interchange and the diffusion of knowledge. It could be argued that entrepreneurship as well can create knowledge and favor social connections, which might in turn influence the level of democracy. Similarly, H3 states that a wider civil-society participation in political process can foster entrepreneurial activity. However, entrepreneurs may decide to be involved in political processes to preserve the interest of their business, increasing the level of political participation and the connection with institutions.

In this regard, Figure 1 suggests that the direction of the relationship is more likely to be from democracy to entrepreneurship rather than the inverse. Nevertheless, we want to address this potential source of endogeneity in a more formal and robust way. To do that, we perform a two-step GMM estimation by instrumenting the first-difference of democracy with lagged first-differences, considering up to three-years lags. In order to preserve the largest number of observations, we add values of democracy prior to 1972. Column (1) of Table 3 reports estimates of the two-step GMM specification. Statistics are heteroscedasticity- and autocorrelation-consistent (HAC). Coefficients of either dimensions of democracy remain positive and statistically significant and the size of the effects looks larger comparing to those reported in column (5) of Table 2. According to the Kleibergen-Paap test we can reject the null hypothesis that the model is under-identified, and thus consider our instruments to be relevant. Moreover, failure to reject the Hansen J-statistics means that the instruments can be considered as exogenous.

This is not the only empirical specification we use to control for possible endogeneity due to reverse causality. Some of the additional models that are illustrated in the following of the paper are helpful to further address this issue.

4.2.2 Additional robustness

Columns (2-5) of Table 3 report estimates of supplementary robustness tests. We additionally consider the fact that the 23 OECD countries of our sample have been highly impacted by the Financial Crisis started in 2007. In this regard, the number of business owners might have markedly been reduced by the global economic downturn. In line with this argument, Figure 1 shows a sharp decline in the business ownership rate during the Financial Crisis. Thus, to eliminate any potential confounding effects arising from this event, in column (2) we estimate Model (2) by excluding years from 2007 onwards.

Further, to check to what extent our results are driven by the democratic transitions in Greece, Portugal and Spain, we estimate Model (2) by excluding these three countries. We do this by considering both the full sample period (column 3) and the period before the Financial Crisis (column 4).

Another phenomenon that occurred over the sample period is the entry in the European Union (EU) of six countries of the sample. Greece joined the EU in 1981, Portugal and Spain in 1986, and Austria, Finland and Sweden in 1995. The access to the EU and to the European Single Market might have introduced relevant consequences for entrepreneurship. Thus, to account for this issue, we estimate Model (2) by restricting the analysis at the period prior to 1981, the Greece entry year in the EU. Estimates are reported in column (5).

Panel A shows that the coefficient associated to democracy remains positive and statistically significant in all specifications but column (3), where Greece, Portugal and Spain are excluded. However when we consider the period prior to the Financial Crisis, the coefficient is significant even after excluding these three countries. In a similar way, in panel B we observe that the positive and statistically significant coefficient of democracy is preserved in all specifications.

Overall, findings reported in Tables 2 and 3 provide evidence of the validity of H1, H2 and H3.

We find that democracy foster entrepreneurship (H1) and that the promotion of social connections and the pursuit of civil-society involvement in political processes are two driving dimensions of this positive relationship (H2 and H3).

[Insert Table 3 about here]

4.3 Second approach: Exploiting democratic transitions

We also examine H1-H3 by developing a second and complementary empirical approach. Among the countries included in the sample, three of them experienced a transition from autocracy to democracy. We refer to the fall of the regimes of the Colonels in Greece, Salazar in Portugal, and Franco in Spain. After the end of these regimes new constitutions were introduced in 1975, 1976 and 1978 respectively.

Figure 2 reports values of the *Electoral* and *Participatory democracy index* for Greece, Portugal and Spain over the sample period. In each country we observe a marked and sharp increase in the indices immediately after the transitions. In Greece, compared to Portugal and Spain, the autocratic regime was in power for a more limited period. However, even prior, Greece did not have a sound democratic environment, which was instead established after the fall of the regime.

On the whole, for each of the three countries we observe a sharp increase in both dimensions of democracy.

[Insert Figure 2 about here]

We exploit these historical events to perform a difference-in-differences model by considering Greece, Portugal and Spain as treated countries. By exploring pre- and post-democratization, we perform a counterfactual analysis to test whether these transitions to democracy had a positive impact on entrepreneurship. Further, this quasi-natural experiment using an exogenous institutional

shock is an additional way to rule out endogeneity that may be caused by the mutual interplay of democracy and entrepreneurship. While with the cross-countries longitudinal analyses we use changes in the intensity of democracy, with this approach we exploit changes in political regimes and democratic transitions.

To conduct this analysis, we restrict the sample to the years 1972-1981. This allows to consider the period around the transitions and to limit possible confounding effects arising from other events, such as the entry of Greece, Portugal and Spain in the European Union. We define a control group by including countries whose level of democracy remained stable over the reference period and up to ten years prior to the beginning of the sample. Moreover, to compare Greece, Portugal and Spain with countries with as similar as possible contextual and cultural characteristics, except for the level of democracy, we include in the control group only European countries.[21]

Figure 3 compares the yearly *Business ownership rate* in Greece, Portugal and Spain with the yearly average rate in the control group. In the graph related to Portugal, prior to 1974, the year of the fall of the autocratic regime, the rates followed a parallel slightly downward trend. Just after the 1974 we notice a divergence between the two groups. From 1976, the year of the approval of the new Constitution, the rate of Portugal follows a continuous upward trend, while that of the control group continues with the previous path. Similarly, in the graph related to Spain, starting from the death of Franco in 1975, we observe a divergence in trends. Before 1975, the rate was declining for both groups. After 1975, the rate of Spain inverts the trend, while that of the control group does not. Finally, looking at the graph related to Greece, we do not observe parallel trends before the transition, with the rate of Greece following an upward path even prior. To account for this issue and for the fact that the three transitions materialized in different years, we first consider a treated group including the three countries together and then we look at each country separately.

[Insert Figure 3 about here]

[21] The final control group includes Austria, Belgium, Denmark, Finland, Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway and United Kingdom.

Once the Treated and the Control groups are defined, we develop the following difference-in-differences model:

$$Entrepreneurship_{c,t} = \beta_1 Post + \beta_2 Treated + \beta_3 Treated*Post + \alpha_c + \delta_t + \varepsilon_{c,t} \quad (3)$$

Variable *Post* is a dummy equal to zero in the period prior to the democratic transition and to one afterwards. As threshold year for this variable, we choose 1976 when *Treated* includes the three countries together. This allows to consider a date between the three transitions. When *Treated* refers to a single country, we choose the year of approval of the new Constitution, that is 1975 for Greece, 1976 for Portugal and 1978 for Spain. This way, we set our threshold at the end of the transition period and at the official start of the new democratic regime. Moreover, to account for country and time invariant components, we include both country and year fixed effects. Standard errors are clustered at country level. The coefficient of interest here is β_3. A positive and statistically significant coefficient of the interaction term would testify that the transition to democracy was beneficial for entrepreneurship.

Table 4 reports estimates of Model (3) by using different treated groups. Column (1) considers the three countries together, while columns (2-4) separately. As Table 4 shows, the coefficient of the interaction term is positive and statistically significant in all specifications. This suggests that the unquestionable increase in the level of democracy after the regime changes had a positive effect on the level of entrepreneurship. Thus, estimates in Table 4 further confirm the validity of H1. Moreover, as Figure 2 documents a sharp increase in either dimensions of democracy, we can as well consider these findings to be an additional proof of H2 and H3.

With two complementary empirical approaches we test our hypotheses by considering both changes in the intensity of democracy that might occur in democratic countries and changes from non-democratic to democratic regimes. We show that both introducing and strengthening democracy matter for entrepreneurship.

[Insert Table 4 about here]

4.4 The lagged effect of democracy

Once H1, H2 and H3 are verified, we move to test H4. We hypothesize that entrepreneurship is also positively affected by historical values of democracy. An increase in the level of democratization may produce effects that are not visible in the very near future and that can take time to emerge. As the specifications performed so far focused on the short-term relationship, we need to complement our analysis with the longer-term one.

To detect the lagged effect of democracy on entrepreneurship we perform the two following models. First, instead of differencing democracy in *t* and in *t-1*, we do differences between average past values of democracy over different time horizons, starting from *t-1* up to *t-10*. We run different regressions by differencing the two- up to ten-years averages of the values of democracy. This specification is defined by Model (4):

$$\Delta Entrepreneurship_{c,t} = \beta\Delta\left(\overline{Dem}_{c;t-1,t-i}\right) + \sum_{j=1}^{n}\gamma_j\,\Delta(Controls_{c,t}) + \delta_t + \Delta\varepsilon_{c,t} \quad (4)$$

Where $\overline{Dem}_{c;t-1,t-i}$ is the average value of democracy observed in country *c* over the period *t – 1*, *t – i*, with *i* = [2; 10] . By doing so, we consider the differences between average values observed over longer periods rather than the difference between current and one-year prior values.

Second, instead of the first-difference we use longer-term differences in the levels of democracy. We do the difference between values in *t-1* and those observed in periods from *t-2* to *t-10*. This gives changes in the level of democracy up to a ten-years horizon. This specification is defined by Model (5):

$$\Delta Entrepreneurship_{c,t} = \beta(Dem_{c,t-1} - Dem_{c,t-i}) + \sum_{j=1}^{n}\gamma_j\,\Delta(Controls_{c,t}) + \delta_t + \Delta\varepsilon_{c,t} \quad (5)$$

Where i = [2; 10]. By doing so, we investigate how the current change in entrepreneurship is affected by longer-period changes in democracy. To estimate both Models (4) and (5), we include in the sample values of democracy prior to 1972. This way, we can preserve the maximum number of available observations. Moreover, including lagged values represent an additional way to limit the simultaneity bias (Reed, 2015).

Table 5 reports estimates of Model (4). Columns from (1) to (10) consider average values of democracy from two up to ten years. Estimates in panel A, which refers to the *Electoral democracy index*, show positive and statistically significant coefficients up to the five-years average. Coefficients associated to longer-term averages remain positive but they are no longer statistically significant. Similarly in panel B, which considers the *Participatory democracy index*, coefficients are positive and statistically significant up to the six-years average. These findings suggest that entrepreneurship is positively affected by past values of democracy as well, and that historical values of democracy up to five-six years prior matter to determine the current level of entrepreneurship.

[Insert Table 5 about here]

Similar evidence emerges from Table 6, which reports estimates of Model (5). Columns from (1) to (10) consider changes in democracy between two up to ten years prior. Estimates show that entrepreneurship is positively affected by changes in democracy up to six years prior ($Dem_{t-1} - Dem_{t-6}$), when the *Electoral democracy index* is considered, and seven years ($Dem_{t-1} - Dem_{t-7}$) when the *Participatory democracy index* is considered.

[Insert Table 6 about here]

Overall, Models (4) and (5) both provide evidence for what we state in H4. Along with contemporaneous values, entrepreneurship is also sensitive to historical values of democracy.

4.5 Do democracy and entrepreneurship need development?

Our four hypotheses being tested with both panel data techniques and a quasi-natural experiment, we perform a complementary analysis by investigating whether a high level of economic development is a precondition for democracy to foster entrepreneurship. As Rodrik and Wacziarg (2005) and Acemoglu et al., (2019) point out, some critics of the view that democracy is good for economic performance suggest that democracy might be economically costly in absence of sufficiently high level of economic development.

Following a similar approach as Acemoglu et al., (2019), we investigate this conjecture by evaluating the effect of democracy on entrepreneurship for the sample countries by distinguishing two country-groups, according to the level of economic development (as proxied by GDP per capita). Although our sample does not include extremely poor countries, this exercise is an interesting first step to investigate whether democracy needs necessarily high level of economic development to affect positively entrepreneurship. Specifically, we estimate the following model:

$$\Delta Entrepreneurship_{c,t} = \beta_1 \Delta Democracy_{c,t} + \beta_2 \Delta Interaction_{c,t} + \sum_{j=1}^{n} \gamma_j \Delta(Controls_{c,t}) + \delta_t + \Delta\varepsilon_{c,t} \quad (6)$$

Coefficient β_1 indicates the effect of democracy on entrepreneurship for all countries (thus including the less developed countries in the lowest 25th percentile of GDP per capita), while variable *Interaction* isolates the additive effect for more developed countries (above the 25th percentile). If a high level of economic development is a precondition for democracy to foster

entrepreneurship, we should expect a non-positive coefficient β_1 and a positive and statistically significant coefficient β_2.

