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RÉSUMÉ

Cette thèse est composée de trois essais en économie de l'entrepreneuriat, avec pour objectif général d'apporter des contributions aux travaux existants sur le rôle des contraintes financières, des coûts administratifs de démarrage d'entreprise et des politiques de protection de l'emploi, dans l'explication du choix occupationnel des individus et de la dynamique entrepreneuriale.

Le premier essai utilise des microdonnées d'individus provenant de trois grandes enquêtes comparables en Europe et aux États Unis d'Amérique (SHARE, ELSA et HRS) ainsi que des données mesurant la réglementation des entreprises (Doing Business) de la Banque Mondiale, pour évaluer empiriquement l'effet des coûts de démarrage d'entreprise sur la relation liant entrepreneuriat et richesse. Nous exploitons la dimension temporelle des données pour explorer les impacts de la dernière crise financière mondiale de 2007-2010. Nos estimations soutiennent une relation croissante entre richesse individuelle et probabilité relative d'être entrepreneur. Cependant, cette relation est affaiblie par l'effet des coûts de démarrage d'entreprise. Ceci suggère que les réglementations d'établissement d'entreprises diminuent la valeur marginale de la richesse pour des fins d'entrepreneuriat, en présence de contraintes d'emprunt. Nous trouvons que cet effet négatif des réglementations de démarrage a été relativement plus prononcé en période de crise.

Le second essai fournit une évidence empirique robuste de l'impact macroéconomique de la concurrence bancaire sur la création d'entreprises. Des études précédentes ont montré que les marchés boursiers, grâce à leurs effets de liquidité,

favorisent la création de nouvelles entreprises à travers leur potentiel de recyclage du capital financier et non-financier qui est fourni aux entreprises naissantes par les intermédiaires financiers. En prenant en compte l'effet de synergie entre banques et marchés boursiers dans le processus de création de nouvelles firmes, nous évaluons dans un cadre d'analyse intégré, l'ampleur de deux hypothèses alternatives concernant l'effet de la concurrence bancaire sur l'accès au crédit. Conformément à l'hypothèse du pouvoir de marché, nous trouvons que la concurrence bancaire a un effet global positif sur l'entrepreneuriat, dû à son impact bénéfique sur l'accès au crédit. Néanmoins, cet effet de la concurrence bancaire diminue avec la taille du marché boursier, ce qui se justifie par le rôle du prêt relationnel, qui sous-tend le processus de recyclage du "capital informé" susmentionné. Ce dernier résultat est en cohérence avec l'hypothèse d'information.

Le troisième essai examine l'effet des coûts de licenciement et des coûts administratifs de démarrage endurés par les entrepreneurs, sur le choix occupationnel des individus, dans un modèle dynamique d'équilibre général comportant des contraintes d'emprunt, et dans lequel les firmes du secteur de production non-entrepreneurial, peuvent entrer et sortir du marché de façon endogène, tout en devant payer des coûts d'ajustement de leurs niveaux d'emploi. Nous trouvons que les coûts de licenciement payés par les firmes non-entrepreneuriales encouragent les travailleurs salariés à devenir entrepreneurs, et diminuent les taux de sortie d'entrepreneuriat, ce qui induit une augmentation du taux d'entrepreneuriat d'état stationnaire. Ceci s'explique par l'effet négatif de la taxe de licenciement sur les niveaux de productivité et de salaire, ce qui induit une perte de bien-être aux travailleurs. Les coûts de démarrage endurés par les nouveaux entrepreneurs, réduisent l'impact de la taxe de licenciement sur les transitions vers l'entrepreneuriat.

Mots-clés : Entrepreneuriat, Choix occupationnel, Habiletés, Risque, Coûts de démarrage d'entreprise, Contraintes d'emprunt, Richesse, Concurrence bancaire, Marché boursier, Capital informé, Prêt relationnel, Taxe de licenciement.

ABSTRACT

This dissertation consists of three essays in the economics of entrepreneurship, with the overall goal to add value to the literature on the role of liquidity constraints, start-up costs and employment protection policies, in explaining entrepreneurial dynamism and the occupational choice of individuals.

The first essay exploits individual level data from 3 uniquely comparable surveys (SHARE, ELSA and HRS) in Europe and the United States, as well as the World Bank's Doing Business data, to empirically investigate the impact of start-up costs on the self-employment-wealth relationship. The longitudinal nature of the data enables us to investigate potential effects of the last global financial crisis. Results confirm the strong positive relationship between the entrepreneurial choice and wealth. We also find that start-up costs flatten this relationship, which suggests that entry regulations decrease the marginal value of wealth for entrepreneurial entry, under liquidity constraints. Interestingly, although there is no strong evidence that wealth in itself played a bigger role during the crisis, we find that the negative impact of start-up costs on the entrepreneurship-wealth relationship proved to be significantly pronounced during the last crisis.

The second essay provides robust international evidence on the macroeconomic impact of bank competition on new business creation. Previous research has shown that the stock market, due to its liquidity externalities, stimulates business creation by allowing and expediting the recycling of "informed capital" supplied to new start-ups by financial intermediaries. Building on the complementarity between banks and stock markets in the business creation process, we

evaluate in a unifying framework, the extent of two competing theories of bank competition effects on entrepreneurial financing. We find that, in line with the market power hypothesis, bank competition has an overall beneficial impact on new business density by boosting credit access to new entrepreneurs. Yet, consistent with the information hypothesis, this result attenuates as the size of the stock market increases, due to the importance of relationship lending underlying the informed capital recycling.

The third essay studies the effects of firing costs and start-up costs incurred by new entrepreneurs, on the occupational choice in a dynamic general equilibrium model with borrowing constraints and a non-entrepreneurial sector that allows for endogenous entry and exit of corporate firms, as well as labor adjustment across periods. We find that a tax on job destruction at the corporate firm level increases the steady state entrepreneurship rate by prompting the transition of workers into entrepreneurship and decreasing the proportion of exiting entrepreneurs. This is because the firing tax has a negative impact on labor productivity and the equilibrium wage rate, leading to significant welfare losses for workers. Start-up costs significantly lessen the impact of the firing tax on entrepreneurship as they make the transition into entrepreneurship very cumbersome in a financially constrained environment.

Keywords: Entrepreneurship, Occupational choice, Skills, Risk, Start-up costs, Liquidity constraints, Wealth, Bank competition, Stock market, Informed capital, Relationship lending, Firing tax.

INTRODUCTION

Entrepreneurship is a multidisciplinary subject which is widely studied in fields such as finance, management, corporate business, sociology and, not in the least, economics. In fact, the analysis and implications of entrepreneurship, including its dimensions, variants, determinants and explicit integration in macroeconomic models, is increasingly viewed and acknowledged as an important area of scholarly inquiry in economics. Several definitions of entrepreneurship can be found in the literature and in general, the relevant understanding of the concept directly depends on the particular issue at stake or the specific line of thought being considered. For instance, according to the Schumpeter (1934)' s school of thought, an entrepreneur can be defined as someone who is actively engaged in product or organizational innovation in goods or services markets.

In this dissertation, however, an entrepreneur is generically understood as an individual who creates, owns and manages a business project or firm that constitutes his (her) main source of income. In accordance with this definition, an innovator can be considered an entrepreneur only if he (she) owns and manages the new innovative venture. Furthermore, the literature has distinguished between the concepts of "opportunity" and "necessity" entrepreneurship, which have generally been linked to the "pull" and "push" factors of entrepreneurship. In essence, an "opportunity entrepreneur" is someone who is "pulled" into entrepreneurship or decides to start a business project because of a strong willingness, determination and commitment to pursue this choice of occupation which materializes with the identification of a business opportunity or the maturation of a business idea that can be exploited. In contrast, "necessity entrepreneurs" are "pushed"

into entrepreneurship, primarily for lack of appropriate alternative options in the labor market. Typically, they are found in prolonged unemployment status before starting their business projects. In practice, however, it may be difficult to draw a line between these two types of entrepreneurship as ambitions, pull factors or a business mindset could well emerge from states of desperation. Ultimately, even necessity entrepreneurs have to analyze market opportunities, develop an idea and commit to it before turning it into a bankable business venture.

The truth is that, not everyone is able to become entrepreneur, notwithstanding individual ambitions and compulsions. The occupational choice to become entrepreneur is significantly influenced by individual factors, including personal characteristics, as well as the institutional environment. Several theories of individual selection into entrepreneurship emphasize the prominent role of human capital, skill variety and risk aversion. For instance, two seminal papers are Kihlstrom and Laffont (1979) and Lazear (2005). The former proposes a general equilibrium theory of the firm in which risk aversion is the main determinant of the individual choice between wage work and entrepreneurship. The model equilibrium has the key property that less risk averse individuals become entrepreneurs, with the more risk averse being workers. On the other hand, the theory proposed by Lazear (2005) suggests that individuals with balanced skills are more likely to become entrepreneurs, considering entrepreneurship requires some knowledge in a variety of roles, while wage work emphasizes expertise in a specific area. More recently, Hsieh et al (2017) show that risk aversion may encourage individuals to invest in balanced skills, which in turn, increases their likelihood to become entrepreneurs. Their finding suggests that risk aversion per se may not be a deterrent in converting creative ideas to financially viable projects. High risk-averse people could become very successful entrepreneurs if they have the necessary skills. In other words, entrepreneurial ability appears to be the most important factor

determining individual selection into entrepreneurship.

Importantly, starting a new business necessitates not only ability, but also initial investment capital. Evidently, the size of capital depends on the specifics of the individual business, but regardless, most start-ups require some personal investment by the entrepreneur – either through direct injection of cash or assets used as collateral to secure financing. Thus, in an environment characterized by significant borrowing constraints, personal wealth may play a key role in the decision to become entrepreneur. The importance of wealth for entrepreneurial entry and survival in economies with substantial financial frictions, has been extensively debated in the literature. Evans and Jovanovic (1989) provide the first formalization of the idea, and show that personal wealth is critical to the choice to be an entrepreneur. Their finding has been challenged by Hurst and Lusardi (2004) who empirically documents that personal wealth appears to be statistically significant only for individuals at the top of the wealth distribution. Their finding tends to negate the importance given to wealth as a buffer against borrowing constraints, considering that wealthy individuals would clearly be the least likely to experience borrowing constraints. A number of subsequent studies have addressed their key finding, and show that it suffers from aggregation bias. For instance, Fairlie and Krashinsky (2012) show that the job displacement status of individuals plays a significant role in accounting for the finding by Hurst and Lusardi (2004) that the business entry rate exhibits a flat slope throughout most of the wealth distribution. After separating the same sample of individuals into job losers and non-losers, it turns out that entry into entrepreneurship becomes positively associated with personal wealth across the entire wealth distribution.

Furthermore, recent dynamic models of occupational choice such as Quadrini (2000), Cagetti and De Nardi (2006) and other subsequent derivatives, show that although wealth may not always be fundamental to entry into entrepreneurship,

it is clearly key for survival, the scale of future operations or investment dynamics. It is understood that individuals with low working ability –thus, poor outside options as a wage worker in the labor market – could decide to start very small scale business projects despite relatively low wealth holdings. However, workers with reasonable labor ability and superior entrepreneurial ability are more likely to accumulate enough wealth through increased saving rates, to enable them to transition into a promising entrepreneurial career. Wealth accumulation will continue to be important following entry, in order to maintain and increase the scale of business operations. Otherwise, it might be more optimal for individuals to offer their labor services as a worker in the corporate sector.

Besides skills and borrowing constraints, the occupational choice can also be influenced by institutional factors such as product market regulations and labor market policies. In particular, administrative burdens on starting a business may be costly for entrepreneurs and lower entry rates into entrepreneurship. For instance, Fonseca et al. (2001), Djankov et al. (2002) and Klapper et al. (2006) show that business creation is lower in countries with high start-up costs. In fact, data show that there is a negative correlation between the number of days that it takes to open a business and the entry rate of businesses. As shown by Klapper et al. (2006), countries where the legal status to operate firms can be obtained more cheaply and quickly see significantly more entry in industries that should naturally have more entry – that is, industries that experience expansionary global demand and technology shifts. Furthermore, employment protection policies in the labor market have the potential to affect the decision to be an entrepreneur or a wage worker. On one hand, data indicate that there is significant positive correlation between self-employment and the strictness of employment protection policies across countries. On the other hand, several industry equilibrium models and empirical studies show that employment protection regulations such as firing

costs, could significantly impinge on firms' performance and labor productivity. Thus, there is need to delve further into the relationship between these policies and the occupational choice of individuals.

The goal of this dissertation is to contribute to the analysis of the role of liquidity constraints, start-up costs and employment protection policies in explaining entrepreneurial dynamism and the occupational choice of individuals. To achieve this, we develop three chapters that can be read as stand-alone papers. The first two chapters are empirical contributions and the third provides a theoretical analysis.

The first chapter examines to what extent the interaction between liquidity constraints and start-up costs could affect the choice to be entrepreneur in a context of a financial crisis. We exploit individual level data from 3 large-scale and comparable surveys on people older than 50 years across Europe, England and the US (SHARE, ELSA and HRS). Our investigation focuses on the 2008-2010 financial crisis, which is indirectly identified through time fixed effects. Our study is built on the paper by Fonseca et al. (2007) which analyzes the impact of start-up costs on the wealth-entrepreneurship relationship under liquidity constraints, and finds that entry regulations flatten this relationship as they decrease the marginal value of wealth for entrepreneurial entry. The global crisis is viewed as a credit crunch type of situation, in which small businesses and households faced severe difficulty in accessing credit. We hypothesize that the negative impact of start-up costs could be more pronounced under such circumstances. We document a positive relationship between wealth and the propensity of individuals to be self-employed, which is attenuated in countries with more substantial start-up costs. More importantly, the evidence suggests that the negative impact of entry regulations was significantly more noticeable during the crisis.

The second chapter addresses the role of the stock market in the bank competition -entrepreneurship relationship. Banks are the primary source of external finance for start-ups and small businesses. Thus, an important way to alleviate liquidity constraints faced by entrepreneurs, is to tackle problems in the banking sector that could inhibit credit availability for entrepreneurs. In particular, the level of competition in banking markets influences the supply and cost of credit, which is vital for new business creation. The theoretical literature identifies two competing hypotheses linking bank competition to access to finance: the market power hypothesis and the information hypothesis. According to the market power hypothesis, bank competition reduces the cost of credit and increases its accessibility. On the other hand, the information hypothesis argues that market power is a solution to information asymmetries issues inherent to the banking sector, and therefore, can improve credit availability by enabling the formation of lending relationships between banks and their clients.

We empirically evaluate the macroeconomic impact of bank competition on new business creation while emphasizing the role of the stock market in this relationship. When banks engage in lending relationships with firms, they use their expertise, reputation and assets–that is, their "informed capital"– in order to monitor, advise and promote these firms. Extant literature has shown that the stock market facilitates the recycling of the informed capital by allowing the sufficiently mature firms to go public and the monitors to redirect their resources toward new entrepreneurs. We find that bank competition has an overall beneficial impact on new business density by boosting credit access to new entrepreneurs. Yet, consistent with the information hypothesis, this result attenuates as the size of the stock market increases, due to the importance of relationship lending underlying the informed capital recycling.

Finally, the last chapter explores the impacts of start-up costs and firing costs on the occupational choice, in a financially constrained environment. Empirical evidence points to a positive correlation between self-employment and the rigidity of employment protection policies. We also know that start-up costs are negatively correlated to firm creation. This suggests that entry costs for new businesses and employment protection regulations such as the enactment of a firing tax, could have distinct but opposite effects on the decision to become entrepreneur. The investigation of these effects is key to assessing the effectiveness of strategies aimed at fostering entrepreneurship and wage employment. In fact, theoretical insights and empirical evidence point to a strong correlation between product market policies and the strictness of employment protection laws. For instance, Blanchard and Giavazzi (2003) and Spector (2004) contend that product market regulations determine the size of rents as captured through firms' markups, while labor market regulations dictate the sharing rule of these rents between corporations and their employees. Thus, there seems to be a clear mapping between product market regulations and labor market policies, which suggest that both institutions should be analyzed in a unified framework.

We build a dynamic general equilibrium model featuring borrowing constraints and a non-entrepreneurial production sector that allows for endogenous entry and exit of corporate firms, as well as labor adjustment across periods. This set-up is used to evaluate the effects of start-up costs incurred by new entrepreneurs and firing costs paid by corporate firms, on the choice to be either an entrepreneur or a worker. We find that the firing tax increases the entrepreneurship rate by promoting the transition of workers into entrepreneurship while dissuading existing entrepreneurs from offering their services as workers in the corporate sector. This is because the firing tax provokes a decrease in wage and productivity rates, which leads to significant welfare losses for workers. However,

a significant share of workers could not effectively transition into entrepreneurship due to the costly procedures required to start a business. Indeed, start-up costs are found to significantly lessen the impact of the firing tax on the decision to move away from a corporate job.

CHAPTER I

SELF-EMPLOYMENT, WEALTH AND START-UP COSTS: EVIDENCE FROM A FINANCIAL CRISIS

Abstract

Using individual level data from 3 uniquely comparable surveys (SHARE, ELSA and HRS) in Europe and the United States, as well as the World Bank's Doing Business data, this paper empirically zeroes in on the impact of start-up costs on the self-employment-wealth relationship. The longitudinal nature of the data enables us to investigate potential effects of the last global financial crisis. Results confirm the strong positive relationship between the entrepreneurial choice and wealth, as well as the negative effect stemming from the increase in start-up costs. Interestingly, although there is no strong evidence that wealth in itself played a bigger role during the crisis, we find that the negative impact of start-up costs on the entrepreneurship-wealth relationship proved to be significantly pronounced during the last crisis.

Keywords: Self-employment, Occupational choice, Wealth, Start-up costs, Financial crisis

JEL Classification: E02, E21, J21, J24

1.1 Introduction

While it seems that we live in an era of the cult of the entrepreneur, it is important to remember that institutional regulations such as the ease of getting credit, or the extent of start-up costs, might prevent some individuals from embarking on a new business venture. The decision to become an entrepreneur rather than a wage worker, is of course an individual choice and is made on the basis of many considerations. In this paper, we however focus on how start-ups costs could impinge on this occupational choice when individuals are already faced with important liquidity constraints. Start-up costs here, should not be confused with the financial amount required to start a particular business project – which varies depending on the type of project. Instead, we refer to the fixed cost (in terms of administrative burdens) of meeting the regulatory requirements for setting up a limited liability company, in a given country for instance. In that sense, these entry costs [1] could be viewed as a disutility stemming from meeting these mandatory entry regulations. On the other hand, there is ample evidence suggesting that high start-up costs could be more detrimental to the entry of low-quality entrepreneurs as compared to highly trained or innovative entrepreneurs. [2] This has been explained, inter alia, by the relatively high expected returns associated with innovative entrepreneurship, as well as better opportunities to access external financing which help attenuate the administrative burdens. In general, entry costs by imposing a barrier and some sort of selection mechanism, allow new entrants to capture potential future rents through a reallocation process. That being said,

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1. We use the terms start-up costs and entry costs interchangeably throughout the paper.

2. This is documented among others by Monteiro and Assuncao (2012), Branstetter et al. (2013), Rostam-Afschar (2013) or Block et al. (2015). We discuss and take this into account in Section 5, when specifying our econometric model.

it still remains that these one-off costs incurred at the point of entrance, create a disutility to the individual.

The question on whether or not financial constraints in itself, influence the individual decision to turn entrepreneur, has received much attention in the rapidly increasing literature on entrepreneurship. [3] If these constraints constitute a determinant factor, one should observe, other things being equal, that wealthier people are more likely to start new businesses. That seems to be the case as documented by the recent class of dynamic occupational choice models (see Cagetti and De Nardi (2006) for instance), as well as empirical contributions on the topic. Against this backdrop, how possibly could start- up costs affect the wealth-entrepreneurship relationship? Do the wealth and start-up costs effects vary with the business cycle? For instance, assuming that liquidity constraints are more severe during financial crises or economic downturns, should we expect the wealth and start-up costs effects on the individual decision to start a new venture, to be more pronounced during these times? These are the questions we address in this paper.

The definition of an entrepreneur is a controversial issue and can differ in some extent, depending on the particular questions one wishes to address (see Quadrini (2009) for a discussion on that matter). However, in empirical studies and particularly in the occupational choice literature, an entrepreneur is commonly identified as a self-employed person as opposed to an individual working for someone else. Given the nature of the questions addressed in this paper, we also follow this definition. Recent cross-country evidences report that self-employment expands during downturns (see Bosch and Maloney (2008) or Loayza and Rigolini (2011) for instance). Controlling for this effect through time specific

3. Key papers and some of the recent studies on the topic are reviewed in the next section.

effects, we empirically investigate the possibility that individuals could in fact, be less likely to start their own business during times of recessions or severe financial crises owing to the financing constraints inherent to these periods. More interestingly, we examine the joint effects of liquidity constraints and start-up costs, under these circumstances, on the choice to become self-employed. Our focus is on the effects stemming from the recent global financial crisis. The latter was associated with a large and sudden decline in personal wealth and venture capital funding, on top of a severe tightening of credit to small businesses or start-ups. Although several policy sources report the detrimental effects the global crisis had on entrepreneurship as well as on small and medium businesses, quantitative and detailed empirical studies on the issue are still rather scarce. Using the United States (US) Current Population Survey (CPS) data, Fairlie (2013) is the first to undertake a thorough analysis of the effects of the Great Recession on business creation. He finds among other things that, home owners with higher local home prices were more likely to start new businesses. However, to the best of our knowledge, no study has examined how the crisis might have influenced the joint effects of liquidity constraints and entry costs. This is unfortunate, considering the relevance of this question for start-ups policies during credit crunches.

Our paper is related to the vast literature on the role of wealth for entrepreneurship entry in presence of financing constraints (see Quadrini (2009) for a review of earlier studies). Start-up costs constitute another important element that could somehow affect the decision to start a new venture. Despite the evidence that they vary substantially across countries (see work by Nicoletti et al. (1999) for OECD countries), the issue has received relatively far less attention in the occupational choice literature. The idea that start-up costs might negatively impinge on the decision to become entrepreneur, has already been developed in Fonseca, Lopez-Garcia and Pissarides (2001). Introducing an occupational choice

decision in a search and matching model, they show that start-up costs discourage entrepreneurship and decrease the level of employment in the economy. However, their focus is on the employment effects of start-up costs; so how the latter decrease the fraction of entrepreneurs in an economy without financial market imperfections is left unanswered. Rissman (2007) assesses the impact of start-up costs on employment transitions using a search framework of the labor market which allows for mobility between unemployment, self-employment and wage work. She finds a very small negative effect of business start-up costs on the steady state self-employment rate. In fact, as carefully pointed out in her paper, that result simply indicates that entry costs do not have a significant impact in an environment that completely abstracts from liquidity constraints. For a sample of European firms, Klapper et al. (2006) show that high start-up costs hamper the creation of new firms, especially in sectors that should naturally have high entry rates. Yet, their interest is not on the individual occupational choice and consequently they do not examine the role of wealth in the process. The closest work to our paper is the one by Fonseca et al. (2007) which provides interesting insights into the interplay between liquidity constraints and start-up costs and its implications for the occupational choice. Using a dynamic occupational choice model, they document a positive relationship between the fraction of entrepreneurs in the economy and the level of wealth at equilibrium, but more interestingly, find that this relationship flattens out with the introduction of start-up costs. The reason is that, entry costs–being a sort of disutility– decrease the marginal value of wealth under liquidity constraints, thus making it even more important for the entrepreneurship decision. We refer to this negative impact of start-up costs, as the "start-up costs hypothesis". This theoretical prediction is supported by the empirical estimation conducted in their paper.

Our study differs from theirs in investigating the joint effects of wealth

and start-up costs in a dynamic context, with a focus on the 2007-2010 financial crisis. To do so, we use several waves of individual level data as well as new institutional data on start-up costs. The individual level data come from three sibling surveys which focus on people aged 50 and more: The Survey of Health, Ageing and Retirement in Europe (SHARE), the English Longitudinal Study of Ageing (ELSA) in England and the Health and Retirement Study (HRS) in the US. Several interesting considerations related to the use of these surveys are worth mentioning: First, there is a high incidence of self-employment among the older population, which has been documented and explained in the literature (see for instance Quinn (1980); Hochguertel (2010) or Zissimopoulos and Karoly (2007) among others). In fact, existing empirical literature shows that self-employment significantly increases with age, and potential explanations for this fact can be found in previous labor market experience and wealth accumulation. For instance, Blanchflower (2004) using aggregated and disaggregated data across 70 countries– with a special focus on US and European countries (including those in our sample)– documents that the probability of being self-employed rises significantly with age, and reaches a maximum at age 76 for the European Union [4]as a whole. For the US, there is a large number of papers documenting the positive self-employment-age relationship for the full age range. [5] For example, according

4. This significantly positive relationship between self-employment and age in Europe has been confirmed in a recent report by the UK Institute for Public Policy Research (Izzy Hatfield, 2015), entitled "Self-Employment in Europe". While the report notes that the likelihood of an individual in employment being self-employed increases dramatically with age in Europe, it highlights the special case of the UK where one in five older workers (aged 55-65) is self-employed, compared to one in seven of the total workforce and one in 20 young workers (15-24). Gonzalez Menendez and Cueto (2015) also document the case of Spain using data from the Spanish Labor Force Survey (LFS).

5. Parker (2004)) extensively reviews and summarizes some of these studies.

to data from the Bureau of Labor Statistics, based on the Current Population Survey (CPS), in 2002, workers aged 45 and older represented 38 percent of the workforce in total, but they made up 54 percent of the self-employed population. Similar statistics are reported for more recent years.

Secondly and directly related to the importance of wealth for entry into self-employment, Hurst and Lusardi (2004) document that the average wealth of workers aged 50 and more who transition into self-employment is about $ 362,000, which is more than double the wealth of those aged between 16 and 60 (about $ 144,800 for the latter). Thus, it can be very informative and insightful to specifically study this population for the issue at stake. Furthermore, these surveys are unique in providing directly comparable key and timely variables (especially the wealth and labor market variables variables in our case) across several European countries and the US, which is crucial to address our empirical questions. The country level (institutional) data are mainly a product of the World Bank's Doing Business Project. The longitudinal nature of the data enables us to exploit time variation in effects in order to investigate the influence of the 2008-2010 global financial crisis.

Estimation results validate the start-up costs hypothesis. That is, there is a strong positive relationship between the propensity to become self-employed and personal wealth; yet start-up costs tend to weaken this relationship. What this suggests is that, the marginal value of wealth is attenuated under liquidity constraints, in countries with bigger start-up costs. To put it another way, entry costs constitute an additional burden that makes wealth even more important in presence of financing constraints. More interestingly, we find evidence that the negative impact of start-up costs is not a non-varying phenomenon, but rather presents an important "dynamic" component. In particular, while wealth in itself does not seem to play a bigger role during the crisis, we document that the negative

impact of start-up costs on the self-employment-wealth relationship proves to be significantly pronounced during the crisis.

The remainder of the paper is structured as follows. In the next section, we provide a succinct discussion on the importance of liquidity constraints in the entrepreneurship literature. Section 1.3 briefly summarizes the theoretical basis of the empirical work we undertake in this paper. Section 1.4 describes the data. In section 1.5, we present our econometric strategy. Section 1.6 discusses the results and we conclude in section 1.7.

1.2 Liquidity Constraints and Entrepreneurship in the Literature

To the best of our knowledge, this paper is the first work that evaluates the impact of start-up costs on the entrepreneurship-wealth relationship during a financial crisis. However, it is worth mentioning that the contribution and argumentation in our paper hinge on the premise that liquidity constraints constitute a major factor in the individual decision to become entrepreneur. Thus, it might be useful to provide a background discussion on how this particular question has evolved in the literature. A very large number of studies have investigated the implications of liquidity constraints for the occupational choice decision. The objective of this section is not to provide an exhaustive review of this literature, but rather to highlight key and relatively recent papers that capture the gist and current state of the issue.

One of the pioneering works on the topic is the well-known study by Evans and Jovanovic (1989). In an estimated static occupational choice framework under liquidity constraints, where individuals can choose between self-employment and wage work, they show that there exists a minimum level of wealth above which in-

dividuals choose to become entrepreneur. In their model, the liquidity constraint is introduced through a parameter that restricts the amount of capital that an individual is able to borrow and which is directly proportional to his wealth. They document that this financial constraint not only deters a substantial proportion of the population from trying entrepreneurship, but also induces a sub-optimal investment capital for those who succeed to enter the pool, thus reducing the total amount of capital flowing to entrepreneurship. The validity of this hypothesis has further been questioned by Hurst and Lusardi (2004) who find that the positive relationship between wealth and entry into entrepreneurship–documented in many other empirical studies– holds only at the top of the wealth distribution, thus cannot be regarded as an implication of borrowing constraints. However, Cagetti and De Nardi (2006) clearly show through their rich occupational choice model, that Hurst and Lusardi's result is in fact, not inconsistent with the view that entrepreneurs are borrowing constrained, and that modelling and taking into account dynamic considerations is key to understanding the importance of wealth for the entrepreneurial decision. Their model has been able to reproduce very well key empirical observations, including the wealth distribution in the data, and a version of it has been used by Basseto et al. (2015) to study the effects of credit shocks on the production sector and firm dynamics. One of the key results found in that latter paper is that, the extent to which a financial shock erodes entrepreneurial wealth appears to be crucial in determining the speed of recovery of the real activity, which is fuelled by entrepreneurs. This finding is another evidence on how important is wealth for entry into entrepreneurship, especially following a credit crunch scenario.

One of the key challenges faced by empirical studies attempting to clearly identify causal effects of wealth on entrepreneurship, is the potential endogeneity of the wealth variable. In fact, there is ample evidence that entrepreneurs accumu-

late more wealth than others (see Quadrini (2000) for instance). For that reason, a number of papers have elected to investigate more exogenous components of wealth, in an attempt to tackle the problem. Fairlie and Krashinsky (2012) extensively revisit that literature and the central question both at the theoretical and empirical level. Overall, their results are very consistent with the existence of liquidity constraints, making wealth a key factor in the entrepreneurial decision. Interestingly, they show that the job displacement status of individuals plays a significant role in accounting for the finding by Hurst and Lusardi (2004) that the business entry rate exhibits a flat slope throughout most of the wealth distribution. In fact, a disaggregated analysis–clearly separating the sample into job losers and non-losers–appears to restore the positive relationship between wealth and entry into self-employment, commonly found in the literature. They also conduct a Monte Carlo exercise based on a dynamic version of Evans and Jovanovic (1989) model, in addition to exploiting changes in housing equity, to confirm the validity of the liquidity constraint hypothesis. Another interesting study is the one by Bates et al. (2014) who find high levels of personal wealth to be essential for entry into high-barrier industries–that is, those intensive in either financial capital or owner education.

More recent and notable papers on the topic include those by Corradin and Popov (2015), Adelino et al. (2015), Bloemen et al. (2016) and Frid et al. (2016). Corradin and Popov (2015) exploit the exogenous variation in home equity for a large sample of US households over the period 1996-2006, and find that the probability of starting a new business is strongly correlated with housing wealth. Specifically, a 10 percent increase in home equity is found to raise the share of individuals becoming self-employed each year by above 1 percent. Along similar lines, Adelino et al. (2015) emphasize the role of collateral lending channel in entrepreneurial entry. Their estimates suggest that the rise of housing prices

in US between 2002 and 2007 allowed individuals to start small businesses by increasing access to collateral. In addition, they document that small ventures experiencing increases in housing prices had stronger growth in employment than large firms in the same areas and industries.

For their part, Bloemen et al. (2016) use a large sample from administrative data for the Netherlands, and investigate effects of the 2006 pension policy reform, on transitions into self-employment. They estimate that an average reduction of net future pension wealth by 16 000 euros has a significantly negative effect on entrepreneurship, reducing the transition rate by 38 percent. Their study is particularly interesting because it identifies pension wealth as an important wealth component to which workers react.

Finally, the study by Frid et al. (2016) using the US Panel Study of Entrepreneurial Dynamics II (PSED II), directly investigates the relationship between the personal wealth of business founders and their ability to access external financing during the business creation process. They find that low-wealth entrepreneurs are less likely to get external funds, and receive much lower amounts when they do. One of the originalities of their paper is the fact that they directly measure liquidity constraints in the context of business creation, that is prior to the creation of a new venture.

Clearly it appears that, results from the recent literature are consistent with a positive wealth-entrepreneurship relationship, confirming the central importance of wealth for the decision to become entrepreneur. In the next section, we outline for completeness' sake, the theoretical underpinning of our paper, which is borrowed from the study by Fonseca et al. (2007) regarding the interaction effects of liquidity constraints and start-up costs on the individual occupational decision.

1.3 Theoretical Foundation

The empirical work conducted in this paper is, in substance, a test of the start-up costs hypothesis. Therefore, it is worth recalling the mechanism behind this hypothesis.[6] The latter stipulates that wealthier people are more likely to become entrepreneur in presence of liquidity constraints; yet this advantage provided by wealth is attenuated by start-up costs. This insight is derived from a dynamic occupational choice equilibrium model, where individuals, at the beginning of each period, choose to become entrepreneur, a wage worker or stay in non-employment (including retirement or labor market exit) , by comparing the value functions of each occupational option. These value functions result from optimization problems and depend on the individual's wealth, his entrepreneurial ability as well as his ability as a (wage) worker.

Using standard notations, let $V(a, y, \theta)$, $V_e(a, y, \theta)$, $V_w(a, y, \theta)$ and $V_i(a, y, \theta)$ respectively be the optimal value function of the individual, the value function of an entrepreneur, the worker's function and the one belonging to an inactive individual. The individual's state variables are his current assets (wealth) a, his working ability y and his entrepreneurial ability θ. In order to enter entrepreneurship, individuals might pay some one-off costs. We denote these start-up costs as $\tilde{c}$ where $\tilde{c} \in \{0, \psi\}$, with $\psi > 0$. These entry costs are captured in terms of utility loss, since they are mainly administrative burdens that people must go through before starting a new venture. The occupational choice decision is then defined by:

$$V(a, y, \theta) = \max\{V_e(a, y, \theta) - \tilde{c}, V_w(a, y, \theta), V_i(a, y, \theta)\} \tag{1.1}$$

That is to say, the individual optimally decides the occupational option

6. Full details of the theoretical setting and analysis are described in Fonseca et al.(2007).

which will provide him with the highest utility (value function), and based on his known abilities as an entrepreneur and a wage worker, as well as the social security benefits of inactivity (non-employment). Fonseca et al. (2007) show that, there exists a minimum level of wealth beyond which individuals choose to become entrepreneur in the absence of start-up costs ($\tilde{c} = 0$). However, after the introduction of start-up costs in the resolution ($\tilde{c} = \psi$), the threshold level increases because these administrative burdens shift downward the expected utility of entrepreneurship. To put it differently, start-up costs decrease the marginal value of wealth under liquidity constraints, making the role of wealth even more important. As a result, the fraction of entrepreneurs in the economy decreases since the wealth requirement becomes more severe.

To sum up, the start-up cost hypothesis can be splitted into two parts: Firstly, it suggests the existence of a positive relationship between the propensity to become entrepreneur and personal wealth. Secondly and more interestingly, the slope of this relationship tends to flatten as the size of start-up costs increases. Besides, this attenuation effect caused by the entry costs tends to be more pronounced in the middle of the wealth distribution, while on the other hand, the slope seems to be intact at the top–which can be rationalized by the high level of wealth, preventing individuals at the top from feeling the negative impact of start-up costs.

1.4 Data and Descriptive Analysis

The analysis is based on cross-country data from various sources and at different periods of time. We distinguish between individual level data and country level institutional data.

1.4.1 Individual Data

These data come from three longitudinal surveys: The Survey of Health, Ageing and Retirement in Europe (SHARE), the English Longitudinal Study of Ageing (ELSA) in England, and the Health and Retirement Study (HRS) in the US. They focus on individuals aged 50 and over, provide comparable information and can be used for various analyses. Detailed information on health, socio-economic status and family networks are available in these studies. The SHARE is the last (of the three) to be established and its development closely follows its sibling studies. We use the first four (4) regular [7] SHARE waves: the first collected in 2004, the second in 2006, the fourth in 2010 and the fifth in 2012. For ELSA, we use the waves 2 (2004), 3 (2006), 4 (2008), 5 (in 2010) and 6 (2012). Likewise, we exploit the HRS waves 7 (2004), 8 (2006), 9 (2008), 10 (2010) and 11 (in 2012). [8] Our analysis is exclusively based on respondents between 50 and 80 years old. This choice is motivated by the fact that few people are on the labor market after 80.

We essentially use three categories of variables from these surveys: the demographic variables, the labor market status and the household wealth. Demographic variables include: gender, education, marital status, age, household size and health status. Two levels of education are considered: Highly educated individuals and the others. Highly educated are college graduate and over. We lump low and middle educated individuals together. Household size is the number of people in the household. As for the self-reported health status, three categories

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7. The third wave (SHARELIFE) which is conducted in 2008/2009, focuses on people's life histories while variables of interest in our study are more about current life circumstances.

8. Because the 2008 observations are only available for ELSA and HRS, we do not include them in the econometric analysis undertaken in the next section.

are retained: Very good health, Good health and fair/Poor health. The marital status is whether the respondent is currently married or not. The labor market status and the household wealth constitute together with the institutional variables, our main variables of interest. Table 1.1 summarizes descriptive statistics for selected variables.

With regard to the labor market status, we allow for three options: Self-employed, wage workers and non-working people. A self-employed [9] in our analysis, is someone who reports being self-employed and making a living only from that activity. In other words, we exclude those who declare being self-employed but not receiving earnings from it, and those who are self-employed but also hold a wage work in addition. Although this is a broad definition of entrepreneurship, it certainly includes people who possess and manage businesses –regardless of whether they are own-account workers or employers. Besides, self-employment as a measure of entrepreneurship is commonly used in the occupational choice literature, especially in empirical studies (as discussed in Quadrini (2009)). Non-working population includes retired, unemployed, disabled (sick) respondents. Table 1.2 below displays the percentage of individuals in each group, by country.

The percentage of respondents in the non working population is remarkably important in all countries. This is not surprising given this group includes different sorts of people (retired, unemployed, disabled, sick). It can also be explained in some extent by the age characteristics of our sample (50 to 80 years old individuals). The share of self-employed is reasonably and unsurprisingly low. However, it also varies substantially across countries –from 3.34% in Austria to 13.19% in Greece. The latter is well known to have a high self-employment rate (in fact, one

9. We use the terms “self-employed” and “entrepreneur” interchangeably.

Table 1.1 – Summary Statistics of Selected Variables

Variables	Mean	Standard Deviation	Minimum	Maximum
		Individual Level: Non-workers		
Female	57%	49%	0	1
Married	69%	46%	0	1
Household Size	1.98	0.85	1	15
Age	67	7	50	80
High Education	14%	35%	0	1
Good Health	39%	49%	0	1
Fair/Poor Health	42%	49%	0	1
		Individual Level: Wage workers		
Female	49%	50%	0	1
Married	73%	44%	0	1
Household Size	2.25	0.98	1	12
Age	55%	4%	50	80
High Education	32%	47%	0	1
Good Health	44%	50%	0	1
Fair/Poor Health	17%	37%	0	1
		Individual Level: Self-employed		
Female	35%	48%	0	1
Married	76%	43%	0	1
Household Size	2.40	0.98	1	10
Age	57%	5%	50	80
High Education	31%	46%	0	1
Good Health	42%	49%	0	1
Fair/Poor Health	17%	38%	0	1
		Individual Level: All Categories		
Female	54%	50%	0	1
Married	70%	46%	0	1
Household Size	2.05	0.90	1	15
Age	64%	8%	50	80
High Education	19%	39%	0	1
Good Health	40%	49%	0	1
Fair/Poor Health	35%	48%	0	1

Source: Own calculations using pooled data from SHARE, ELSA and HRS. Computed statistics are weighted based on sampling weights.

Table 1.2 – Occupational Status by Country

Country	Non-Workers	Wage Workers	Self-Employed	Self-Employment Rate
USA	72.46	19.38	8.16	29.64
Austria	83.22	13.44	3.34	19.90
Germany	68.07	26.53	5.40	16.90
Sweden	58.07	37.02	4.91	11.71
Netherlands	69.29	26.22	4.49	14.61
Spain	80.79	13.54	5.66	29.45
Italy	81.94	12.39	5.67	31.39
France	72.54	23.08	4.38	15.95
Denmark	60.10	35.34	4.56	11.44
Greece	68.20	18.61	13.19	41.47
Switzerland	59.03	31.85	9.12	22.26
England	61.69	31.07	7.25	18.92

Source: Own calculations using data from SHARE, ELSA and HRS. The unit is percentage (%). Computed statistics are weighted based on sampling weights and concern the population aged 50-80 and the years 2004, 2006, 2008, 2010 and 2012. The self-employment rate is defined as the percentage of self-employed over the working population.

of the highest in Europe for many years [10]). This is also confirmed in our selected sample of older people. The last column of Table 1.2 reports the self-employment rate for the group. It is computed as the percentage of self-employed individuals over the working population. The figures are higher if compared to statistics for the whole working population (regardless of age), which is consistent with the documented fact that self-employment increases with age.

Now, let us turn our attention to the second variable of interest: the household wealth. We use the net current wealth reported by individuals in the surveys. It is defined as the sum of the net value of housing, stocks, bonds, saving accounts, private retirement accounts and other annuities minus all debts the household may have. Wealth figures are all converted in Euros and adjusted for purchasing power parity, using OECD values. By doing this computation, we make the respondents' figures easily comparable across countries. It is important to note that the wealth variable is not ex-ante (prior to employment transitions) but rather an estimation of (current) wealth at the time of the survey. Ideally, an ex ante measure would suit best the econometric analysis we undertake (next section) to test the validity of the start-up costs hypothesis. However, we show that a bias (if any at all) is very likely to be insignificant. Table 1.3 gives a glimpse of the distribution across wealth classes, by labor force status.

We can notice that contrary to wage workers and non working people who are more or less equally distributed across wealth classes, most of self-employed in our sample clearly belong to top classes (Quantiles 4 and 5). In fact, 62.41 % of self-employed belong to quantiles 4 and 5, while only 47.50% of workers and 41.83% of non working belong to these top wealth classes. Although this does

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10. See OECD (2011), Labour Force Statistics or World Development Indicators (World Bank Data Bank).

Table 1.3 – Distribution of Wealth by Occupational Status

Wealth classes	Self-Employed	Wage Workers	Non-Workers
Quantile 1	8.85	14.03	17.47
Quantile 2	15.29	18.63	19.40
Quantile 3	13.45	19.84	21.30
Quantile 4	20.52	25.16	22.80
Quantile 5	41.89	22.34	19.03

Source: Own calculations using pooled data from SHARE, ELSA and HRS. Individuals are classified into 5 equal wealth classes. Quantile 5 is the highest class (top 20 % of the wealth distribution. Figures (weighted statistics) represent the percentage of individuals in each class by labor force status)

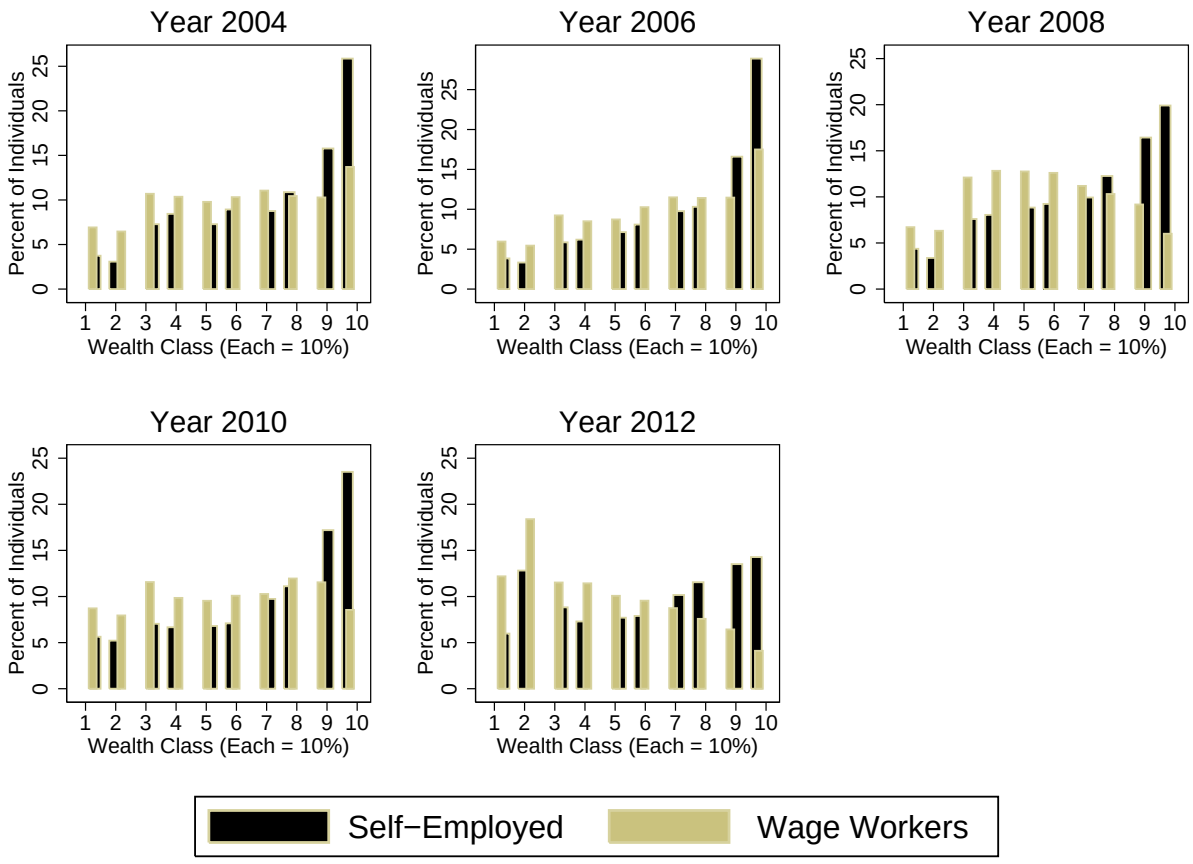
not necessarily mean that wealth is important for entrepreneurship entry, it does provide positive information in this direction.

Figure 1.1 shows the distributions of self-employed and (wage) workers over wealth decile classes, for the five waves (periods) in our sample. As can be seen, the self-employed are disproportionately concentrated in the top classes (deciles 9 and 10) throughout the waves. Behind this general picture, there are some different configurations across countries. We report in Appendix B, selected country figures. For instance, the concentration of self-employed at the top of the wealth distribution is strikingly apparent in the Netherlands' case.

1.4.2 Institutional Data

We are interested in measuring start-up costs at the country level. To do so, we take advantage of a set of indicators provided by the World Bank's Doing Business Project.The latter was launched in 2002 and makes available objective and comparable measures of business regulations and their enforcement across

Figure 1.1. Percentage of Self-Employed and Wage workers over Wealth Classes



Note: Own calculations (weighted and pooled data). Individuals are now sorted into 10 ascending equal wealth classes –Each includes 10 % of all individuals

many countries and selected cities over time. In order to exploit the maximum variability in the indicators, we use factor analysis procedure to construct a score [11] as a proxy for start-up costs at the country level. Factor analysis is often used for data reduction purposes. It can help to get a small set of variables (preferably

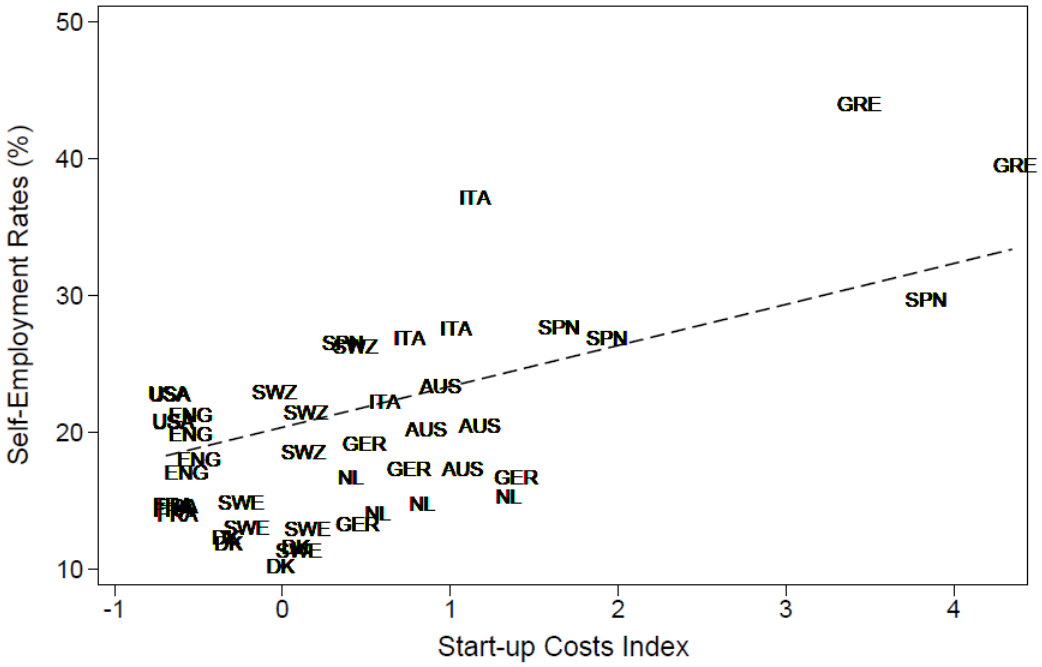
11. Kaiser (1960)'s criterion (which is to keep factors with eigenvalues ≥ 1) is used to retain relevant factors and predict scores. The latter are centered to 0 and normalized to have unit variance by default.

uncorrelated) from a large set of variables (most of which are correlated to each other). Another purpose is to create indexes with variables that conceptually measure similar things. This last purpose serves precisely our needs.

Three institutional measures are used to compute the start-up costs index. The first is the total number of days required to register a business. It captures the median duration that incorporation lawyers indicate is necessary to complete a procedure with minimum follow-up with government agencies and no extra payments. The second is a cost measure, expressed as a percentage of the country's income per capita. It includes all official fees and fees for legal or professional services if such services are required by law. The third is also expressed in percentage of income per capita and measures the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation. Figure 1.2 plots the relationship between the constructed index - using Principal Component Factoring - and the self-employment rates across the countries of our sample. The self-employment country figures are computed as the percentage of self-employed individuals over the working group (self-employed and salaried workers). We also report in Appendix B, scatter graphs based on the three components of administrative burdens used to compute the start-up costs index(Figures 1.3, 1.4 and 1.5).

Figure 1.2 seems to depict a positive correlation between self-employment rates and the size of start-up costs at the country level. In other words, countries where start-up costs are higher, tend also to be the ones with the larger share of self-employed workers. The highest rates of self-employment are found in Greece, where approximately 40 % of the workers are self-employed. It is followed by the two other Southern European countries (Italy and Spain). The rest of the countries have generally modest self-employment statistics and relatively low start-up costs. They are concentrated around the lower end of the fitted line. This positive

Figure 1.2. Self-Employment Rates and Start-up Costs: Our sample



Note: World Bank's data and own calculations. USA=United States, ENG=England, DK=Denmark, SWE=Sweden, AUS=Austria, SPN=Spain, GRE=Greece, ITA=Italy, NL=Netherlands, GER=Germany, SWZ=Switzerland, FRA=France

correlation between start-up costs and self-employment rates, may appear a priori counter-intuitive. However, this does not tell us much about how the entry costs impact individuals' choices under liquidity constraints. In fact, we argue that the effect of start-up costs on entrepreneurship entry, makes more sense in a financially constrained environment; therefore should be accurately assessed through its influence on the wealth-entrepreneurship relationship. A positive (negative) correlation between self-employment and start-up costs, only tells us that self-employed individuals are more (less) likely to be in countries with more cumbersome entry costs. Yet, this gives us no information on the underlying mechanisms through

which these costs operate at the individual level. The pattern shown in Figure 2 is therefore another motivation to delve into the matter more deeply. We examine this issue in the next section.

Apart from our institutional variable of interest (the start-up costs measure), we also control for three other country level regulation measures: the ease of getting credit, a "tax" variable and the net pension replacement rates. As with the start-up costs index, the ease of getting credit is computed using Principal Component Factoring. To do so, another set of World Bank's Doing Business indicators [12] are used: the strength of legal rights index, the depth of credit information index, the credit registry coverage and the credit bureau coverage. The legal rights index ranges from 0 to 12 and measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. Higher scores indicate that the laws are better designed to expand access to credit. The depth of credit information index measures the rules and practices affecting the coverage, scope and accessibility of credit information available through either a credit bureau or credit registry. Likewise, higher scores mean better access to credit. The credit registry coverage reports the number (expressed as a percentage of the adult population) of individuals and firms listed in a credit registry's database. Finally, the credit bureau coverage reports the number of individuals and firms, now listed in a credit bureau database (see World Bank's Doing Business Project for further details).

The "tax" variable measures the total amount of taxes and mandatory contributions borne by the business in the second year of operation. It is expressed as a share of commercial profit and is designed to provide a comprehensive measure

12. Further details on all these indicators can be found on the World Bank's Doing Business website.

of the cost of all the taxes a business bears. Note that it differs from the statutory rate which merely provides the factor to be applied to the tax base. The third institutional variable is the net pension replacement ratio. Since our analysis is based on people aged 50 and more, it is important to control for the impact of the pension regulations at the country level on the individual occupational choice. The replacement rates are defined as the net pension entitlement as a percentage of pre-retirement earnings. We use OECD figures for an average single man earner. Table 1.4 summarizes descriptive statistics of aggregate country-level variables.

Table 1.4 – Country Level Indicators

Variables	Mean	Standard Deviation	Minimum	Maximum
Start-up Costs Index	0	1	-0.69	4.35
Credit Index	0	1	-2.31	0.97
Net Replacement Ratio	61.98%	20.48%	40.89%	110.75%
Tax	46.69%	11.72%	27%	76.8%

Source: Own calculations and World Bank's Doing Business indicators. Net Replacement Ratios come from OECD Statistics Database.

1.5 Econometric Strategy

The start-up costs hypothesis stipulates that wealthier people are more likely to become entrepreneur in presence of liquidity constraints; yet this advantage provided by wealth is attenuated by start-up costs. The latter act as a disutility and increase the threshold level of wealth that is necessary to start an own business. It is important to understand that it is not the "monetary value" of start-up costs which is at stake here, but instead the harmful effects associated with the process of meeting the administrative regulations.

1.5.1 The baseline model

Our strategy is to exploit the variation in start-up costs across countries (and periods) to identify how they affect the relation between the propensity to become self-employed and wealth. Although our main interest is to investigate the potential impact of the global financial crisis on the start-up costs effect, we begin by examining a baseline specification.

Consistently with the categorization adopted in the previous section, we allow for three options for the dependent variable (the occupational choice): Self-Employed, Wage Worker and Non-Worker. A non linear functional form is used as proxy for wealth since the wealth effects are most unlikely to be linear. Thus, we choose to use quintile dummies for net wealth. The model can be written as:

$$Y_{ijm,t} = \alpha_m X_{ij,t} + \sum_{k=2}^{5} \beta_{k,m} q_{ijk,t} + \sum_{k=2}^{5} \delta_{k,m} q_{ijk,t} \times SC_{j,t} + \gamma_m SC_{j,t} + \theta_j + \lambda_t + \epsilon_{ijm,t} \tag{1.2}$$

where $Y_{ijm,t}$ represents the occupational choice m of the individual i in country j at time t, m taking the values 0, 1 and 2 respectively for "Non-worker", "Wage worker" and "Self-Employed"; $q_{ijk,t}$ takes the value 1 if the individual's net wealth in country j at time t is in the k^{th} quantile of the overall wealth distribution. The first quintile ($k = 1$) is omitted because of the constant parameter in the specification. $SC_{j,t}$ denotes our measure of start-up costs. θ_j and λ_t denote respectively country fixed effects and time fixed effects; $\epsilon_{ijm,t}$ represents the error term which is assumed to follow a logistic distribution. $X_{ij,t}$ is a vector of control variables (including the constant parameter). The control variables include individual demographic characteristics and country level regulation measures.

To be specific, the demographic variables which we control for, are the

individual's age (and the age squared–to capture non-linearity in the age effects), his (her) gender, his (her) level of education (highly educated or not), his (her) marital status, the household size and health status. We also add an interaction term between the level of education and our measure of start-up costs, to capture the fact that the fraction of entrepreneurs in a specific country could depend on the share of highly educated people in this country. Another motivation for the inclusion of this interaction term is that, the level of entry costs might impinge on the type (or quality) of entrepreneurship. For instance, Monteiro and Assuncao (2012), Branstetter et al. (2013) and Rostam-Afschar (2013) find that low start-up regulations lead to the entry of low ability entrepreneurs who are mainly active in low-tech industries (e.g. retailing businesses). In the same vein, Block et al. (2015) argue that start-up costs impose a selection effect and increase the likelihood of innovative entrepreneurship in a country. Thus, by including the interaction term between start-up costs and the level of education, we are explicitly controlling for the relationship that might exist between individual ability (proxied by education), the extent of start-up costs, and the propensity to be self-employed.

Since we exploit cross-country variation in start-up costs to investigate the individual decision to become self-employed, we can not disregard the role of country institutional, cultural or historical factors in explaining entry into entrepreneurship. That is important because the prevalence of self-employment varies widely across countries. For instance, it is quite higher in Southern Europe than in Northern Europe. While the vast majority of studies on self-employment and the role of institutions are country-specific, there is a number of papers such as Carrasco and Ejrnaes (2003), Hochguertel (2010), Zissimopoulos et al. (2007) and Torrini (2005), that have analyzed the issue in an international context. Carrasco and Ejrnaes (2003) focus on two European countries (Spain and Denmark) and examine institutional factors such as the generosity of unemployment benefits sys-

tems, child care policies and labor market flexibility among others. Hochguertel (2010) uses the SHARE data and investigates the issue for ten European countries, while Zissimopoulos et al. (2007) focus on institutional differences between the UK and US, based on the HRS and ELSA data. It comes out from these three studies that, factors such as the generosity of unemployment benefits, pension systems and the flexibility of labor markets, matter significantly for cross-country variation in self-employment rates. Besides, the study by Torrini (2005) finds taxation to play a major role in explaining large disparities in self-employment across OECD countries. The relatively recent paper by Christelis and Fonseca (2015) using data from SHARE, ELSA and HRS, provides a good overview of the role of various institutional and labor market policies in explaining transitions in and out of self-employment of older workers.

In this paper, our main focus is on the role of individual's wealth and start-up costs–as a country regulation– on the decision to become self-employed. The only way institutional differences across countries could affect our results, is when they are not taken into account but happen to be significantly correlated to individuals' wealth or the measure of start-up costs. While it is not clear how and to what extent country level institutions could influence accumulation of wealth at the individual level, we cannot rule out the fact that administrative burdens to start a new business, might be correlated in some ways with the general institutional environment of a country. Thus, we do control for relevant time variant institutional measures such as the ease of access to credit, the business taxation, the pension systems (Replacement ratios). More importantly, we include in all our specifications, country fixed effects that capture all unobservable and non-measurable country specific institutional or cultural differences in self-employment rates. The country fixed effects are evidently allowed to be correlated with our main variables of interest.

Let us now examine the equation (1.2). For the start-up costs hypothesis to be validated, we should have $\beta_{5,2} > \beta_{4,2} > \beta_{3,2} > \beta_{2,2} > \beta_{1,2} > 0$ and $\delta_{k,2} < 0$. In other words, there exists a positive relationship between entrepreneurship and wealth (individuals belonging to wealthier quantiles are relatively more likely to be entrepreneur) but the slope of this relationship flattens with the magnitude of start-up costs at the country level. Another interpretation is that, the marginal value of wealth (for entrepreneurship entry) is decreased in countries with more substantial start-up costs. The inclusion of time fixed effects ensures that any cyclical effects of entrepreneurship entry in itself, are taken into account.

1.5.2 The augmented specifications

Next, we turn our attention to the potential effects of the global financial crisis. We acknowledge that the identification of these effects, is an extremely challenging task, even more considering the international dimension of our sample. As we previously discussed in Section 1.2, recent studies which have attempted to identify causal effects of wealth on entrepreneurship, have done so by exploiting policy reforms or wealth shocks in the context of one single country. While the wealth-entrepreneurship relationship is fundamental to our exercise, our main interest is on how the slope of this relationship is affected by the extent of start-up costs. Since we do not directly observe wealth shocks in our data, the strategy here, is to exploit the timing of the global crisis to capture indirectly its effects. We cannot however claim to fully single out the crisis effects, although the time variation in marginal effects should provide us with interesting insights in this regard. In particular, we assume that ceteris paribus, the effects of the crisis (if any at all) should be more pronounced in 2008. In fact, although the crisis officially started in the second half of 2007, 2008 was the "year of disaster". However, because 2008 individual data are only available for two countries (US and England),

the year 2010 is our period of particular interest to capture the crisis effects.

In order to investigate whether wealth played a bigger role for entrepreneurship entry during the crisis, we estimate the following equation, where the notations are unchanged.

$$Y_{ijm,t} = \alpha_m X_{ij,t} + \sum_{k=2}^{5} \beta_{k,m} q_{ijk,t} + \sum_{k=2}^{5} \eta_{k,m} q_{ijk,t} \times \lambda_t + \sum_{k=2}^{5} \delta_{k,m} q_{ijk,t} \times SC_{j,t}$$

$$+ \gamma_m SC_{j,t} + \theta_j + \lambda_t + \epsilon_{ijm,t} \tag{1.3}$$

The difference between equation (1.2) and equation (1.3) is the third term in the right hand side of equation (1.3): the interaction terms between wealth quintiles and period indicators. Special attention will be put on the parameters $\eta_{k,2}$, which will tell us how different are the slopes of the self-employment-wealth relationship across the periods. If the financial crisis made it particularly difficult for individuals to start a new venture because of more severe liquidity constraints, wealth should play a bigger role during 2010 (compared to the periods 2004, 2006 and 2012). If that appears to be the case, we should expect the 2010 interaction parameters to be significantly greater than the others (2004, 2006, 2012), for individuals belonging to top wealth classes (Quantiles 4 and 5), but lower for those belonging to bottom wealth classes (Quantiles 1 to 3). In other words, every other things being equal, wealthier people should be the ones more able to start a new venture during the crisis because of the occurring severe liquidity constraints. On the other hand, individuals at the bottom of the wealth distribution should be less likely to be entrepreneur in 2010 compared to the other years. Keep also in mind that the inter-period comparison is made independently for each wealth (quantile) class.

Finally, we examine whether the influence of start-up costs on the wealth-entrepreneurship relationship is different across the periods. This is implemented by adding to the previous specification (1.3), interaction terms of wealth, start-up costs and period indicators. That is, by estimating:

$$Y_{ijm,t} = \alpha_m X_{ij,t} + \sum_{k=2}^{5} \beta_{k,m} q_{ijk,t} + \sum_{k=2}^{5} \eta_{k,m} q_{ijk,t} \times \lambda_t + \sum_{k=2}^{5} \delta_{k,m} q_{ijk,t} \times SC_{j,t}$$

$$+ \sum_{k=2}^{5} \psi_{k,m} q_{ijk,t} \times SC_{j,t} \times \lambda_t + \gamma_m SC_{j,t} + \lambda_t + \theta_j + \epsilon_{ijm,t} \tag{1.4}$$

The parameters of special interest in this full specification are the $\psi_{k,2}$ on the interaction terms of wealth, start-up costs and period dummies. They tell us if the negative impact of start-up costs on the self-employment-wealth relationship, vary with the periods. In particular, we examine whether the joint effect of start-up costs and liquidity constraints is (significantly) more severe during 2010 compared to the other periods. Remark that we still control for the non-dynamic impact of start-up costs, as well as the (stand-alone) dynamic effect of wealth– that is, the third term in the right hand side of equation (1.3).

We implement a multinomial logit estimation for all our equations of interest. Because there is no natural baseline (comparison) outcome, we choose respectively Non-Worker and Worker as baseline outcomes. The first because it represents the most frequent outcome and also due to the age feature of our sample (older people). The second choice is to facilitate interpretation of entrepreneurship entry in direct comparison with wage work. We discuss all the estimation findings in the next section.

1.6 Estimation Results

We first present results from testing the (benchmark) start-up costs hypothesis (equation (1.2)). Then we discuss the crisis estimation results. All the estimation tables report marginal effects (instead of simple coefficients). The models generally fit well the data as shown by the Pseudo R^2. Although we report outcome results for both self-employed and workers with the aim of highlighting the differences, our main interest and discussion are on the former (Predicted Outcome: Self-Employed). In our multinomial estimation setting, two baseline outcomes (Non-worker and Wage worker) are relevant and valid options for the investigation. However, given the "non-worker" outcome is the most frequently occurring status–which is essentially explained by our sample of individuals aged 50 and more–the natural (and most relevant) baseline outcome would be the "Non-worker" status. Thus, our main results reported below are obtained using this outcome as point of reference. [13]

1.6.1 Testing the Start-up Costs Hypothesis: The baseline specification

Table 1.5 shows the results from estimating (1.2) taking "Non worker" as the baseline outcome. Results confirm the positive relationship between self-employment and wealth (for all quintiles). That is, there exists a certain hierarchy

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13. Nevertheless, as robustness checks, we also report in the Appendices, all the estimation results taking the "Wage worker" status as the baseline outcome. It appears that the estimated effects are not sensitive to the choice of the baseline outcome (Non-worker vs. Wage worker). Evidently, as in any multinomial estimation framework, the computed marginal effects should be always interpreted in relation to the base category–that is, in terms of relative probability to the benchmark outcome.

in the marginal effects of wealth (as should be expected): individuals in the fifth quantile (the wealthiest) are relatively more likely than any other one to become self-employed compared to non-worker; those in the fourth quantile (Q4) are relatively more likely than others in poorer quantiles, and so on. Notice for instance that, this is not true for the wage workers: Especially , since the parameter on the fifth quintile is not significantly different of zero, that means that both individuals at the bottom and at the top of the wealth distribution have the same relative propensity to become self-employed.

The estimated positive relationship between self-employment and wealth is necessary but not sufficient to validate the start-up costs hypothesis. We also need to look at the sign of the quintiles interaction terms with start-up costs. With the exception of the fifth quintile, all others' interactions with start-up costs are significantly negative. Interestingly enough, the marginal effects are more pronounced in the middle of the wealth distribution (Quantile 3 and Quantile 4). The fact that the start-up costs' effects are found to be absent at the top of the wealth distribution is simply because the wealthiest are very unlikely to feel the burden of entry costs. In particular, our empirical results show that the marginal effect of wealth on the relative probability to be self-employed is smaller in countries with more substantial start-up costs (or when these costs become bigger within a country). In fact, depending on the wealth class of individuals (and/or the extent of start-up costs), some people could well find it difficult to enter entrepreneurship. The reason is that, these costs decrease the marginal value of wealth under liquidity constraints.