Estimates of Model (6) are reported in Table 7, where columns (1) and (2) consider the baseline GDP prevailing respectively at the beginning (1972) and at the end (2010) of the sample to determine the percentiles. As the table suggests, the effect for less developed countries is still positive and statistically significant, while there is no significant additive effect for more developed countries. This suggests that democracy is beneficial for entrepreneurship also in less rich countries and that the impact does not depend on the level of economic development.

As validation, we also estimate Model (6) by considering the bottom 10^{th} percentile of economic development, instead of the 25^{th}. Results in Table 8 are similar to those reported in Table 7.

[Insert Tables 7 and 8 about here]

These findings hint that a high level of economic development is not necessarily a pre-requirement for democracy to stimulate entrepreneurship. Although we cannot draw general conclusion, these results provide first insights suggesting that entrepreneurship can benefit from more democracy also in less developed countries. As such, expanding the analysis to a larger set of developing or emerging countries might be an interesting extension for future research. This would allow to delve deeper into the role of economic development in shaping the relationship between democracy and entrepreneurship.

5 Discussion

Our findings help to deepen knowledge on the under-researched links between democracy and entrepreneurship. By providing the first systematic empirical evidence that these two concepts are

inherently connected, our study has important theoretical and practical implications for the entrepreneurship literature.

5.1 Implications for Theory

Grounded in the view that institutional and contextual conditions matter for entrepreneurship (Welter, 2011; Autio et al., 2014; Bradley and Klein, 2016; Schmutzler et al., 2019; Urbano et al., 2019; Welter et al., 2019, Bennett et al., 2022), we expand the growing literature linking entrepreneurship to institutions by substantiating a relationship that prior to this study was only conjectured. Our primary contribution is to demonstrate that democracy, arguably the most qualifying attribute of Western developed countries, does foster entrepreneurship. In doing that, we add a new and non-negligible component to the array of contextual dimensions that have been found to be beneficial for entrepreneurship (Korosteleva and Belitski, 2017; Boudreaux et al., 2018; Fu et al., 2020). Prior to this study, no quantitative evidence of the direct link between entrepreneurship and democracy existed in the entrepreneurship literature. We fill this important gap by showing that entrepreneurship is directly affected by democracy. Though this link is not exclusive, as vivid entrepreneurial activities can also occur in non-democratic countries like the former Soviet Union or China (Sautet, 2013), this study suggests that a democratic environment can *per se* facilitate entrepreneurship and promote its growth. In this regard, our two complementary empirical approaches show that, along with substantial changes in democracy (e.g. democratic transitions), entrepreneurship is sensitive to gradual changes in the intensity of democracy as well. This implies that the relationship between entrepreneurship and democracy matters for countries that democratize and for democratic societies alike. Not only introducing democracy, but also enhancing existing democracies leads to more entrepreneurship. We further qualify this relationship as we show that democracy unleashes entrepreneurial activity in both the short- and long-run. According to our estimates, entrepreneurship is sensitive to both contemporaneous and historical values of democracy up to five-six years. On the one hand, the long-run effect confirms that

democracy takes time to produce socio-economic outcomes (Geddes, 1999; Rodrik and Wacziarg, 2005; Gao et al., 2017). On the other, the short-run effect shows that changes in the institutional context, and particularly in the intensity of democracy, can also produce rapid consequences in entrepreneurship. It might reveal the existence of entrepreneurial ideas that could be implemented quickly within a propitious institutional context. This corroborates emerging evidence that even small and short-term changes in context affect entrepreneurial activity (Davidsson, 2020; Mickiewicz et al. 2021).

Our research also helps to have a more nuanced and holistic understanding of the entrepreneurship-democracy nexus by exploring two underlying channels. Not only do we document that democracy fosters entrepreneurship, as we ask in our first research question, but we also explore two mechanisms through which this can happen. Concerning our second research question, the knowledge channel and the trust channel show that the promotion of freedom and social interchange, on the one hand, and the involvement of civil society in political process, on the other, are two dimensions of democracy that matter for entrepreneurship. This suggests that a multidimensional perspective is needed to examine more fine-grained aspects behind the democracy-entrepreneurship connection.

Our complementary analysis offers additional theoretical insights to understand whether economic development shapes our relationship of interest. The fact that democracy is conducive to more entrepreneurship also in less rich countries of our sample, hints that the link between democracy and entrepreneurship is not affected by the stage of economic development. This is in line with Rodrik and Wacziarg (2005) and Acemoglu et al., (2019), who contradict the view that democracy produces poor economic outcomes when certain preconditions in terms of economic development are not satisfied. However, a wider set of developing or emerging countries should be considered to infer generalizability to this insight.

Finally, our research advances knowledge on how democracy can shape socio-economic contexts. Along with economic growth, human capital, health, innovation and other issues examined by past

research (Acemoglu et al., 2019; Baum and Lake, 2003; Kudamatsu, 2012; Wang, 2021), we document that democracy as well has a direct influence on entrepreneurship. Not only does democracy matter, our results show that it matters for entrepreneurship. Thus, our findings shed new light on the understanding of the decline in entrepreneurship in advanced economies. Several factors have been suggested to explain this phenomenon, such as the declining population growth, the growing market concentration, the zombie-firm congestion or more burdensome regulations (Naudé, 2022). By showing that entrepreneurship is directly connected to democracy, we suggest a new element that entrepreneurship scholars may consider. The documented contraction of democracy (Diamond, 2015, 2020; Plattner, 2015; Lührmann et al., 2019, Adler et al., 2023) might be part of the explanation. Entrepreneurs and governments who want to preserve entrepreneurship should not neglect the ongoing retreat of democracy.

Overall, our empirical findings give a new perspective to the compelling conversation on the connection between entrepreneurship and democracy. Rather than a conjecture, we can look at it as substantiated evidence.

5.2 Implications for Practice

This study also offers concrete ways in which political institutions can promote entrepreneurship. By guaranteeing and preserving freedom, social interchange and the civil society participation in political processes, they can help to facilitate entrepreneurial activity. Furthermore, our research suggests that the ongoing debate on democracy should perhaps be deepened. Firstly, the concept of "democracy" needs to be enriched with that of "intensity of democracy". Secondly, when scholars or policy-makers wonder about the linkage between democracy and a socio-economic outcome, such as entrepreneurship, along with posing the issue as, "Does democracy matter?", another relevant question is, "Which dimensions of democracy matter?". The nuanced attributes and components of democracy might play different role depending on the relationship of interest.

We introduce a new argument whereby democratic institutions should be safeguarded. If we want entrepreneurship to prosper, there is a need to preserve and nurture democracy.

6 Limitations and Future Research

This study has limitations that offer intriguing avenues for future research. First, our sample is limited to 23 OECD countries. This is due to the choice of considering countries where entrepreneurship is more opportunity- rather than necessity-driven. We encourage scholars to investigate the relationship between entrepreneurship and democracy in different contexts. For instance, considering developing and emerging countries should provide additional interesting insights on how the level of development could shape this relationship. In our final complementary analysis, we show that democracy affects positively entrepreneurship also in less rich countries. However, we cannot draw general conclusion for poorest countries, where necessity entrepreneurship plays a relevant role. In this regard, having a sample of developing or emerging countries might also allow to exploit a larger number of transitions over the very recent years.

Our study shows that, along with the intensity of democracy, transitions to democracy also matter for entrepreneurship. Greece, Portugal and Spain had a greater increase in entrepreneurship over the years after democratizations than those countries that did not experience a similar event. As our quasi-natural experiment design is restricted to three transitions, exploring other transitions could be helpful to delve deeper into the role that regime changes have in determining the level of entrepreneurship.

Second, along with the two we investigate, other dimensions of democracy may be found to matter for entrepreneurship. Future studies should examine other components and test additional underlying mechanisms through which democracy can foster entrepreneurship.

Third, we are also conscious that the definition of entrepreneurship we use is not the unique one. To assess the largest population of entrepreneurs, we select an inclusive measure of entrepreneurship

considering the total number of owners of incorporated and unincorporated businesses. While it is helpful to capture opportunity rather than necessity entrepreneurship, our measure does not distinguish between more subtle types of entrepreneurship, such as productive and unproductive (Baumol, 1990), local and systemic (Sautet, 2013), social (Dacin et al., 2011), hybrid (Schulz et al., 2016), institutional (Dorado, 2005) or informal (Siqueira et al., 2016) entrepreneurship. Investigating how democracy is linked to each of these types would be an intriguing extension of our findings. This will help to understand if there is a specific connection with democracy depending on which type of entrepreneurship we look at.

Fourth, we acknowledge that the controls included in the empirical specifications may not be exhaustive. On the one hand, the long time-period is a value added of our research, as it allows to grasp country changes in both democracy and entrepreneurship over time and to rule out time-invariant unobserved components with panel-data techniques. On the other, such a backward starting date makes it difficult to find measures covering the whole sample time-period. Thus, the risk of omitted variables bias might not be entirely ruled out by the controls included in the analyses.

Fifth, our sample ends in 2010 due to data constraints. While large, our time period does not detect recent events that may challenge democratic and entrepreneurial beliefs. The ascent of populisms (Bennett et al., 2022) and authoritarianisms (Adler et al., 2023), the growing markets concentration (Naudé, 2022), the resurgence of monopoly (Feldman et al., 2021), the dominant role of digital technologies and platforms (Kenney and Zysman, 2016) reveal a growing concentration of political and economic power alike, which contrasts with the underpinnings of democracy and entrepreneurship. Hence, examining whether and how such events affect the entrepreneurship-democracy relationship and the two channels we explored is an intriguing question. For instance, the knowledge channel might be shaped by the booming virtual communication and interactions. Likewise, recent emergencies such as climate change and pandemics might have deteriorated the institutional trust underlying the trust channels. While we document a positive relationship between

democracy and entrepreneurship over the reference time-period (1972-2010), further research may complement our findings by analyzing the determinants of the contraction of democracy over the last decade and by exploring whether this phenomenon is an antecedent of the ongoing slowdown in entrepreneurial activity (Naudé, 2022). Crises affect entrepreneurship (Batjargal et., 2023). The one of democracy may not be exception.

All these venues leave room for fascinating future research agendas in the entrepreneurship literature. Our study provides new insights about what we hope could be a long and promising research direction.

7 Conclusion

This study investigates the direct link between democracy and entrepreneurship. With the help of cross-countries longitudinal analyses and a quasi-natural experiment with three transitions to democracy, not only we show that democracy fosters entrepreneurship, but we also suggest that considering different intensities and dimensions of democracy matters to understand the mechanisms underlying this relationship. We test two possible driving channels: the *knowledge channel*, focusing on the promotion of freedom and social interchange, and the *trust channel*, which rather refers to the participatory dimension of democracy. We also find evidence that the beneficial effect of democracy on entrepreneurship is observable in both the short- and the long-run, whereby entrepreneurship is sensitive to contemporaneous and historical values of democracy.

From this study we conclude that it is not possible to think of entrepreneurship and democracy as two unrelated phenomena. The more democracy is preserved, the more entrepreneurship will flourish. Stated differently, undermining democracy is undermining entrepreneurship and all those economic and social factors for which entrepreneurship is a primary sources. Entrepreneurship needs democracy. This is what we learn from this study. We hope that our work could open new horizons for other important and fruitful research in the entrepreneurship field. Not only does

entrepreneurship matter, as entrepreneurship scholars have shown in previous studies, but in particular it is the result of vibrant democracy.