The estimated (direct) marginal effect of start-up costs on the relative probability to become self-employed is found to be significantly positive (at the 10%

level). Note however, that this is not a robust [14] result throughout all our specifications. That is, other things being equal, individuals are relatively more likely to become self-employed in countries with bigger start-up costs. Recall that we find a similar correlation when describing the data in Section 1.3 (Figure 1.2). We emphasize the fact that this finding is not inconsistent with the start-up costs hypothesis. A positive (or negative for that matter) relationship between the relative propensity to become entrepreneur and start-up costs, is in itself not that informative. What really matters, is the fact that these entry regulations soften the marginal value of wealth under liquidity constraints, thereby constituting an additional burden to overcome. If the aspiring entrepreneur is wealthy enough, start-up costs should not deter him from his purpose. Otherwise, he might be discouraged by the costly entry regulations. Therefore, it is important to examine the significativity of the interaction variable between wealth and start-up costs, while controlling for the direct effect of these entry costs. In our case, although data do not suggest a clear evidence regarding the direct relationship between entry into self-employment and the extent of start-up costs, the evidence on the influence of the latter on the wealth-entrepreneurship nexus is clearly robust.

As discussed earlier in the paper, the wealth variable used to undertake the analysis, is not ex ante, but rather a measure of wealth at the time of the survey – that is current wealth. Therefore, one may think that the estimated marginal effects of wealth are biased because of the endogeneity of this variable [15]. We

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14. In fact, the "Start-up Costs" variable (SC) loses its significance in our full specification: equation (1.4)

15. Using current wealth instead of wealth at the moment of transitioning, can be viewed to some extent, as committing a measurement error on the true value of wealth (ex ante). In that particular case, our estimated effects should suffer from attenuation bias (downward bias). This bias is not a concern here because a correction would only strengthen our main results.

Table 1.5 – Pooled Multinomial Logit estimation with Non-Worker as comparison outcome – Start-up Costs Hypothesis

	Baseline Outcome: Non-Worker			
	Self-employed		Wage worker	
	Estimate	Standard error	Estimate	Standard error
Q2 Wealth	0.024***	0.004	0.074***	0.006
Q3 Wealth	0.031***	0.004	0.066***	0.006
Q4 Wealth	0.046***	0.004	0.049***	0.007
Q5 Wealth	0.087***	0.004	0.003	0.007
Q2 Wealth * SC	-0.008*	0.005	-0.057***	0.008
Q3 Wealth * SC	-0.014***	0.005	-0.046***	0.008
Q4 Wealth * SC	-0.013***	0.008	-0.032**	0.008
Q5 Wealth * SC	-0.000	0.005	-0.012	0.009
Credit	0.042***	0.009	0.032*	0.017
SC	0.010*	0.006	0.026**	0.011
Household Size	0.002**	0.001	0.007***	0.002
Age	-0.017***	0.002	-0.027***	0.004
Age Square	0.000***	0.000	-0.000	0.000
High Education	0.017***	0.003	0.079***	0.004
SC * High Education	0.005	0.004	0.033***	0.007
Good Health	-0.016***	0.002	-0.053***	0.003
Poor Health	-0.052***	0.002	-0.227***	0.005
Female	-0.056***	0.002	-0.054***	0.003
Married	-0.007***	0.002	-0.008*	0.004
Tax	-0.001	0.000	-0.005***	0.001
Replacement Ratio	-0.000	0.000	-0.000	0.000
Constant	0.662***	0.073	2.059***	0.161
Country Fixed Effects	Yes		Yes	
Period Fixed Effects	Yes		Yes	
Observations	130000			
Pseudo R^2	0.257			

Estimated coefficients are marginal effects at mean. Standard errors are clustered at the individual level. ***, **, * denote respectively significance at the 1%, 5% and 10% levels.

use current wealth as proxy for ex ante wealth. However, as a robustness check, we re-estimate (1.2), using the previous period/wave's wealth as our indicator. The results in table 1.11 in Appendix A (using previous period's wealth measure) should be compared to those reported in table 1.5. As can be seen, the findings are generally the same. Besides, although it is true that many other observable and unobservable factors are likely to influence the occupational choice, our focus and interest in this paper is on the role of start-up costs (as an institution). Since these entry regulations are measured at the country level, we should not expect any bias on their impact on the self-employment-wealth relationship.

1.6.2 Augmented specifications: Impacts of the Global Crisis

Without further ado, we now examine how the global financial crisis might have impinged on the occupational choice decision through its effects on wealth and start-up costs. We report in table 1.6, the results from estimating equation (1.3). For the sake of readability, we only show here, the estimation parameters of the key variables of interest. Note that 2004 is the omitted (reference) year. The negative impact of entry costs on the self-employment-wealth relationship is still present. We can however, notice that almost none of the interaction parameters between wealth quintiles and year indicators, is significant. In particular, the 2010 interaction terms do not seem to significantly differ from those of the 2004, 2006 and 2012 periods, and this holds for individuals in all wealth classes. What this suggests is that, there was no particular impact of the crisis on the wealth-entrepreneurship relationship. But what about the negative impact of start-up

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Another source of endogeneity of the wealth variable is the reverse causality issue (simultaneity bias). That is, self-employment helping people to become wealthier. Although we cannot totally discard this possibility, one should nevertheless keep in mind that our measure of wealth is not an ex-post measure neither; therefore the bias (if any at all) is most likely to be marginal.

costs on this relationship? Is there any "dynamic" pattern in this regard?

Table 1.7 displays the results from the estimation of equation (1.4): the full dynamic specification. [16] An interesting pattern emerges. The year 2010 interaction terms with Start-up Costs and wealth quintiles (3, 4 and 5) become significantly negative (estimated marginal effects of -0.023, -0.015 and -0.022) respectively at the 1%, 10% and 1% significance level. Recall that the inter-period comparison is made within each wealth class and also that the year 2004 is the omitted benchmark comparison period in our estimations. For instance, if we consider individuals belonging to the wealth quantile 3 (those in the middle of the distribution), and taking into account that the estimated interaction coefficient of Q3 with Start-up Costs (SC) and year 2006, is also significantly negative (-0.019 at the 1% level), our estimated parameter of -0.023 (for the 2010 interaction term), suggests that entry costs exert a more pronounced negative impact on the propensity of those individuals to become self-employed, in 2010 compared to the periods 2004, 2006 and 2012. That is the case for individuals in the fourth quantile, and even those at the top of the wealth distribution (fifth quantile). Because we exploit time variation to capture the crisis effects, these findings can be interpreted this way: Although the global crisis had not made wealthier people particularly more likely to start a new venture, it seems to have a negative impact on the propensity to become self-employed, when the occurring severe liquidity constraints that took place during that period, are coupled with the additional burden of start-up costs. Interestingly enough, we also find that the "non-dynamic" effects of start-up costs (the wealth quintiles interaction terms with start-up costs) become insignificant once we introduce the "dynamic" effects (interactions with period indicators). This result highlights the fact that the joint effects of liquidity constraints and start-up costs on the propensity to become self-

16. We only report the key estimated interaction parameters of interest.

Table 1.6 – Pooled Multinomial Logit estimation with Non-Worker as comparison outcome – Wealth and Period Interactions

	Baseline Outcome: Non-Worker			
	Self-employed		Wage worker	
	Estimate	Standard error	Estimate	Standard error
Q2 Wealth	0.028***	0.006	0.063***	0.009
Q3 Wealth	0.033***	0.006	0.060***	0.009
Q4 Wealth	0.045***	0.006	0.040***	0.009
Q5 Wealth	0.087***	(0.005)	-0.011	0.009
Q2 Wealth * SC	-0.008	0.005	-0.053***	0.008
Q3 Wealth * SC	-0.013**	0.005	-0.044***	0.008
Q4 Wealth * SC	-0.012**	0.005	-0.031***	0.009
Q5 Wealth * SC	0.000	0.005	-0.008	0.009
Q2 Wealth * Year 2006	-0.011	0.007	0.012	0.011
Q3 Wealth * Year 2006	-0.006	0.007	0.007	0.010
Q4 Wealth * Year 2006	-0.008	0.006	0.020	0.010
Q5 Wealth * Year 2006	-0.009*	0.006	0.010	0.009
Q2 Wealth * Year 2010	-0.005	0.007	0.013	0.012
Q3 Wealth * Year 2010	-0.006	0.007	0.009	0.011
Q4 Wealth * Year 2010	0.001	0.007	0.012	0.011
Q5 Wealth * Year 2010	0.004	0.006	0.028**	0.011
Q2 Wealth * Year 2012	-0.002	0.007	0.026**	0.012
Q3 Wealth * Year 2012	0.001	0.007	0.010	0.013
Q4 Wealth * Year 2012	0.010	0.007	-0.001	0.013
Q5 Wealth * Year 2012	0.005	0.007	0.028**	0.013
Country Fixed Effects	Yes		Yes	
Period Fixed Effects	Yes		Yes	
Control Variables	Yes		Yes	
Observations	130000			
Pseudo R^2	0.257			

Estimated coefficients are marginal effects at mean. Standard errors are clustered at the individual level. ***, **, * denote respectively significance at the 1%, 5% and 10% levels. Year 2004 is the omitted (benchmark comparison) period.

employed, have an important "dynamic" component, thus are likely to vary with the business cycle, especially when credit market imperfections become severe, as was the case during the recent global crisis.

A few words can be said regarding our control variables. With respect to the socio-demographic variables, the results are generally consistent with what has been documented in many other empirical studies in the occupational choice literature. For instance, highly educated individuals and men are relatively more likely to be self-employed, while married persons are found to be less inclined to become so. Since our target population is people aged 50 and more, the entrepreneurship-age profile has an inverted U-shape, which is consistent with the fact that self-employment increases with age, but at the same time, highlights the evidence that the non-employment population is rather preponderant (compared to entrepreneurs) after an advanced age. We do not find significant evidence that higher start-up costs are associated with higher quality (or innovative) entrepreneurship. Recall that we capture this possibility by introducing an interaction term between start-up costs and education (a proxy for ability). This result is somehow consistent with the ambiguity that exists in this regard in the literature. In fact, it has also been argued that low start-up costs may lead to the entry of high quality entrepreneurs because lower costs are associated with more dynamic markets and lower levels of corruption (see Djankov et al., 2002 or De Soto, 1989). As for the institutional control variables, we find that better access to credit has a positive effect on the relative propensity to become self-employed. However, the tax regulations and the replacement ratio configurations do not appear to play a significant role in the occupational choice decision.

Table 1.7 – Pooled Multinomial Logit estimation with Non-Worker as comparison outcome – Testing Crisis and Start-up Costs Interaction Effects

	Baseline Outcome: Non-Worker			
	Self-employed		Wage worker	
	Estimate	Standard error	Estimate	Standard error
Q2 Wealth	0.029***	0.006	0.063***	0.009
Q3 Wealth	0.036***	0.006	0.060***	0.009
Q4 Wealth	0.047***	0.006	0.039***	0.009
Q5 Wealth	0.088***	0.006	-0.012*	0.009
Q2 Wealth * Year 2006	-0.012	0.008	0.005	0.012
Q3 Wealth * Year 2006	-0.013*	0.007	0.007	0.011
Q4 Wealth * Year 2006	-0.011	0.007	0.022**	0.010
Q5 Wealth * Year 2006	-0.011*	0.006	0.011	0.010
Q2 Wealth * Year 2010	-0.009	0.009	0.026**	0.013
Q3 Wealth * Year 2010	-0.016**	0.008	0.007	0.011
Q4 Wealth * Year 2010	-0.006	0.007	0.020	0.012
Q5 Wealth * Year 2010	-0.006	0.007	0.036***	0.012
Q2 Wealth * Year 2012	0.053	0.049	0.334***	0.079
Q3 Wealth * Year 2012	0.063	0.041	-0.096	0.076
Q4 Wealth * Year 2012	-0.039	0.038	-0.287***	0.083
Q5 Wealth * Year 2012	0.000	0.037	-0.369***	
Q2 Wealth * SC * Year 2006	-0.002	0.007	-0.018	0.011
Q3 Wealth * SC * Year 2006	-0.019***	0.006	-0.004	0.010
Q4 Wealth * SC * Year 2006	-0.008	0.006	0.006	0.010
Q5 Wealth * SC * Year 2006	-0.005	0.004	0.005	0.010
Q2 Wealth * SC * Year 2010	-0.007	0.010	0.026*	0.016
Q3 Wealth * SC * Year 2010	-0.023***	0.009	0.014	0.014
Q4 Wealth * SC * Year 2010	-0.015*	0.007	0.017	0.014
Q5 Wealth * SC * Year 2010	-0.022***	0.006	0.016	0.014
Q2 Wealth * SC * Year 2012	0.086	0.076	0.483***	0.123
Q3 Wealth * SC * Year 2012	0.094	0.063	-0.172	0.123
Q4 Wealth * SC * Year 2012	-0.082	0.060	-0.461***	0.133
Q5 Wealth * SC * Year 2012	-0.010	0.058	-0.621***	0.162

Year 2004 is the omitted (benchmark comparison) period. We still control for the non dynamic effects of SC on wealth quintiles, and they turn out to be all insignificant for the entrepreneurs predicted outcome. They are omitted from the table for the sake of readability.

1.7 Conclusion

Recent theoretical work and empirical evidence show that institutional factors such as the extent of liquidity constraints and start-up costs, significantly influence the individual decision to become self-employed. This paper takes advantage of new data to further explore this issue. Our interest has been on the joint effect of liquidity constraints and start-up costs on the propensity of individuals to start their own business. We refer to this effect–previously documented in the literature at the theoretical level– as the start-up costs hypothesis. The idea is that, wealthier individuals are more likely to become self-employed, yet start-up costs decrease the marginal value of wealth. As a result, there is an increase in the minimum level of wealth which is optimally required to start one own business. We stress the fact that start-up costs in our sense, need to be viewed as a disutility coming from the burdensome regulations that an aspiring entrepreneur has to comply with, before starting his (her) new venture. The longitudinal feature of our data has allowed us, in particular, to investigate effects of the 2006-2010 global crisis. The latter has brought the issue of liquidity constraints to the forefront because of the large and rapid decline in personal wealth and venture capital funding, as well as the severe tightening of credit to small businesses, which took place. Given this unfavourable global economic and financial environment, one can imagine that wealth might play a bigger role for entrepreneurship entry, and that the marginal effects of start-up costs might be more pronounced.

A number of studies and policies reports have found that self-employment is very prevalent among the mature and older population. Besides other factors (such as labor market experience) which could explain this observation, the importance of wealth cannot be overstated. Thus, we have taken advantage of three uniquely harmonized surveys on people aged 50 and more across many European

countries and the US, to address our research questions–where wealth plays a central role. We have documented a positive relationship between self-employment and wealth. More importantly, the start-up costs hypothesis is supported by our empirical analysis. Our identification strategy has been to exploit the timing of the crisis to capture its effects, while controlling for any specific period shocks or business cycle effects through the inclusion of time fixed effects. We have not found strong evidence that wealth (in itself) had particularly played a bigger role during the crisis period (that is in 2010, compared to the periods before and after). However, results clearly show that the detrimental impacts of start-up costs–on the entrepreneurship-wealth relationship– had been more marked during the crisis. In other words, the addition of start-up costs to the liquidity constraints, had been the main driver of the negative influence of the global crisis. We have acknowledged the difficulty and complexity of identifying the specific effects of the crisis, especially given the international dimension of our sample. Although we are confident that our strategy enables us to obtain significant insights in this regard, we cannot claim to completely single out the particular effects of the financial crisis. That is a limitation of our study.

While we cannot convincingly infer the results of our investigation to the whole population (that is, without regard to age), the fact that wealth is one of the main explanations for why self-employment is very common in the mature and older population, should give a good motivation to better understand, and recognize the full implications of the findings obtained in this paper. We believe that our results add important insights to the existing literature, regarding the role of administrative burdens in the start-up process; and are naturally relevant for policy makers in the design of entrepreneurship policies. There are clearly several considerations that individuals make when taking the decision to start a business. Those include personal as well as institutional motivations. Understanding how

institutional factors such as the extent of administrative burdens could impinge on the decision to become entrepreneur, especially in a financially constrained context or credit crunches scenarios, provides undeniably important insights to the development of policies to support the creation of new businesses and the private sector dynamism.

Appendix to Chapter 1

A. Robustness checks

B. Additional country figures

Table 1.8 – Pooled Multinomial Logit estimation with Wage Worker as comparison outcome – Start-up Costs Hypothesis

	Baseline Outcome: Wage Worker			
	Self-employed		Non-Worker	
	Estimate	Standard error	Estimate	Standard error
Q2 Wealth	0.024***	0.004	-0.100***	0.007
Q3 Wealth	0.031***	0.004	-0.099***	0.007
Q4 Wealth	0.046***	0.004	-0.096***	0.007
Q5 Wealth	0.087***	0.004	-0.091	0.008
Q2 Wealth * SC	-0.009*	(0.004)	0.065***	0.009
Q3 Wealth * SC	-0.014***	0.005	0.060***	0.009
Q4 Wealth * SC	-0.013***	0.005	0.047***	0.009
Q5 Wealth * SC	-0.001	0.005	0.012	0.010
Credit	0.042***	0.009	-0.074***	0.019
SC	0.010*	0.006	-0.037	0.012
Household Size	0.002**	0.001	-0.009***	0.002
Age	-0.018***	0.002	0.045***	0.005
Age Square	0.000***	0.000	-0.000	0.000
High Education	0.017***	.003	-0.097***	0.005
SC * High Education	0.006	0.004	-0.039***	0.008
Good Health	-0.016***	0.002	0.069***	0.004
Poor Health	-0.052***	0.002	0.279***	0.005
Female	-0.056***	0.002	0.110***	0.004
Married	-0.007***	0.002	0.015*	0.005
Tax	-0.001	0.001	0.006***	0.001
Replacement Ratio	-0.001	0.000	0.001	0.000
Constant	0.663***	0.073	-2.722***	0.177
Country Fixed Effects	Yes		Yes	
Period Fixed Effects	Yes		Yes	
Observations	130000			
Pseudo R^2	0.257			

Estimated coefficients are marginal effects at mean. Standard errors are clustered at the individual level. ***, **, * denote respectively significance at the 1%, 5% and 10% levels.

Table 1.9 – Pooled Multinomial Logit estimation with Wage Worker as comparison outcome – Wealth and Period Interactions

	Baseline Outcome: Wage Worker			
	Self-employed		Non-Worker	
	Estimate	Standard error	Estimate	Standard error
Q2 Wealth	0.027***	0.006	-0.091***	0.011
Q3 Wealth	0.033***	0.006	-0.094***	0.010
Q4 Wealth	0.045***	0.006	-0.086***	0.010
Q5 Wealth	0.086***	0.005	-0.076***	0.009
Q2 Wealth * SC	-0.008	0.005	0.061***	0.009
Q3 Wealth * SC	-0.013**	0.005	0.057***	0.009
Q4 Wealth * SC	-0.012**	0.005	0.044***	0.010
Q5 Wealth * SC	0.000	0.005	0.007	0.010
Q2 Wealth * Year 2006	-0.009	0.007	-0.004	0.013
Q3 Wealth * Year 2006	-0.005	0.007	-0.002	0.012
Q4 Wealth * Year 2006	-0.007	0.006	-0.015	0.012
Q5 Wealth * Year 2006	-0.008	0.006	-0.001	0.011
Q2 Wealth * Year 2010	-0.005	0.007	-0.010	0.014
Q3 Wealth * Year 2010	-0.005	0.007	-0.005	0.013
Q4 Wealth * Year 2010	0.000	0.007	-0.013	0.013
Q5 Wealth * Year 2010	0.004	0.006	-0.033**	0.013
Q2 Wealth * Year 2012	0.001	0.007	-0.027**	0.015
Q3 Wealth * Year 2012	0.002	0.007	-0.015	0.015
Q4 Wealth * Year 2012	0.011	0.007	-0.009	0.015
Q5 Wealth * Year 2012	0.007	0.007	-0.036**	0.015
Country Fixed Effects	Yes		Yes	
Period Fixed Effects	Yes		Yes	
Control Variables	Yes		Yes	0.
Observations	130000			
Pseudo R^2	0.257			

Estimated coefficients are marginal effects at mean. Standard errors are clustered at the individual level. ***, **, * denote respectively significance at the 1%, 5% and 10% levels. Year 2004 is the omitted (benchmark comparison) period.

Table 1.10 – Pooled Multinomial Logit estimation with Wage Worker as comparison outcome –Testing Crisis and Start-up Costs Interaction Effects

	Baseline Outcome: Wage Worker			
	Self-employed		Non-Worker	
	Estimate	Standard error	Estimate	Standard error
Q2 Wealth	0.027***	0.006	-0.091***	0.011
Q3 Wealth	0.035***	0.006	-0.095***	0.011
Q4 Wealth	0.046***	0.006	-0.086***	0.011
Q5 Wealth	0.088***	0.006	-0.076***	0.011
Q2 Wealth * Year 2006	-0.009	0.008	0.001	0.014
Q3 Wealth * Year 2006	-0.012	0.007	0.003	0.012
Q4 Wealth * Year 2006	-0.010	0.007	-0.014	0.012
Q5 Wealth * Year 2006	-0.010	0.006	-0.002	0.011
Q2 Wealth * Year 2010	-0.007	0.009	-0.022	0.016
Q3 Wealth * Year 2010	-0.016*	0.008	-0.003	0.015
Q4 Wealth * Year 2010	-0.007	0.007	-0.015	0.014
Q5 Wealth * Year 2010	-0.006	0.007	-0.032**	0.014
Q2 Wealth * Year 2012	0.056	0.049	-0.383***	0.092
Q3 Wealth * Year 2012	0.064	0.040	0.019	0.087
Q4 Wealth * Year 2012	-0.050	0.038	0.358***	0.093
Q5 Wealth * Year 2012	0.015	0.037	0.343***	0.114
Q2 Wealth * SC * Year 2006	-0.001	0.007	0.015	0.012
Q3 Wealth * SC * Year 2006	-0.019***	0.006	0.018	0.011
Q4 Wealth * SC * Year 2006	-0.008	0.006	0.003	0.011
Q5 Wealth * SC * Year 2006	-0.004	0.004	-0.003	0.011
Q2 Wealth * SC * Year 2010	-0.004	0.010	-0.026	0.017
Q3 Wealth * SC * Year 2010	-0.024***	0.009	0.007	0.016
Q4 Wealth * SC * Year 2010	-0.014*	0.008	-0.005	0.015
Q5 Wealth * SC * Year 2010	-0.022***	0.006	0.003	0.016
Q2 Wealth * SC * Year 2012	0.086	0.076	-0.558***	0.143
Q3 Wealth * SC * Year 2012	0.095	0.065	0.059	0.140
Q4 Wealth * SC * Year 2012	-0.101*	0.060	0.594***	0.150
Q5 Wealth * SC * Year 2012	0.009	0.058	0.593***	0.178

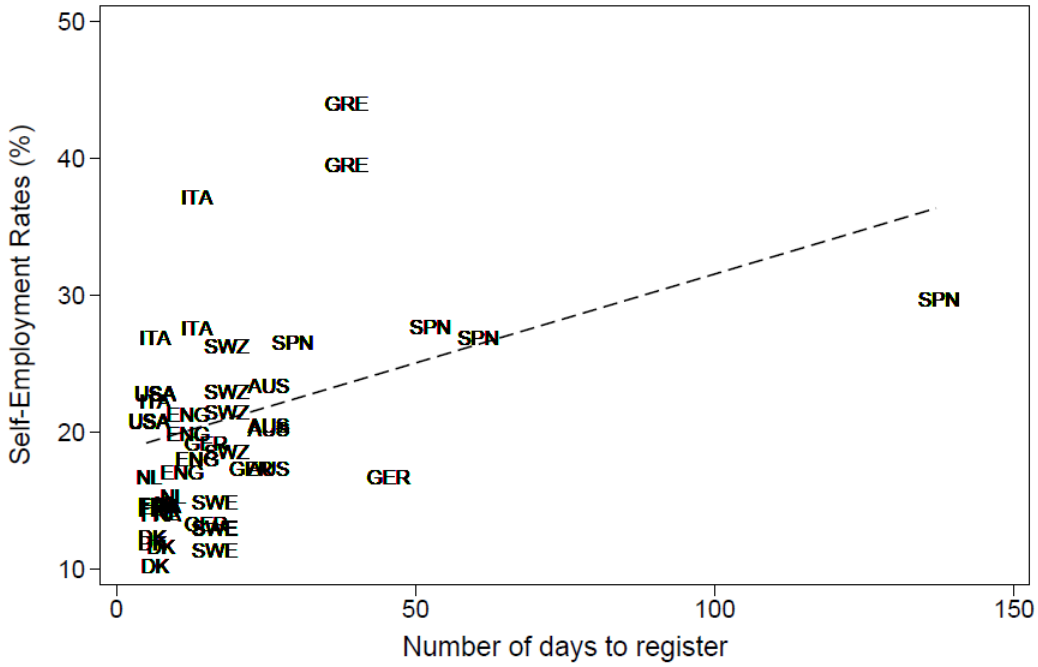
Year 2004 is the omitted (benchmark comparison) period. We still control for the non dynamic effects of SC on wealth quintiles, and they turn out to be all insignificant for the entrepreneurs predicted outcome. They are omitted from the table for the sake of readability.

Table 1.11 – Pooled Multinomial Logit estimation with Wage Worker as comparison outcome – Start-up Costs Hypothesis: Using Previous Period's Wealth

	Baseline Outcome: Wage Worker			
	Self-employed		Non-Worker	
	Estimate	Standard error	Estimate	Standard error
Q2 Lag Wealth	0.022***	0.004	0.049***	0.006
Q3 Lag Wealth	0.029***	0.004	0.029***	0.006
Q4 Lag Wealth	0.041***	0.004	0.009	0.007
Q5 Lag Wealth	0.076***	0.004	-0.044***	0.007
Q2 Lag Wealth * SC	-0.010**	0.005	-0.041***	0.008
Q3 Lag Wealth * SC	-0.018***	0.005	-0.035***	0.008
Q4 Lag Wealth * SC	-0.020***	0.005	-0.012	0.009
Q5 Lag Wealth * SC	-0.006	0.005	-0.019*	0.010
Credit	-0.002	0.018	0.003	0.028
SC	-0.038*	0.022	0.013	0.039
Household Size	0.002**	0.001	0.007***	0.002
Age	-0.020***	0.002	-0.060***	0.005
Age Square	0.000***	0.000	0.000***	0.000
High Education	0.017***	0.003	0.064***	0.005
SC * High Education	0.009**	0.004	0.020***	0.007
Good Health	-0.016***	0.002	-0.052***	0.004
Poor Health	-0.050***	0.003	-0.208***	0.005
Female	-0.051**	0.002	-0.047***	0.004
Married	-0.007***	0.003	-0.002	0.005
Tax	0.003*	0.002	-0.005	0.003
Replacement Ratio	0.000	0.000	0.001	0.001
Country Fixed Effects	Yes		Yes	
Period Fixed Effects	Yes		Yes	
Observations	80120			
Pseudo R^2	0.246			

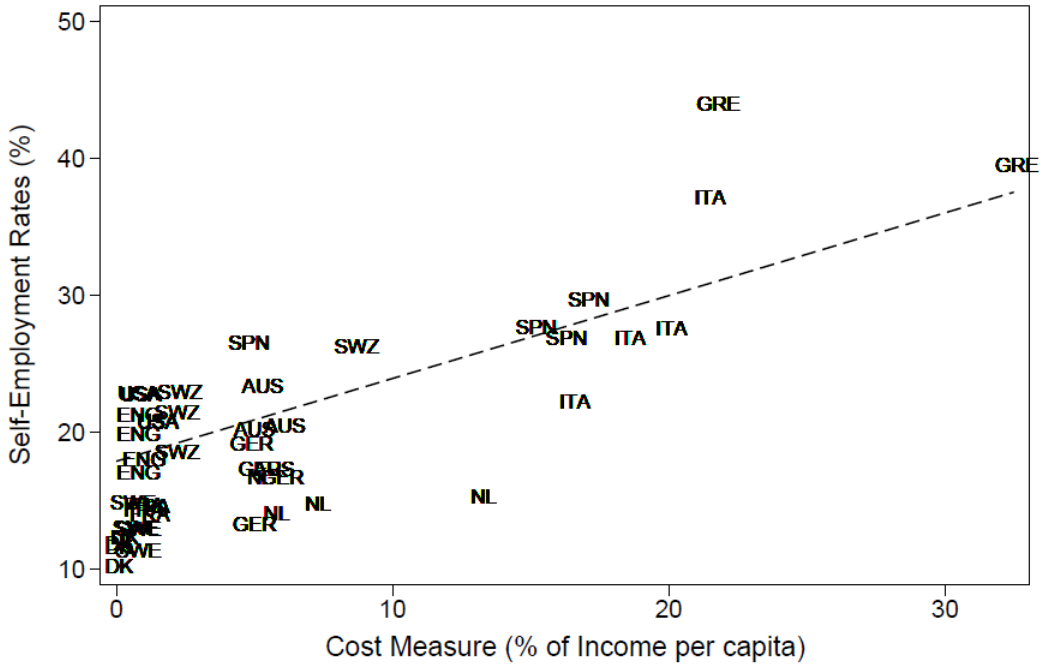
Estimated coefficients are marginal effects at mean. Standard errors are clustered at the individual level. ***, **, * denote respectively significance at the 1%, 5% and 10% levels.

Figure 1.3. Self-Employment Rates and Days to Register a New Business: Our sample



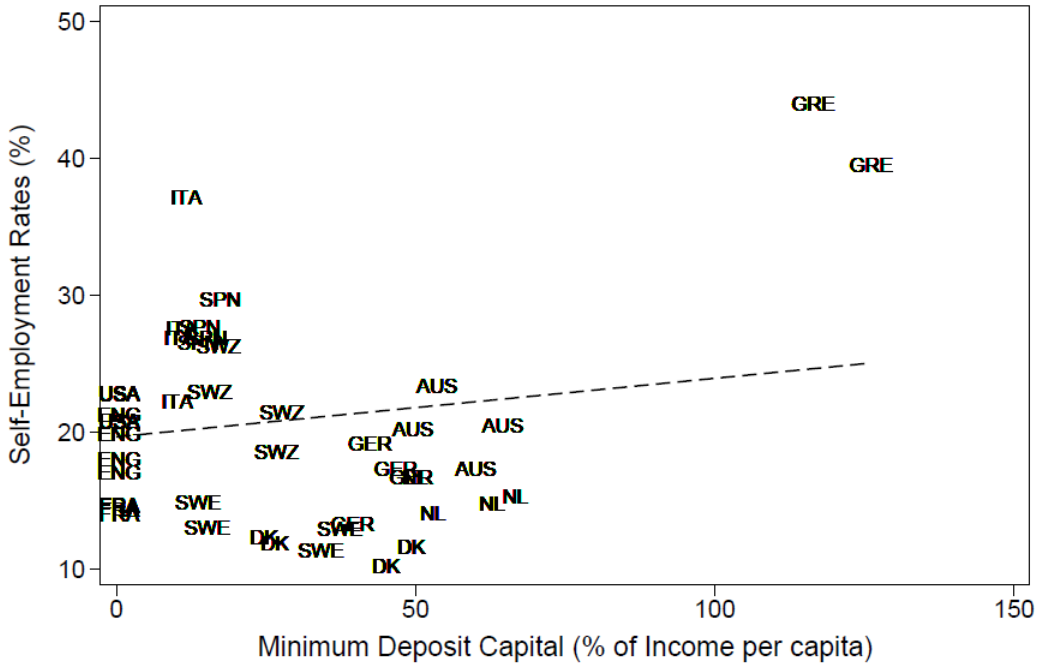
Note: World Bank's data and own calculations. USA=United States, ENG=England, DK=Denmark, SWE=Sweden, AUS=Austria, SPN=Spain, GRE=Greece, ITA=Italy, NL=Netherlands, GER=Germany, SWZ=Switzerland, FRA=France

Figure 1.4. Self-Employment Rates and Measure of Services Costs: Our sample



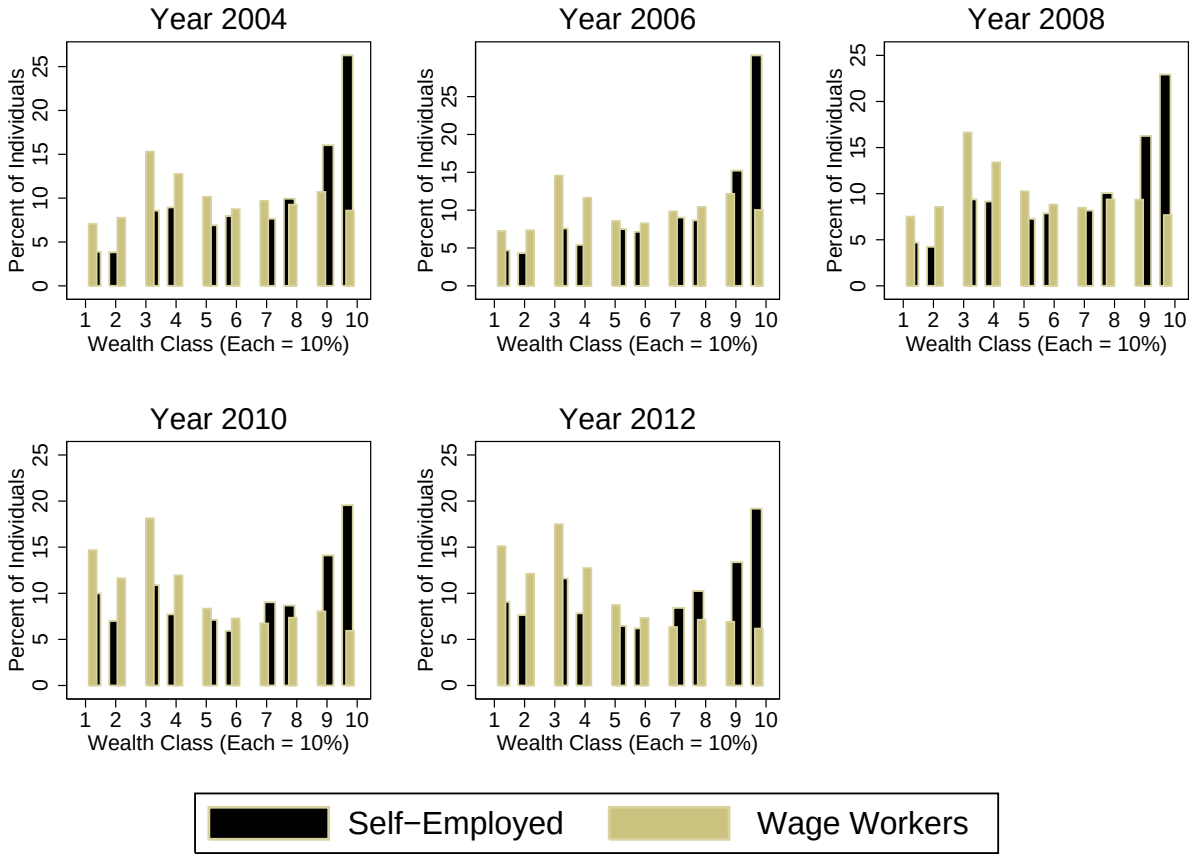
Note: World Bank's data and own calculations. USA=United States, ENG=England, DK=Denmark, SWE=Sweden, AUS=Austria, SPN=Spain, GRE=Greece, ITA=Italy, NL=Netherlands, GER=Germany, SWZ=Switzerland, FRA=France

Figure 1.5. Self-Employment Rates and Minimum Deposit Capital: Our sample



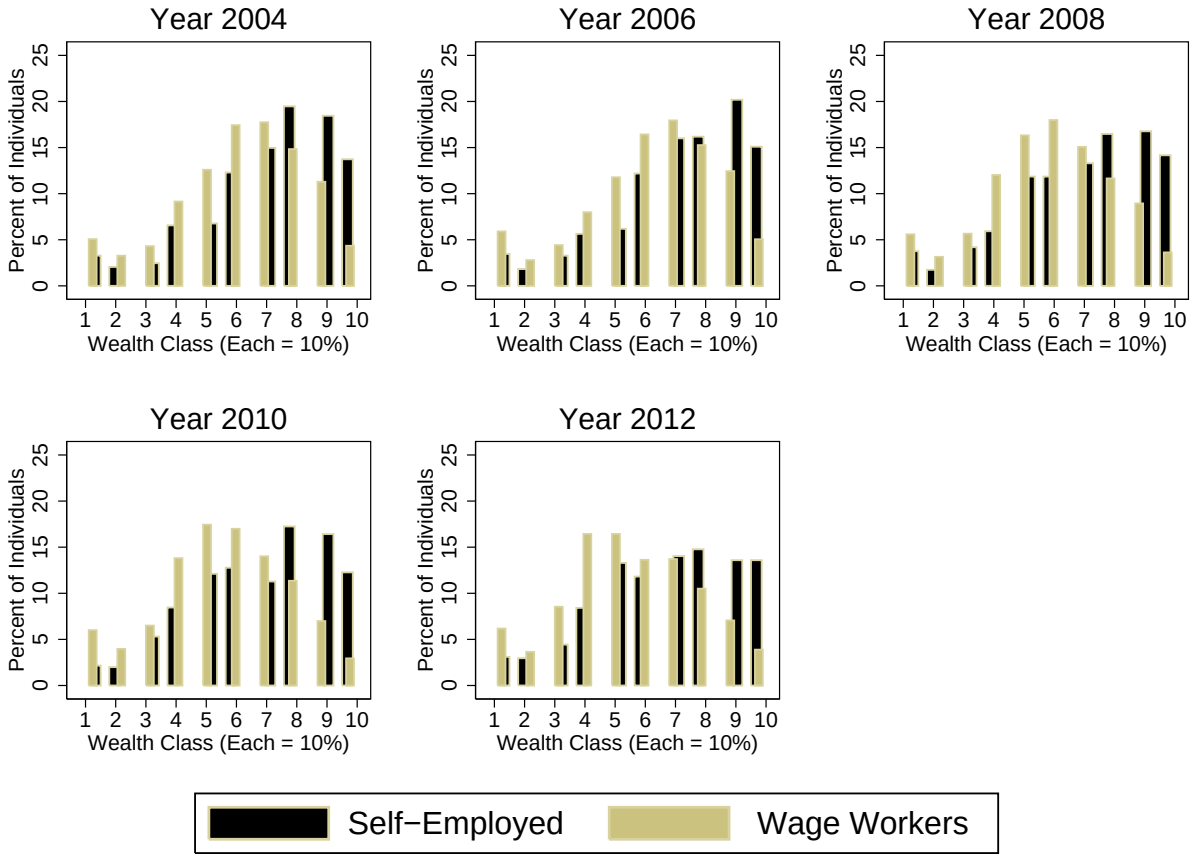
Note: World Bank's data and own calculations. USA=United States, ENG=England, DK=Denmark, SWE=Sweden, AUS=Austria, SPN=Spain, GRE=Greece, ITA=Italy, NL=Netherlands, GER=Germany, SWZ=Switzerland, FRA=France

Figure 1.6. United States: Percentage of Self-Employed and Wage workers over Wealth Classes



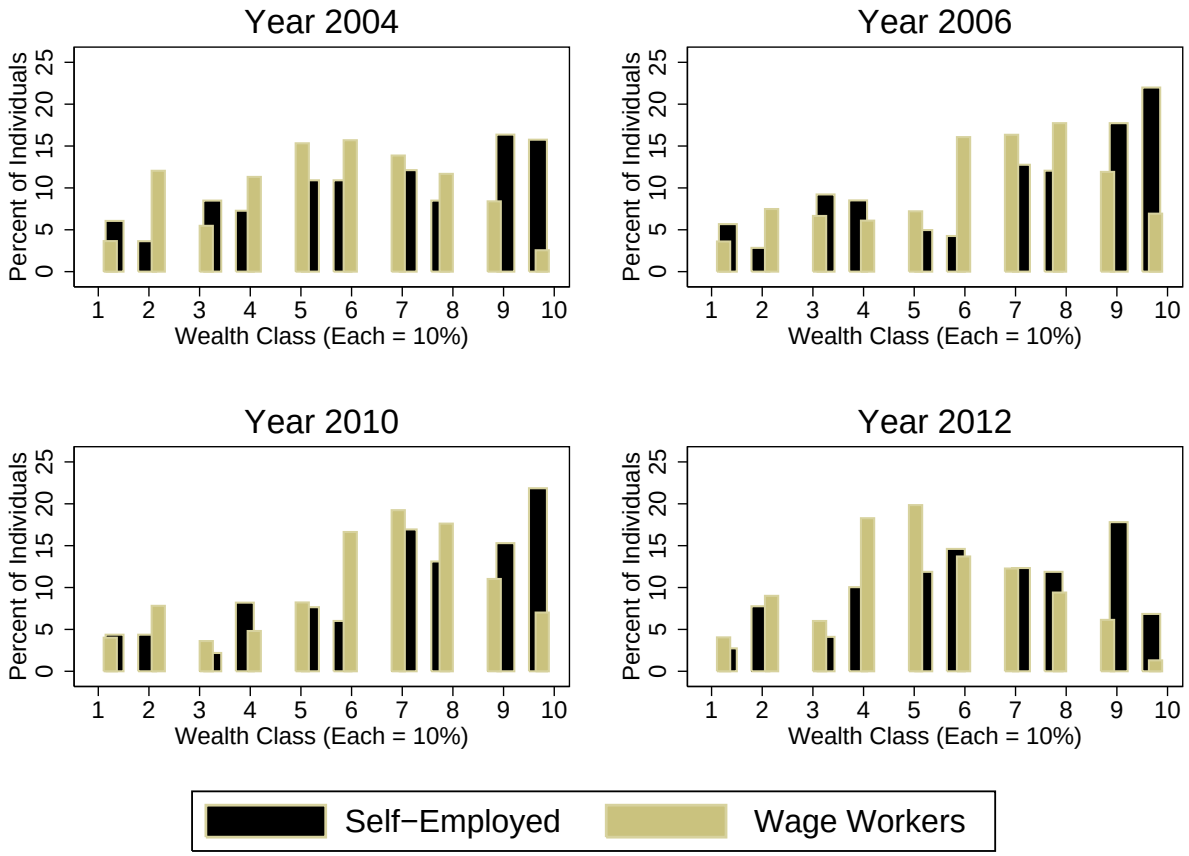
Note: SHARE, HRS and ELSA data and own calculations. Individuals are now sorted into 10 ascending equal wealth classes –Each includes 10 % of all individuals

Figure 1.7. England: Percentage of Self-Employed and Wage workers over Wealth Classes



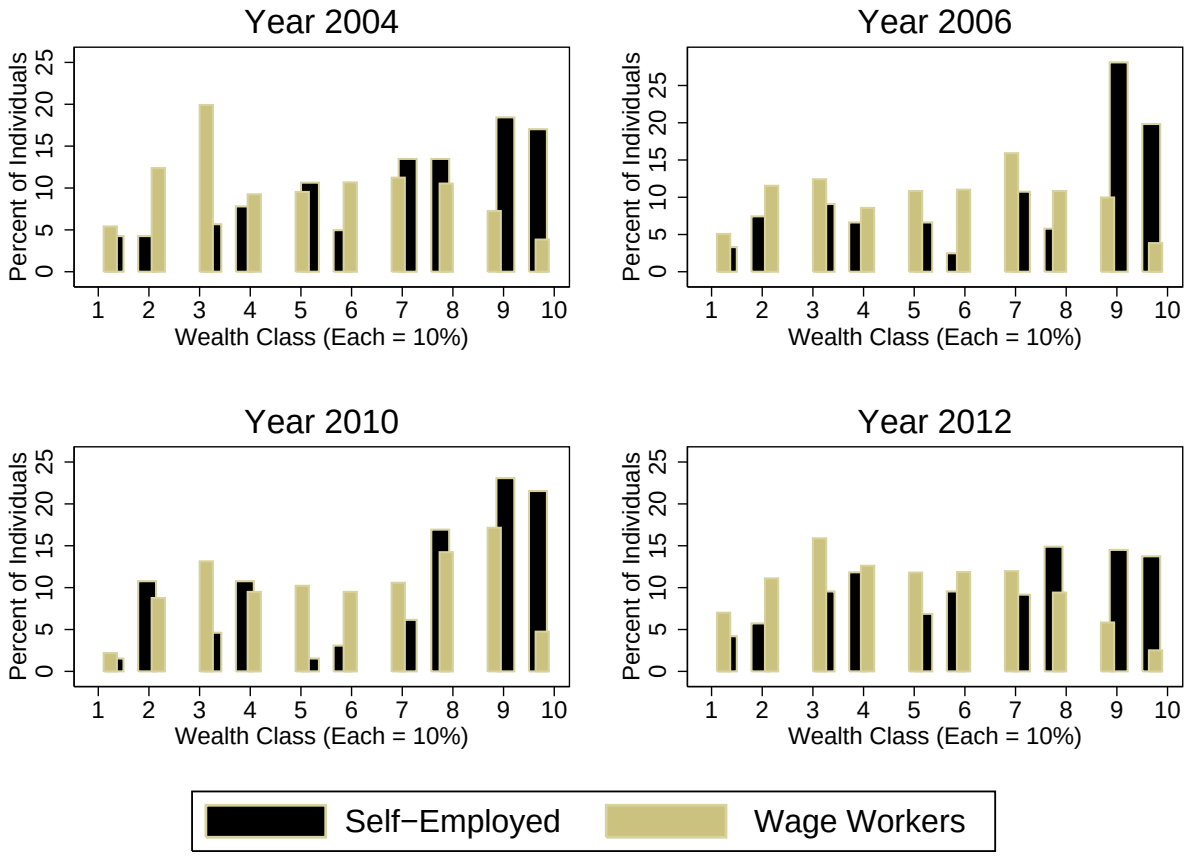
Note: SHARE, HRS and ELSA data and own calculations. Individuals are now sorted into 10 ascending equal wealth classes –Each includes 10 % of all individuals

Figure 1.8. Italy: Percentage of Self-Employed and Wage workers over Wealth Classes



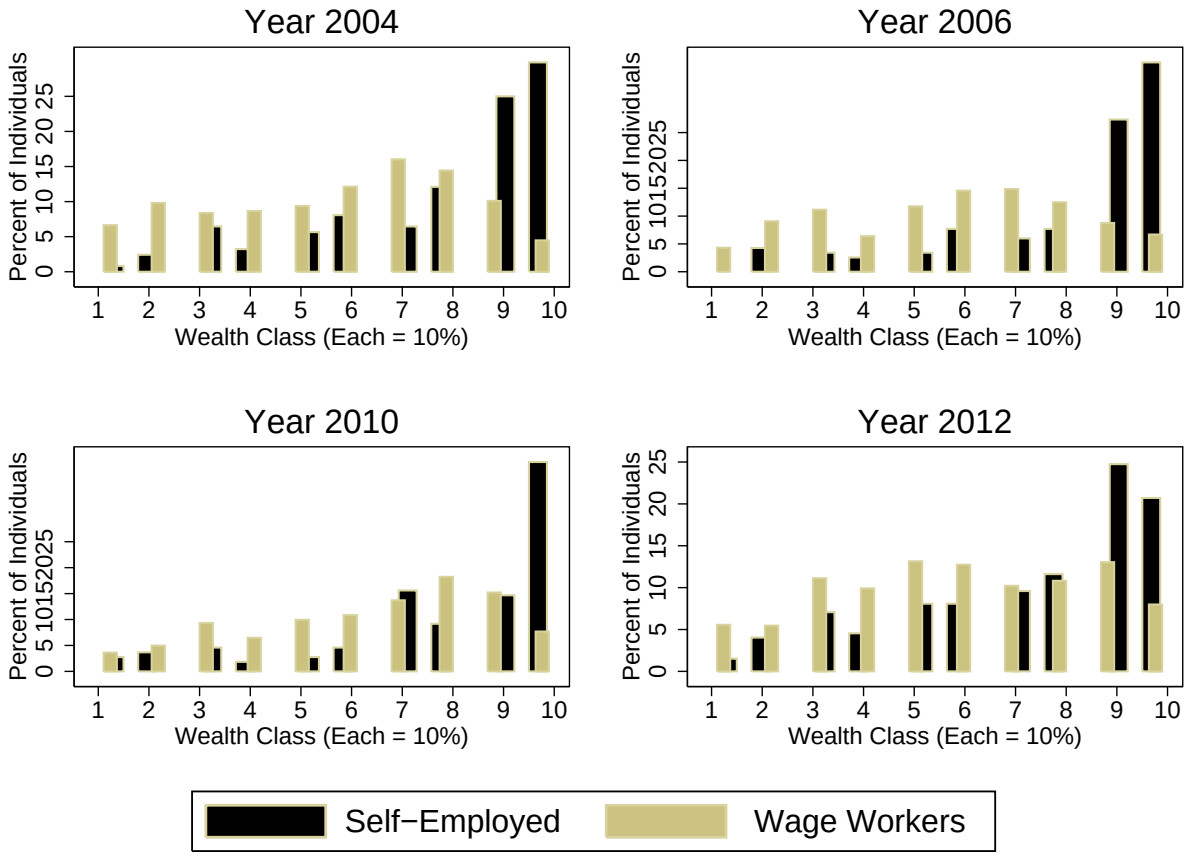
Note: SHARE, HRS and ELSA data and own calculations. Individuals are now sorted into 10 ascending equal wealth classes –Each includes 10 % of all individuals

Figure 1.9. Germany: Percentage of Self-Employed and Wage workers over Wealth Classes



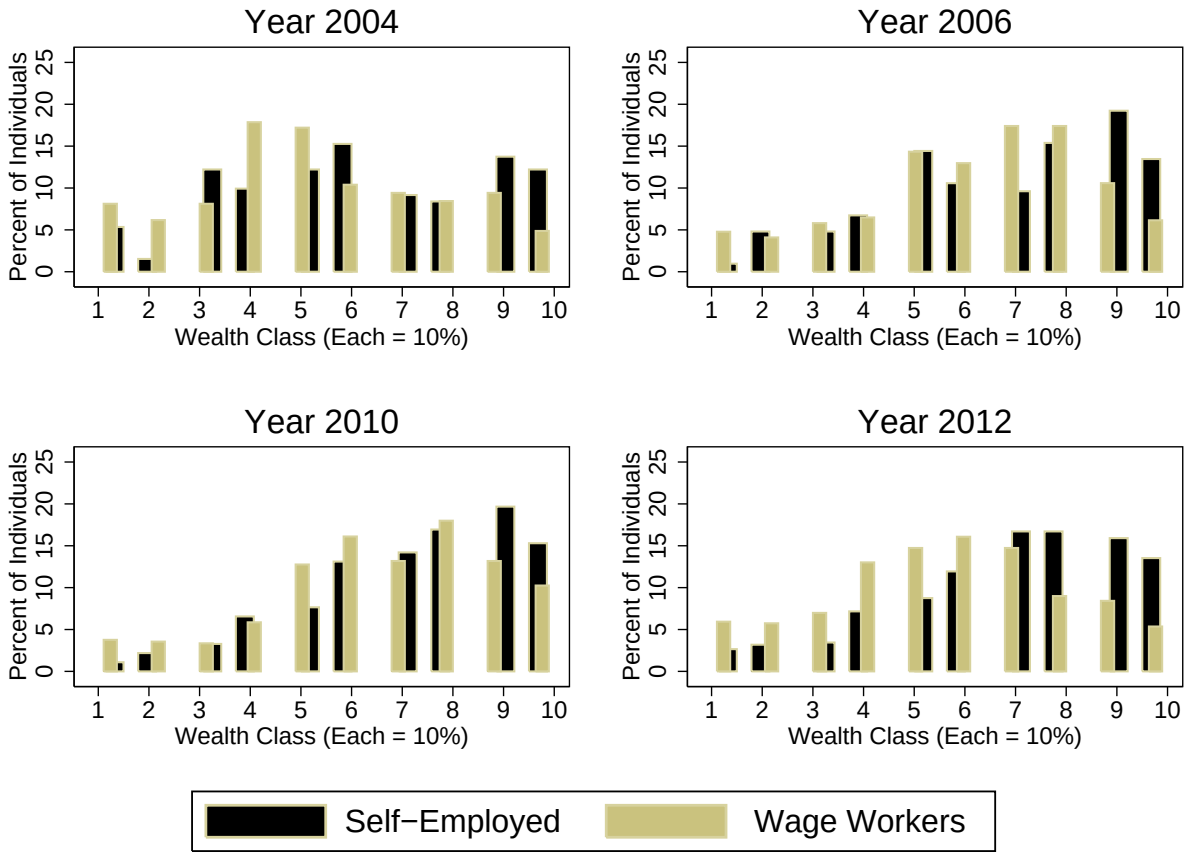
Note: SHARE, HRS and ELSA data and own calculations. Individuals are now sorted into 10 ascending equal wealth classes –Each includes 10 % of all individuals

Figure 1.10. The Netherlands: Percentage of Self-Employed and Wage workers over Wealth Classes



Note: SHARE, HRS and ELSA data and own calculations. Individuals are now sorted into 10 ascending equal wealth classes –Each includes 10 % of all individuals

Figure 1.11. Spain: Percentage of Self-Employed and Wage workers over Wealth Classes



Note: SHARE, HRS and ELSA data and own calculations. Individuals are now sorted into 10 ascending equal wealth classes –Each includes 10 % of all individuals

CHAPTER II

THE MODERATING ROLE OF STOCK MARKETS IN THE BANK COMPETITION-ENTREPRENEURSHIP RELATIONSHIP

Abstract

Using a worldwide database on entrepreneurship dynamics, and non-structural measures of competition in banking markets, this paper provides robust international evidence on the macroeconomic impact of bank competition on new business creation. Previous research has shown that the stock market, due to its liquidity externalities, stimulates business creation by allowing and expediting the recycling of "informed capital" supplied to new start-ups by financial intermediaries. Building on the complementarity between banks and stock markets in the business creation process, the paper evaluates in a unifying framework, the extent of two competing theories of bank competition effects on entrepreneurial financing. It is found that, in line with the market power hypothesis, bank competition has an overall beneficial impact on new business density by boosting credit access to new entrepreneurs. Yet, consistent with the information hypothesis, this result attenuates as the size of the stock market increases, due to the importance of relationship lending underlying the informed capital recycling.

Keywords: Entrepreneurship, Bank competition, Relationship lending, Stock market, Informed capital.

JEL Classification: G20, L1, L26, M13.

2.1 Introduction

The birth of new firms, understandably, cannot materialize without a certain amount of initial financial capital. There are generally three major sources of external finance for new businesses: banks, venture capitalists and angel investors. However, the banking industry is by far, the most dominant source among the three, with the two others remaining relatively substantial in industrialized countries. Parker (2009) extensively documents the importance of the different sources of entrepreneurial financing. For instance, even in countries such as the United Kingdom (UK) or the United States (US), where the venture capital industry and the angel investment market are well-developed, about 60 per cent of external finance for start-ups is reported to be raised through banks. Thus, any intensification of competition within the banking sector, whether through a fall in entry barriers or a more aggressive interaction between banks, has the potential to affect the availability and price of loans to start-ups, and hence new business creation.

The theoretical literature identifies two competing mechanisms linking bank competition to access to finance: the market power hypothesis and the information hypothesis. The former is the conventional view of industrial organization, and contends that market power (less competition) is just as detrimental in banking as in other industries. According to this theory, a competitive banking environment reduces the cost of credit and increases its accessibility. The information hypothesis argues that market power is in fact, a solution to information asymmetries issues inherent to the banking sector. As shown in the seminal paper by Petersen and Rajan (1995), higher competition in the banking market may deter the formation of relationships between firms and banks, since in a competitive setting, there are important constraints on the ability of creditors and firms to share the intertemporal surplus. That is, even if a bank is willing to initially offer cheaper

credit to the young (and opaque) firm, it is unable to retain its successful client later on, when the need to regain earlier losses will appear. Under these competitive circumstances, lending relationships are found to be less valuable both for firms and banks. While the impact of bank competition on access to finance can evidently be assessed for the entire population of firms in an economy, in light of the two above-mentioned mechanisms, one would concur that the question is particularly relevant for new entrepreneurs. In fact, new firms are more reliant on banks as their main source of finance, and at the same time, appear to be more prone to information asymmetries issues.

The main objective of our study is to assess the macroeconomic impact of bank competition on new firm formation, while underscoring the potential role of the stock market in this relationship. When banks engage in lending relationships with firms, they use their expertise, reputation and assets–that is, their "informed capital"– in order to monitor, advise and promote these (client) firms. Previous works show that the stock market facilitates the recycling of informed capital by allowing the sufficiently mature firms to go public and the monitors (banks or venture capitalists) to redirect their resources toward new start-ups (see Back and Gibson, 1998; Lin and Smith, 1998; or Gompers and Lerner, 1999 for some of the evidence on the recycling role of the stock market). While banks and stock markets are generally considered as alternative financing options for firms, this clearly suggests the existence of a mechanism whereby the two institutions complement each other in terms of allowing new businesses to take form. Michelacci and Suarez (2004) further formalize this argument in a general equilibrium model, and show that a developed stock market can significantly contribute to business creation, as it increases the net gains from young firms to go public, which in turn enables the informed capital to be rapidly recycled. This complementarity between banks and stock markets in the business creation process is the cornerstone of our analysis.

That enables us to investigate in a unifying framework, the scope of both the market power and information hypotheses, keeping in mind that, relationship lending by banks is the engine of the recycling process of informed capital. Our empirical work exploits a worldwide database on new business registrations produced by the World Bank, and non-structural measures of bank competition (the Lerner index, the efficiency adjusted Lerner index, and the Boone indicator) suggested by the New Empirical Industrial Organization (NEIO) literature as more precise measures of competition.

In line with the market power hypothesis, we find that bank competition has a beneficial impact on new business density, by increasing access to credit for new entrepreneurs. Importantly, the level of development of the stock market appears to play a moderating role. In particular, the positive impact of competition is found to diminish as the size of the stock market increases. This result is consistent with the information hypothesis. Indeed, the recycling process of informed capital, leading ultimately to new business creation, is fuelled by bank lending relationships. Therefore, if as argued by the information hypothesis, bank competition is inimical to lending relationships, this attenuating effect should be expected. Our results are robust to concentration in banking systems, and alternative measures of stock market development. We also document that the beneficial effect of bank competition is more pronounced in Sub-Saharan African countries, and that the moderating role of the stock market is particularly evident in developed countries.

This paper adds to the existing literature addressing the impacts of bank competition on access to finance, especially on its repercussions on entrepreneurship. The vast majority of the studies in this vein of the literature are country case studies and have used structural measures of competition, which recent research

has found to be inaccurate proxies for competition. [1] Two recent papers using international data are notable exceptions. Love and Martinez-Peria (2015) focus on access to finance at the firm level and find evidence supporting the market power hypothesis. The paper by Agostino and Trivieri (2016) is the only one to the best of our knowledge, which studies the impact on entrepreneurship using structural and non-structural measures of competition. They find that only the latter significantly affect new business creation. Their results also support the market power hypothesis. Our key contribution is the attention paid to the complementarity between banks and the stock market, which appears to play a significant role in addressing the issue. We implement an identification strategy that ensures that the impact of bank competition on entrepreneurship is not spurious, but rather effectively channels through its influence on bank credit to the private sector. Upon doing so, our study is also the first to the best of our knowledge, to offer empirical evidence – albeit indirect – supporting the "stock market-business creation" general equilibrium theory of recycling of informed capital, developed by Michelacci and Suarez (2004).

The remainder of the paper is organized as follows. The next section discusses the background literature leading to the work we undertake in this paper. Section 2.3 presents the data used in the analysis. We detail the methodology and identification strategy in section 2.4, and discuss the baseline results in section 2.5. In section 2.6, we provide several robustness tests. Finally, Section 2.7 concludes.

2.2 Background Discussion

The discussion is structured in two sections. We first review the literature on the links between bank competition, access to credit and entrepreneurship.

1. We review some of these studies in the next section

Secondly, we touch on the recycling role of the stock market and related works. Testable hypotheses are highlighted accordingly.

2.2.1 Competition, Access to Credit and Entrepreneurship

The rationale for investigating the impact of bank competition on entrepreneurship is that competition in banking markets has a direct effect on the supply of credit, which is vital for new entrepreneurs. The theoretical literature identifies two conflicting views: the market power hypothesis and the information hypothesis.

The market power hypothesis essentially suggests that competition in the banking industry is no different than competition in other industries, and it should only increase the supply of funds, by driving down the costs of credit [2], or through other related channels as discussed below. Besanko and Thakor (1992) construct a spatial equilibrium model in which the location and product attributes of a bank distinguish it from its competitors, on both the loan and deposit markets. They show that an injection of competition in the industry decreases the equilibrium loan interests, while the deposit interest rates rise. In the model by Chiappori et al. (1995), competition stems from the regulation of deposit rates, which results in more branches and lowers credit rates. Further insights are provided in relatively recent works such as Guzman (2000), Gehrig and Stenbacka (2007), Barth et al. (2009) and Hainz et al. (2013). Guzman (2000) analyzes in a general equilibrium model featuring credit rationing, how the market structure of the banking system affects capital accumulation. Comparing two economies, one having a competitive banking sector and the other a monopolistic one, he shows that market power has

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2. Freixas and Rochet (1997) provide a review of traditional models of Industrial Organization (IO) consistent with this view.

adverse effects on capital accumulation. In particular, he finds that monopoly banking is more likely to lead to credit rationing, and even when the credit is not rationed, the costs of credit become higher. Gehrig and Stenbacka (2007) consider a framework where banks have to compete for informational advantages. They show that anti-competitive information exchange among lenders penalizes creditworthy borrowers without an established credit record, and may even exclude talented entrepreneurs from credit markets. Building on an earlier study by Beck et al. (2006) documenting the importance of corruption in bank lending, Barth et al. (2009) propose a Nash bargaining model between a loan applicant and a loan officer, where bank competition is found to reduce corruption lending by lowering the normal interest rate and the bargaining power of the loan officer. More recently, Hainz et al. (2013) use a version of a Salop model (i.e a model of spatial competition useful for the introduction of market power in the banking sector), to highlight how bank competition could affect the access to loans through its effects on collateral requirements. In their model, lenders deal with information asymmetries on the borrower's types, either by requesting a collateral or screening the client. They show that competition alleviates credit constraints by making the use of collateral less likely, and the choice of screening rather attractive.

Formally, the market power argument in the context of our study can be summarized as follows:

Hypothesis 1 (H1): *Greater competition in the national banking market increases credit availability to new firms, which leads to higher new business density in the country.*

The information hypothesis is the alternative view which states that competition is detrimental to the formation of lending relationships between banks and borrowers, and reduces credit availability to more opaque clients–who happen

to benefit the most from these relationships. This hypothesis recognizes that the banking system is fraught with important information asymmetries issues, which make it distinct from any other industry. Banks often mitigate adverse selection and moral hazard issues in their interactions with firms through the establishment of lending relationships or to a lesser extent, via initial screening. Relationship lending (as opposed to arm's length or transactional lending) usually involves the development of sector-specific expertise by banks, close and continued interactions with individual firms including the acquisition of proprietary information and monitoring activities. A number of studies (such as the ones by Petersen and Rajan, 1994 and Berger and Udell, 1995) show that banking relationships have special value for opaque firms–those having little credit history or tangible assets (start-ups being a prime example of such clients). With this in mind, the real question pertaining to the information hypothesis is: How (and why) does bank competition deter the development of lending relationships between lenders and firms? The answer to this question has been provided in the pioneering paper by Petersen and Rajan (1995). The crux of the argument lies in the ability for banks in a less competitive environment to smooth the intertemporal surplus (cash flows) of the financed firm over the duration of their relationship. In particular, banks with market power can offer credit to a young (and usually opaque) firm at a lower rate initially, and manages to extract rents in the future, without the threat of its successful client being lured away by competitors. This strategy is clearly not sustainable in a competitive setting as credit market competition imposes constraints on the ability of the firm and the creditor to intertemporally share surplus. Therefore, it is not in the interest of neither the bank nor the firm to engage in relationship lending in such circumstances, which results in young firms being either denied credit or finding the costs so high that they are unable to afford it.

Thus, the information contention can be formally stated as follows:

Hypothesis 2 (H2): *Greater competition in the national banking market reduces credit availability to new firms by hindering the development of lending relationships, hence leads to lower new business density in the country.*

Each of the aforementioned two hypotheses offers valid supporting arguments. Thus, because of their conflicting nature, one needs to turn to empirics in order to evaluate the strength of underlying mechanisms. A good number of papers have attempted to address the issue. [3] However, the vast majority of these studies focus on one country, and almost all of them rely on structural (usually concentration) measures as proxies for market power. Black and Strahan (2004) use deregulation of US branching laws as a platform to examine the effects of changes in the competitive environment on entrepreneurship. They find that the rate of new business incorporations increases following deregulation of branching restrictions. However, Wall (2004) documents that this effect is far from being clear-cut, as entrepreneurship seems to be negatively associated with deregulation in some regions. Cetorelli and Strahan (2006) also use US data and find that lower concentration and looser restrictions on geographical expansions are very favorable to new and young firms, by allowing them to gain access to credit more easily. Using data from 22 industries across Italian provinces, Bonaccorsi di Patti and Dell'Ariccia (2004) document a bell-shaped relationship between bank market power–as measured by several structural indicators–and firm creation at the local (provincial) level. However, their analysis taking into account the degree

3. Many studies investigate the impact of bank competition on credit availability to firms in general (see Love and Martinez-Peria, 2015 for the most recent paper on the subject). Our interest in this paper is on the implications on entrepreneurship. Thus, without claiming to be exhaustive, we only mention studies relevant to that.

of opaqueness of industrial sectors, provides supporting evidence for the information hypothesis. Gagliardi (2009) finds similar results for Italy with a focus on cooperative firms. The study by Bergantino and Capozza (2012) focuses on a sample of Central and Eastern European countries, and finds an overall positive effect of bank concentration on entrepreneurship. Yet this positive effect decreases for technology intensive sectors–which are more dependent on external finance. Rogers (2012) examines the issue for the US using a panel specification to evaluate differences in firm creation within and across US states. While the results point to an overall negative impact of competition on firm creation, he finds that the number of small banks and the greater availability of banking branches, all contribute significantly to new business creation. More recently, Backman (2015) examines the question for the case of Sweden, with the main aim to assess the importance of the local bank sector for new firm formation. He finds, among other things, that low levels of branches employment concentration are associated with high rates of new firm creation.