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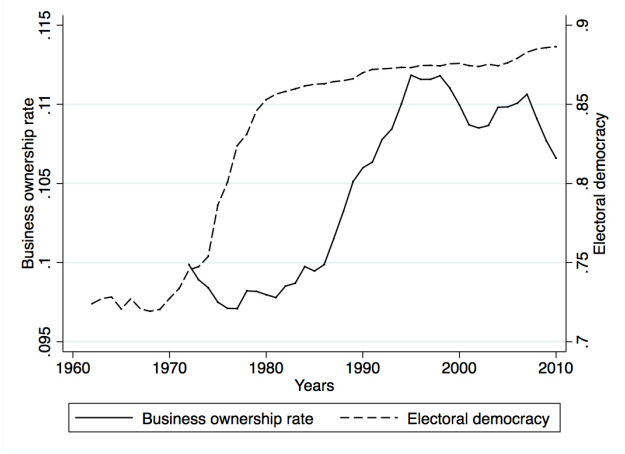
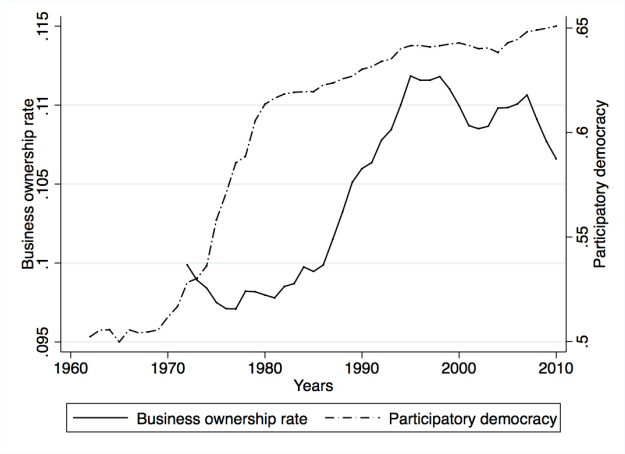
Figures and Tables

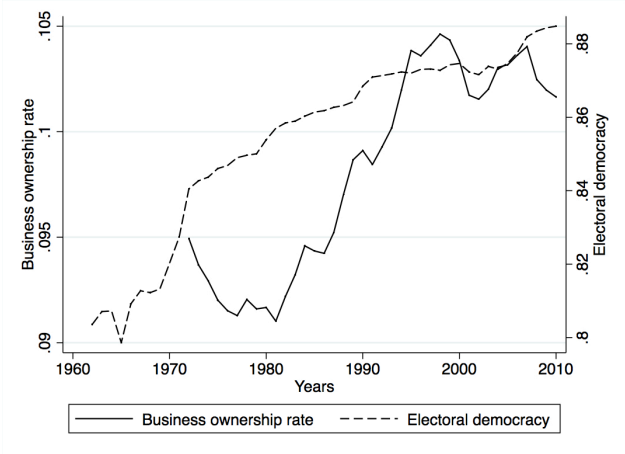
Figure 1: Democracy and entrepreneurship.



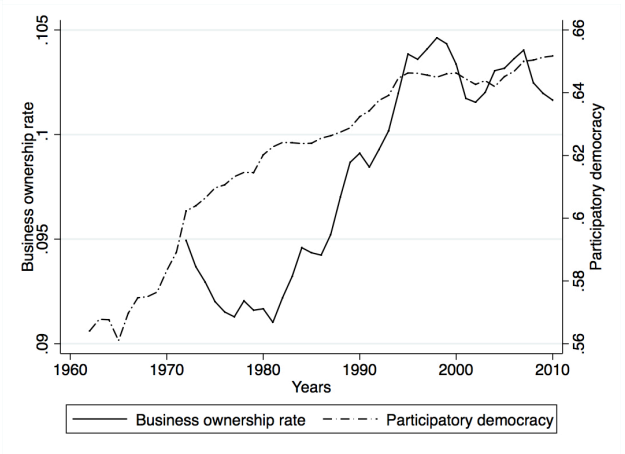
(a) Full sample



(b) Full sample



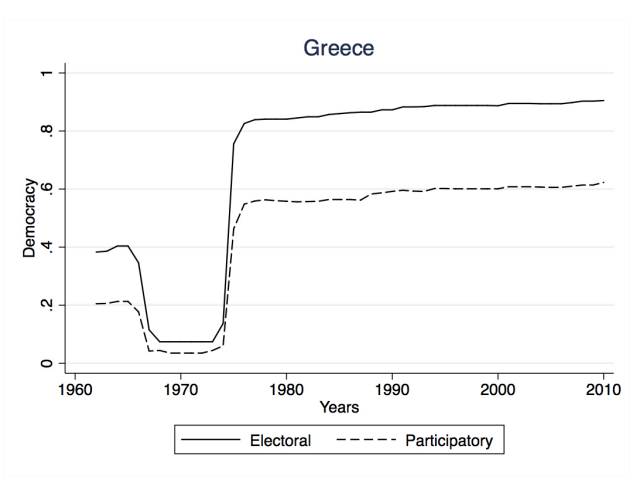
(c) No Greece, Portugal and Spain



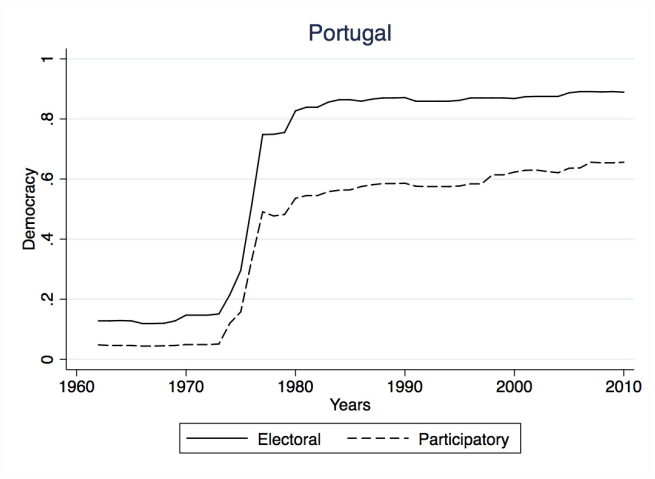
(d) No Greece, Portugal and Spain

Notes: Panel (a) reports the trends of the Business ownership rate and the Electoral democracy index over the 1962-2010 period including all sample countries; panel (b) reports the trends of the Business ownership rate and the Participatory democracy index over the 1962-2010 period including all sample countries; Panel (c) reports the trends of the Business ownership rate and the Electoral democracy index over the 1962-2010 period excluding Greece, Portugal and Spain; Panel (d) reports the trends of the Business ownership rate and the Participatory democracy index over the 1962-2010 period excluding Greece, Portugal and Spain.

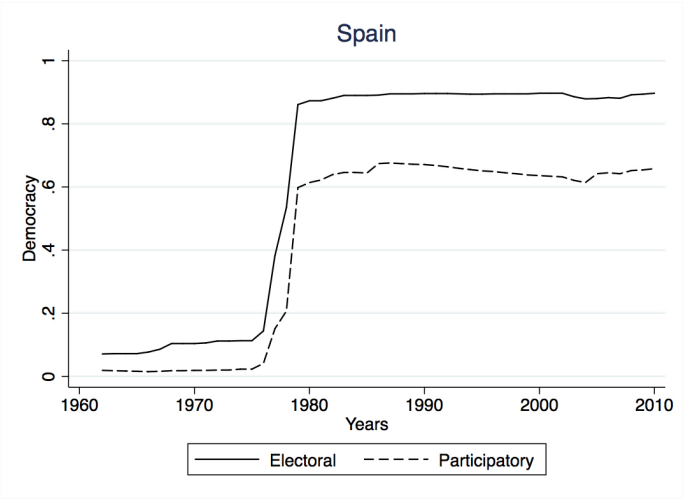
Figure 2: Democratic transitions.



(a)



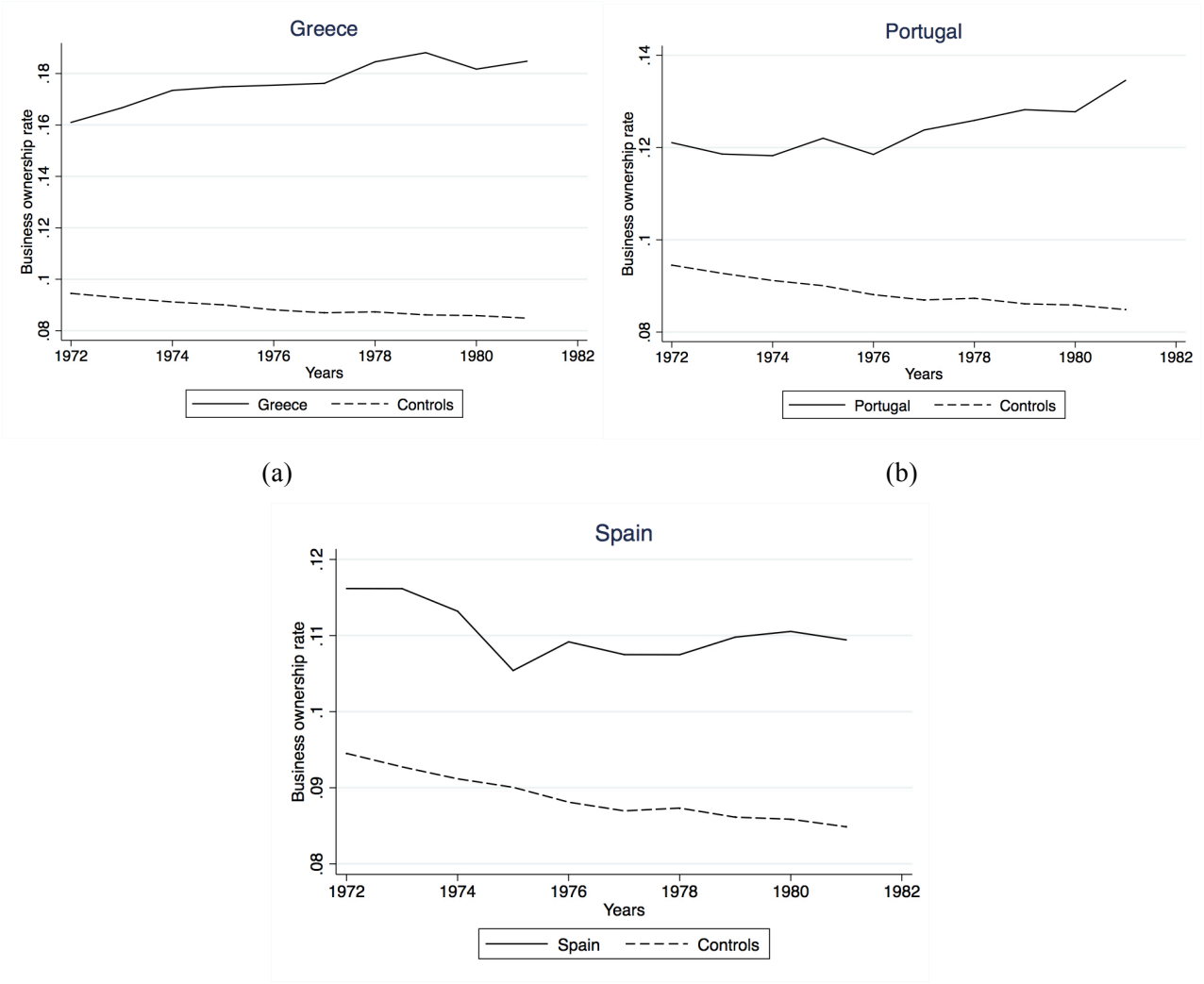
(b)



(c)

Notes: This figure reports the trends of the Electoral democracy index and the Participatory democracy index in Greece (a), Portugal (b) and Spain (c) over the 1962-2010 period.

Figure 3: Democracy and entrepreneurship – Treated and Control groups.



(a) (b)

(c)

Notes: This figure compares the trends of the Business ownership rate of Greece (a), Portugal (b) and Spain (c) with the average Business ownership rate of the control group, over the 1972-1981 period.

Table 1: Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Business ownership rate	897	.104	.036	.043	.210
Electoral democracy	897	.855	.091	.074	.916
Participatory democracy	897	.619	.088	.020	.794
GDP (log)	897	12.498	1.614	8.046	16.272
GDP per capita (log)	897	10.004	.318	9.018	11.096
Trade	897	69.467	43.726	11.340	343.561
Population (log)	897	16.315	1.624	12.250	19.549
Female population	897	50.872	.638	49.445	52.949
Urbanization	897	75.863	10.621	39.591	97.651
Primary enrolment rate	897	96.202	4.886	72.301	99.997
Secondary enrolment rate	897	84.350	14.004	23.777	99.997
Electoral democracy (1962-2010)	1127	.828	.143	.071	.916
Participatory democracy (1962-2010)	1127	.596	.121	.015	.794

Notes: This table presents descriptive statistics of the variables used in the empirical analysis. Unless it is specified differently, the time period refers to 1972-2010.

Table 2: Democracy and entrepreneurship.

	(1) Within	(2) GLS	(3) PCSE	(4) DK	(5) FD
DV: Entrepreneurship; ΔEntrepreneurship					
Panel A: Electoral					
Democracy	0.024** (0.012)	0.011*** (0.003)	0.011** (0.005)	0.024*** (0.004)	
ΔDemocracy					0.005*** (0.002)
Obs.	897	897	897	897	874
(Within) R^2	(0.25)	-	0.96	(0.25)	0.09
Panel B: Participatory					
Democracy	0.037* (0.018)	0.014*** (0.003)	0.015** (0.006)	0.037*** (0.006)	
ΔDemocracy					0.007** (0.003)
Obs.	897	897	897	897	874
(Within) R^2	(0.25)	-	0.96	(0.25)	0.09
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of the effect of democracy on entrepreneurship. Panel A considers *Electoral democracy index*, while Panel B *Participatory democracy index*. Cols.1-4 report results from Model (1) by using the within estimator with clustered standard errors (col.1), the GLS estimator (col.2), Prais-Winsten regression with panel corrected standard errors (col.3), and the fixed effect model with Discoll-Kraay standard errors (col.4). Col.5 presents estimates of the first-difference Model (2). Country controls include GDP (log) and GDP per capita (log), trade openness, urbanization, total (log) and female population, primary and secondary enrolment rate. Standard errors are reported in parentheses, ***p < 0.01, **p < 0.05, *p < 0.1.