To the best of our knowledge, the only study which uses non-structural measures of bank competition to address the issue at hand, is the recent contribution by Agostino and Trivieri (2016).[4] Their study is also the first to provide an international (worldwide) evidence on the topic. Their strategy was to consider alternative measures of competition –including structural and non-structural indicators (specifically the Lerner index and the Boone indicator for the latter)– and to examine their impact on business creation at the country level. It emerges that, only the non-structural measures of market power significantly affect entrepreneurship. Overall, their results are consistent with the market power hypothesis, as

4. Non-structural measures of bank competition have already been used to address other questions, including the impacts of competition on firms' access to finance in general (see Love and Martinez-Peria, 2015 for a recent contribution).

competition in the banking industry seems to foster new business registrations.

The use of structural measures of bank competition has been underpinned by the structure conduct performance (SCP) paradigm (Mason, 1939; Bain, 1956), which proposes a stable, causal relationship between the structure of the banking industry, firm conduct, and performance. In that framework, competition (i.e. conduct) is negatively related to concentration measures (i.e. structure). For instance, this approach suggests that fewer and larger banks are more likely to engage in anti-competitive behavior. However, the predictive accuracy of structural measures has been conceptually challenged by the efficiency structure (ES) hypothesis (Demsetz, 1973; Peltzman, 1977) and the theory of contestability (Baumol et al., 1982). The ES hypothesis argues that the structure of the market may reflect differences in efficiency rather than competition. According to the theory of contestability, the behavior of banks in contestable markets is determined by the threat of entry and exit. In particular, banks can be pressured to behave competitively in an environment with low entry restrictions and easy exit conditions for unprofitable institutions – even if the market is concentrated. Furthermore, collusion is shown to be sustainable even in least concentrated markets. For instance, Bernheim and Whinston (1990) show that multimarket contacts raise the incentive for collusion by changing the relative costs and benefits of cooperating. Notwithstanding their theoretical limitations, structural measures have been widely used in empirical works as proxies for competition, primarily due to their relatively low data requirement. Focusing on the banking industry, Claessens and Laeven (2004) provide evidence that concentration measures do not take into account the degree of contestability of markets, thus are not good predictors of competition. A more comprehensive critical review of these measures is also provided by Degryse et al. (2009).

The New Empirical Industrial Organization (NEIO) literature addresses the

major weaknesses associated with structural measures. It gauges competition by directly observing the conduct and pricing behavior of firms in the market. Non-structural measures such as the Lerner index, the adjusted Lerner index and the Boone indicator are in line with this literature. In particular, both the Lerner index and the adjusted Lerner index are based on oligopoly theory, and conceptually capture static aspects of competition, while the more recently developed Boone indicator incorporates its dynamic features – especially the extent of contestability of markets. [5] Fernandez de Guevara and Maudos (2011), and Boone et al. (2013) show that such non-structural measures are more precise and robust estimators of competition.

2.2.2 Stock Market and The Recycling of Informed Capital

As discussed earlier in this section, relationship lending is a very valuable tool, not only for banks, but also for new entrepreneurs. When the latter engage in such relationship, they are provided with necessary credit to start their businesses, but benefit also from the bank's expertise, reputation, advisory and marketing services. These financial and non-financial services provided to new firms by banks, venture capitalists or business angels constitute what is called "informed capital".

While there are a variety of reasons for a company to go public (including the financing of current and future investments), this decision is not usually made until the company reaches a certain level of maturity. The reason is that, it is very costly for young (non-mature) firms to afford the requirements and implications of this decision, which is for instance, in terms of unveiling proprietary information

5. A concise description of the three measures, and the computation procedures are presented in Appendix A

or the potential underpricing of their shares due to greater uncertainty on the value of the firms. That is where informed capital plays a big part in easing the process to a successful Initial Public Offering (IPO) by a new company on the stock market. Because informed capital is in limited supply, when a beneficiary start-up goes public, its relationship partner and financier (i.e. venture capitalist, bank, or business angel) is able to redirect its resources toward new companies in need. That is to say, the stock market enables the informed capital to be recycled by providing new listed companies the support that allows the relationship creditor-firm to become at least less "intense", after the IPO. This recycling power of the stock market has been extensively documented for the special case where informed capital is provided by venture capitalists (see among others, papers by Black and Gilson (1998), Lin and Smith (1998), Gompers (1996) or Gompers and Lerner (1999)). For instance, Black and Gilson (1998) argue that a well-developed stock market that permits venture capital firms to exit their relationship with portfolio companies via an IPO, is essential for the existence of a vibrant venture capital market.

Michelacci and Suarez (2004) extend this idea to other providers of informed capital (in particular, banks) and propose a general equilibrium model highlighting interesting implications for business creation and growth. In their model economy, businesses are developed by entrepreneurs when the latter obtain a match with monitors (suppliers of informed capital) after a costly search process. The business creation rate in equilibrium, is a direct function of the number of entrepreneurs that search for informed capital and the available amount of this capital. As expected, the latter increases when it is quickly recycled by the stock market. Using that framework, they show that a developed stock market enables young firms to go public earlier, allowing the informed capital to be recycled more quickly, which in turn boosts the business creation rate of the economy. In fact,

a developed stock market is typically associated with liquidity (thick market) externalities [6] which encourage firms especially young ones to open their shares to public investors. These externalities decrease the costs for young firms to go public and can arise through various channels. For instance, since investors may have access to a larger number of similar companies listed in the stock market – that is, companies of the same characteristics, size and/or sector of activity – they can better diversify idiosyncratic risks or reduce the costs of gathering information about the firms. Likewise, they can better identify factors behind firm performance, which will help to implement more effective management control systems. Furthermore, with a larger number of similar IPOs, investment banks are better equipped to effectively assist new firms since they can exploit scale economies and experience gains in information processing and price setting. Overall, young firms may feel empowered by the wealth of facilities or benefits available via a large stock market, which in a way, reduces their potential fear of failure and supports their decision to go public.

Clearly, the complementarity between monitors and the stock market in the business creation process is a key insight that should not be ignored when assessing impacts of bank competition on entrepreneurship. This complementarity which stems from the recycling of informed capital, is underpinned by lending relationships between monitors (banks) and firms, thus fully consistent with the information hypothesis (H2). Theoretically, two alternative scenarios can emerge conditional on the prevailing hypothesis between H1 and H2, when abstracting from the complementarity between banking and stock markets. In the first scenario where bank competition has an a priori beneficial impact on

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6. A thick market – as opposed to a thin market – is one with a high number of buyers and sellers, which increases the liquidity of stocks – that is the extent to which assets are bought and sold at stable prices on the market.

business creation (H1), the stock market will moderate this effect through the information channel as it contributes to the formation of new lending relationships by redirecting the informed capital toward new start-ups. The strength of the attenuating effect will ultimately depend on the extent to which market power by certain banks may enable the development of monitoring relationships with the new firms. Formally, we derive the following hypothesis:

Hypothesis 3 (H3): *The beneficial impact of bank competition on new business density decreases with the level of development of the stock market.*

In the alternative situation where bank competition has an a priori negative impact on business creation through its deterrent effect on lending relationships (H2), the stock market will reinforce this effect considering that the recycling role of the stock market is fuelled by lending relationships. Formally, we hypothesize:

Hypothesis 4 (H4): *The negative impact of bank competition on new business density increases with the level of development of the stock market.*

2.3 The Data

Our analysis is based on bank level and country level data from different sources. We first present the source and the main characteristics of our measure of entrepreneurship. Next, we introduce all the macro-financial data. Finally we provide the source and details of institutional and governance indicators used as control variables in our analysis.[7] Using available and relevant variables from these different sources, we construct a country-year unbalanced panel covering the

7. Tables recapitulating the list of variables and key descriptive statistics are provided in Appendices.

period 2004-2010.[8] The list of countries for which all data are available is also provided in the appendix B (Table 2.9).

2.3.1 Measuring Entrepreneurship Dynamics

Entrepreneurship data come from the World Bank Group Entrepreneurship Survey (WBGES). The database is a unique source of comparable, cross-country data on new business registrations. Entrepreneurship is specifically defined as "the activities of an individual or a group aimed at initiating economic activities in the formal sector under a legal form of business". Only businesses operating in the formal sector and registered under limited liability (or its equivalent) form, are considered.[9] Data are provided on new business density, defined as the number of newly registered corporations per 1000 working-age people (15-64 years old).

Besides its worldwide coverage, three key features make the WBGES measure particularly relevant to our study. First, it captures "actual" entrepreneurship (as opposed to "potential" entrepreneurship). In addition, emphasis is put on business creation, rather than an occupational status per se. Secondly, data are drawn from official sources and importantly are non-survey data. In fact, in order to accurately assess any impact of bank competition on business creation, one absolutely needs to examine its effects on actual (effective) business registrations instead of effects on the potential supply of entrepreneurs (which includes nascent or aspiring entrepreneurs). Lastly, the measure focuses on limited liabil-

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8. Most of institutional data (World Bank Doing Business data) are only available from 2004, while data constraints on bank competition measures limit our sample period to the year 2010.

9. This is adopted for the sake of comparison or consistency across countries of different legal and economic systems.

ity (incorporated) companies – which are on average bigger than unincorporated ones, thus may require more finance. Hence, it can particularly help identify the impact of bank competition.

The uniqueness and relevancy of the WBGES data to our study can be further appreciated by comparing this database to two other well-known internationally harmonized databases on entrepreneurship: the Global Entrepreneurship Monitor (GEM) dataset and the Comparative Entrepreneurship Data for International Analysis (COMPENDIA). [10] In fact, we argue that the impact of bank competition on entrepreneurship is more likely to be perceived through the lens of a flow variable–that is, a dynamic measure of entrepreneurship. [11]

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10. The GEM project is a popular study in entrepreneurship research, which provides survey based data on entrepreneurial activity across countries all over the world. The key country indicator of this dataset is the Total Entrepreneurial Activity which is defined as the percentage of 18-64 population who are either nascent entrepreneur or owner-manger of a new business. This indicator clearly could not be used, as it does not capture actual business creation. The related new business ownership measure does not fit the purpose either as it captures businesses aged up to 42 months. Besides, countries which participate in the survey differ from year to year. Thus, from the perspective of our study which exploits variation across countries and within countries, this is not an optimal choice. The COMPENDIA database focuses on the Organization for Economic Co-operation and Development (OECD) countries (See Van Stel, 2005 for documentation on this database). It provides annual data on self-employment which includes owner-managers of both unincorporated and incorporated businesses. The drawbacks of this dataset in the context of our study, are the fact that the business ownership indicator includes unincorporated companies (not to mention the emphasis on the occupational status) and the measure is a "stock" variable.

11. We investigate the issue using the COMPENDIA dataset in the robustness section.

2.3.2 Macro-Financial Indicators

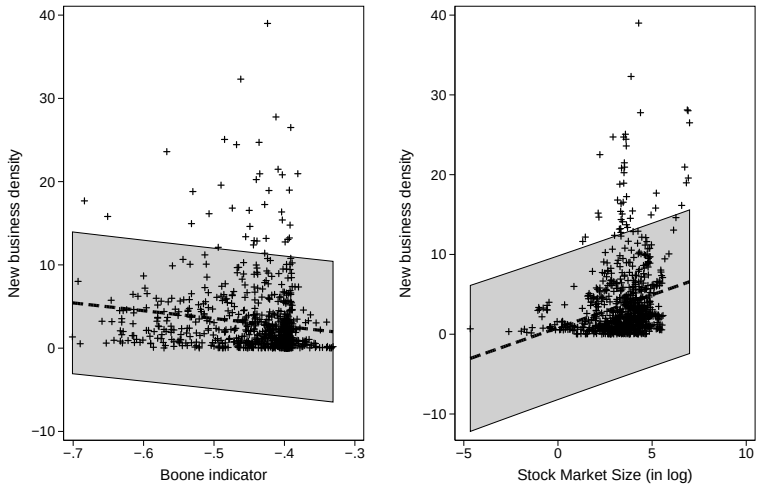
We use three alternative indicators of bank competition: the Boone indicator, the Lerner index, and the adjusted Lerner index. All three are inverse measures of bank competition – that is, higher values of these variables correspond to less competition. The estimates are drawn from Clerides et al. (2015) based on bank level data from Bankscope, a commercial database produced by Bureau Van Dijk providing detailed information about banks around the world. [12] The other financial and macroeconomic indicators used in this paper are drawn from the World Development Indicators database (WDI, World Bank) and the Global Financial Development Database (GFDD, World Bank). In particular, the WDI variables include the annual economic growth and the bank credit to the private sector as a percentage of GDP. The GFDD variables include stock market development indicators (Market capitalization as a percentage of GDP, value of all shares traded as a percentage of GDP), and bank concentration measures (Assets of the three and five largest banks as a fraction of total banking assets).

A first look at the data provides key descriptive insights. For instance, Figure 2.1 gives a glimpse of the relationship between bank competition (measured by the Boone indicator) and new business density on the one hand, and the link between stock market size (proxied by the market capitalization as a percentage of GDP) and new business density, on the other hand. Since the Boone indicator is an inverse measure of bank competition, the graph suggests an a priori positive relationship between bank competition and new business density, which tends to support the market power hypothesis. In addition, it describes a positive relationship between stock market size and new business density, consistent with

12. Note that as of January 2017, Bankscope is no longer available and has been replaced by Orbis Bank Focus.

the theory.

Figure 2.1. Bank Competition, Stock Market Development Vs. New Business Density



Note: Author's computation using data from GFDD, WBGES and Clerides et al. (2015). Confidence intervals at 95% (in grey) are computed using the standard error of forecast.

2.3.3 Institutional and Governance Indicators

We use these indicators as control variables in order to take into account the role of the whole business and political environment in the business creation process. We construct business environment variables using several indicators from the World Bank Doing Business Database (DBD), and a Principal Component Factor Analysis (PCA). The DBD indicators in this study are regrouped under six relevant topics: Starting a business; Resolving insolvency; Getting credit; Paying taxes; Enforcing contracts; and Registering property. The use of PCA allows us to construct a unique score for each topic containing sub-indicators that are correlated and which conceptually measure similar things. In doing so, we are able to exploit the maximum variability within each of the topics, while being

parsimonious in our approach. Kaiser (1960)'s criterion (which is to keep factors with eigenvalues ≥ 1) is used to retain relevant factors and predict the individual scores.

The topic "Starting a business" includes three sub-indicators that aim to capture the extent of start-up costs required to start a business: The number of days required to complete necessary procedures; the official cost to complete the procedures; and the paid-in minimum capital which reflects the amount that the entrepreneur must deposit in a bank or with a notary before registration or up to three months after incorporation. A higher score thus implies that it is more difficult to start a business. The topic "Resolving insolvency" aims to study the cost and outcome of insolvency proceedings involving domestic entities. Sub-indicators include the cost required to recover debt and the recovery rate for a secured creditor. A higher score indicates positive business environment–that is, with low costs and higher recovery rates. The topic "Getting credit" includes four sub-indicators capturing the existence of laws and tools that ease access to credit: The strength of legal rights index measuring the degree to which collateral and bankruptcy laws facilitate lending; the depth of credit information index measuring the availability of more credit information from either a credit bureau or a credit registry; the credit bureau coverage and the credit registry coverage. Sub-indicators under "Paying taxes" include the time required to comply with major taxes, and the total tax rate (share of commercial profit) measuring the amount of taxes and mandatory contributions borne by the business in the second year of operation. The topic "Enforcing contracts" includes sub-indicators measuring the time and the cost for resolving a commercial dispute in the court system. Finally, the topic "Registering property" includes two sub-indicators that capture the time and the cost required to purchase and transfer property between two local companies. While it may be interesting to also control for countries' employment

protection legislations in our analysis, data constraints for our worldwide sample, make it challenging. [13] However, given the time dimension of our data, we attempt to control for it through the introduction of country fixed effects.

The political environment and governance indicators come from the Worldwide Governance Indicators (WGI) by Kauffman et al. (2010). The indicators cover six dimensions of governance: Voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. For all the six indicators, higher values indicate more enabling governance environments.

Before moving on to the inference analysis, we present in Figure 2.2, another key descriptive insight that is obtained from the data. The figure combines the relationship between the three indicators of bank competition and the actual credit provided by banks to the private sector, with the relationship between bank credit and new business density. It clearly suggests that more competitive banking markets are associated with greater credit to the private sector, and the latter in turn, increases new business density. The correlation coefficient between competition and bank credit is significantly strong and the one between credit and new business density, even stronger (figures are respectively around 0.22 and 0.60 as shown in Table 2.8 in Appendix B). While these are only descriptive statistics, they however constitute an underpinning of our identification strategy.

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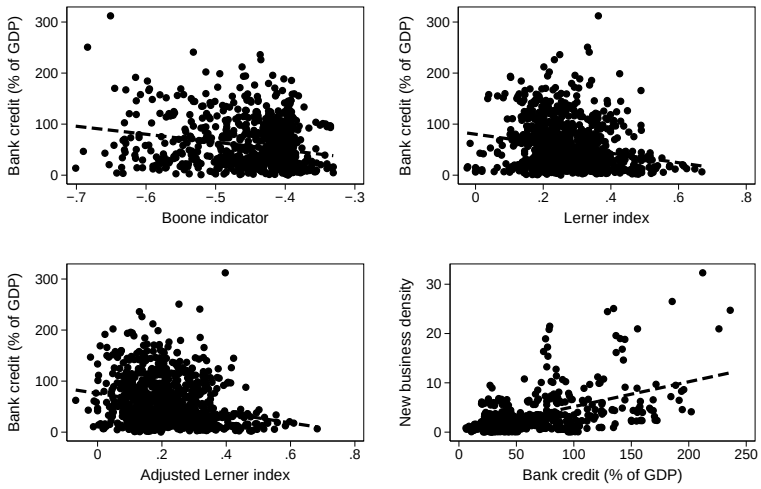
13. Data on employment protection laws (EPL) are available for OECD countries. However, historical worldwide data on labor market rigidities are not available in the DBD nor elsewhere.

Figure 2.2. Bank Competition, Credit to Private Sector and New Business Density



Source: Author's computation using data from WDI, WBGES and Clerides et al. (2015)

2.4 Methodology and Identification Strategy

We adopt a parametric approach that allows us to exploit the maximum variability given by the panel structure of the data, while isolating the specific effect of competition. We start with a benchmark econometric model which can be specified as follows:

$$Y_{it} = \beta_1 BCO_{it} + \beta_2 SMS_{it-1} + \theta X_{it} + \alpha_i + \delta_t + \gamma t + \epsilon_{it} \tag{2.1}$$

where the dependent variable Y_{it} is the measure of entrepreneurship (new business density) in country i at year t; BCO_{it} [14] is the bank competition indicator (alternatively, the Boone indicator, the Lerner index and the Adjusted Lerner index); SMS_{it-1} denotes the stock market size (market capitalization as a percentage of

14. We also considered specifications where the impact of competition is allowed to be non-monotone. The non-monotonicity effects were insignificant.

GDP) where the lag is taken to discard any potential simultaneity bias [15]; α_i and δ_t are respectively a matrix of country fixed effects and year fixed effects; ϵ_{it} is the error term. X_{it} is a matrix of time-variant country characteristics (control variables) and θ is the corresponding vector of parameters; t is a linear trend variable that controls for any global macroeconomic trends (e.g. the general trend in bank competition across the countries) that may affect annual new business density or its dynamics. The country fixed effects α_i control for any time-invariant unobservable determinants of new business density at the country level, while the year fixed effects δ_t capture any macroeconomic or financial shocks that occur during a specific year (e.g. the 2008 financial crisis). The vector of time-variant control variables X_{it} includes annual economic growth, business environment as well as political and governance indicators , which are presented in Section 2.3. [16]

The parameter of special interest is β_1 which identifies the impact of bank competition on new business density. Since the bank competition variable is an inverse measure of competition, the estimated β_1 should be negative if the market power hypothesis (H1) prevails over the information hypothesis (H2), and positive in the opposite case. The parameter β_2 is expected to be positive as the theory predicts higher business creation in more developed stock markets.

Furthermore the impact of competition on entrepreneurship is expected to manifest itself through a credit channel. Thus, it is equally important to implement a strategy that clearly identifies this channel of transmission. To do so, we perform a multilevel (panel) mediation analysis in line with the approaches

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15. A simultaneity bias could occur if newly registered businesses launch their IPO during the first year of operation, which is very unlikely.

16. Our key results are robust to experimenting with a number of other plausible control variables, including unemployment and lagged GDP growth.

by Baron and Kenny (1986), Sobel (1986), and Krull and MacKinnon (2001). The natural mediator candidate in this study is the bank credit to the private sector. This variable may be considered a mediator to the extent to which it carries the influence of bank competition to the dependent variable (new business density). More specifically, mediation can occur when (i) the bank competition indicator affects new business density in the model abstracting from bank credit, (ii) bank competition affects bank credit, and (iii) bank credit has a significantly unique effect on new business density while the effect of bank competition on new business density shrinks upon the addition of bank credit to the model (2.1). Formally the fully augmented model can be written as follows:

$$Y_{it} = \beta_{1a} BCO_{it} + \beta_2 SMS_{it-1} + \beta_3 CRE_{it} + \theta X_{it} + \alpha_i + \delta_t + \gamma t + \epsilon_{it} \qquad (2.2)$$

where CRE_{it} denotes the bank credit to the private sector. We study the change in the magnitude of the coefficient associated with the bank competition variable, once the model is augmented with the mediator variable. For mediation to effectively occur, we should have $|\beta_{1a}| < |\beta_1|$, and $\beta_3 \neq 0$. We complement this estimation procedure by formally testing the significance of the mediation (indirect) effect through a robust multilevel version of the Sobel test. In particular, to increase the statistical power of the test, standard errors are bootstrapped and clustered at the country level. The test also controls for the country fixed effects in a parsimonious model specification.

Our identification analysis so far has abstracted from the complementarity between stock and banking markets, which stems from the recycling of informed capital. To take this into account, we modify the benchmark model (2.1) by adding an interaction term between the stock market size and the bank competition variable. The new specification becomes:

$$Y_{it} = \beta_{1b} BCO_{it} + \beta_2 SMS_{it-1} + \beta_4 BCO_{it} \times SMS_{it-1} + \theta X_{it} + \alpha_i + \delta_t + \gamma t + \epsilon_{it} \quad (2.3)$$

As the stock market grows and the informed capital becomes quickly recycled, competition in banking markets is expected to exert a negative impact on new business density via its deterrent effect on the formation of lending relationships. If H3 holds, we should have $\beta_{1b} < 0$ and $\beta_4 > 0$.[17] In other words, the stock market will moderate the beneficial impact of bank competition on new business density. Alternatively, if H4 holds, we should have $\beta_{1b} > 0$ and $\beta_4 > 0$. That is, the stock market will magnify the detrimental effect of bank competition on new business density. Or, formulated differently, the stock market will magnify the positive effect of market power by banks on new business density.

The models are estimated using the within (fixed effects) estimator. This estimator assumes that the country fixed effects are correlated with the time-variant covariates. Thus, estimated coefficients cannot be biased because of omitted time-invariant characteristics. The standard errors provided by this estimator are also based on the strong assumption that the error terms ϵ_{it} are identically and independently distributed (iid). While we can easily make the assumption of independence across countries (clusters), assuming on the other hand that the errors are uncorrelated within clusters seems to be problematic. To make accurate inferences, it is fundamental to obtain accurate standard errors of estimates. In fact, failure to control for within-cluster correlation can lead to misleading small standard errors. We formally conduct a test of independence of error terms (Wooldridge, 2002; Drukker, 2003), which is ultimately strongly rejected. Thus, standard errors are specified to allow for intra-group correlation.

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17. Recall that the bank competition variable BCO (Boone indicator, Lerner index and adjusted Lerner index) is an inverse measure of competition.

2.5 Baseline Results

The exposition closely follows the order of the equations specified in the previous section.[18] Table 2.1 summarizes the results from the estimations of equations (2.1) and (2.2) using alternatively the three indicators of competition. The first two columns report estimates based on the Boone indicator; columns (3) and (4) are obtained using the Lerner index; finally columns (5) and (6) concern the efficiency adjusted Lerner index.

The first column of Table 2.1 reports results from estimating the benchmark equation (2.1) using the Boone indicator. The estimated coefficient associated with the competition indicator is significantly negative ($\beta_1 = -4.305$) at the 5% level. This result supports the market power hypothesis (H1) and suggests that increased bank competition is beneficial to new business density. In column (2), we present the results from the estimation of equation (2.2) which is a key component of the mediation analysis.[19] After controlling for bank credit to the private sector, the magnitude of the marginal effect of competition substantially decreases as expected (that is, $|\beta_{1a}| = 2.937 < |\beta_1| = 4.305$). However, the significant relationship between the mediator (bank credit) and the dependent variable (new business density) documented in Figure 2.2 and Table 2.8, is not robust to the inclusion of the full set of control variables. In fact, the estimated isolated effect of bank credit on new business density ($\beta_3 = 0.018$) turns out to be insignificant. While this result may appear to weaken our mediation analysis,

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18. For the sake of readability and compactness, only estimates of the key variables – including significant control variables – are reported.

19. The estimations also confirm that bank competition indicators are strongly related to bank credit, as also shown in Figure 2.2 and Table 2.8 (Appendix B). In particular, increased bank competition leads to higher levels of bank credit.

the more robust multilevel mediation test implemented shows that the mediation (indirect) effect remains strongly significant at the 5% level. About 89% of the total effect of bank competition on new business density is mediated through bank credit to new entrepreneurs.

Columns (3) and (5) report estimates from equation (2.1) using respectively the Lerner index and the adjusted Lerner index. The impact of competition on entrepreneurship is found to be insignificant using these two indicators. However, while all the specifications in Table 2.1 systematically control for the effect of the stock market size on new business density, finding significantly positive estimates, they do not take into account the complementarity between banking and stock markets in the business creation process.

As discussed, this complementarity is key to accurately evaluate macroeconomic impacts of bank competition. In table 2.2, we present results from estimating equation (2.3). In column (1) using the Boone indicator, the qualitative results remain unchanged compared to what is found in the benchmark model (2.1) abstracting from the interaction effect. The market power hypothesis still prevails as increased bank competition is found to foster new business density. While the magnitude of the marginal effect of bank competition on the dependent variable decreases with stock market size, the complementary effect (i.e. $\beta_4 = 0.019$) is insignificant.

In contrast, the moderating role of the stock market becomes strikingly apparent in columns (2) and (3) using respectively the Lerner index and the adjusted Lerner index as indicators of competition. Recall that the estimated effect of competition (based on these two measures) turned out to be insignificant in the benchmark model abstracting from the interaction term (Table 2.1). Interestingly, the marginal impact of bank competition becomes significant. ($\beta_{1b} = -3.355$ and

Table 2.1 – Impact of bank competition on entrepreneurship: Benchmark models

Variable	Dependent Variable: New Business Density					
	Using Boone indicator		Using Lerner index		Using Adjusted Lerner index	
	(1)	(2)	(3)	(4)	(5)	(6)
Bank competition	-4.305**	-2.937**	-0.199	0.014	0.477	0.878
	(2.094)	(1.386)	(1.437)	(1.329)	(1.068)	(1.120)
Stock market size	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Bank credit		0.018		0.021*		0.022*
		(0.012)		(0.012)		(0.012)
Starting a business	-0.968*	-1.093**	-1.075**	-1.186**	-1.090**	-1.206**
	(0.507)	(0.477)	(0.534)	(0.492)	(0.538)	(0.497)
GDP growth	0.065***	0.071***	0.060**	0.068***	0.056**	0.063**
	(0.024)	(0.025)	(0.024)	(0.025)	(0.025)	(0.025)
Resolving insolvency	1.673***	1.412**	1.401***	1.191**	1.346**	1.119*
	(0.556)	(0.583)	(0.529)	(0.596)	(0.518)	(0.587)
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Observations	482	475	482	475	482	475
Within R^2	0.22	0.24	0.20	0.23	0.20	0.23
Multilevel Mediation Test:						
Indirect Effect		-1.656**		-0.227		-0.493
		(0.653)		(0.018)		(0.337)
Direct Effect		-0.205		-0.828		1.202
		(0.921)		(1.170)		(1.045)
Total Effect		-1.861*		-1.055		0.709
		(1.033)		(0.989)		(0.709)

Note: Robust standard errors (clustered at the country level) are reported in parentheses. ***, **, * denote respectively, significance of estimates at the 1%, 5% and 10% levels. For the multilevel random intercept mediation test, robust bootstrapped standard errors clustered at the country level, are reported in parentheses. The test controls for non-observable country fixed effects. Other control variables include four DBD indicators and six WGI indicators as described in Section 2.3.3.

$\beta_{1b} = -2.132$ respectively for the Lerner and adjusted Lerner indices). In other words, bank competition encourages new business creation. Even more interesting, the interaction term is now significantly positive ($\beta_4 = 0.049$ and $\beta_4 = 0.055$, respectively) while the estimated (direct) impact of stock market size on new business density (β_2) loses its significance. Clearly, the non-consideration of the complementary effect in the benchmark model (2.1) tends to greatly conceal the beneficial impact of bank competition on new business density. It is also obvious that the moderating role of the stock market is more visible through the interaction mechanism with the banking market. In particular, better developed stock markets allow new firms to go public earlier, which enables the informed capital provided by banks to be recycled more quickly. Because the recycling process of the informed capital hinges on relationship lending, and considering that competition is claimed to be inimical to the formation of relationship banking, an increase in the size of the stock market tends to attenuate the beneficial impact of competition on new business density. Overall, these results support the hypothesis H3.

Out of the control variables included to essentially avoid the possibility of our key results being driven by model misspecifications, only three of them come out significant across the different models: GDP growth, the "Starting a business" measure and the "Resolving insolvency" indicator. GDP growth captures the reaction of business creation to economic fluctuations. Its estimated coefficient is positive, suggesting that new business registrations tend to increase during economic expansions and fall during contractions. This result has previously been documented by Klapper et al. (2015). The negative coefficient estimate associated with the "Starting a business" variable suggests that administrative burden costs required to start a business, constitute a key impediment for business formation at the macroeconomic level. Likewise, the positive estimate on "Resolving

Table 2.2 – Impact of bank competition on entrepreneurship: Complementary effect of stock market

	Dependent Variable: New Business Density		
Variable	(1)	(2)	(3)
Bank competition	-5.877***	-3.355**	-2.132*
	(1.665)	(1.474)	(1.164)
Stock market size	0.017***	-0.001	0.002
	(0.005)	(0.002)	(0.003)
Bank competition * Stock market size	0.019	0.049***	0.055***
	(0.016)	(0.009)	(0.012)
GDP growth	0.068***	0.053**	0.054**
	(0.024)	(0.023)	(0.023)
Starting a business	-0.976*	-1.114**	-1.027**
	(0.508)	(0.508)	(0.485)
Resolving insolvency	1.663***	1.396**	1.365**
	(0.542)	(0.567)	(0.558)
Other Control variables	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Trend	Yes	Yes	Yes
Observations	482	482	482
Within R^2	0.22	0.27	0.28

Note: The column (1) reports estimates using the Boone indicator as an inverse measure of bank competition, while results in columns (2) and (3) are based respectively on the Lerner index and the Adjusted Lerner index. Robust standard errors (clustered at the country level) are reported in parentheses. ***, **, * denote respectively, significance of estimates at the 1%, 5% and 10% levels.

insolvency" measure indicates that lower costs of insolvency proceedings or higher related recovery rates seem to encourage new business creation. These last two variables are directly related to the business environment, so it is not surprising that they turn out to matter significantly for new business density at the country level. The political and governance factors, on the other hand, do not seem to explain much of the variation in new business density, within and across countries.

2.6 Robustness Analysis

This section presents several robustness checks or supplemental analyses. First, we investigate heterogeneous effects of bank competition across different groups of countries. Secondly, we use an alternative measure of stock market development. Thirdly, we evaluate the robustness of the results to concentration in banking markets. Finally, we perform the analysis using the COMPENDIA database on entrepreneurship.