Table 3: Democracy and entrepreneurship – robustness.

	(1) 2-Step GMM	(2) Years < 2007	(3) No Greece Portugal and Spain	(4) (2)+(3)	(5) Years < 1981
DV: ΔEntrepreneurship					
Panel A: Electoral					
ΔDemocracy	0.013**	0.006***	0.032	0.040*	0.004**
	(0.007)	(0.002)	(0.023)	(0.023)	(0.002)
Obs.	874	782	760	680	207
R^2	0.09	0.08	0.10	0.10	0.11
Additional 2-Step GMM statistics (col.1):					
Under-identification test: p-value = 0.052					
Hansen J statistics: p-value = 0.54					
Panel B: Participatory					
ΔDemocracy	0.033***	0.009***	0.037*	0.051**	0.007***
	(0.013)	(0.003)	(0.021)	(0.019)	(0.002)
Obs.	874	782	760	680	207
R^2	0.07	0.09	0.11	0.11	0.12
Additional 2-Step GMM statistics (col.1):					
Under-identification test: p-value = 0.039					
Hansen J statistics: p-value = 0.30					
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of the set of robustness tests on the first-difference Model (2). Panel A considers *Electoral democracy index*, while Panel B *Participatory democracy index*. Col.1 reports estimates of the 2-Step GMM; col. 2 excludes years after the Financial Crisis; col.3 excludes Greece, Portugal and Spain; col.4 excludes Greece, Portugal and Spain and years after the Financial Crisis; col.5 considers years prior the EU entries. Country controls include GDP (log) and GDP per capita (log), trade openness, urbanization, total (log) and female population, primary and secondary enrolment rate. Standard errors are reported in parentheses, ***p < 0.01, **p < 0.05, *p < 0.1.

Table 4: Democratic transitions.

	(1) All	(2) Greece	(3) Portugal	(4) Spain
DV: Entrepreneurship				
Post	-0.003 (0.002)	-0.005** (0.002)	-0.005* (0.002)	-0.002 (0.002)
Post*Treated	0.011** (0.004)	0.018*** (0.001)	0.012*** (0.001)	0.004* (0.002)
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Obs.	150	130	130	130
Within R^2	0.34	0.42	0.39	0.42

Notes: This table reports estimates of Model (3), by using as treated group Greece, Portugal and Spain together (col.1), and Greece (col.2), Portugal (col.3), and Spain (col.4) separately. Standard errors are reported in parentheses, ***p < 0.01, **p < 0.05, *p < 0.1.

Table 5: Lagged effect of democracy - past average values.

	(1) 2y	(2) 3y	(3) 4y	(4) 5y	(5) 6y	(6) 7y	(7) 8y	(8) 9y	(9) 10y
DV: ΔEntrepreneurship									
Panel A: Electoral									
ΔDemocracy	0.005*	0.010**	0.013**	0.010**	0.007	0.004	0.000	-0.001	0.001
	(0.003)	(0.004)	(0.006)	(0.004)	(0.005)	(0.006)	(0.008)	(0.010)	(0.010)
Obs.	874	874	874	874	874	874	874	874	874
R^2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Panel B: Participatory									
ΔDemocracy	0.007**	0.014*	0.018*	0.016**	0.012*	0.009	0.005	0.003	0.007
	(0.003)	(0.007)	(0.009)	(0.007)	(0.006)	(0.007)	(0.010)	(0.012)	(0.010)
Obs.	874	874	874	874	874	874	874	874	874
R^2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of Model (4). Panel A considers *Electoral democracy index*, while Panel B *Participatory democracy index*. Each column considers a different time horizon for the computation of the average values of democracy, ranging from 2 years (col.1) to 10 years (col.9). Country controls include GDP (log) and GDP per capita (log), trade openness, urbanization, total (log) and female population, primary and secondary enrolment rate. Standard errors are reported in parentheses, ***p < 0.01, **p < 0.05, *p < 0.1.

Table 6: Lagged effect of democracy – longer term changes.

	(1) 2y	(2) 3y	(3) 4y	(4) 5y	(5) 6y	(6) 7y	(7) 8y	(8) 9y	(9) 10y
DV: ΔEntrepreneurship									
Panel A: Electoral									
ΔDemocracy	0.004	0.003*	0.003**	0.003**	0.002**	0.001	0.001	0.000	-0.000
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Obs.	874	874	874	874	874	874	874	874	874
R^2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Panel B: Participatory									
ΔDemocracy	0.006*	0.004**	0.005*	0.004**	0.003**	0.002*	0.001	0.001	0.000
	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Obs.	874	874	874	874	874	874	874	874	874
R^2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of Model (5). Panel A considers *Electoral democracy index*, while Panel B *Participatory democracy index*. Each column considers a different time horizon for the computation of the change in values of democracy, ranging from 2 years (col.1) to 10 years (col.9). Country controls include GDP (log) and GDP per capita (log), trade openness, urbanization, total (log) and female population, primary and secondary enrolment rate. Standard errors are reported in parentheses, ***p < 0.01, **p < 0.05, *p < 0.1.

Table 7: Democracy and development - 25th percentile.

	(1)	(2)	(3)	(4)
DV: ΔEntrepreneurship				
Panel A: Electoral				
ΔDemocracy	0.006***		0.009*	
	(0.002)		(0.005)	
ΔInteraction	0.006		0.016	
	(0.009)		(0.017)	
Panel B: Participatory				
ΔDemocracy		0.011**		0.012*
		(0.004)		(0.007)
ΔInteraction		0.028		0.022
		(0.020)		(0.033)
Observations	874	874	874	874
R^2	0.09	0.09	0.09	0.09
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: This table reports estimates of Model (6) by distinguishing countries according to the bottom 25th percentile of economic development (proxied by the GDP per capita). Cols.1 and 2 determine the percentile by considering the baseline GDP per capita that prevails in 1972; cols.3 and 4 by considering the baseline GDP per capita that prevails in 2010. Country controls include GDP (log) and GDP per capita (log), trade openness, urbanization, total (log) and female population, primary and secondary enrolment rate. Standard errors are reported in parentheses, ***p < 0.01, **p < 0.05, *p < 0.1.

Table 8: Democracy and development - 10th percentile.

	(1)	(2)	(3)	(4)
DV: Δ Entrepreneurship				
Panel A: Electoral				
ΔDemocracy	0.005**		0.006***	
	(0.002)		(0.002)	
ΔInteraction	0.006		0.016	
	(0.009)		(0.017)	
Panel B: Participatory				
ΔDemocracy		0.007**		0.008***
		(0.003)		(0.003)
ΔInteraction		0.028		0.022
		(0.020)		(0.033)
Observations	874	874	874	874
R^2	0.09	0.09	0.09	0.09
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: This table reports estimates of Model (6) by distinguishing countries according to bottom 10th percentile of economic development (proxied by the GDP per capita). Cols.1 and 2 determine the percentile by considering the baseline GDP per capita that prevails in 1972; cols.3 and 4 by considering the baseline GDP per capita that prevails in 2010. Country controls include GDP (log) and GDP per capita (log), trade openness, urbanization, total (log) and female population, primary and secondary enrolment rate. Standard errors are reported in parentheses, ***p < 0.01, **p < 0.05, *p < 0.1.

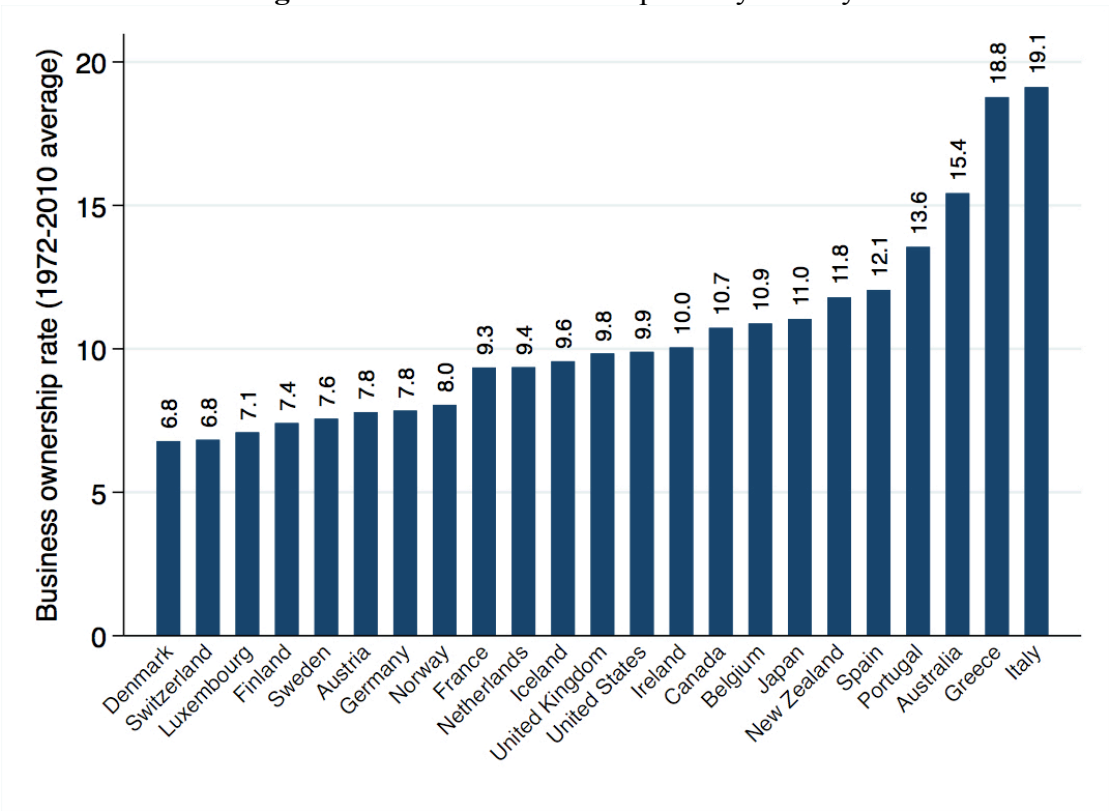
Appendix

Table A1: Variables definition.

Variable	Definition	Source
Business ownership rate	Total number of incorporated and unincorporated self-employed (outside agriculture, hunting, forestry, and fishing industry, who carry out self-employment as their primary employment activity) as a fraction of total labor force	Compendia
Electoral democracy index	The electoral principle of democracy seeks to embody the core value of making rulers responsive to citizens, achieved through electoral competition for the electorate's approval under circumstances when suffrage is extensive; political and civil society organizations can operate freely; elections are clean and not marred by fraud or systematic irregularities; and elections affect the composition of the chief executive of the country. In between elections, there is freedom of expression and an independent media capable of presenting alternative views on matters of political relevance.	V-Dem
Participatory democracy index	The participatory principle of democracy emphasizes active participation by citizens in all political processes, electoral and non-electoral. It is motivated by uneasiness about a bedrock practice of electoral democracy: delegating authority to representatives. Thus, direct rule by citizens is preferred, wherever practicable. This model of democracy thus takes suffrage for granted, emphasizing engagement in civil society organizations, direct democracy, and subnational elected bodies.	V-Dem
GDP	US$, constant prices, constant PPPs, reference years 2000	Compendia
GDP per capita	In PPP per US$ at 2000 prices	Compendia
Trade	Sum of exports and imports of goods and services measured as a share of GDP	World Bank
Population	Total country population	World Bank
Female population	Percentage of the population that is female	World Bank
Urbanization	Percentage of population living in urban areas	World Bank
Primary enrolment rate	Percentage of primary school-aged population enrolled in primary school	Barro-Lee
Secondary enrolment rate	Percentage of secondary school-aged population enrolled in secondary school	Barro-Lee

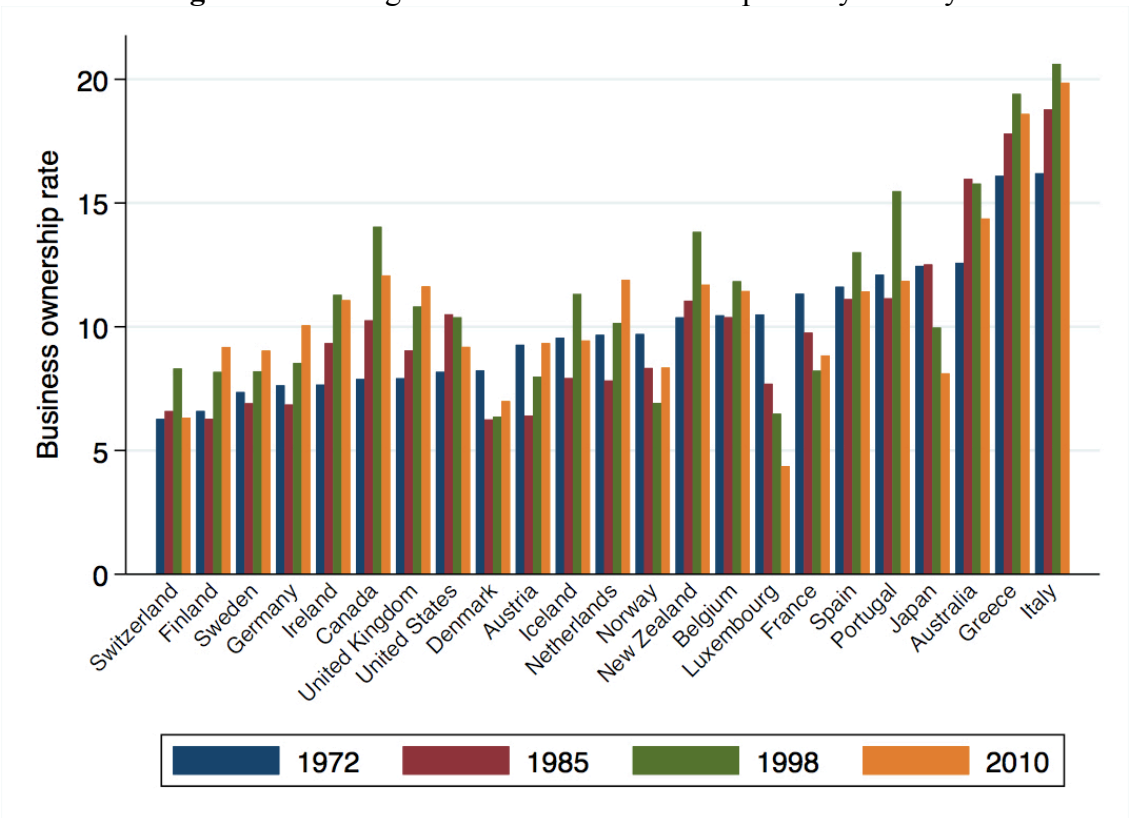
Notes: This table presents definitions and sources of the variables used in the analysis.

Figure A1: Business ownership rate by country.



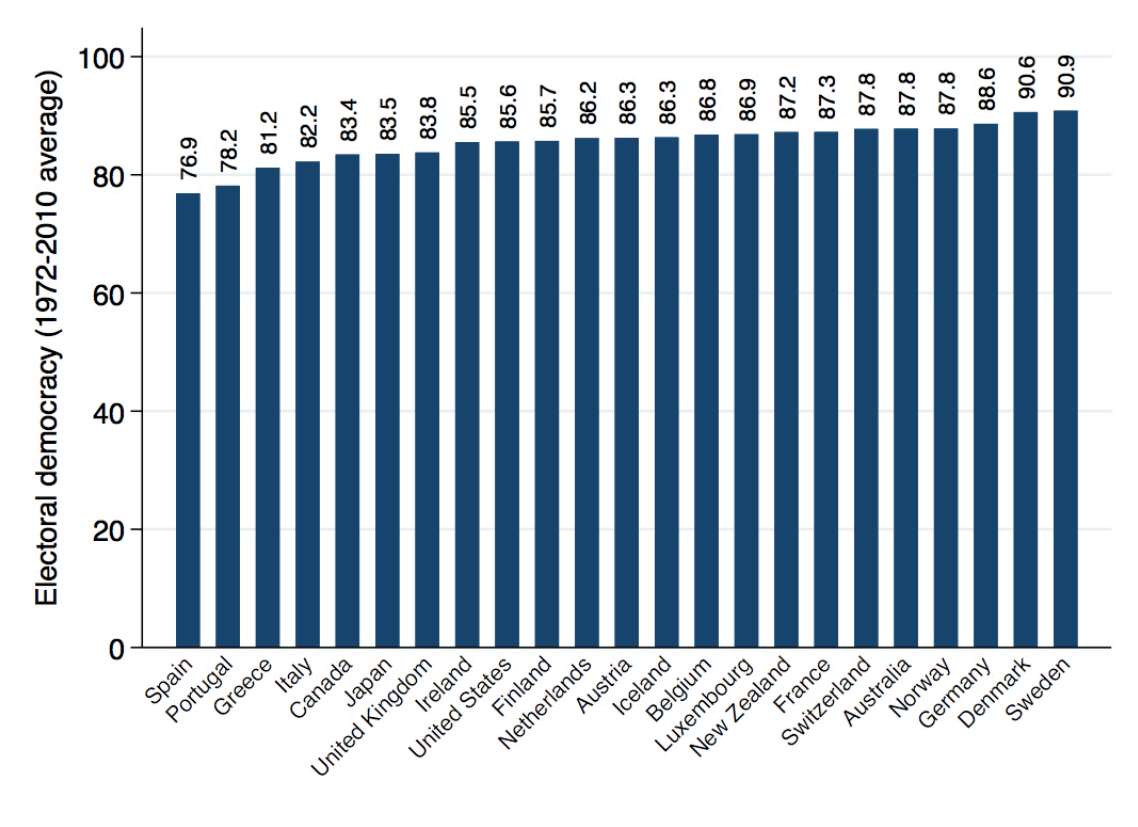
Notes: This figure reports the average Business ownership rate by country over the 1972-2010 period.

Figure A2: Change in the Business ownership rate by country.



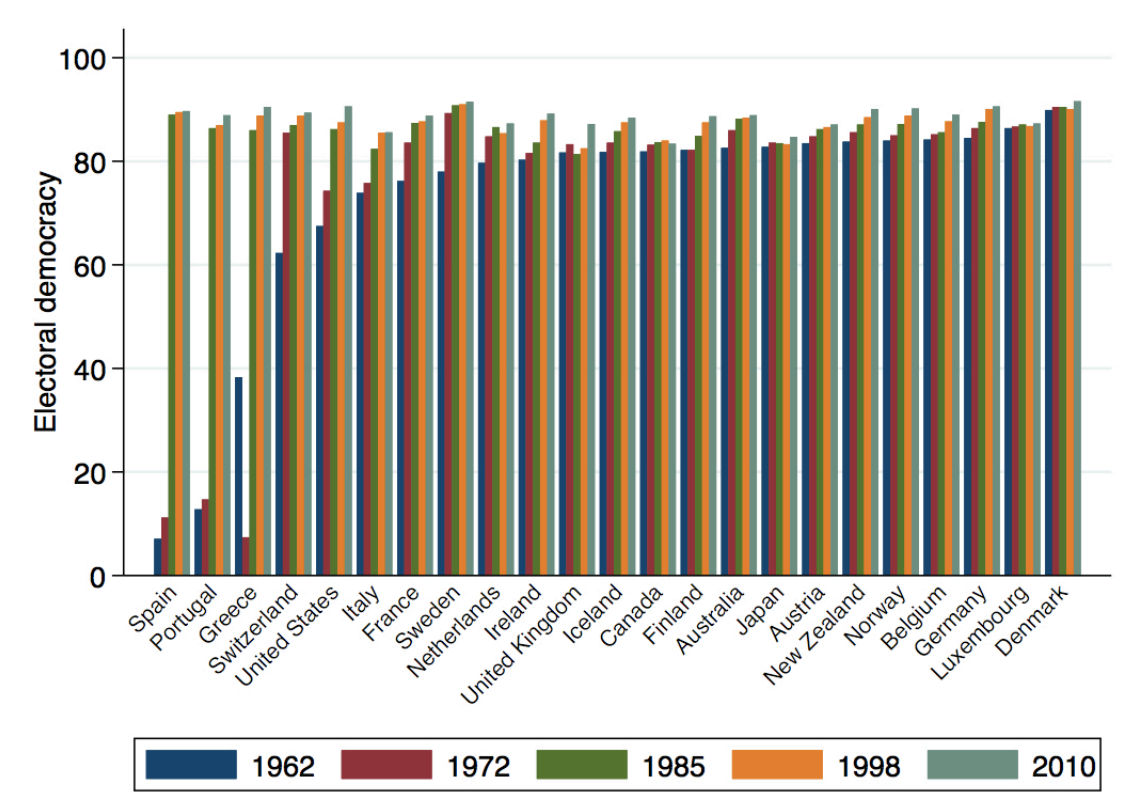
Notes: This figure reports the value of the country Business ownership rate observed in 1972, 1985, 1998, and 2010.

Figure A3: Electoral democracy index by country.



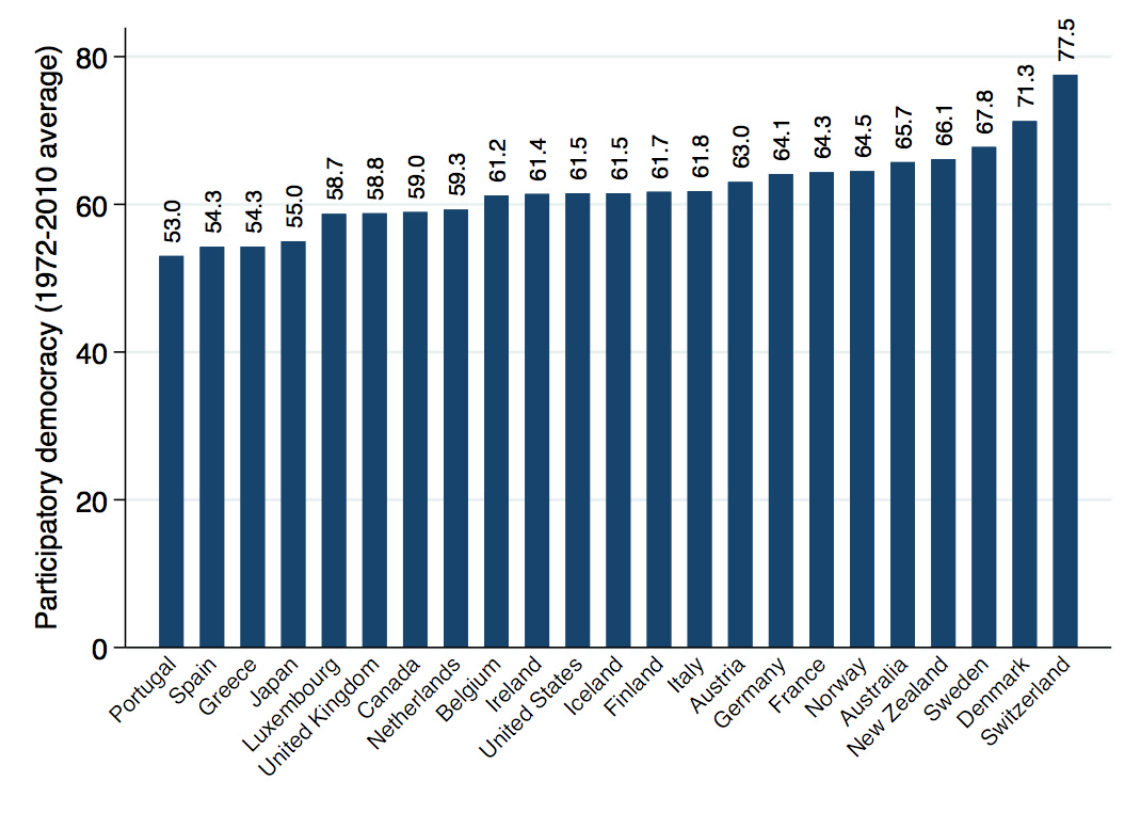
Notes: This figure reports the average Electoral democracy index by country over the 1972-2010 period.

Figure A4: Change in the Electoral democracy index by country.