2.6.1 Heterogeneous Effects by Income Group

While the impact of bank competition on entrepreneurship is evidently relevant to any country regardless of its level of economic development, there are reasons to believe that the magnitude of our results may vary significantly across different groups of countries. For instance, despite notable progress, African banking systems still lag behind those of other developing and developed countries. They are small, shallow and costly, with limited outreach. Beck and Cull (2014a, 2014b) extensively discuss some of the specificities of Sub-Saharan Africa's financial systems. Key challenges are the structure of banking markets and sociopolitical instability that contribute to the lack of competition, therefore higher costs of credit and limited inclusion. Still, debt financing from banks remains the

most prevalent external funding source for entrepreneurs. Besides, African stock markets are generally less developed in comparison with those in other economies. These facts suggest that increased bank competition could have more beneficial effects in these countries. At the same time, since stock markets are relatively well-developed in high income countries, the moderating effect of the stock market can be expected to be stronger. To explore heterogeneities in the findings, we divide our sample into three groups according to the World Bank classification of countries by income categories: the group of high income countries, the group of Sub-Saharan African countries – which is a subset of the group of developing countries – and the group of "other developing countries". We create indicator variables for each of these groups and interact them with the key variables. Specifically, we estimate the following augmented version of equation (2.3):

$$\begin{aligned} Y_{it} = {} & \beta_{1c} BCO_{it} + \beta_{1d} BCO_{it} \times SSA_i + \beta_{1e} BCO_{it} \times HI_i + \beta_2 SMS_{it-1} \\ & + \beta_{4a} BCO_{it} \times SMS_{it-1} + \beta_{4b} BCO_{it} \times SMS_{it-1} \times SSA_i \\ & + \beta_{4c} BCO_{it} \times SMS_{it-1} \times HI_i + \cdots + \epsilon_{it} \end{aligned} \tag{2.4}$$

where SSA is an indicator variable taking the value of 1 if a country belongs to Sub-Saharan Africa and 0 otherwise, and HI is its counterpart for the group of high income countries. The group of "other developing countries" serves as a benchmark for evaluating differentiated effects across the three groups. In particular, β_{1c} and β_{4a} capture the singular impact of bank competition on new business density for the group of "other developing countries" – with β_{4a} identifying the attenuating role of the stock market. β_{1d} and β_{4b} measure the differentiated impact for Sub-Saharan African countries, while β_{1e} and β_{4c} do the same for high income countries. The estimation results are presented in Table 3. [20] In column

20. Although the interest here is on testing heterogeneous effects of impacts of bank competition (including the moderating effect of stock markets), we also run a version of model (4)

(1) using the Boone indicator as an inverse measure of competition, we find that β_{1d} is strongly negative and significant ($\beta_{1d} = -15.120$), which suggests that the beneficial impact of bank competition on new business density is more pronounced for Sub-Saharan African countries compared to high income and other developing countries. The impact is not significantly different between high income countries and other developing economies (β_{1e} is insignificant). Results in columns (2) and (3) using respectively the Lerner index and the adjusted Lerner index show that the moderating effect of the stock market is significantly stronger and more manifest in high income countries as per prior expectations ($\beta_{4c} > 0$). Banks in these countries complement relatively well stock markets, which due to their size, enable the speedy recycling of informed capital – a process that is more compatible with some level of market power in the hands of banks. Taken together, these results suggest that the beneficial impact of bank competition on entrepreneurship in developed economies, may tend to be relatively moderate.

2.6.2 Alternative Measure of Stock Market Development

Thus far, we have used the stock market size measured by the degree of market capitalization, as a proxy for market development. This indicator is the most commonly used measure in the literature. Bayraktar (2014) proposes the use of capacity and effort measures of market capitalization for cross-country studies. He argues that those measures take into account country specific characteristics, thus can provide useful insights on the development level of stock markets across countries. The suggested measures are clearly relevant for cross-country comparisons, but less useful for inferential purposes. For the purpose of this study, an

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in which the variable "stock market size (SMS)" is equally allowed to present differentiated impacts. The results are generally robust to this specification.

Table 2.3 – Impact of bank competition on entrepreneurship: Heterogeneous effects

	Dependent Variable: New Business Density		
Variable	(1)	(2)	(3)
Bank competition	-4.979**	0.113	0.813
	(2.265)	(1.336)	(1.153)
Bank competition * Sub-Saharan Africa	-15.120**	-5.162	-4.170
	(6.230)	(4.869)	(3.028)
Bank competition * High income	0.971	-3.338	-2.865
	(2.844)	(2.010)	(1.904)
Stock market size	0.022***	-0.001	0.001
	(0.001)	(0.002)	(0.003)
Bank competition * Stock market size	0.054***	0.007	0.001
	(0.013)	(0.015)	(0.015)
Bank competition * Stock market size * Sub-Saharan Africa	-0.001	-0.001	0.016
	(0.023)	(0.023)	(0.026)
Bank competition * Stock market size * High income	-0.018	0.045**	0.055**
	(0.011)	(0.020)	(0.024)
GDP growth	0.052**	0.036	0.033
	(0.022)	(0.022)	(0.024)
Starting a business	-0.992*	-0.952*	-0.853*
	(0.518)	(0.515)	(0.505)
Resolving insolvency	1.438***	1.555***	1.556**
	(0.467)	(0.558)	(0.591)
Other Control Variables	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Trend	Yes	Yes	Yes
Observations	454	454	454
Within R^2	0.21	0.27	0.27

Note: The column (1) reports estimates using the Boone indicator as an inverse measure of bank competition, while results in columns (2) and (3) are based respectively on the Lerner index and the Adjusted Lerner index. Robust standard errors (clustered at the country level) are reported in parentheses. ***, **, * denote respectively, significance of estimates at the 1%, 5% and 10% levels. The variables "High income" and "Sub-Saharan Africa" are indicator variables that take the value 1 if a country belongs to the relevant group of countries, and 0 otherwise. This also explains why they do not appear as additive terms in the control variables.–that is, they have no "within" or intra-period variation. The benchmark group to which the interaction variables should be compared, is the group of "other developing countries".

actual market capitalization measure (rather than capacity and effort measures) is more appropriate. To ensure our results are not sensitive to the measure of market development, we re-estimate the models using the stock market activity level as an alternative proxy for market development. The stock market activity is measured by the total value of shares traded during the period as a percentage of GDP, and is also viewed as an indicator of market depth or liquidity. Table 2.4 provides the results of estimating equation (2.3) replacing stock market size by stock market activity. Estimates in Table 2.4 can be directly compared to those in Table 2.2. It emerges that the results are generally unchanged, robust to the alternative measure of stock market development.

2.6.3 Robustness to Concentration in Banking Markets

An arguably more important concern is the possibility that the competition effects might be in reality driven by the level of concentration in banking markets. For instance, Mirzaei and Moore (2014) using data on a wide sample of countries, find that concentration in banking systems is one of the driving forces of bank competition, especially in developing economies. While we do not find much correlation between concentration and competition measures in the data (see Table 2.8 in Appendix B), to solidify our results, we reassess the models with bank concentration as a control variable, in order to disentangle competition effects from those of concentration (if any). Table 2.5 describes the results. For each of the competition variables, we report estimates based on two alternative measures of bank concentration (*Bank concentration 3* which is the share of assets of the 3 largest banks, and *Bank concentration 5*, that of the 5 largest banks). Overall, the results remain unchanged, although competition effects are slightly reduced. Interestingly, the interaction term between bank competition and stock market size in columns (1) and (2) using the Boone indicator, is now significant at the 1%

Table 2.4 – Impact of Bank Competition on Entrepreneurship: Using Stock Market Activity Level as a proxy for Market Development

	Dependent Variable: New Business Density		
Variable	(1)	(2)	(3)
Bank competition	-6.014***	-2.703**	-1.384
	(1.593)	(1.348)	(1.049)
Stock market activity	0.016*	-0.000	-0.000
	(0.009)	(0.003)	(0.002)
Bank competition * Stock market activity	0.012	0.039***	0.048***
	(0.026)	(0.012)	(0.010)
GDP growth	0.070***	0.063***	0.065***
	(0.023)	(0.023)	(0.023)
Starting a business	-1.213**	-1.248**	-1.177**
	(0.564)	(0.588)	(0.563)
Resolving insolvency	1.617***	1.399***	1.247***
Other Control Variables	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Trend	Yes	Yes	Yes
Observations	488	488	488
Within R^2	0.26	0.25	0.27

Note: The column (1) reports estimates using the Boone indicator as an inverse measure of bank competition, while results in columns (2) and (3) are based respectively on the Lerner index and the Adjusted Lerner index. Robust standard errors (clustered at the country level) are reported in parentheses. ***, **, * denote respectively, significance of estimates at the 1%, 5% and 10% levels.

level, whereas it was not significant earlier in Table 2.2. Furthermore, we do not find any significantly unique effect of bank concentration on new business density.

The Boone indicator–arguably the most robust of the three bank competition indicators–is the one which provides the strongest effects of competition. [21] Since our key result is that the beneficial effect of competition on new business density attenuates in better developed stock markets, it may be interesting to determine the stock market size that neutralizes the beneficial effect of bank competition. To do so, we use estimates provided in column (2) of Table 2.5, where the competition effects are the strongest, and compute an imaginary size of stock market that offsets the beneficial effect of bank competition. We find that "cut-off" point to be a market capitalization representing about 124.5 % of GDP. In the context of our study, this value is slightly below the 90^{th} percentile of the distribution of the stock market size – which is estimated at 129.2 % of GDP – thus may be considered as a relatively large stock market.

2.6.4 Using the COMPENDIA Database

Earlier in Section 2.3, we have noted that the selection of entrepreneurship measure is crucial in evaluating the impact of bank competition on entrepreneurship. As a supplemental test, we investigate the issue using the COMPENDIA database on entrepreneurship. As already mentioned, this database provides harmonized official data on business ownership across OECD countries (See Van Stel, 2005 for documentation on this database). However, the business ownership rate is based on unincorporated and incorporated self-employment data. Moreover, since this indicator is a "stock variable", we incorporate its persistence in the model by introducing the lagged dependent variable in the control variables. Thus, we

21. This is also true for the baseline models–where we do not control for bank concentration.

Table 2.5 – Impact of Bank Competition on Entrepreneurship: Robustness to concentration measures

Variable	Dependent Variable: New Business Density					
	Using Boone indicator		Using Lerner index		Using Adjusted Lerner index	
	(1)	(2)	(3)	(4)	(5)	(6)
Bank competition	-4.485***	-4.856***	-2.782**	-2.686**	-1.831	-1.656
	(1.273)	(1.435)	(1.137)	(1.096)	(1.131)	(1.129)
Bank concentration 3	0.002		0.004		0.004	
	(0.008)		(0.009)		(0.009)	
Bank concentration 5		0.001		0.007		0.008
		(0.009)		(0.010)		(0.010)
Stock market size	0.021***	0.022***	-0.001	-0.001	0.002	0.001
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Bank competition * Stock market size	0.034***	0.039***	0.048***	0.047***	0.050***	0.050***
	(0.008)	(0.008)	(0.009)	(0.010)	(0.013)	(0.013)
GDP growth	0.055**	0.049**	0.041**	0.035*	0.043**	0.035
	(0.021)	(0.021)	(0.020)	(0.020)	(0.021)	(0.021)
Starting a business	-0.928*	-0.912*	-0.997**	-1.010**	-0.926**	-0.936*
	(0.492)	(0.508)	(0.478)	(0.494)	(0.461)	(0.478)
Resolving insolvency	1.267***	1.520***	1.184**	1.473***	1.176**	1.495***
	(0.428)	(0.464)	(0.511)	(0.550)	(0.523)	(0.558)
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Observations	472	454	472	454	472	454
Within R^2	0.21	0.20	0.26	0.25	0.26	0.25

Note: Robust standard errors (clustered at the country level) are reported in parentheses. ***, **, * denote respectively, significance of estimates at the 1%, 5% and 10% levels.

estimate this modified autoregressive version of equation (2.3):

$$Y_{it} = \beta_0 Y_{it-1} + \gamma_2 BCO_{it} + \gamma_3 SMS_{it-1} + \gamma_4 BCO_{it} \times SMS_{it-1} + \theta X_{it} + \alpha_i + \epsilon_{it} \quad (2.5)$$

where Y_{it} is the business ownership indicator of country i at year t, and the lagged dependent variable (Y_{it-1}) is introduced to capture the persistence of that variable. The other variables remain the same as in equation (2.3).

Equation (2.5) cannot be estimated as before with the within (fixed effects) estimator because of the dynamic specification of the model. In fact, while the fixed effects α_i are "differenced out" of the data using the within estimator, the differenced lagged dependent variable $Y_{it-1} - \bar{Y_i}$ (where $\bar{Y_i}$ is the country specific mean of Y_{it-1}) is correlated by construction, to the differenced error term $\epsilon_{it} - \bar{\epsilon_i}$. As a result, applying fixed effect estimation to such model yields inconsistent estimates. This bias is known in the literature as the Nickel bias (Nickel, 1981). Thus, we estimate the model using the System Generalized Method of Moments (System GMM) instrumental variables approach for dynamic panel models. It also has the advantage to address the potential endogeneity issue of other independent variables. Basically, it combines in a system, the differenced version of equation (11) with the model in level (11), and uses lagged levels and lagged first differences of endogenous variables as instruments. Blundell and Bond (1998) provide evidence based on Monte Carlo simulations, that the System GMM performs better than earlier GMM estimators (such as the Arellano-Bover estimator). Soto (2009) confirms the robustness of this estimation method with small sample data, where the number of groups (countries) is very low (as in our case).

Table 2.6 provides the results of estimating (2.5) using the System GMM procedure and the Boone indicator as measure of bank competition. In Column (1), we present the results of the benchmark model and in column (2) we augment that benchmark model by introducing bank credit as additional control variable.

The findings suggest a strong persistence in the business ownership rate as shown by the estimated parameter $\beta_0 = 0.890$ (which is close to 1), thereby providing support to the dynamic specification of the model. However, we do not find neither a significant impact of bank competition, nor a cyclical pattern of the business ownership rate. In fact, while the sign of the estimated parameters capturing effects of competition ($\gamma_2 = -0.015$ and $\gamma_4 = 0.000$) are consistent with our findings using new business density as dependent variable, these estimates are not significant.

Findings from the estimation procedure are not conclusive as the key variables of interest are all insignificant. In fact, the lagged dependent variable captures virtually all of the variation in the dependent variable, which suggests a strong persistence in the business ownership indicator. The definition (in particular the inclusion of unincorporated businesses) and the "stock" nature of this entrepreneurship measure can largely account for the absence of significant effects. The impact of bank competition on entrepreneurship is more likely to be perceived through the lens of a "flow variable" (that is, a dynamic measure of entrepreneurship), with a focus on actual business formation–rather than stocks of self-employment. The acyclicality of business ownership is not that surprising and can be explained by the same reason (stock variable), and also reveals ambiguous effects at the microeconomic level (also found in previous studies).

2.7 Conclusion

Banks play an important role as primary providers of external finance to young and new businesses. Still, their value to new entrepreneurs goes beyond financing. They can use their wealth, expertise, reputation, and marketing resources, to advise and promote their client firms within the structure of long-term

Table 2.6 – Impact of Bank Competition on Entrepreneurship: COMPENDIA database

	Dependent Variable: (Total) Business Ownership Rate	
Variable	(1)	(2)
Business ownership rate (Lagged)	0.890***	0.970***
	(0.122)	(0.089)
GDP growth	0.000	0.000
	(0.001)	(0.000)
Boone indicator	-0.015	-0.016
	(0.042)	(0.033)
Stock market size	0.000	0.000
	(0.000)	(0.000)
Boone indicator * Stock market size	0.000	0.000
	(0.000)	(0.000)
Bank credit		0.000
		(0.000)
Starting a business	-0.001	-0.002
	(0.005)	(0.004)
Resolving insolvency	0.002	-0.001
	(0.004)	(0.004)
Other Control Variables	Yes	Yes
Observations	174	172
Arellano-Bond test for AR(1) in first differences	0.007	0.007
Arellano-Bond test for AR(2) in first differences	0.184	0.029
Arellano-Bond test for AR(3) in first differences	0.192	0.209
Hansen test of overidentifying restrictions	0.336	0.465
Number of instruments	28	27

Note: Robust standard errors are reported in parentheses. The model is estimated using the one-step System Generalized Method of Moments (GMM). P-values of related tests are reported at the bottom of the table. The number of lags of explanatory variables used to build the matrix of instruments has been carefully chosen to avoid the "instrument proliferation" problem and also based on the test results. The rule of thumb of setting the number of instruments below the number of countries has been adopted. ***, **, * denote respectively significance of estimates at the 1%, 5% and 10% levels.

relationships. These financial and non-financial services provided to new businesses constitute banks' informed capital – which is key to easing the process to a successful Initial Public Offering (IPO) by a new company on the stock market. In this paper, we have analyzed the macroeconomic impact of bank competition on new business density, while paying special attention to the role of the stock market in the process. Theoretically, there exist two competing hypotheses linking competition to credit supply and entrepreneurship. On the one hand, the market power hypothesis contends that bank competition increases the supply of funds, by driving down the costs of credit. On the other hand, the information hypothesis states that competition is detrimental to the formation of lending relationships between banks and borrowers, hence reduces credit availability, especially to the young and more opaque clients.

The central contribution of this study is that, it has revealed a complementary effect of the stock market in the bank competition-entrepreneurship debate, by exploiting the synergy between banking and stock markets in the recycling of the informed capital. The complementarity between the two markets is underpinned by lending relationships between banks and firms, thus fully consistent with the information argument. Accordingly, we have hypothesized that any beneficial impact of bank competition on new business density should decrease with the level of development of the stock market. This holistic approach to addressing the issue, has also allowed us to offer a more precise assessment of the strength of the two fundamental views underlying competition effects on entrepreneurship. Our empirical work has utilized worldwide data from a variety of sources, including particularly, the World Bank Group Entrepreneurship Survey database. Besides, competition in national banking markets has been captured through three alternative measures (the Boone indicator, the Lerner index and the efficiency adjusted Lerner index), in line with the New Empirical Industrial Organization

literature. These three indicators capture conceptually static and dynamic aspects of competition, and have been found to be more robust and precise than structural measures.

We have found that bank competition has an overall beneficial impact on new business density, by increasing credit supply to new entrepreneurs. However, this positive effect attenuates as the size and liquidity of the stock market increase. This result is explained by the relationship lending underlying the complementarity between banks and stock markets in the cycle of business creation. The Boone indicator has provided the strongest effects of competition, while the moderating role of the stock market is particularly manifest through the Lerner indices. We have also documented heterogeneous effects across different groups of countries. It has emerged that the beneficial impact of bank competition is more pronounced for Sub-Saharan African countries compared to high income and other developing countries. Additionally, the attenuating effect of the stock market is significantly stronger and more visible in high income economies. These results are robust to concentration in banking markets and alternative measures of stock market development.

A key limitation of this study is that it has not explicitly identified a specific channel through which the development of the stock market expedites the recycling of informed capital that ultimately leads to the moderated impact of bank competition on entrepreneurship. However, some of the liquidity spillovers associated with a developed stock market – including the increased possibilities of diversification of firms' individual risks as well as the economies of scale and experience accumulation in information and price setting processes – have been mentioned as plausible explanations. We leave the space for further detailed investigation of this issue for future research. This project may effectively be undertaken in the context of country case studies, with rich disaggregated data on firms, banks, and stock

markets. Another promising area for future research is delving into the complex links between bank competition, economic fluctuations and entrepreneurship. In this regard, it is worthy of note that empirical evidence points to a deterioration of bank competition during the upward phase of the business cycle, and its rise during worsening economic conditions (see Clerides et al., 2015 for instance). At the same time, economic theory does not provide a clear-cut relationship between entrepreneurship and the business cycle. Notwithstanding, recent international evidence suggests that new business creation is procyclical, with the strength of this relationship increasing with financial development (see Klapper et al., 2015). Further theoretical and empirical research around these issues will clearly advance understanding on the interplay between entrepreneurship, competition in banking markets, and their cyclical dimensions.

The present study offers evidence that can be useful for the design of pro-entrepreneurial policies. Importantly, the finding of the moderated impact of bank competition on new business creation, should not be interpreted as a negation of policies directed at injecting competition in banking markets around the world. Indeed, our analysis has substantiated the view that bank competition – either through a fall in entry barriers or a more aggressive interaction between institutions – is beneficial for finance-seeking firms, thus should be promoted. Besides, the stronger effects uncovered through the Boone indicator, imply that policies that focus on reducing entry and exit barriers in banking markets may prove to be particularly effective in bringing about the benefits of competition. It should be noted that the attenuated effect documented in this paper is essentially driven by the need for banks to hold some degree of market power in order to mitigate information asymmetries issues, and invest in long-term relationships with new businesses. This suggests that, efforts toward maximizing the benefits of bank competition should emphasize the development of effective and efficient credit in-

formation sharing mechanisms that do not jeopardize the formation of banking relationships. These institutional mechanisms should be primarily designed to help alleviate adverse selection and moral hazard problems – that appear to hinder the development of bank-firm relationships under competitive circumstances. Moreover, the formulation of competition laws and policies in the banking sector should explicitly provide for rules against illegal poaching of client firms by banks, which essentially aims at luring entrepreneurs away from well-established bank-firm lending relationships.

Appendix to Chapter 2

A. Measuring Competition in Banking Markets

A.1 The Lerner Index

The most widely used and oldest measure of competition is the Lerner index (also called the price-cost margin). It is intended to capture the extent of market power of a monopolist firm and originates with the work by Lerner (1934) [22]. To illustrate, let us consider a profit-maximizing bank, which produces the output level q at a cost $C(q)$. The optimization problem of the bank can be formulated in terms of the level of output it wishes to sell, with the price determined by the inverse demand function $P(q)$. Thus, the Lerner index for market power of that bank is defined as:

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22. While Lerner (1934) specifically addresses issues surrounding the measurement of monopoly power, one can easily extend it to any market situation where firms have some sort of market power.

$$L_1 = \frac{P(q) - C'(q)}{P(q)} \tag{A.1}$$

where $C'(q)$ is the firm's marginal cost. The index shows the ability of an individual bank to charge a price above its marginal cost. Theoretically, the Lerner index ranges from 0 (perfect competition) to 1, with higher figures corresponding to greater levels of market power (i.e less competitive environment). Under the assumption of profit maximization, the index also equals the absolute value of the inverse of the price elasticity of demand.

A.2 The Efficiency Adjusted Lerner Index

The adjusted Lerner index is an attempt to introduce some improvements on the original measure of market power. As noted by Koetter et al. (2012), the price-cost margin implicitly assumes that firms (banks in our case) are fully efficient, therefore any behavior that violates this assumption may introduce biases into the measurement of market power. [23] In particular, they show that the non-consideration of both profit and cost inefficiencies from banks would lead to important biases in price-cost margins. Profit inefficiencies come from situations where firms do not take the maximum advantage of their pricing opportunity set, and cost inefficiencies refer to sub-optimal choice of inputs by firms.

The authors derive an efficiency adjusted Lerner index, which can be written as follows:

$$L_2 = \frac{\pi(q) + C(q) - C'(q).q}{\pi(q) + C(q)} \tag{A.2}$$

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23. According to the quiet life hypothesis (Hicks, 1935), monopolistic firms may trade potential rents in exchange for profit and cost inefficiencies.

where $\pi(q)$ is the estimated profit of the firm. As with the conventional Lerner index, the efficiency adjusted index also ranges from 0 to 1, with higher values indicating greater market power for the operating firm. In their paper, Koetter et al. (2012) document for the US banking industry that, the adjusted Lerner indices are significantly larger than the conventional indicators. While we can generally expect the two indices to be highly and positively correlated, the fact that costs and efficiency levels vary considerably with the economic and institutional environment in which banks operate (see Chaffai et al., 2001) constitutes another motivation to consider in our investigation the adjusted Lerner index in addition to the original measure.

A.3 The Boone Indicator

The Boone indicator, also known as the profit elasticity (PE) or relative profit differences (RPD) is the latest addition to the family of non-structural indicators of competition. It serves to measure bank competition through both a fall in entry barriers and a more aggressive interaction between banks. This indicator developed by Boone (2008) is based on the main idea that more competitive markets punish firms more harshly for being inefficient, through an output reallocation process. To illustrate the point, let us consider a banking market made up of three banks with different efficiency levels, where $n'' > n' > n$. For a bank with efficiency n, the associated profit is denoted $\pi(n)$. The RPD is then defined as follows:

$$RPD = \frac{\pi(n'') - \pi(n)}{\pi(n') - \pi(n)} > 0 \tag{A.3}$$

Boone (2008) shows that any intensification of competition brought about by an easier entry into the market or a more aggressive interaction between exist-

ing institutions, increases the RPD owing to the reallocation of output from less efficient banks to more efficient ones. The Boone indicator is shown to be a more robust measure of competition from a theoretical perspective. In practice, efficiency levels are captured via marginal costs. In particular, Boone et al. (2013) suggest the estimation of a profit elasticity resulting from the following simple equation:

$$ln\pi_i = \alpha + \beta lnc_i + \epsilon_i \tag{A.4}$$

where π_i denotes the variable profit of a firm i and c_i, its associated marginal cost. The estimated coefficient $\beta < 0$ is the profit elasticity, that is, the percentage decrease in profits following a one percentage increase in marginal costs for existing firms in the market. In other words, a higher absolute value of β (the Boone indicator) means an intensification of competition in the market, as less efficient banks (higher marginal costs) are penalized in terms of profit losses due to the reallocation of output from them in favor of more efficient institutions.

A.4 Estimation of Marginal Costs

An important requirement for all three measures is the robust estimation of banks' marginal costs. This, in turn, involves the specification and estimation of a cost function. The identification of banks' inputs and outputs for that function is made by using the intermediation approach (Klein, 1971; Monti, 1972), which assumes that deposits constitute another input (besides labor and capital) used to produce output. Key variables are measured in practice as follows: Total costs are measured by real total expenses; output by real total earning assets (including loans, securities, investment and insurance assets); the price of labor by the ratio of personnel expenses to total assets; the price of physical capital given by the

ratio of capital expenditures to fixed assets; the price of deposits measured as total interest expenses over total customer deposits; profits are total profits of a bank before taxes; the aggregate output price (needed for the Lerner indices) are computed as the ratio of total income over total earning assets.

A key step in the estimation of the cost function is the choice of an appropriate functional form, because the validity of any inference will crucially depend on the assumptions made with regard to the adopted form. Clerides et al. (2015) implement a semi-parametric methodology that allows increasing the flexibility of the structure imposed on the cost function. Delis et al. (2014) and Wheelock and Wilson (2012) show that marginal costs estimated using semi-parametric and non-parametric approaches, perform better than commonly used functional forms like the parametric translog specification. Finally, the Lerner and Adjusted Lerner indices for a particular country in a specific year are computed as averages of the individual indices for all banks in that market for the corresponding year, whereas the Boone indicator does not require any aggregation.

B. Additional Tables

Table 2.7 – Summary Statistics of Variables

Variable	Observations	Mean	Std. Dev.	Min	Max
New business density	454	3.53	4.49	0.03	32.31
Business ownership rate	152	0.11	0.04	0.04	0.21
GDP growth	454	3.73	4.49	-14.81	17.98
Boone indicator	454	-0.44	0.06	-0.64	-0.34
Lerner index	454	0.26	0.08	-0.02	0.52
Adjusted Lerner index	454	0.21	0.09	-0.07	0.50
Stock market size	454	67.44	107.87	0.14	1086.48
Stock market activity	454	38.41	78.15	0.00	821.96
Bank credit	454	68.04	44.80	6.17	236.09
Bank concentration 3	454	66.90	17.76	22.53	99.70
Bank concentration 5	454	80.77	15.50	30.24	100
Starting a business	454	-0.29	0.30	-0.65	1.37
Getting credit	454	0.32	0.91	-1.36	2.47
Paying taxes	454	-0.01	0.93	-1.26	5.60
Registering property	454	-0.16	0.83	-1.23	6.36
Enforcing contracts	454	-0.14	0.90	-1.48	2.89
Resolving insolvency	454	0.26	0.88	-2.37	2.01
Rule of law	454	0.42	0.94	-1.44	2.00
Political stability	454	0.12	0.96	-2.67	1.58
Control of corruption	454	0.44	1.03	-1.42	2.56
Voice and accountability	454	0.42	0.83	-2.10	1.77
Government effectiveness	454	0.56	0.88	-1.20	2.43
Regulatory quality	454	0.58	0.81	-1.62	1.99

Note: Statistics are computed using the most restrictive sample specification.

Table 2.8 – Pairwise Correlation Matrix for Key Variables of Interest

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
New business density (1)	1								
Boone indicator (2)	-0.142*	1							
Lerner index (3)	-0.067	0.303*	1						
Adjusted Lerner index (4)	-0.053	0.292*	0.817*	1					
Bank concentration 3 (5)	0.092*	0.042	0.035	0.106*	1				
Bank concentration 5 (6)	0.119*	0.045	0.049	0.088*	0.940*	1			
Bank credit (7)	0.594*	-0.219*	-0.204*	-0.225*	0.075*	0.097*	1		
Stock market size (8)	0.386*	0.032	0.000	0.085*	0.090*	0.068*	0.419*	1	
GDP growth (9)	-0.088*	0.098*	0.259*	0.350*	-0.017	0.012	-0.283*	-0.003	1

Note: The symbol * indicates significance of correlation coefficients at the 5% level.

Table 2.9 – List of Countries

Argentina	India	Oman
Armenia	Indonesia	Pakistan
Australia	Ireland	Panama
Austria	Israel	Peru
Bangladesh	Italy	Philippines
Belgium	Jamaica	Poland
Bolivia	Japan	Portugal
Bosnia and Herzegovina	Jordan	Qatar
Botswana	Kazakhstan	Romania
Brazil	Kenya	Russia
Bulgaria	Republic of Korea	Serbia
Canada	Kyrgyz Republic	Singapore
Chile	Latvia	Slovak Republic
Columbia	Lithuania	Slovenia
Costa Rica	Luxembourg	South Africa
Croatia	Macedonia (FYR)	Spain
Cyprus	Malawi	Sri Lanka
Czech Republic	Malaysia	Sweden
Denmark	Mauritius	Switzerland
El Salvador	Mexico	Thailand
Estonia	Mongolia	Tunisia
Finland	Montenegro	Turkey
France	Morocco	Uganda
Georgia	Namibia	Ukraine
Germany	Nepal	United Arab Emirates
Ghana	Netherlands	United Kingdom
Greece	New Zealand	Uruguay
Hong Kong	Nigeria	Uzbekistan
Hungary	Norway	Zambia
Iceland		

Note: This is the list of countries where data are simultaneously available for all the variables used in the analysis.

CHAPTER III

OCCUPATIONAL CHOICE IN A MODEL WITH FIRING TAX AND BUSINESS START-UP COSTS

Abstract

This paper studies the effects of firing costs and start-up costs incurred by new entrepreneurs, on the occupational choice in a dynamic general equilibrium model with borrowing constraints and a non-entrepreneurial sector that allows for endogenous entry and exit of corporate firms, as well as labor adjustment across periods. We find that a tax on job destruction at the corporate firm level increases the steady state entrepreneurship rate by prompting the transition of workers into entrepreneurship and decreasing the proportion of exiting entrepreneurs. This is because the firing tax has a negative impact on labor productivity and the equilibrium wage rate, leading to significant welfare losses for workers. Start-up costs significantly lessen the impact of the firing tax on entrepreneurship as they make the transition into entrepreneurship very cumbersome in a financially constrained environment.

Keywords: Firing tax, Start-up costs, Entrepreneurship, Borrowing constraints.

JEL Classification: E21, E22, J24, J65, L26, L51.

3.1 Introduction

It has been extensively argued that labor market and product market regulations explain much of the differences in labor market performance and firm dynamics across countries, with special emphasis between European and United States (US) markets. In contrast, much less attention has been given to the effects of these regulations on the occupational choice in the labor market, in which individuals may decide to either become an entrepreneur – and thus starting their own venture – or work for a firm in exchange for a wage. Two examples of such regulations are of special relevance for the occupational decision: start-up costs [1] for new businesses, as part of the broader product market regulations; and employment protection laws (EPL) as a key component of labor market institutions. The purpose of this paper is to examine the impact of start-up costs and dismissal costs on the individual decision to be an entrepreneur, in an environment with important financial frictions.

International data [2] and empirical evidence suggest that start-up costs can hamper significantly new business creation. For instance, using OECD data, Fonseca, Lopez-Garcia and Pissarides (2001) show that entry costs discourage transitions into entrepreneurship and decrease employment levels. Likewise, Klapper

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1. The terms start-up costs and entry costs are used interchangeably throughout the paper. They are mandatory procedures that new entrepreneurs must comply with as they seek to establish their businesses. These regulatory costs imposed on new companies are administrative burdens that may include registration formalities, fees for legal and other professional services, licensing requirements and amount of time spent completing the necessary procedures and waiting for clearance.

2. Data from the World Bank's Doing Business and Entrepreneurship surveys suggest a significantly negative relationship between start-up costs and new business density, with correlates of about – 0.44 for OECD countries and -0.23 worldwide.

et al. (2006) exploit a rich sample of European firms to document that higher start-up costs deter the creation of new firms, particularly in sectors that should naturally have high entry rates. More recently, Fonseca et al. (2007) and Elitcha and Fonseca (2018) uncover interesting links between occupational choice, wealth and start-up costs, based on microdata from three comparable surveys (SHARE, ELSA and HRS) in Europe and the United States (US). They find that there is a strong positive relationship between the propensity of individuals to become entrepreneur and their personal wealth, yet start-up costs tend to weaken this relationship, which suggests that the marginal value of wealth for entrepreneurial entry is attenuated in countries with more cumbersome start-up procedures.

To the best of our knowledge, the theoretical link between firing costs and the decision to become entrepreneur has yet to be systematically explored in quantitative economic models featuring financial frictions. The existing literature has mainly focused on effects of employment protection on hiring and firing decisions, reallocation processes, firm size or employment dynamics. However, these impacts on firms may ultimately have a ripple effect on workers' well-being, which could in turn, influence how they value entrepreneurship as compared to a corporate job. The seminal paper by Hopenhayn and Rogerson (1993) provides an interesting insight in this regard, which we exploit in our analysis. In particular, it shows that a tax on job destruction leads to substantial welfare losses for workers that stem principally from the significant decrease in labor productivity caused by this policy. Clearly, this finding could have important implications for the occupational choice of individuals.

On the empirical level, cross-country data from the OECD Employment Protection database tend to indicate a significantly positive relationship between

self-employment [3] and the strictness of employment protection laws. [4] This is in line with the finding from the systematic empirical review conducted by Addison and Teixeira (2003), pointing to a positive association between employment protection and self-employment. More recently, Liebregts and Stam (2019) investigate the effects of EPL on occupational status, using individual level data from the Global Entrepreneurship Monitor (GEM) project and institutional country level data from the World Bank. They empirically document a positive relationship between redundancy payment and the relative probability to be self-employed. One reason that is provided for this finding is that, higher levels of employment protection could reduce hiring and firing of workers and increase the likelihood of corporations contracting the services of entrepreneurs.

The foregoing suggests that entry requirements for new businesses and employment protection regulations such as the enactment of a firing tax, could have distinct but opposite effects on the individual decision to become entrepreneur or a wage worker. The identification and investigation of these effects is key to assessing the effectiveness of such policies and strategies aimed at fostering entrepreneurship and wage employment. In fact, theoretical insights and empirical evidence point to a strong correlation between product market policies, including business start-up costs, and the rigidity of employment protection laws. For in-

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3. Self-employment is commonly used as a proxy for entrepreneurship in the data and in empirical studies focused on occupational choice. It includes self-employed without employees as well as those with employees.

4. Self-employed are defined as individuals who, working on their own account or with one or a few partners, hold jobs where the remuneration is directly dependent upon the profits derived from the goods and services produced. The strictness of employment protection laws (EPL) is compiled based on several sub-indicators including notification procedures, length of notice period, severance payment and compensation following unfair dismissal. The correlation coefficient between self-employment rate and the strictness of EPL in the data is about 0.25.

stance, Blanchard and Giavazzi (2003) and Spector (2004) contend that product market regulations determine the size of rents as captured through firms' markups, while labor market regulations dictate the sharing rule of these rents between corporations and their workers. As such, there seems to be a clear mapping between product market regulations and labor market policies, which suggest that both institutions should be analyzed in a unified framework. Furthermore, Delacroix and Samaniego (2009) provide empirical evidence on the positive correlation between product market policies, especially business start-up costs, and the intensity of employment protection legislation, consistent with earlier findings by Blanchard and Giavazzi (2003) and Spector (2004). [5] The above elements form the basis for the analysis undertaken in this paper.

We develop a dynamic general equilibrium model with occupational choice, financial constraints, and a corporate sector that is built as in Hopenhayn and Rogerson (1993). Indeed, a key difference of our model from the existing occupational choice frameworks, is our dynamic modelling of the non-entrepreneurial sector, which allows for entry and exit of firms as well as labor adjustment between periods. Every period, households are subject to idiosyncratic shocks on their working and entrepreneurial abilities and have to decide whether to be an entrepreneur or a worker. Entrepreneurs are self-employed business owners who actively manage their venture and receive profits from it as their only source of income. In our framework, the corporate sector is distinct from the entrepreneurial sector and is the only one which employs workers. Firms in the corporate sector are not owned by any specific household, but rather are collectively owned. The layoff decision is associated with firing costs proportional to both wage and the

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5. Updated data from the OECD and World Bank point to a correlation coefficient between start-up costs and the strictness of employment protection, of about 0.3 for OECD countries.

size of employment adjustment. Due to the existence of borrowing constraints, the level of asset holdings acts as a collateral and plays an important role in the decision to become entrepreneur. In addition, households must pay a fixed start-up cost in terms of utility to enter the entrepreneurial sector. We calibrate the model to match closely the transitions into and out of entrepreneurship as observed in US data, and use this set-up to evaluate the joint effect of a tax on job destruction and business start-up costs on the occupational decision of individuals.

To the best of our knowledge, we provide the first systematic analysis of the joint effects of business start-up costs and a tax on job destruction on the decision to be entrepreneur, in a dynamic general equilibrium model of occupational choice with financial constraints. We find that firing costs cause an increase in the share of workers transitioning into entrepreneurship and a decrease in the share of exiting entrepreneurs. For instance, a firing tax equivalent to 6 months' wage increases the proportion of workers becoming entrepreneurs from 2.32% for the benchmark equilibrium with no firing costs, to 4.11%, while reducing the share of entrepreneurs moving to the corporate sector from 26.16% to 25.28%. This results in an increase of the proportion of entrepreneurs from 38.08% to 39.42%. Workers with high entrepreneurial ability are more likely to shift from the corporate sector to the entrepreneurial sector as a result of the policy change. The firing tax creates inefficiencies at the corporate firm level, which negatively affect labor productivity and equilibrium wage rates, and ultimately induces welfare losses for workers in the corporate sector. However, the impact of the firing tax on the decision to become entrepreneur is significantly attenuated by the fixed start-up cost required from entering entrepreneurs. This is because start-up costs constitute a significant burden to aspiring entrepreneurs, especially those who are already financially constrained.

The rest of the paper is structured as follows. Section 3.2 provides a concise

review of relevant literature. Sections 3.3 and 3.4 describe the model economy and the calibration procedure, respectively. The results are presented in Section 3.5. We conclude in Section 3.6, highlighting future work and possible extensions.

3.2 Related works

Our paper has a direct relation to two main strands of literature. The first one includes the class of general equilibrium models with financial imperfections and heterogeneous agents, which study entrepreneurship and analyze some of its implications on macroeconomic and social aggregates.[6] Papers such as Quadrini (2000), Cagetti and De Nardi (2006, 2009), Fonseca et al. (2007), Buera (2009), Luo et al. (2010), Buera and Shin (2013), Basseto et al. (2015) and Buera et al (2015b) belong to this line of literature. The second strand includes empirical and theoretical studies examining the micro-level and aggregate effects of employment protection and product market regulations on labor market outcomes and firm performance.

Quadrini (2000) and Cagetti and De Nardi (2006) show that the modelling of entrepreneurial activities is key to generating high wealth inequality and concentration of assets in the hands of entrepreneurs as observed in US data. The reason is the higher saving rates of entrepreneurs as compared to workers, which as highlighted in Quadrini (2000), also explains the higher upward wealth mobility of entrepreneurs in society. Cagetti and De Nardi (2006) also show that borrowing constraints have a negative impact on investment levels, aggregate capital and the fraction of entrepreneurs in the economy. Buera (2009) further zeroes in on the effects of borrowing constraints on entrepreneurship, still in a dynamic set-

6. Buera et al (2015a) provide a review of both the theoretical and empirical literature on entrepreneurship and financial frictions.

ting. He finds that the existence of financial constraints implies a non-monotonic relationship between wealth and entry into entrepreneurship. In particular, the probability to become entrepreneur as a function of wealth, is found to increase for low wealth levels, but tends to be weaker at the top of the wealth distribution. He also documents significant welfare costs of borrowing constraints, which are mainly due to undercapitalized entrepreneurs. Luo (2010) demonstrates that the introduction of entrepreneurial risk can increase aggregate entrepreneurial capital stock owing to precautionary motives and borrowing constraints. Furthermore, Buera and Shin (2013) quantify the role of financial frictions and resource misallocation in economic development processes in a model with endogenous occupational choice, while Buera et al. (2015b) and Basseto et al. (2015) study the effects of credit shocks on entrepreneurial firms of different sizes and ages as well as on real activity. For instance, Basseto et al. (2015) show that the entrepreneurship rate of the economy declines as a result of a temporary credit shock. In addition, the speed of economic recovery from the shock is found to primarily depend on the extent to which the shock erodes entrepreneurial wealth.

The major common denominator for all the above models is that they explicitly acknowledge, in presence of borrowing constraints, the importance of wealth for entrepreneurial entry, the initial scale of a business project and investment dynamics. Similarly, this is a fundamental feature in our framework. To the best of our knowledge, however, the interplay between start-up costs, wealth and entry into entrepreneurship in a dynamic general equilibrium model has only been studied by Fonseca et al. (2007). [7]They show that business start-up costs flatten

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7. Luo et al. (2010) also introduce a fixed cost to be an entrepreneur in their model. This fixed cost is intended to capture the amount of effort required to be an entrepreneur and is paid in each period regardless of the occupational status (entrepreneur or worker) in the previous period. The interplay between this effort cost to start a business and liquidity constraints or

the positive relationship between wealth and entry into entrepreneurship due to their disutility effect, which leads to an increase in the minimum level of wealth required to enter the entrepreneurial sector. In other words, the marginal value of wealth for entrepreneurial entry in an environment with important liquidity constraints, is found to decrease with start-up costs. Our key addition to their model and all the other works in this line of literature, is our dynamic modelling of the non-entrepreneurial sector of production, and in particular, our provision for employment adjustment costs across periods.

There is a rich theoretical and empirical literature on the effects of employment protection policies on firm performance and labor market outcomes. Seminal papers in this literature include Lazear (1990) and Hopenhayn and Rogerson (1993).[8] Lazear (1990) documents that severance payment has a negative impact on employment. Hopenhayn and Rogerson (1993) extend the industry equilibrium model presented in Hopenhayn (1992) to a general equilibrium setting, and provide further interesting insights. They show that a firing tax significantly impinges on total employment, which is consistent with the finding by Lazear (1990). However, the documented efficiency costs of this policy are more inter-

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individual wealth is not studied in their paper.

8. Other papers of interest which are not closely related to ours, include Hobijn and Sahin (2013), Boedo and Mukoyama (2012), Barseghyan and DiCecio (2011) and Baumann and Brandle (2012). Hobijn and Sahin (2013) analyze the effects of labor market rigidities and frictions on firm size distributions and dynamics in a model of endogenous entrepreneurship with homogeneous agents and no financial frictions. The models by Boedo and Mukoyama (2012) and Barseghyan and DiCecio (2011) are industry equilibrium frameworks built on Hopenhayn and Rogerson (1993), which are used to study international productivity and income differences. Finally, Baumann and Brandle (2012) use a static occupational choice model without financial constraints and start-up costs, but featuring search frictions, to study the effect of educational attainment and employment protection on the decision to become self-employed.

esting. In particular, they find that the firing tax leads to large welfare losses for workers, due to its negative impact on labor productivity. We embed key ingredients of their industry framework in our dynamic general equilibrium model of occupational choice, with the goal of studying the joint effect of start-up costs and firing tax on the decision to become entrepreneur in a financially constrained environment. Our study is also related to the recent empirical paper by Fonseca and Utrero (2017), which assesses the impact of employment protection laws and start-up costs on firm size. Using the longitudinal UNIDO Industrial Statistics database across 15 OECD countries, they show that strict employment protection laws and high barriers to entrepreneurship negatively affect the size of firms in sectors that are particularly dependent on external funds. Thus, their results suggest that the interaction between labor and product market regulations, coupled with financial imperfections, can significantly explain variation in firm structure and performance across sectors and countries. Their empirical analysis is however at the firm level and does not address individual occupational choice issues. In our model, we focus on the impact of start-up costs and liquidity constraints on entrepreneurs and only introduce the firing tax in the non-entrepreneurial sector of production, for our assessment.

Another study that is relatively close to our paper is by Delacroix and Samaniego (2009). It builds on previous studies that have studied the impact of product market and labor market regulations on unemployment in economies with frictions in the labor market (e.g. Blanchard and Giavazzi, 2003; Spector, 2004 and Delacroix, 2006). The authors construct a quantitative general equilibrium model with endogenous occupational choice, matching frictions in the labor market, entry costs for firm creation and firing costs, to analyze the creation and distribution of rents by these product and labor market policies. While having key ingredients of our framework, their model differs from ours in several aspects, two

of which are cardinal. First and foremost, there are no financial frictions in their model and labor is the only factor of production. Clearly, financial constraints and investment capital are central to our analysis. Secondly, firms in their model, are owned and run by individual entrepreneurs who hire workers, and there is a distinction between entrepreneurs and self-employed. The latter work on their own account, using their own labor input.[9] Only entrepreneurs are subject to entry costs and firing costs. In our framework, however, we assume there are firms controlled by individual entrepreneurs who face financial constraints, and those that are collectively owned by households, thus not subject to borrowing constraints. Our modelling of the non-entrepreneurial sector is a feature that is absent from all the existing dynamic general equilibrium frameworks that separate between these two broad units of production.

Furthermore, in the framework of Delacroix and Samaniego (2009), employment separation and exit of firms/entrepreneurs are assumed to occur at exogenously given rates. In contrast, in our model, there is an endogenous entry and exit of non-entrepreneurial firms in the market, and firing costs are only paid by these firms when they endogenously either reduce their labor force or exit the market. They find that firing costs dramatically increase the share of self-employed, while moderately decreasing the percentage of entrepreneurs and workers. Entry costs, on the other hand, are found to have no impact on entrepreneurship, but increase self-employment. Overall, our results regarding the effects of these two regulations on the occupational choice, differ from theirs, which is not surprising, considering the major differences in the two frameworks as highlighted above.

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9. In our model, the distinction between "entrepreneurs" and "self-employed" does not apply and these terms are used interchangeably.

3.3 The model economy

The economy is populated by a continuum of infinitely-lived households, of total measure normalized to one. At the beginning of each period, the households are subject to idiosyncratic shocks and they have to decide whether to be an entrepreneur or a worker for the period, without facing any aggregate uncertainty. As in Quadrini (2000) and Cagetti and De Nardi (2006), there are two sectors of production: the entrepreneurial sector and the corporate sector. It is assumed that the entrepreneurial sector is composed of start-ups owned by households while the corporate sector includes large units of production that are collectively owned. There is a fixed start-up cost to pay before entering the entrepreneurial sector and corporate firms are also subject to employment adjustment costs across periods. Furthermore, there is a financial intermediation sector whose primary role is to collect deposits from households and provide loans to support production processes.

3.3.1 Households

Households are endowed with two types of abilities: a working ability y and an entrepreneurial ability θ. These abilities are assumed to be exogenous, stochastic, positively correlated over time, but uncorrelated with each other. The working ability captures the capacity to produce income out of labor supplied to the market. The entrepreneurial ability, on the other hand, is the capacity to invest productively in an entrepreneurial project. Both abilities follow a first-order Markov process.

The household maximizes the expected lifetime utility represented as

$$E_0\Big\{\sum_{t=0}^{\infty}\beta^t u(c_t)\Big\} \tag{3.1}$$

where $\beta \in (0,1)$ is the intertemporal discount rate, $u(c)$ is a continuous and strictly concave utility function that depends on consumption c, and E_0 is the expectation operator at time zero. In particular, the instantaneous utility function is assumed to be of the constant relative risk aversion form, $u(c) = c^{1-\sigma}/(1-\sigma)$, where σ is the risk aversion coefficient. Households choose an occupation, consume, save and make capital investment decisions; the latter only if they choose to be an entrepreneur.

3.3.2 Technologies

Each of the two production sectors of the economy has a specific technology, as described below.

Entrepreneurs invest in a technology whose return directly depends on their entrepreneurial ability, such that those with higher ability have higher returns from capital investment. As in Cagetti and De Nardi (2006), we assume that the entrepreneur employs his own labor service directly in the start-up in substitution of hired labor. This simplification is adopted due to our particular focus on the occupational choice of individuals, rather than issues regarding start-up employment capacity and growth. In particular, the entrepreneurial production technology is defined by

$$f(k,\theta) = \theta k^{\nu} \tag{3.2}$$

where k is the capital invested by the entrepreneur and $\nu \in (0,1)$ is the "span of control" element [10] as in Lucas (1978). This production technology implies that entrepreneurs face decreasing returns from investment. In other words, although the entrepreneurial ability is exogenous, the rate of return on the other hand, is

10. The idea is that the entrepreneur's managerial skills become gradually stretched over projects of larger size.

endogenous and ultimately depends on the size of the business project which the entrepreneur decides to undertake.

Firms in the corporate sector are not owned by any specific household. Instead, they are collectively owned by households.[11] The sector functions as in Hopenhayn and Rogerson (1993). In our framework, however, we allow for firms to rent capital from households and use it in addition to labor as production inputs. Capital depreciates at the same rate δ in both sectors. In each period, firms are subject to specific shocks to their production technology. In particular, the stochastic production technology in the corporate sector is represented by a standard Cobb-Douglas function, with decreasing returns to scale, as follows

$$sF(n, k_c) = sAn^{\alpha}k_c^{\gamma} \tag{3.3}$$

where n and k_c are respectively labor (measured in efficiency units) and capital used by the corporate firm in the current period, s is a firm-specific shock to production following a first-order Markov process, A is a constant scaling factor and $\alpha + \gamma \in (0, 1)$. The assumptions of perfectly competitive product and input markets, and a corporate technology characterized by decreasing returns to scale, jointly ensure the existence of economic profits that can be redistributed to households.

3.3.3 Credit market constraints

In this economy, funds are lent and borrowed at a risk-free interest rate r. However, the credit market is characterized by borrowing constraints that may restrict the ability of households to start or expand entrepreneurial activities. It is

11. One can view households as shareholders of a mutual fund owning all the firms in the corporate sector.

assumed that corporate firms do not face such constraints, as they are collectively owned.

The entrepreneur directly uses his wealth to implement his business project. To invest the amount of capital k, the entrepreneur has to borrow $k-a$ through a financial intermediary at the interest rate r, where a is his current wealth. Considering that investment capital k is endogenously determined, it is still possible that $k \leq a$. In that particular case, it is clear that the entrepreneur is not financially constrained. However, in the more likely scenario when $k > a$, which means that the entrepreneur becomes a net borrower, the credit market constraints come into play and may influence significantly the occupational decision.

Following Buera and Shin (2009), the borrowing constraint is defined by

$$k \leq \lambda a \tag{3.4}$$

where $\lambda > 1$. The parameter λ captures the degree of credit frictions. A higher λ means that the entrepreneur can get more financing for the same amount of wealth. A value $\lambda = \infty$ corresponds to the case of perfect credit markets. When $\lambda = 1$, the entrepreneur clearly self-finances his business. The entrepreneur must invest an amount k that satisfies equation (3.4). [12] This sets an upper limit on the amount that he is able to borrow on the credit market, which directly depends on his asset holdings.

The entrepreneur' s wealth plays a fundamental role, acting as a collateral. Households with little wealth can therefore only borrow little, even if they are high ability entrepreneurs. Since the entrepreneur forgoes his potential earnings as a

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12. Equation (3.4) is derived from a simple limited enforcement problem, where the borrower can run away with a fraction $1/\lambda$ of the rented capital, at the risk of losing his wealth (a) deposited at a bank as a collateral. Thus, the condition of no default in equilibrium is $k/\lambda \leq a$, which leads directly to the borrowing constraint (3.4).

worker, he will choose to become entrepreneur only for projects deemed high-value or promising, which may then require access to significant amounts of credit.

3.3.4 The corporate firm problem

The corporate sector is composed of incumbent firms and new entrants which come into the market in each period. It is assumed that there is a large pool of ex ante identical firms which may freely enter the industry, after incurring a one-time cost ψ_c. In each period of operation, firms choose the size of labor and capital inputs consistent with their optimization objective. The decision to lay off workers is associated with firing costs which are proportional to both wage and the size of employment adjustment. We assume that these firing costs are redistributed as a lump-sum to households.

At the start of each period, an incumbent firm has to decide whether or not to continue operation in the productive sector. This decision is made on the basis of its previous period's employment n_{-1} and productivity shock s_{-1}. In the case of exit, the firm must pay the maximum adjustment costs as it terminates employment of all its existing workers. If a firm instead opts to stay, it must pay a fixed operating cost c_f, which is due every period a firm remains in the market. The firm then observes the current value of its productivity shock s and proceeds with optimal input choices for production. The output price is normalized to one.

Let $V_c(s, n_{-1})$ be the value function of an incumbent corporate firm which has already decided to stay in the market this period and received its new idiosyncratic productivity draw s, with n_{-1} its previous employment level. Thus, the state variables of the firm's decision problem are n_{-1} and s. The corresponding

Bellman equation can be written as

$$V_c(n_{-1}, s) = \max_{n,k_c} sF(n, k_c) - wn - (r + \delta)k_c - c_f - \tau w \max\{n_{-1} - n, 0\}$$

$$+ \beta \max\{\mathbb{E}(V_c(n, s')|s), -\tau wn\} \tag{3.5}$$

where n is labor input expressed in efficiency units and τ is the fixed firing tax on each unit of labor dismissed by the firm. As suggested by the last term of the right-hand side of equation (3.5), although the firm will formally make its exit decision at the beginning of the next period, it is still able to anticipate that decision conditional on its realization of current employment level n and the value of the random productivity s.

The firm's exit decision rule at the beginning of the current period can be characterized as

$$\chi(n_{-1}, s_{-1}) = \max\{\mathbb{E}(V_c(n_{-1}, s)|s_{-1}), -\tau wn_{-1}\} \tag{3.6}$$

Let $\chi^* \in \{0, 1\}$ denote an indicator function for the stay/exit decision. In particular, the firm decides to exit the market ($\chi^* = 1$) if its expected value of remaining in the productive sector is strictly less than the discounted value of profits associated with closure, that is $\mathbb{E}(V_c(n_{-1}, s)|s_{-1}) < -\tau wn_{-1}$. Otherwise, it remains active in the market ($\chi^* = 0$).

The remaining decision rules of the incumbent firm correspond to the choice of $n^d(n_{-1}, s)$ and $k_c^d(n_{-1}, s)$, the optimal levels of labor and capital respectively. After solving numerically for $n^d(n_{-1}, s)$ via equation (3.5), $k_c^d(n_{-1}, s)$ can be derived through the first order condition with respect to k_c given by

$$sF_2(n^d(s, n_{-1}), k_c^d(s, n_{-1})) = r + \delta. \tag{3.7}$$

Evidently, entering firms do not have an exit/stay decision to make in their first period. After paying the fixed cost ψ_c, a new entrant receives its current produc-

tivity shock s and starts the period with zero employee. Free entry in the sector ensures that

$$\mathbb{E}V_c(0, s) = \psi_c \tag{3.8}$$

Although new entrants are governed by a distinct stochastic process at the point of entry [13] into the market, they follow the same decision rules regarding both labor and capital upon settling the fixed cost of entry ψ_c.

3.3.5 Household decision problems

The occupational choice

Each household starts the period with wealth holding a, working ability y and entrepreneurial ability θ, and decides whether to be an entrepreneur or a worker. Thus, the set of state variables for the household's occupational choice problem is (a, y, θ). For households to enter the entrepreneurial sector, they must incur fixed start-up costs denoted ψ_e. However, households who were already entrepreneurs during the previous period, do not have to incur these costs again. Start-up costs represent administrative burdens on new entrepreneurs and as such, are viewed as one important barrier to entrepreneurship.

Let $V_e(a, y, \theta)$ be the value function of a household who decides to be an entrepreneur for the current period and $V_w(a, y, \theta)$ the value function of one who opts to be a worker for the period. Hence, the occupational choice of an incumbent

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13. Notice that the expectation in the Bellman equation for incumbent firms are taken conditional on current productivity s, while the expectation in the free entry condition – hence applying to entrants – is taken unconditionally. The exogenous stochastic process governing entrants is assumed invariant across periods.

entrepreneur is characterized by

$$\Omega_e(a, y, \theta) = \max\{V_e(a, y, \theta), V_w(a, y, \theta)\} \tag{3.9}$$

The occupational choice of a worker is characterized by

$$\Omega_w(a, y, \theta) = \max\{V_e(a, y, \theta) - \psi_e, V_w(a, y, \theta)\} \tag{3.10}$$

The entrepreneur's problem

In contrast to firms in the corporate sector, each entrepreneur is the sole proprietor of his business, and as such faces financial constraints on investment. The problem of a household who decides to be an entrepreneur for the current period can be described as

$$V_e(a, y, \theta) = \max_{c,k,a'}\{u(c) + \beta\mathbb{E}\Omega_e(a', y', \theta'\} \tag{3.11}$$

subject to

$$c + a' = (1 - \delta)k + \theta k^{\nu} - (1 + r)(k - a) + \Pi_c + R_c, \tag{3.12}$$

$$k \leq \lambda a, \tag{3.13}$$

$$a' \geq 0, \tag{3.14}$$

and

$$k \geq 0. \tag{3.15}$$

where Π_c and R_c are respectively aggregate corporate profits and firing costs transferred to households, and the expectation in the Bellman equation is taken conditional on the set of current abilities (y, θ).

The choice of capital investment by the entrepreneur can be simply characterized. Let k_u denote the unconstrained optimal level of capital. The capital investment decision is a static problem. For any given value of (a, a', θ), k_u can

be found by solving the following problem, obtained from substituting the budget constraint (3.12) into the utility function.

$$\max_{k} \quad u(\theta k^{\nu} + (1-\delta)k + \Pi_c + R_c - (1+r)(k-a) - a') \tag{3.16}$$

which gives

$$k_u = \left(\frac{\theta\nu}{r+\delta}\right)^{\frac{1}{1-\nu}} \tag{3.17}$$

Notice that the unconstrained level of capital does not depend on the level of assets (a, a'), but rather on entrepreneurial ability θ.[14]

The constrained level of capital investment is necessarily λa. Thus, the optimal investment decision is characterized by

$$k^* = \min\{k_u(\theta), \lambda a\} \tag{3.18}$$

This suggests that the borrowing constraint will bind only when $k_u \geq \lambda a$. In that case, $k^* = \lambda a$. Otherwise, if $k_u < \lambda a$ the entrepreneur will be able to implement his unconstrained optimal level of capital, $k^* = k_u$.

The worker's problem

The problem of a household who chooses to be a worker during the current period can be described as

$$V_w(a, y, \theta) = \max_{c,a'}\{u(c) + \beta\mathbb{E}\Omega_w(a', y', \theta')\} \tag{3.19}$$

subject to

$$c + a' = wy + (1+r)a + \Pi_c + R_c \tag{3.20}$$

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14. The unconstrained consumption is given by $c_u = (1-\nu)\theta^{\frac{1}{1-\nu}}\left(\frac{\nu}{r+\delta}\right)^{\frac{\nu}{1-\nu}} + (1+r)a - a'$ which depends on (a, a', θ).

and

$$a' \geq 0. \tag{3.21}$$

where w is the wage earned in the corporate sector.

3.3.6 Definition and computation of equilibrium

Definition of equilibrium

A steady state competitive equilibrium for this model economy consists of the following: a risk-free interest rate r, wage rate w, household decision functions $a'(a, y, \theta)$, $k(a, y, \theta)$, $d(a, y, \theta)$ where $d \in \{entrepreneur, worker\}$ is the occupational choice, corporate firms' policy functions $n(n_{-1}, s), k_c(n_{-1}, s)$, a stay/exit decision of incumbent corporate firms $\chi(n_{-1}, s_{-1})$, a mass of entering firms in the corporate sector ($M_c^\star > 0$), a distribution of households over their state variables $\lambda^\star(a, y, \theta, d)$ and a distribution of firms in the corporate sector $\mu_c^\star(n_{-1}, s)$, such that, given r and w,

- Agents (corporate firms, entrepreneurs and workers) optimise according to their problems as described above;
- Labor and and capital markets clear. The interest rate r clears the capital market directly as does the wage rate for the labor market;
- The condition of free entry in the corporate sector (3.8) holds;
- The stay/exit rule of incumbent corporate firms is given by (3.6);
- The distributions $\lambda^\star$ and $\mu_c^\star$ are the invariant distributions for the economy.

Distributions of corporate firms and households

The evolution of the economy over time, can be fully described by the distribution of the state variables for all firms in the corporate sector as well as

the distribution of households types (entrepreneurs, workers) over their respective state variables.

Let $\mu_c(n_{-1}, s)$ denote the measure of incumbent firms over employment and productivity levels in the corporate sector. In period t, this measure does not include the entrants that incurred the fixed entry cost ψ_c, but have yet to produce. These entrants are included as incumbents in the period $t+1$ distribution μ_c'. Let M_c be the mass of entrants. The transition from μ_c to μ_c' is denoted $\mu_c' = T(\mu_c, M_c)$ where T is an operator which is linearly homogeneous in μ_c and M_c jointly. The transition function T is computed based on the corporate firm's optimal decision rules. In a stationary distribution, $\mu_c = T(\mu_c, M_c)$.

We know that we can start by computing the distribution per entrant $\widehat{\mu}_c = T(\mu_c, 1)$, and then obtain $\mu_c = M_c\widehat{\mu}_c$. The linear homogeneity of T in μ and M_c implies that if $\widehat{\mu}_c$ is a fixed point for a unit mass of entry, then $M_c\widehat{\mu}_c$ is also a fixed point for M_c units of entrants, with $M_c > 0$.

Next, we define the distribution of household types over their state variables. Let $\lambda_e(a, y, \theta)$ be the distribution of entrepreneurs over wealth, working and entrepreneurial abilities. The corresponding distribution for workers is denoted by $\lambda_w(a, y, \theta)$. The transition from (λ_e, λ_w) in period t to (λ_e', λ_w') in period $t+1$ is derived from the households' occupational choice and saving decisions. A stationary distribution implies that $\lambda_e' = \lambda_e$, $\lambda_w' = \lambda_w$.

Market clearing

The market clearing condition in the labor market is given by

$$M_c \iint n^d(s, n_{-1}) d\widehat{\mu}_c(s, n_{-1}) = \iiint y d\lambda_w(a, y, \theta) \tag{3.22}$$

which indicates that aggregate labor demand in the corporate sector equals total efficiency units of labor supplied by households who make the occupational choice of working in the corporate sector.

The capital market clearing condition is given by

$$\iiint a d\lambda_e(a,y,\theta) + \iiint a d\lambda_w(a,y,\theta) = M_c \iint k_c^d(s,n_{-1}) d\widehat{\mu}_c(s,n_{-1}) + \iiint k^d(a,y,\theta) d\lambda_e(a,y,\theta) \quad (3.23)$$

which states that total savings by households of all types (entrepreneurs and workers) equals aggregate capital demand coming from the corporate and entrepreneurial production sectors.

3.4 Calibration

The model cannot be solved analytically due to its complexity. Numerical routines including value function iteration (VFI) and bisection methods are used accordingly. The computational procedure is described in Appendix A. Currently, the model is not fully independently calibrated. The value of some parameters are taken from previous studies, while other parameters are calibrated to match key statistics in US data. Each period corresponds to one year. As described below, some parameters are calibrated using equilibrium conditions that can only be verified after solving the model. The overall calibration of the model targets an interest rate r of 6 per cent and a wage rate w of 1. Table 3.1 summarizes the calibration values for the baseline model.

The discount factor β is set at 0.9 as in Luo et al. (2010) [15]. In the steady

15. This value is also close to those in Quadrini (2000) and Cagetti and De Nardi (2006) which are respectively 0.934 and 0.865.

Table 3.1 – Calibration values for the baseline model

Parameter	Notation	Value
Intertemporal discount rate	β	0.9
Coefficient of relative risk aversion	σ	1.5
Capital depreciation rate	δ	0.06
Corporate capital income share	γ	0.2583
Labor income share	α	0.6667
Constant in the corporate technology	A	1
Entrepreneurial capital income share	ν	0.55
Borrowing constraint parameter	λ	2
Entrepreneurship start-up costs	ψ_e	2.7
Working ability	y	{0.2468 0.4473 0.7654 1.3097 2.3742}
Transition matrix for the working ability	$\mathbf{P}_y$	$\begin{bmatrix} .7376 & .2473 & .0150 & .0002 & .0000 \\ .1947 & .5555 & .2328 & .0169 & .0001 \\ .0113 & .2221 & .5333 & .2221 & .0113 \\ .0001 & .0169 & .2328 & .5555 & .1947 \\ .0000 & .0002 & .0150 & .2473 & .7376 \end{bmatrix}$
Entrepreneurial ability	θ	{0.489 0.565}
Transition matrix for the entrepreneurial ability	$\mathbf{P}_\theta$	$\begin{bmatrix} .964 & .036 \\ .206 & .794 \end{bmatrix}$
Entry cost in the corporate sector	ψ_c	0.7234
Operating cost	c_f	0.0179
Firing tax	τ	0
Corporate firms idiosyncratic shocks	s	See description in text
Probability distribution of productivity shocks	$\mathbf{P}_s$	See description in text

state of our model, this generates a capital-output ratio of 4.3. The risk aversion coefficient σ is assumed to be 1.5, a standard value in the literature. Likewise, the capital depreciation rate in the two production sectors δ is taken to be 6 percent, as common in the literature. The share of income that goes to labor is set to 0.6667, which is close to the value that is used in Hopenhayn and Rogerson (1993) and in line with several other studies in the real business cycle literature. The corporate capital income share is then calibrated at 0.2583, to match a corporate profit ratio of 7.5 percent as shown in US data. [16] The scaling factor A in the corporate technology is normalized to one.