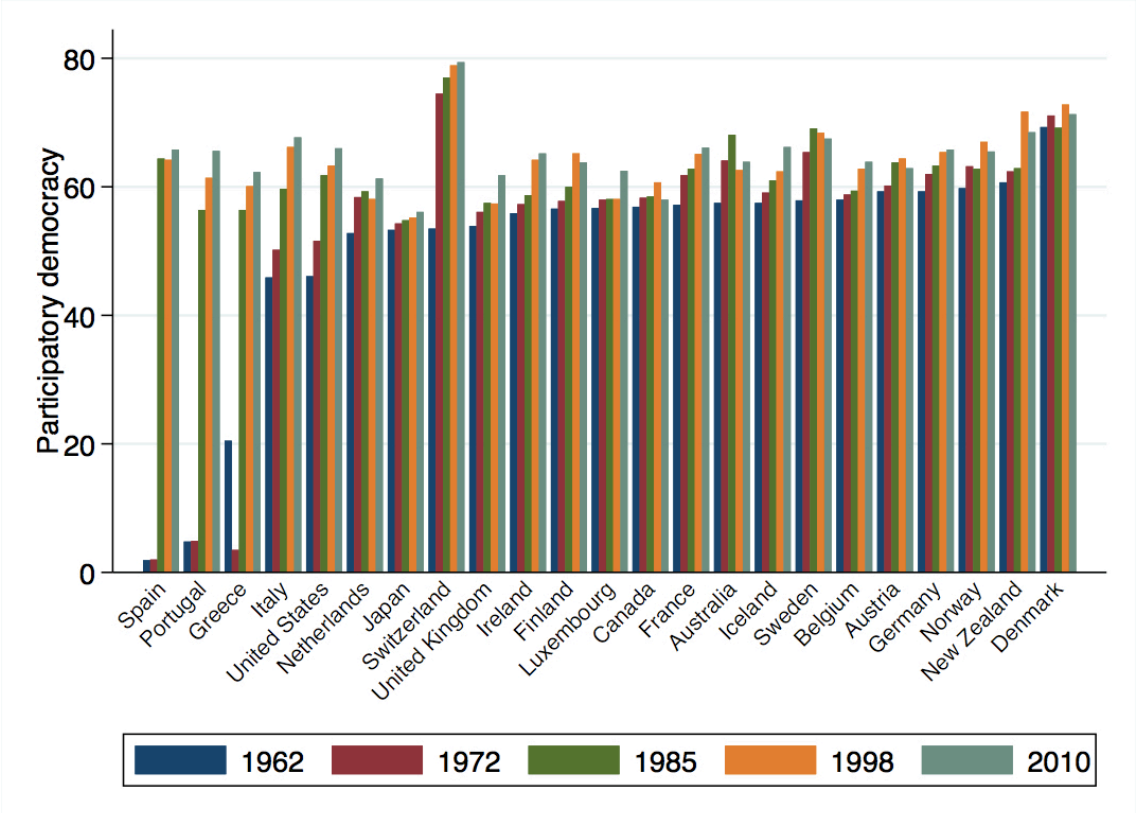
Notes: This figure reports the value of the country Electoral democracy index observed in 1962, 1972, 1985, 1998, and 2010.

Figure A5: Participatory democracy index by country.



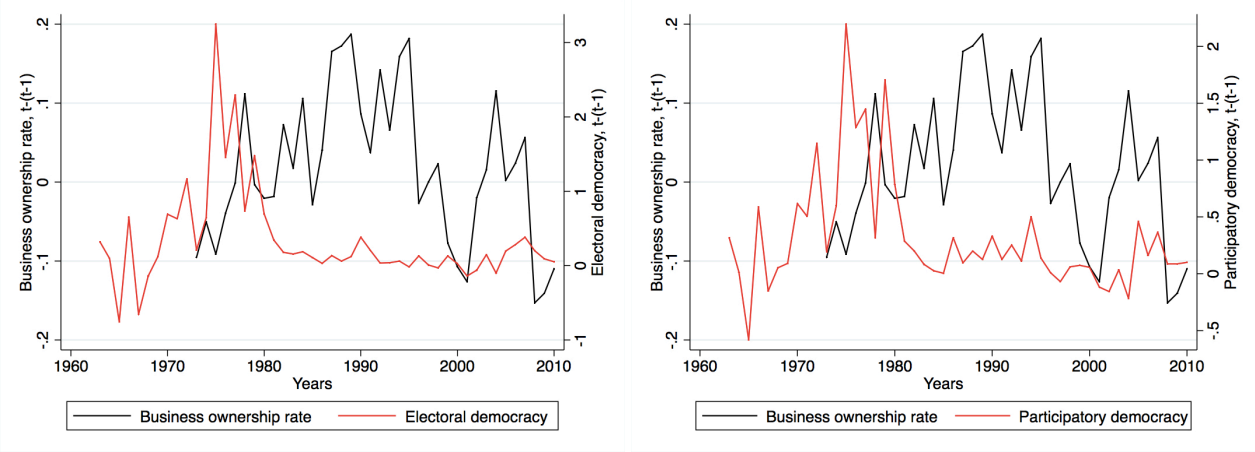
Notes: This figure reports the average Participatory democracy index by country over the 1972-2010 period.

Figure A6: Change in the Participatory democracy index by country.



Notes: This figure reports the value of the country Participatory democracy index observed in 1962, 1972, 1985, 1998, and 2010.

Figure A7: First-differences.



(a) (b)

Notes: This figure plots first-difference yearly averages of the Business ownership rate with the Electoral democracy index (a) and with the Participatory democracy index (b), over the 1962-2010 period.

References

Acemoglu, D., & Robinson, J. A. (2000). Why did the West extend the franchise? Democracy, inequality, and growth in historical perspective. *The Quarterly Journal of Economics*, *115*(4), 1167-1199.

Acemoglu, D., Johnson, S., Robinson, J. A., & Yared, P. (2005). From education to democracy? *American Economic Review*, *95*(2), 44-49.

Acemoglu, D., Johnson, S., Robinson, J. A., & Yared, P. (2008). Income and democracy. *American Economic Review*, *98*(3), 808-42.

Acemoglu, D., Naidu, S., Restrepo, P., & Robinson, J. A. (2015). Democracy, redistribution, and inequality. In *Handbook of income distribution* (Vol. 2, pp. 1885-1966). Elsevier.

Acemoglu, D., Naidu, S., Restrepo, P., & Robinson, J. A. (2019). Democracy does cause growth. *Journal of Political Economy*, *127*(1), 47-100.

Acemoglu, D., Egorov, G., & Sonin, K. (2021). Institutional change and institutional persistence. In *The Handbook of Historical Economics* (pp. 365-389). Academic Press.

Acs, Z. J., Autio, E., & Szerb, L. (2014). National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy*, *43*(3), 476-494.

Acs, Z. J., Desai, S., & Hessels, J. (2008). Entrepreneurship, economic development and institutions. *Small Business Economics*, *31*(3), 219-234.

Acs, Z. J., Audretsch, D. B., & Lehmann, E. E. (2013). The knowledge spillover theory of entrepreneurship. *Small Business Economics*, *41*(4), 757-774.

Adler, P. S., Adly, A., Armanios, D. E., Battilana, J., Bodrožić, Z., Clegg, S., ... & Sheppard-Jones, K. (2023). Authoritarianism, Populism, and the Global Retreat of Democracy: A Curated Discussion. *Journal of Management Inquiry*, *32*(1), 3-20.

Aghion, P., Dewatripont, M., & Stein, J. C. (2008). Academic freedom, private-sector focus, and the process of innovation. *The RAND Journal of Economics*, *39*(3), 617-635.

Aghion, P. (2017). Entrepreneurship and growth: lessons from an intellectual journey. *Small Business Economics*, *48*(1), 9-24.

Aghion, P., Jaravel, X., Persson, T., & Rouzet, D. (2019). Education and military rivalry. *Journal of the European Economic Association*, *17*(2), 376-412.

Aidis, R., Estrin, S., & Mickiewicz, T. (2008). Institutions and entrepreneurship development in Russia: A comparative perspective. *Journal of Business Venturing*, *23*(6), 656-672.

Aidt, T. S., Dutta, J., & Loukoianova, E. (2006). Democracy comes to Europe: franchise extension and fiscal outcomes 1830–1938. *European Economic Review*, *50*(2), 249-283.

Akcigit, U., & Ates, S. T. (2021). Ten facts on declining business dynamism and lessons from endogenous growth theory. *American Economic Journal: Macroeconomics*, *13*(1), 257-98.

Aldrich, H. E., & Fiol, C. M. (1994). Fools rush in? The institutional context of industry creation. *Academy of Management Review*, *19*(4), 645-670.

Aldrich, H. E. (2000). Entrepreneurial strategies in new organizational populations. *Entrepreneurship: The social science view* (pp. 211-228). Oxford University Press.

Aldrich, H. E., & Cliff, J. E. (2003). The pervasive effects of family on entrepreneurship: Toward a family embeddedness perspective. *Journal of Business Venturing*, *18*(5), 573-596.

Amorós, J. E., Ciravegna, L., Mandakovic, V., & Stenholm, P. (2019). Necessity or opportunity? The effects of state fragility and economic development on entrepreneurial efforts. *Entrepreneurship Theory and Practice*, *43*(4), 725-750.

Andersson, M., & Larsson, J. P. (2016). Local entrepreneurship clusters in cities. *Journal of Economic Geography*, *16*(1), 39-66.

Anokhin, S., & Schulze, W. S. (2009). Entrepreneurship, innovation, and corruption. *Journal of Business Venturing*, *24*(5), 465-476.

Aparicio, S., Urbano, D., & Audretsch, D. B. (2016). Institutional factors, opportunity entrepreneurship and economic growth: Panel data evidence. *Technological Forecasting and Social Change*, *102*, 45-61.

Armour, J., & Cumming, D. (2008). Bankruptcy law and entrepreneurship. *American Law and Economics Review*, *10*(2), 303-350.

Ashraf, B. N. (2017). Political institutions and bank risk-taking behavior. *Journal of Financial Stability*, *29*, 13-35.

Audretsch, D. B., & Thurik, A. R. (2000). Capitalism and democracy in the 21st century: from the managed to the entrepreneurial economy. *Journal of Evolutionary Economics*, *10*(1), 17-34.

Audretsch, D. B., & Lehmann, E. E. (2005). Does the knowledge spillover theory of entrepreneurship hold for regions? *Research Policy*, *34*(8), 1191-1202.

Audretsch, D. B., Keilbach, M. C., & Lehmann, E. E. (2006). *Entrepreneurship and economic growth*. Oxford University Press.

Audretsch, D. B., Seitz, N., & Rouch, K. M. (2018). Tolerance and innovation: the role of institutional and social trust. *Eurasian Business Review*, *8*(1), 71-92.

Audretsch, D. B., & Belitski, M. (2020). The role of R&D and knowledge spillovers in innovation and productivity. *European Economic Review*, *123*, 103391.

Audretsch, D. B., & Moog, P. (2022). Democracy and entrepreneurship. *Entrepreneurship Theory and Practice*, *46*(2), 368-392.

Autio, E., Kenney, M., Mustar, P., Siegel, D., & Wright, M. (2014). Entrepreneurial innovation: The importance of context. *Research Policy*, *43*(7), 1097-1108.

Barro, R. J. (1996). Democracy and growth. *Journal of Economic Growth*, *1*(1), 1-27.

Batjargal, B. A. T., Hitt, M. A., Tsui, A. S., Arregle, J. L., Webb, J. W., & Miller, T. L. (2013). Institutional polycentrism, entrepreneurs' social networks, and new venture growth. *Academy of Management Journal*, *56*(4), 1024-1049.

Batjargal, B., Jack, S., Mickiewicz, T., Stam, E., Stam, W., & Wennberg, K. (2023). Crises, Covid-19, and Entrepreneurship. *Entrepreneurship Theory and Practice*, 10422587221145676.

Bhattacharyya, S., & Hodler, R. (2010). Natural resources, democracy and corruption. *European Economic Review*, *54*(4), 608-621.

Baum, M. A., & Lake, D. A. (2003). The political economy of growth: democracy and human capital. *American Journal of Political Science*, *47*(2), 333-347.

Baumol, W.J. (1990). Entrepreneurship, productive, unproductive, and destructive. *Journal of Political Economy*, *98*(5), 893-921.

Belitski, M., Chowdhury, F., & Desai, S. (2016). Taxes, corruption, and entry. *Small Business Economics*, *47*(1), 201-216.

Bennett, D. L. (2021). Local economic freedom and creative destruction in America. *Small Business Economics*, *56*(1), 333-353.

Bennett, D. L., Boudreaux, C., & Nikolaev, B. (2022). Populist discourse and entrepreneurship: The role of political ideology and institutions. *Journal of International Business Studies*, 1-31.

Besley, T., & Kudamatsu, M. (2006). Health and democracy. *American Economic Review*, *96*(2), 313-318.

Bettinelli, C., Fayolle, A., & Randerson, K. (2014). *Family entrepreneurship: a developing field* (Vol. 10, No. 3, pp. 161-236). Now publishers.

Berggren, N., & Elinder, M. (2012). Is tolerance good or bad for growth?. *Public Choice*, *150*(1), 283-308.

Berggren, N., & Bjørnskov, C. (2022). Political institutions and academic freedom: evidence from across the world. *Public Choice*, *190*(1), 205-228.

Birch, D. (1981). Who creates jobs? *The National Interest*, 3-14.

Bird, B. (1988). Implementing entrepreneurial ideas: The case for intention. *Academy of Management Review*, *13*(3), 442-453.

Bjørnskov, C., & Foss, N. J. (2008). Economic freedom and entrepreneurial activity: Some cross-country evidence. *Public Choice*, *134*(3), 307-328.

Black, S. E., & Strahan, P. E. (2002). Entrepreneurship and bank credit availability. *The Journal of Finance*, *57*(6), 2807-2833.

Blaydes, L., & Kayser, M. A. (2011). Counting calories: democracy and distribution in the developing world. *International Studies Quarterly*, *55*(4), 887-908.

Blanchflower, D. G. (2000). Self-employment in OECD countries. *Labour Economics*, *7*(5), 471-505.

Block, J. H., Thurik, A. R., & Zhou, H. (2013). What turns knowledge into innovative products? The role of entrepreneurship and knowledge spillovers. *Journal of Evolutionary Economics*, *23*(4), 693-718.

Bono, J. E., & McNamara, G. (2011). Publishing in AMJ—part 2: research design. *Academy of Management Journal*, *54*(4), 657-660.

Boubakri, N., Mansi, S. A., & Saffar, W. (2013). Political institutions, connectedness, and corporate risk-taking. *Journal of International Business Studies*, *44*(3), 195-215.

Boudreaux, C. J., Nikolaev, B. N., & Holcombe, R. G. (2018). Corruption and destructive entrepreneurship. *Small Business Economics*, *51*(1), 181-202.

Bradley, S. W., & Klein, P. (2016). Institutions, economic freedom, and entrepreneurship: The contribution of management scholarship. *Academy of Management Perspectives*, *30*(3), 211-221.

Brunetto, Y., & Farr-Wharton, R. (2007). The moderating role of trust in SME owner/managers' decision-making about collaboration. *Journal of Small Business Management*, *45*(3), 362-387.

Brunkert, L., Kruse, S., & Welzel, C. (2019). A tale of culture-bound regime evolution: the centennial democratic trend and its recent reversal. *Democratization*, *26*(3), 422-443.

Calvino, F., & Criscuolo, C. (2019). *Business dynamics and digitalisation*. *OECD Science, Technology and Industry Policy Papers, No. 62*. OECD Publishing.

Carree, M., Van Stel, A., Thurik, R., & Wennekers, S. (2002). Economic development and business ownership: an analysis using data of 23 OECD countries in the period 1976–1996. *Small Business Economics*, *19*(3), 271-290.

Carree, M. & Thurik, A.R. (2003). The impact of entrepreneurship on economic growth. In Z.J. Acs & D. Audretsch (Eds.), *Handbook of entrepreneurship research: An interdisciplinary survey and introduction* (pp. 437–471). New York: Springer.

Carree, M., Van Stel, A., Thurik, R., & Wennekers, S. (2007). The relationship between economic development and business ownership revisited. *Entrepreneurship & Regional Development*, *19*(3), 281-291.

Cassan, G., & Van Steenvoort, M. (2021). Political Regime and COVID 19 death rate: efficient, biasing or simply different autocracies? *SSM-Population Health, 16*, 100912.

Chowdhury, F., Audretsch, D. B., & Belitski, M. (2019). Institutions and entrepreneurship quality. *Entrepreneurship Theory and Practice*, *43*(1), 51-81.

Colagrossi, M., Rossignoli, D., & Maggioni, M. A. (2020). Does democracy cause growth? A meta-analysis (of 2000 regressions). *European Journal of Political Economy*, *61*, 101824.

Coppedge, M., Gerring, J., Knutsen, C. H., Krusell, J., Medzihorsky, J., Pernes, J. & Lindberg, S. I. (2019). The Methodology of "Varieties of Democracy"(V-Dem). *Bulletin of Sociological Methodology, 143*(1), 107-133.

Cowling, M., & Taylor, M. (2001). Entrepreneurial women and men: two different species?. *Small Business Economics*, *16*(3) 167-175.

Dacin, M. T., Dacin, P. A., & Tracey, P. (2011). Social entrepreneurship: A critique and future directions. *Organization Science*, *22*(5), 1203-1213.

Dahl, R. A. (1971). *Polyarchy: Participation and opposition*. Yale University Press.

Dahl, R. A. (1989). *Democracy and its Critics*. Yale University Press.

Dahl, R. A. (1998). *On Democracy*. Yale University Press.

Davidsson, P., & Honig, B. (2003). The role of social and human capital among nascent entrepreneurs. *Journal of Business Venturing*, *18*(3), 301-331.

Davidsson, P. (2020). Look out! See change? Sea change ahead!. *Academy of Management Discoveries*, *6*(3), 321-324.

De Loecker, J., Eeckhout, J., & Unger, G. (2020). The rise of market power and the macroeconomic implications. *The Quarterly Journal of Economics*, *135*(2), 561-644.

Decker, R. A., Haltiwanger, J., Jarmin, R. S., & Miranda, J. (2014). The role of entrepreneurship in US job creation and economic dynamism. *Journal of Economic Perspectives*, *28*(3), 3-24.

Decker, R. A., Haltiwanger, J., Jarmin, R. S., & Miranda, J. (2016). Declining business dynamism: What we know and the way forward. *American Economic Review*, *106*(5), 203-07.

Diamond, L. (2015). Facing up to the democratic recession. *Journal of Democracy*, *26*(1), 141-155.

Diamond, L. (2020). Breaking out of the democratic slump. *Journal of Democracy*, *31*(1), 36-50.

Dorado, S. (2005). Institutional entrepreneurship, partaking, and convening. *Organization Studies*, *26*(3), 385-414.

Dorado, S., & Ventresca, M. J. (2013). Crescive entrepreneurship in complex social problems: Institutional conditions for entrepreneurial engagement. *Journal of Business Venturing*, *28*(1), 69-82.

Dutta, N., & Sobel, R. (2016). Does corruption ever help entrepreneurship? *Small Business Economics*, *47*(1), 179-199.

Elert, N., & Henrekson, M. (2017). Entrepreneurship and institutions: a bidirectional relationship. *Foundations and Trends in Entrepreneurship*, *13*(3), 191-263.

Erken, H., Donselaar, P., & Thurik, A. R. (2018). Total factor productivity and the role of entrepreneurship. *The Journal of Technology Transfer*, *43*(6), 1493-1521.

Estrin, S., & Mickiewicz, T. (2011). Entrepreneurship in transition economies: The role of institutions and generational change. In *The dynamics of entrepreneurship: Evidence from the global entrepreneurship monitor data*, 181-208. OUP Oxford.

Estrin, S., Mickiewicz, T., & Stephan, U. (2013). Entrepreneurship, social capital, and institutions: Social and commercial entrepreneurship across nations. *Entrepreneurship Theory and Practice*, *37*(3), 479-504.

Evans, D.S., & Leighton, L.S., (1989). Some empirical aspects of entrepreneurship. *American Economic Review*, 79 (3), 519–535.

Faggio, G., & Silva, O. (2014). Self-employment and entrepreneurship in urban and rural labour markets. *Journal of Urban Economics*, *84*, 67-85.

Fairlie, R. W., & Fossen, F. M. (2020). Defining opportunity versus necessity entrepreneurship: Two components of business creation. In *Change at home, in the labor market, and on the job*. Emerald Publishing Limited.

Fan, W., & White, M. J. (2003). Personal bankruptcy and the level of entrepreneurial activity. *The Journal of Law and Economics*, *46*(2), 543-567.

Florida, R. (2004). *The rise of the creative class and how it's transforming work, leisure, community and everyday life (Paperback Ed.)*. New York: Basic Books.

Florida, R., Adler, P., & Mellander, C. (2017). The city as innovation machine. *Regional Studies*, *51*(1), 86-96.

Freitag, M., & Ackermann, K. (2016). Direct democracy and institutional trust: Relationships and differences across personality traits. *Political Psychology*, *37*(5), 707-723.

Fritsch, M., & Storey, D. J. (2014). Entrepreneurship in a regional context: Historical roots, recent developments and future challenges. *Regional Studies*, *48*(6), 939-954.

Fu, K., Wennberg, K., & Falkenhall, B. (2020). Productive entrepreneurship and the effectiveness of insolvency legislation: a cross-country study. *Small Business Economics*, *54*(2), 383-404.

Gallego, F. A. (2010). Historical origins of schooling: The role of democracy and political decentralization. *The Review of Economics and Statistics*, *92*(2), 228-243.

Gao, Y., Zang, L., Roth, A., & Wang, P. (2017). Does democracy cause innovation? An empirical test of the Popper hypothesis. *Research Policy*, *46*(7), 1272-1283.

Gartner, W. B., & Shane, S. A. (1995). Measuring entrepreneurship over time. *Journal of Business Venturing*, *10*(4), 283-301.

Geddes, B. (1999). What do we know about democratization after twenty years? *Annual Review of Political Science*, *2*(1), 115-144.

Gerring, J., Thacker, S. C., & Alfaro, R. (2012). Democracy and human development. *The Journal of Politics*, *74*(1), 1-17.

Ghio, N., Guerini, M., Lehmann, E. E., & Rossi-Lamastra, C. (2015). The emergence of the knowledge spillover theory of entrepreneurship. *Small Business Economics*, *44*(1), 1-18.

Giannetti, M., & Simonov, A. (2009). Social interactions and entrepreneurial activity. *Journal of Economics & Management Strategy*, *18*(3), 665-709.

Giuliano, P., Mishra, P., & Spilimbergo, A. (2013). Democracy and reforms: evidence from a new dataset. *American Economic Journal: Macroeconomics*, *5*(4), 179-204.

Glaeser, E. L. (2009). Entrepreneurship and the City. In *Entrepreneurship and Openness*. Edward Elgar Publishing.

Grosjean, P., & Senik, C. (2011). Democracy, market liberalization, and political preferences. *The Review of Economics and Statistics*, *93*(1), 365-381.

Gründler, K., & Krieger, T. (2016). Democracy and growth: Evidence from a machine learning indicator. *European Journal of Political Economy*, *45*, 85-107.

Gu, M., Shu, C., & Urbano, D. (2022). Knowledge Creation, Knowledge Exploitation, and Employee Venturing Behaviors at the National Level. In *Academy of Management Proceedings* (Vol. 2022, No. 1, p. 12808). Briarcliff Manor, NY 10510: Academy of Management.

Harding, R., & Stasavage, D. (2014). What democracy does (and doesn't do) for basic services: School fees, school inputs, and African elections. *The Journal of Politics*, *76*(1), 229-245.

Hauser, C., Tappeiner, G., & Walde, J. (2007). The learning region: the impact of social capital and weak ties on innovation. *Regional Studies*, *41*(1), 75-88.

Hayek, F. A. (1945). The use of knowledge in society. *The American Economic Review*, *35*(4), 519-530.

von Hippel, E. (1994). "Sticky information" and the locus of problem solving: implications for innovation. *Management Science*, *40*(4), 429-439.

Hwang, H., & Powell, W. W. (2005). Institutions and entrepreneurship. In *Handbook of entrepreneurship research,* 201-232. Springer, Boston, MA.

Huntington, S. P. (1991). Democracy's third wave. *Journal of Democracy*, *2*(2), 12-34.

Kenney, M., & Zysman, J. (2016). The rise of the platform economy. *Issues in Science and Technology*, *32*(3), 61.

Keuschnigg, C., & Bo Nielsen, S. (2004). Progressive taxation, moral hazard, and entrepreneurship. *Journal of Public Economic Theory*, *6*(3), 471-490.

Korosteleva, J., & Belitski, M. (2017). Entrepreneurial dynamics and higher education institutions in the post-Communist world. *Regional Studies*, *51*(3), 439-453.

Kudamatsu, M. (2012). Has democratization reduced infant mortality in sub-Saharan Africa? Evidence from micro data. *Journal of the European Economic Association*, *10*(6), 1294-1317.

Lawson, R. A., Murphy, R., & Powell, B. (2020). The determinants of economic freedom: A survey. *Contemporary Economic Policy*, *38*(4), 622-642.

Lazear, E.P. (2005). Entrepreneurship. *Journal of Labor Economics,* 23(4), 649-680.

Lee, C. S. (2005). Income inequality, democracy, and public sector size. *American Sociological Review*, *70*(1), 158-181.

Lee, S. H., Yamakawa, Y., Peng, M. W., & Barney, J. B. (2011). How do bankruptcy laws affect entrepreneurship development around the world? *Journal of Business Venturing*, *26*(5), 505-520.

Lehmann, E. E., & Seitz, N. (2017). Freedom and innovation: A country and state level analysis. *The Journal of Technology Transfer*, *42*(5), 1009-1029.

Lévesque, M., & Stephan, U. (2020). It's time we talk about time in entrepreneurship. *Entrepreneurship Theory and Practice*, *44*(2), 163-184.

Liñán, F., & Fernandez-Serrano, J. (2014). National culture, entrepreneurship and economic development: different patterns across the European Union. *Small Business Economics*, *42*, 685-701.

Lindberg, S. I., Coppedge, M., Gerring, J., & Teorell, J. (2014). V-Dem: A new way to measure democracy. *Journal of Democracy*, *25*(3), 159-169.

Lindert, P. (2004). *Growing public*. Cambridge: Cambridge University Press.

Ljunge, M. (2014). Social capital and political institutions: Evidence that democracy fosters trust. *Economics Letters*, *122*(1), 44-49.

Lockett, N., Kerr, R., & Robinson, S. (2008). Multiple perspectives on the challenges for knowledge transfer between higher education institutions and industry. *International Small Business Journal*, *26*(6), 661-681.

Lührmann, A., Grahn, S., Morgan, R., Pillai, S., & Lindberg, S. I. (2019). State of the world 2018: democracy facing global challenges. *Democratization*, *26*(6), 895-915.

Madsen, J. B., Raschky, P. A., & Skali, A. (2015). Does democracy drive income in the world, 1500–2000? *European Economic Review*, *78*, 175-195.

McLain, D. L., & Hackman, K. (1999). Trust, risk, and decision-making in organizational change. *Public Administration Quarterly*, *23*(2), 152-176.

McMann, K. M. (2018). Measuring subnational democracy: toward improved regime typologies and theories of regime change. *Democratization*, *25*(1), 19-37.

McMullen, J. S., Bagby, D. R., & Palich, L. E. (2008). Economic freedom and the motivation to engage in entrepreneurial action. *Entrepreneurship Theory and Practice*, *32*(5), 875-895.

Meek, W. R., Pacheco, D. F., & York, J. G. (2010). The impact of social norms on entrepreneurial action: Evidence from the environmental entrepreneurship context. *Journal of Business Venturing*, *25*(5), 493-509.

Mickiewicz, T., Stephan, U., & Shami, M. (2021). The consequences of short-term institutional change in the rule of law for entrepreneurship. *Global Strategy Journal*, *11*(4), 709-739.

Morris, M. H., Kuratko, D. F., & Covin, J. G. (2010). *Corporate entrepreneurship & innovation*. Cengage Learning.

Mulligan, C. B., Gil, R., & Sala-i-Martin, X. (2004). Do democracies have different public policies than nondemocracies? *Journal of Economic Perspectives*, *18*(1), 51-74.

Naudé, W. (2010). Entrepreneurship, developing countries, and development economics: new approaches and insights. *Small Business Economics*, *34*(1), 1-12.

Naudé, W. (2022). From the Entrepreneurial to the Ossified Economy. *Cambridge Journal of Economics, 46*(1), 105-131.

North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.

Nyström, K. (2008). The institutions of economic freedom and entrepreneurship: evidence from panel data. *Public Choice*, *136*(3), 269-282.

Ober, J. (2008). Democracy and knowledge. In *Democracy and Knowledge*. Princeton University Press.

Osei-Tutu, F., & Weill, L. (2022). Democracy favors access to credit of firms. *European Journal of Political Economy*, 102312.

Papaioannou, E., & Siourounis, G. (2008). Democratisation and growth. *The Economic Journal*, *118*(532), 1520-1551.

Parker, S. C., Congregado, E., & Golpe, A. A. (2012). Testing for hysteresis in entrepreneurship in 23 OECD countries. *Applied Economics Letters*, *19*(1), 61-66.

Parker, S. C. (2018). *The Economics of Entrepreneurship - 2nd Edition*. Cambridge. Cambridge University Press.

Peng, M. W., Yamakawa, Y., & Lee, S. H. (2010). Bankruptcy laws and entrepreneur–friendliness. *Entrepreneurship Theory and Practice*, *34*(3), 517-530.

Pieters, H., Curzi, D., Olper, A., & Swinnen, J. (2016). Effect of democratic reforms on child mortality: a synthetic control analysis. *The Lancet Global Health*, *4*(9), e627-e632.

Plattner, M. F. (2015). Is democracy in decline? *Journal of Democracy*, *26*(1), 5-10.

Poschke, M. (2013). 'Entrepreneurs out of necessity': A snapshot. *Applied Economics Letters*, *20*(7), 658-663.

Qi, Y., Roth, L., & Wald, J. K. (2010). Political rights and the cost of debt. *Journal of Financial Economics*, *95*(2), 202-226.

Queralto, A. (2020). A model of slow recoveries from financial crises. *Journal of Monetary Economics*, *114*, 1-25.

Rainer, H., & Siedler, T. (2009). Does democracy foster trust? *Journal of Comparative Economics*, *37*(2), 251-269.

Randerson, K., Bettinelli, C., Fayolle, A., & Anderson, A. (2015). Family entrepreneurship as a field of research: Exploring its contours and contents. *Journal of Family Business Strategy*, *6*(3), 143-154.

Reed, W. R. (2015). On the practice of lagging variables to avoid simultaneity. *Oxford Bulletin of Economics and Statistics*, *77*(6), 897-905.

Reynal-Querol, M. (2005). Does democracy pre-empt civil wars? *European Journal of Political Economy*, *21*(2), 445-465.

Robinson, P. B., & Sexton, E. A. (1994). The effect of education and experience on self-employment success. *Journal of Business Venturing*, *9*(2), 141-156.

Rode, M., & Gwartney, J. D. (2012). Does democratization facilitate economic liberalization? *European Journal of Political Economy*, *28*(4), 607-619.

Rodrik, D. (1999). Where did all the growth go? External shocks, social conflict, and growth collapses. *Journal of Economic Growth*, *4*(4), 385-412.

Rodrik, D., & Wacziarg, R. (2005). Do democratic transitions produce bad economic outcomes? *American Economic Review*, *95*(2), 50-55.

Sautet, F. (2013). Local and systemic entrepreneurship: Solving the puzzle of entrepreneurship and economic development. *Entrepreneurship Theory and Practice*, *37*(2), 387-402.

Scheve, K., & Stasavage, D. (2017). Wealth inequality and democracy. *Annual Review of Political Science*, *20*, 451-468.

Schmutzler, J., Andonova, V., & Diaz-Serrano, L. (2019). How context shapes entrepreneurial self-efficacy as a driver of entrepreneurial intentions: A multilevel approach. *Entrepreneurship Theory and Practice*, *43*(5), 880-920.

Schulz, M., Urbig, D., & Procher, V. (2016). Hybrid entrepreneurship and public policy: The case of firm entry deregulation. *Journal of Business Venturing*, *31*(3), 272-286.

Siqueira, A. C. O., Webb, J. W., & Bruton, G. D. (2016). Informal entrepreneurship and industry conditions. *Entrepreneurship Theory and Practice*, *40*(1), 177-200.

Smith, G. (2009). *Democratic innovations: Designing institutions for citizen participation*. Cambridge University Press.

Sobel, R. S. (2008). Testing Baumol: Institutional quality and the productivity of entrepreneurship. *Journal of Business Venturing*, *23*(6), 641-655.

Stenholm, P., Acs, Z. J., & Wuebker, R. (2013). Exploring country-level institutional arrangements on the rate and type of entrepreneurial activity. *Journal of Business Venturing*, *28*(1), 176-193.

Teorell, J., Coppedge, M., Lindberg, S., & Skaaning, S. E. (2019). Measuring polyarchy across the globe, 1900–2017. *Studies in Comparative International Development*, *54*(1), 71-95.

Terjesen, S., Hessels, J., & Li, D. (2016). Comparative international entrepreneurship: A review and research agenda. *Journal of Management*, *42*(1), 299-344.

Urbano, D., & Alvarez, C. (2014). Institutional dimensions and entrepreneurial activity: an international study. *Small Business Economics*, *42*(4), 703-716.

Urbano, D., Aparicio, S., & Querol, V. (2016). Social progress orientation and innovative entrepreneurship: an international analysis. *Journal of Evolutionary Economics*, *26*(5), 1033-1066.

Urbano, D., Aparicio, S., & Audretsch, D. B. (2019). *Institutions, entrepreneurship, and economic performance*. Cham: Springer International Publishing.

Utterback, J. M. (1971). The process of technological innovation within the firm. *Academy of Management Journal*, *14*(1), 75-88.

Van Stel, A. (2005). COMPENDIA: Harmonizing business ownership data across countries and over time. *The International Entrepreneurship and Management Journal*, *1*(1), 105-123.

Van Stel, A. (2008). The Compendia data base: Comparative entrepreneurship data for international analysis. In *Measuring Entrepreneurship* (pp. 65-84). Springer, Boston, MA.

Van Stel, A., Carree, M., & Thurik, A. R. (2005). The effect of entrepreneurial activity on national economic growth. *Small Business Economics*, *24*(3), 311-321.

Van Stel, A., Storey, D. J., & Thurik, A. R. (2007). The effect of business regulations on nascent and young business entrepreneurship. *Small Business Economics*, *28*(2), 171-186.

Verheul, I., Stel, A. V., & Thurik, R. (2006). Explaining female and male entrepreneurship at the country level. *Entrepreneurship and Regional Development*, *18*(2), 151-183.

Vivona, R. (2023). The new era leadership for the public sector? Entrepreneurship, effectiveness, and democracy. *Public Management Review*, 1-17.

Wang, Q. J., Feng, G. F., Wang, H. J., & Chang, C. P. (2021). The impacts of democracy on innovation: Revisited evidence. *Technovation*, *108*, 102333.

Welter, F., & Smallbone, D. (2006). Exploring the role of trust in entrepreneurial activity. *Entrepreneurship Theory and Practice*, *30*(4), 465-475.

Welter, F. (2011). Contextualizing entrepreneurship - conceptual challenges and ways forward. *Entrepreneurship Theory and Practice*, *35*(1), 165-184.

Welter, F. (2012). All you need is trust? A critical review of the trust and entrepreneurship literature. *International Small Business Journal*, *30*(3), 193-212.

Welter, F., Baker, T., & Wirsching, K. (2019). Three waves and counting: The rising tide of contextualization in entrepreneurship research. *Small Business Economics*, *52*(2), 319-330.

Wennekers, S., & Thurik, A. R. (1999). Linking entrepreneurship and economic growth. *Small Business Economics*, *13*(1), 27-56.

Wennekers, S., Van Wennekers, A., Thurik, A. R., & Reynolds, P. (2005). Nascent entrepreneurship and the level of economic development. *Small Business Economics*, *24*(3), 293-309.

Wolfe, M. T., & Patel, P. C. (2022). Does democracy make it easy? the influence of a sudden onset of democracy and entrepreneurship. *Applied Economics*, 1-16.

Wooldridge, J. M. (2015). *Introductory econometrics: A modern approach*. Cengage learning.

Zuazu, I. (2019). The growth effect of democracy and technology: An industry disaggregated approach. *European Journal of Political Economy*, *56*, 115-131.

Web references

"Democracy in retreat", *Freedom in the World 2019 - Freedom House report*, accessible at https://freedomhouse.org/report/freedom-world/2019/democracy-retreat

"Democracy under Siege", *Freedom in the World 2021 - Freedom House report*, accessible at https://freedomhouse.org/report/freedom-world/2021/democracy-under-siege

"Democracy Index 2021: The China Challenge", *Economist Intelligence Unit*, accessible at https://www.eiu.com/n/campaigns/democracy-index-2021/

"Autocratization Changing Nature?", *Varieties of Democracy Report 2022*, accessible at https://v-dem.net/media/publications/dr_2022.pdf

"The relationship between democracy and business", *CEO Today Magazine*, August 05, 2021, accessible at https://www.ceotodaymagazine.com/2021/08/the-relationship-between-democracy-and-business/

Rebecca Hendersen, "Business Can't Take Democracy for Granted", *Harvard Business Review*, January 08, 2021, accessible at https://hbr.org/2021/01/business-cant-take-democracy-for-granted

Michael Carney, "Democracy Needs Business & Business Needs Democracy", *U.S. Chamber of Commerce Foundation*, January 12, 2021, accessible at https://www.uschamberfoundation.org/blog/post/democracy-needs-business-business-needs-democracy

Matthew Douglas, "Democracy is good for business", *TechCrunch*, March 12, 2019, accessible at https://techcrunch.com/2019/03/12/democracy-is-good-for-business/

Alvin Carpio, "The rise of the political entrepreneurs and why we need them", *World Economic Forum*, November 23, 2017, accessible at https://www.weforum.org/agenda/2017/11/the-rise-of-the-political-entrepreneur-and-why-we-need-more-of-them/