The stochastic process guiding labor ability y is taken from Cagetti and De Nardi (2006). It is assumed that the logarithm of the income process for workers, follows an AR(1) process with a persistence of 0.95. They calibrated the variance to match the Gini coefficient of earnings of 0.38 as found in average in the Panel Study of Income Dynamics (PSID). The process is approximated with a five-point discrete Markov chain that takes the values $y = \{0.2468, 0.4473, 0.7654, 1.3097, 2.3742\}$ with a transition matrix as follows.

$$\mathbf{P}_y = \begin{bmatrix} .7376 & .2473 & .0150 & .0002 & .0000 \\ .1947 & .5555 & .2328 & .0169 & .0001 \\ .0113 & .2221 & .5333 & .2221 & .0113 \\ .0001 & .0169 & .2328 & .5555 & .1947 \\ .0000 & .0002 & .0150 & .2473 & .7376 \end{bmatrix} \tag{3.24}$$

The parameters ν, λ, ψ_e, $\underline{\theta}$ and $\bar{\theta}$ are jointly calibrated to approximate the fraction of exiting entrepreneurs in each period, the fraction of workers becoming

16. According to the New York University Stern School of Business database on profits covering more than 7000 US companies in many different industries, the average profit margin (net margin) as of 2018 was about 8 percent for all companies and about 7 percent for more than 6000 companies excluding financials.

entrepreneurs, the GINI wealth inequality as well as the wealth distribution of entrepreneurs relative to that of workers (the median net worth of entrepreneurs to workers and the share of entrepreneurial wealth to total wealth). This procedure generates an entrepreneurship rate of about 38 per cent, which is however, much higher than in the US data. Specifically, the elasticity of output with respect to capital in the entrepreneurial sector ν takes the value of 0.55, which implies a relatively high rate of decreasing returns to scale. We calibrate the borrowing parameter λ at 2, which suggests that entrepreneurs are only able to borrow a maximum of 50 per cent of their investment capital. For instance, in comparison, the benchmark model in Buera (2009) adopts a tighter borrowing limit, with λ set at 1.01, which is shown to be consistent with strong decreasing returns in the entrepreneurial technology. The value of start-up costs in the entrepreneurial sector ψ_e is taken to be 2.7.

As in Cagetti and De Nardi (2006), we only allow for two values of the entrepreneurial ability θ. Our calibrated values are however, different. In particular, we set the low ability $\underline{\theta}$ at 0.489 and the high ability $\bar{\theta}$ at 0.565. The transition matrix – same as in Cagetti and De Nardi (2006) – suggests that the lower entrepreneurial ability is relatively more persistent than the higher ability.

$$\mathbf{P}_\theta = \begin{bmatrix} .964 & .036 \\ .206 & .794 \end{bmatrix} \tag{3.25}$$

In our baseline model, we assume, for computational simplicity, that there are no employment adjustment costs, thus, the firing tax τ is set to zero, as in Hopenhayn and Rogerson (1993).The stochastic process governing corporate firms' decisions is calibrated using the Business Dynamic Statistics provided by the US Census Bureau as of 2016. We choose 11 equilibrium firm size levels to approximate the size distribution of corporate firms and the associated employment contributions, as observed in the data, and thus, 11 different values of

productivity shocks are needed to match the firms operating in the market. Table 3.5 (Appendix B) describes key features of the targeted empirical distribution of corporate firms used for this calibration process.

In the model economy, firms with poor realization of the productivity shock during the previous period are more likely to exit the market at the beginning of the current period, to avoid paying the fixed operating cost. This implicitly suggests the existence of a reservation shock below which firms decide to cease operations. Accordingly, we add two different values of shocks that lead to an exit decision. The set of values is ultimately derived based on the corporate firm problem, assuming an indifference regarding the exit/stay decision, and using target values of employment, wage and capital cost. The value of the two shocks below the reservation value are set based on the first two (lower) realizations among the 11 shocks matching the operating firms as previously discussed. Their values are set to 0.8481 and 0.9209. The 11 subsequent shocks take the respective values 1.0571, 1.1479, 1.1927, 1.2355, 1.2654, 1.2952, 1.3458, 1.3940, 1.4613, 1.5572 and 1.7452. The transition matrix $\mathbf{P}_s$ is constructed to allow for a persistence of 0.8 for the 11 highest shocks, while matching the exit rate by firm size as observed in the data. The probability values are also calibrated to be consistent with relatively small employment adjustments between periods. The value assigned to the operating cost $c_f = 0.0179$ is obtained by jointly solving for V_c and c_f using Value Function Iteration, and based on target employment and factor price levels. The entry cost in the corporate sector $\psi_c = 0.7234$ is then derived from the associated condition of free entry.

3.5 Results

This section is structured in two parts. We first provide a discussion of the baseline model at equilibrium. This is followed by an exposition of our simulation results.

3.5.1 Discussion of the benchmark model equilibrium

Table 3.2 displays key statistics derived at the equilibrium of our baseline model with no employment adjustment costs. The first row shows the aggregate capital -output ratio in our model economy and in the data. The empirical value of the capital-output ratio is based on data from the Federal Reserve Board Flow of Funds Accounts, where capital is defined to include residential and non-residential structures, plant, equipment, software and inventories. Our value of 4.3 is slightly over the average value of 3 in the data. In our model, the entrepreneurial sector utilizes about 56% of the aggregate capital, which is likewise a little over the value of 50 % reported by the U.S. Small Business Administration.

Considering the central goal of our paper, which is to assess the effects of a dismissal tax and entrepreneurship start-up costs on the occupational choice of individuals, it is fundamental for our benchmark framework to approximate well the transition between the two states as observed in the data. The third and fourth rows of Table 2 provide the relevant statistics obtained from the model and the Survey of Consumer Finances (SCF) data respectively. Both in the data, and naturally in the model, entry and exit rates refer only to individuals who were in the survey or the model in two consecutive periods and effectively transitioned from one occupation to the other. For instance, the statistics from the data exclude people who passed away while being entrepreneur. As shown in the table, the theoretical values match very closely their empirical counterparts. In

particular, the percentage of entrepreneurs becoming workers is about 26% in the model compared to 24% in the data, while the percentage of workers becoming entrepreneurs is virtually 2.3% both in the model and the data. Our model, however, largely overestimates the entrepreneurship rate in the US data. In fact, according to the US Bureau of Labor Statistics, the self-employment rate, although volatile, is quite close to 10%. [17]

Table 3.2 – Key statistics for the baseline model

Variable	Model	Data
Capital-output ratio	4.3	3
Share of entrepreneurs	38.08%	10%
Percentage of exiting entrepreneurs	26.16%	24%
Percentage of workers entering entrepreneurship	2.32%	2.3%
Wealth Gini coefficient	0.4	0.8
Median net worth of entrepreneurs to workers	1.1	5.3
Share of entrepreneurial wealth to total wealth	40.35%	39%

Evidently, our steady state entrepreneurship rate includes individuals who stay in entrepreneurship and those who transition into this state. In the calibration of our benchmark model, we zero in on the empirical transition rates, while attempting to jointly approximate other key moments in the data. Another key weakness of our model is its inability to match well the overall wealth inequality

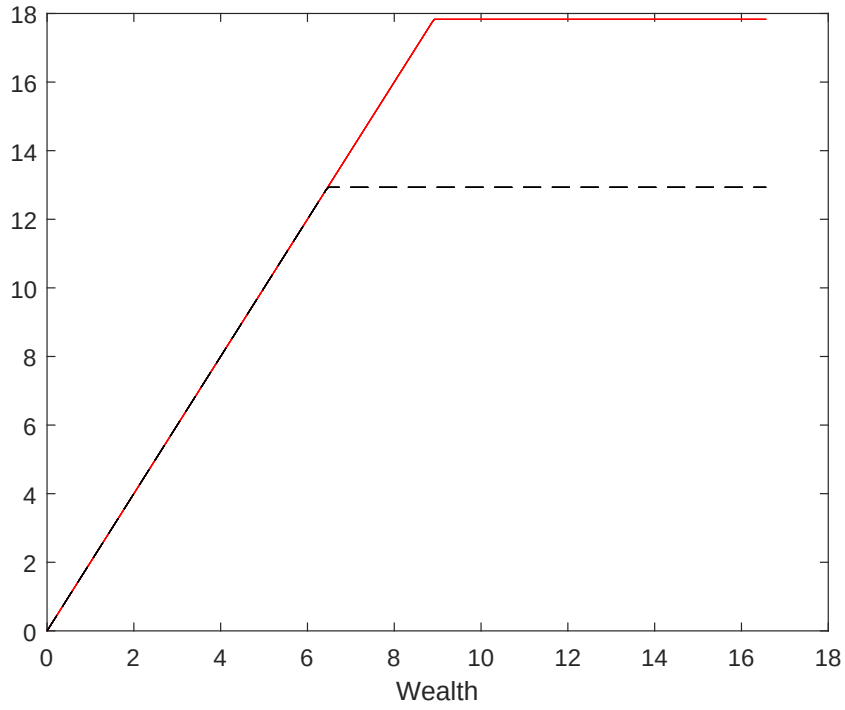
17. The self-employment rate is the percentage of self-employed over total employment. Self-employed individuals include those who had incorporated their businesses and those who had not. As of 2015, the self-employment rate was about 10.1%

observed in the US data as well as the extreme concentration of wealth in the hands of entrepreneurs. The GINI coefficient is about 0.40 in our framework, which is low compared to the value of 0.80 in the data. Nevertheless, entrepreneurs in our model are on average, richer than workers, notwithstanding the relatively low ratio of median net worth of entrepreneurs to workers. They hold about 40% of total wealth in the model economy, which matches quite well the entrepreneurial wealth to total wealth in the data. In fact, according to the SCF data, self-employed, broadly defined, hold about 39% of total wealth, while the share of wealth hold by active business owners is 41.6%, with self-employed business owners holding about 33% of total wealth.

In the presence of borrowing constraints, wealth holding may significantly affect the decision to become entrepreneur. It serves as a collateral in the credit market, and directly influences the size of the entrepreneurial project. Households with little wealth can only borrow little, even if they have a high entrepreneurial ability. Since the entrepreneur forgoes his potential earnings as a worker in the corporate sector, he will likely opt to become entrepreneur only if he is able to implement a sufficiently large project. In our baseline model, about 42% of entrepreneurs are constrained in their investment decisions. Figure 3.1 illustrates entrepreneurial investment as a function of wealth. The solid red line depicts the demand for capital for high ability entrepreneurs and the black dashed line is for low ability entrepreneurs. As shown, capital investment increases with the wealth holdings of entrepreneurs, regardless of their ability levels. The unconstrained investment level does not depend on wealth holding, rather on entrepreneurial ability, and as such, high ability entrepreneurs have a relatively higher level. Borrowing constraints do not affect high ability entrepreneurs at the top of the wealth distribution, as they are able to implement their unconstrained optimal level of capital. The same applies for low ability entrepreneurs, although a larger pro-

portion of them are unaffected, which is consistent with the smaller size of their business projects.

Figure 3.1. Entrepreneurial investment as a function of wealth



Note: The solid red line depicts the demand for capital for high ability entrepreneurs and the black dashed line is for low ability entrepreneurs.

The start-up cost incurred by households to transition into entrepreneurship, constitutes another key impediment that may add to the credit market constraints. It decreases the expected value of entrepreneurship and may discourage people from choosing to become entrepreneur by making the option of working in the corporate sector relatively more attractive. In our baseline model, incumbent entrepreneurs do not have to pay start-up costs and virtually choose to stay entrepreneurs provided that they have a certain minimum of wealth. This is particularly true for high ability entrepreneurs, unless they also have superior

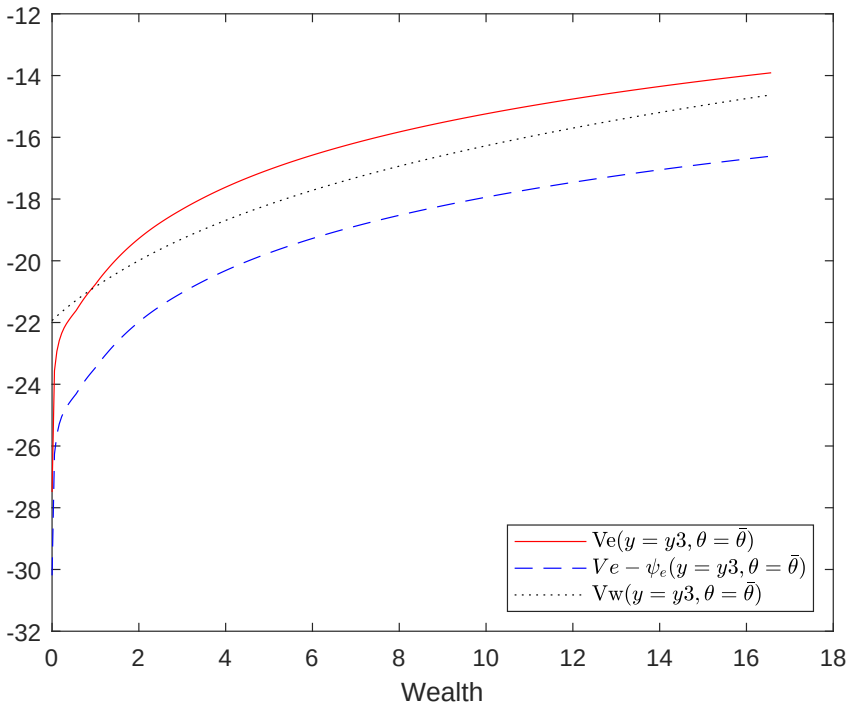
working ability, in which case, the decision is less clear-cut as the values of the two options are very close. For workers transitioning into entrepreneurship, however, start-up costs by significantly reducing the expected value of entrepreneurship, may increase the threshold of wealth required to start a business, and in most cases make the option of a wage work rather dominant. For instance, Figure 3.2 represents the value functions of a worker and an entrepreneur as a function of wealth, for a household with a median working ability and superior entrepreneurial ability. The dotted line represents the value function of a worker, the blue dashed line is the value function of an entrepreneur net of start-up costs, and the solid red line depicts the value of an incumbent entrepreneur. As shown, the worker is clearly better off remaining in the corporate sector, considering the significant disutility of business start-up costs.

3.5.2 Simulation results

As discussed, the properties and findings of our benchmark economy are based on a calibration which assumes no employment adjustment costs for corporate firms. That is, the firing tax (τ) was set to zero. Hence, the decision of workers to become entrepreneurs only factors in the burden of start-up costs and the borrowing constraints, besides their personal abilities. In the experiments below, we examine the steady state effects of a firing tax in conjunction with start-up costs and borrowing constraints respectively. We consider incremental changes in the size of the tax on job destruction, with $\tau = 0.5$ corresponding to 6 months' wages, in line with the calibration of our model economy. All the other parameters of the model are set to their baseline values.

Table 3.3 shows the effects of the firing tax on the transitions into and out of entrepreneurship as well as on the steady state entrepreneurship rate. Panel A

Figure 3.2. Value functions, wealth and occupational choice



Note: The figure shows the value functions of an individual with median working ability ($y = y3$) and high entrepreneurial ability ($\theta = \bar{\theta}$), in the benchmark equilibrium. The dotted line (black) represents the value function of a worker, the dashed line (blue) is the value function of an entrepreneur net of start-up costs ($\psi_e > 0$), and the solid line (red) depicts the value of an entrepreneur with no incurred start-up costs ($\psi_e = 0$).

reports results based on the baseline fixed start-up cost ($\psi_e = 2.7$) while Panels B and C set this parameter at $\psi_e = 2.75$ and $\psi_e = 2.8$ respectively. The figures reported in the first row of Panel A are from our baseline equilibrium as previously described. As shown, the percentage of workers transitioning into entrepreneurship increases with the extent of firing tax, while on the other hand, the share of exiting entrepreneurs decreases as τ rises. In particular, as one moves from $\tau = 0$ to $\tau = 0.5$, the share of workers becoming entrepreneurs increases from 2.32% to 4.11% (that is, an increase of about 77.2%) while the share of entrepreneurs

becoming workers in the corporate sector decreases from 26.16% to 25.28%. This results in an increase in the steady state entrepreneurship rate from 38.08% to 39.42%. Workers with high entrepreneurial ability are more likely to shift from the corporate sector to the entrepreneurial sector as a result of the policy change. In the benchmark scenario assuming no labor force adjustment costs, the transition into entrepreneurship entirely comes from high entrepreneurial ability workers. Interestingly, as τ increases to 50%, low entrepreneurial ability workers make up about 36% of all workers transitioning into entrepreneurship, which is quite significant and provides some insights on the detrimental effects of the policy on workers.

The firing tax creates distortions and welfare losses for workers in the corporate sector, which increases the relative value of entrepreneurship, thus making this option more attractive to households, all other things being equal. More specifically, as employment adjustment costs become substantial, firms are compelled to use their productive resources less efficiently because of other considerations that have to be factored in their decision-making processes. While in the benchmark model ($\tau = 0$), labor demand is solely based on the current value of the productivity shock, this is clearly not the case in presence of a positive firing tax. The previous employment size influences the current demand for labor, which in turn, has implications for the firms' investment levels. As a consequence, the firing tax has a negative impact on productivity levels and the equilibrium wage rate. The last column of Table 3.3 reports the wage rates associated with the different values of the firing tax. The market wage rate decreases with the size of the firing tax. It drops by about 3.23% as one moves from $\tau = 0$ to $\tau = 0.5$, with the average labor productivity decreasing by about 0.4%. The policy change from $\tau = 0$ to $\tau = 0.5$ ultimately induces an average drop in workers' utility of about 0.91%, which is not surprising considering the utility consequences of dis-

tortions are typically on the magnitude of a fraction of a percent. These results are consistent with the findings by Hopenhayn and Rogerson (1993), although they are relatively modest in quantitative terms. For instance, Hopenhayn and Rogerson (1993) find that a tax on job destruction corresponding to 6 months' wages, reduces average productivity by 0.8% and utility by 1.3%, a welfare cost that they acknowledge to be peculiarly large.

The experiments in Panels B and C allow us to evaluate the combined effects of start-up costs and firing tax on the decision to become entrepreneur or a worker. The first rows of these panels show the steady state statistics for a model with no employment adjustment costs ($\tau = 0$) but where the start-up cost parameter is now set to values greater than that of our benchmark economy ($\psi_e = 2.7$). As expected, the share of workers transitioning into entrepreneurship decreases as the size of start-up costs moves up. In particular, with $\psi_e = 2.75$, the percentage of workers becoming entrepreneurs decreases by about 5.6% from its benchmark value, and when $\psi_e = 2.8$, the share of entering entrepreneurs drops by approximately 12.1%. In the two cases, the share of exiting entrepreneurs is virtually unchanged. As discussed, start-up costs not only are a source of disutility to new entrepreneurs, but also may create an additional burden to aspiring entrepreneurs who are already financially constrained. Therefore, as the extent of start-up costs increases, a larger proportion of households are prevented from entering the entrepreneurial sector of the economy.

Overall, the results reported in Panels B and C regarding the effect of the firing tax are qualitatively similar to those in Panel A: the firing tax leads to an increase in the percentage of workers becoming entrepreneurs and a decrease in the proportion of exiting entrepreneurs. Quantitatively, the main difference is on the magnitude of the increase in the percentage of workers transitioning into entrepreneurship due to the effect of the dismissal tax. In fact, relatively less

workers are making the transition in the new environment characterized by increased start-up costs. For instance, for $\psi_e = 2.75$, as the firing tax increases from $\tau = 0$ to $\tau = 0.5$, the proportion of workers becoming entrepreneurs only increases by about 72%, compared to an increase of 77.2% in the benchmark scenario of Panel A. On the other hand, the decline in the share of exiting entrepreneurs remains unchanged at 3.5%. This is because the impact of start-up costs only manifests through the transition into entrepreneurship. Taken together, these results suggest that start-up costs lessen the impact of the mandatory employment adjustment costs on the decision to become entrepreneur.

Importantly, as we discussed, the occupational choice of households is made in a financially constrained environment that may limit the investment capital of entrepreneurs, which naturally, has some bearing on individuals' choices of occupation. Thus, it can be instructive to investigate the implications of relaxing the borrowing constraints for the decision to become entrepreneur, in a setting with employment adjustment costs. To make the constraints less stringent, we increase the parameter λ defining the borrowing limit of entrepreneurs or their extent of leverage. All other parameters are similar to those adopted in the benchmark model. The results are reported in Table 3.4. For ease of comparison, Panel A redescribes the results of the baseline model as in Panel A of Table 3.3. In Panel B, λ is slightly increased to 2.2, and Panel C further relaxes the borrowing constraints, setting λ to 4.

The relaxation of the borrowing constraints leads to significant increases in the transitions into entrepreneurship, starting from the initial scenario with no firing costs to be paid by corporate firms. For instance, when $\tau = 0$ and $\lambda = 2.2$, the share of workers starting a business, increases by about 70%. This value goes up to 84.5% for $\lambda = 4$. In fact, the easing of borrowing restrictions shifts upwards the steady state entrepreneurial investment as a function of wealth, thereby increasing

Table 3.3 – Effects of firing tax and start-up costs on the occupational choice

Firing tax (τ)	Share of entrepreneurs	Transition e $\to w$	Transition w $\to e$	Wage rate
	Panel A: $\psi_e = 2.7$, $\lambda = 2$			
0	0.3808	0.2616	0.0232	1.0614
0.08	0.3861	0.2590	0.0311	1.0511
0.16	0.3878	0.2576	0.0331	1.0455
0.20	0.3887	0.2568	0.0342	1.0422
0.50 (6 months wage equivalent)	0.3942	0.2528	0.0411	1.0271
	Panel B: $\psi_e = 2.75$, $\lambda = 2$			
0	0.3802	0.2616	0.0219	1.0614
0.08	0.3821	0.2586	0.0227	1.0530
0.16	0.3858	0.2571	0.0286	1.0493
0.20	0.3873	0.2561	0.0308	1.0440
0.50	0.3926	0.2524	0.0376	1.0271
	Panel C: $\psi_e = 2.8$, $\lambda = 2$			
0	0.3796	0.2612	0.0204	1.0614
0.08	0.3813	0.2586	0.0211	1.0530
0.16	0.3825	0.2571	0.0219	1.0493
0.20	0.3834	0.2557	0.0225	1.0459
0.50	0.3916	0.2520	0.0352	1.0308

borrowers' leverage in the credit market as well as the proportion of richer and unconstrained investors, regardless of their ability levels. This suggests that, the number of new entrepreneurs rises since more working households are now able to borrow and invest more, or implement their optimal size of business project. The transition into entrepreneurship is further helped and compounded by the welfare loss stemming from the increase in firing costs. However, when the borrowing constraints become too loose as shown in Panel C ($\lambda = 4$), there is a relatively larger proportion of exiting entrepreneurs, although significantly decreasing with the size of firing tax. One reason for this could be the increase in the equilibrium interest rate, which may attract very wealthy entrepreneurs as well as households with low entrepreneurial ability, as they can earn enough interest income from their assets. In any case, the effect of the firing tax on the occupational choice is clear, robust and quite significant throughout the experiments.

3.6 Conclusion

Empirical evidence has shown that employment protection legislation and product market policies such as the regulatory procedures required to start a business, are strongly correlated. In particular, countries with stricter employment protection policies tend to impose more burdensome regulations on new business creation. This suggests that the analysis of the effects of these two types of policies on labor market outcomes and business dynamics should not be dissociated from each other. The objective of this paper has been to explore the impacts of employment adjustment costs and start-up costs imposed on new entrepreneurs, on the occupational choice of individuals. We have constructed a heterogeneous-agent dynamic general equilibrium model in which households face idiosyncratic shocks on their skills and have to decide, in each period, whether to be an entrepreneur or a worker. The individual decision to operate a business is subject to financial

Table 3.4 – Effects of firing tax and borrowing constraints on the occupational choice

Firing tax (τ)	Share of entrepreneurs	Transition e $\to w$	Transition w $\to e$
	Panel A: $\psi_e = 2.7$, $\lambda = 2$		
0	0.3808	0.2616	0.0232
0.08	0.3861	0.2590	0.0311
0.16	0.3878	0.2576	0.0331
0.20	0.3887	0.2568	0.0342
0.50 (6 months wage equivalent)	0.3942	0.2528	0.0411
	Panel B: $\psi_e = 2.7$, $\lambda = 2.2$		
0	0.3849	0.2674	0.0394
0.08	0.3879	0.2628	0.0398
0.16	0.3905	0.2589	0.0434
0.20	0.3917	0.2572	0.0405
0.50	0.3989	0.2471	0.0449
	Panel C: $\psi_e = 2.7$, $\lambda = 4$		
0	0.3573	0.3282	0.0428
0.08	0.3600	0.3234	0.0435
0.16	0.3623	0.3189	0.0435
0.20	0.3632	0.3174	0.0438
0.50	0.3684	0.3084	0.0451

frictions, which limits the amount of capital that entrepreneurs can borrow and allows investment to be an increasing function of wealth holdings. In addition, the transition into entrepreneurship requires a fixed start-up cost that captures administrative burdens or regulatory procedures required to start a new venture. In our framework, workers are employed by the non-entrepreneurial sector that is made up of corporations publicly owned by households. Importantly, corporate firms face idiosyncratic shocks to their production technology and have to incur labor force adjustment costs.

We have found that a tax on job destruction increases the steady state entrepreneurship rate by promoting the transition of workers into entrepreneurship while dissuading existing entrepreneurs from offering their services as workers in the corporate sector. The underlying reason is that, the firing tax provokes a decrease in wage and productivity rates, which leads to significant welfare losses for workers. Notwithstanding, a significant share of workers could not effectively transition into entrepreneurship due to the costly procedures required to start a business. Indeed, it has appeared that the fixed start-up cost incurred by new entrepreneurs, significantly attenuates the impact of the firing tax on the decision to move away from a corporate job. Start-up costs decrease the expected value of entrepreneurship and constitute a key barrier that adds to the borrowing constraints. A tightening of the latter substantially decreases the share of workers becoming entrepreneurs as it undermines the use of leverage to make optimal investment and penalizes households with low wealth holdings. Our results add value to the existing literature on occupational choice, liquidity constraints and the implications of start-up costs for new business creation. We have shown that modelling corporate firm dynamics and introducing dismissal costs can substantially affect the occupational choice of households and thus, provides a more accurate explanation of the dynamics of entrepreneurship in the economy.

These results have important implications for policy analysis and design. On one hand, they suggest that labor market policies which are designed to protect employees, could lead to efficiency costs that will nurture people' s entrepreneurial spirit and promote self-employment. On the other hand, the effectiveness of such policies in fostering actual business creation could be neutralized, or at least weakened, by the extent of regulatory procedures required to start a business. This is particularly relevant considering the common clustering of product and labor market policies, as well as the financial constraints faced by entrepreneurs. A well-thought-out and balanced policy mixture is therefore necessary, and could be guided by the primary objective and priorities of policymakers.

Our model has two key limitations that are closely related. The first is its overestimation of the steady state entrepreneurship rate as compared to the statistic in US data. The second concerns its inability to match well the US wealth inequality, especially the extreme concentration of wealth in the hands of entrepreneurs. Our quantitative results, although already revealing, could be significantly improved by a more fitting calibration. We are currently examining the implications of multiple entrepreneurial ability levels and the addition of inactivity in the model as another labor market occupational option. That is, households can either be an entrepreneur, a worker, or choose to be inactive. Inactive households will receive benefits and may decide to return to the labor market at any time, either as a worker or an entrepreneur. Allowing for this third option may reduce the proportion of entrepreneurs in the economy and could also have important implications for the distribution of wealth. Furthermore, we have assumed that entrepreneurs do not employ external labor services for production. This simplification has mainly been adopted to focus only on the occupational choice, thus ignoring considerations regarding the size of start-ups' employees, its dynamics and their implications for investment and saving decisions, as well as for survival

rates of entrepreneurial firms. For instance, one could explore the impacts of introducing firing costs, perhaps of lesser magnitude, in the entrepreneurial sector. In fact, Bennett (2011) shows that firing costs can have severe effects on firms already facing liquidity constraints, and can increase the demand for funds in the credit market. We leave these extensions for future research.

Appendix to Chapter 3

A. Computational procedure

We are looking to compute the steady state equilibrium of a model with two production sectors - corporate and entrepreneurial, where agents have an occupational choice between entrepreneurship and work in the corporate sector. The capital rental rate r and the wage rate w are taken as given by corporate firms, and also affect the occupational choice of agents. Thus, factor prices play a role in all value function iterations, as well as in the equilibrium clearing conditions, of course. The assumption of stationarity also implies conditions on the firm distribution in the corporate sector and on the distribution of agents according to their assets and sectorial skills.

The algorithm is structured as follows:

Given r,

I - *Corporate sector:*

- For a given w, solve for $V_c(n_{-1}, s)$, using value function iteration, combined with the first-order condition with respect to corporate capital; use the firm free entry condition to obtain w;

- Using the assumption of stationarity, obtain the distribution of corporate firms *per entrant* $\widehat{\mu}_c(n_{-1}, s)$ from the policy rules $k_c^d(n_{-1}, s)$, $n_c^d(n_{-1}, s)$ and $\chi(n_{-1}, s_{-1})$; obtain the aggregate corporate capital demand per entrant $\widehat{K}_c^d$, the aggregate corporate labor demand per entrant $\widehat{L}_c^d$, the aggregate corporate profits per entrant $\widehat{\Pi}_c$ and the aggregate lump-sum redistributions per entrant $\widehat{R}_c$ (from firing taxes).

II - *Entrepreneurial sector and labor market clearing:*

For a given number of entrants in the corporate sector M_c,

- Solve for the value functions $V_e(a, y, \theta)$, $V_w(a, y, \theta)$ and for the occupational choice values $\Omega_e(a, y, \theta)$, $\Omega_w(a, y, \theta)$, using value function iteration;

- Using the assumption of stationarity, obtain the distribution of entrepreneurs and workers $\lambda(a, y, \theta, d)$ from the savings rule $a'(a, y, \theta)$ and the occupational choice rules $d(a, y, \theta)$;

- Update M_c from labor market clearing

$$M_c \widehat{L}_c^d = \sum_{a,y,\theta} y\lambda(a, y, \theta, w);$$

- Iterate on M_c until convergence.

III - *Capital market clearing:*

- Using the policy rule $k(a, y, \theta)$, verify capital market clearing with

$$\sum_{a,y,\theta,d} a\lambda(a, y, \theta, d) = M_c \widehat{K}_c^d + \sum_{a,y,\theta} k(a, y, \theta)\lambda(a, y, \theta, e),$$

and update r until convergence.

B. Key calibration targets for the corporate sector

Table 3.5 – Key targets for the calibration of shocks in the corporate sector

Firm size	Percentage of firms	Employment contribution (%)	Exit rate (%)
1	24.5	1.2	15.7
3	24.5	3.5	11.7
5	10.5	2.5	6.8
8	10.5	4	4.8
11	7	3.6	5.4
15	7	5	4.4
25	5	5.9	4.25
40	5	9.4	4.2
75	3	10.6	4.15
175	2	16.5	4
800	1	37.8	3

Source: Business Dynamics Statistics, US Census Bureau. Minor adjustments are made to obtain the relevant distributions in line with the targeted firm size (number of employees) values, as the level of disaggregation in the data is not as detailed as in the model.

CONCLUSION

Entrepreneurship has been the topic of scholarly research in a variety of academic fields, including but not limited to economics. This thesis has provided three contributions in the economics of entrepreneurship. Its overall goal has been to delve further into the role of liquidity constraints, start-up costs and employment protection policies in explaining entrepreneurial dynamism and the occupational choice of individuals. We have defined entrepreneurship as the ability and readiness of an individual to develop, manage and run a business enterprise, along with any of its uncertainties, with the main objective of making a profit out of the venture.

In the first chapter, we have empirically investigated how the severity of liquidity constraints could affect the impact of start-up costs on the entrepreneurship-wealth relationship. Our empirical analysis has been based on individual level data from three large-scale surveys across countries in Europe and US, as well as institutional country-level data from the World Bank and OECD. To assess the extent to which the severity of liquidity constraints might be important, we have zeroed in on the effects of the 2007-2010 financial crisis, which have been indirectly captured through time effects. We have found that wealthier individuals are more likely to be entrepreneur, yet start-up costs decrease the marginal value of wealth for entrepreneurial choice. More interestingly, we have documented that the detrimental effect of start-up regulations on the entrepreneurship-wealth relationship was more apparent during the crisis period. The key message is that, start-up costs constitute a significant burden to financially constrained individuals, and

as such, their negative impact is more likely to worsen as liquidity constraints become more severe – for instance, in the context of a credit crunch.

In the second chapter, we have reflected on the complementarity between banks and stock markets in the process of new business creation. In particular, we have assessed the macroeconomic impact of bank competition on entrepreneurship, while paying special consideration to the role of the stock market. Two conflicting theories of the impact of bank competition on access to credit were evaluated within a unified framework: the market power hypothesis and the information hypothesis. According to the former, bank competition increases credit availability as it drives down the cost of credit and enlarges the array of financial products available to borrowers. The information hypothesis, on the other hand, argues that bank competition has a negative impact on access to credit since it is inimical to the establishment of lending relationships between banks and their clients. We have estimated that bank competition has an overall beneficial impact on new business density as it increases credit availability to new entrepreneurs. However, this impact has been found to diminish with the level of development of the stock market. The reason is that, the development of the stock market is associated with larger liquidity externalities that expedite the recycling of the informed capital supplied to start-ups by banks and other financial intermediaries. This recycling process or complementarity between banks and stock markets is underpinned by lending relationships that flourish under less competitive banking markets.

In the third chapter, we have studied the impact of firing costs and start-up costs incurred by new entrepreneurs on the individual occupational choice. We have developed a dynamic general equilibrium model of occupational choice featuring borrowing constraints. In our framework, there are two distinct sectors of production: the entrepreneurial sector and the corporate sector. The latter is

composed of firms that are collectively owned by households and are not subject to borrowing constraints. We have allowed for an endogenous entry and exit of corporate firms and they have to pay employment adjustment costs across periods. We have found that firing costs increase the rate of transition into entrepreneurship and decrease the rate of entrepreneurial exit. The consequence is an increase in the steady state entrepreneurship rate. This happens because the firing tax on job destruction at the corporate firm level, impinges on productivity and wage rates, and induces welfare losses for workers. We have also found that start-up costs significantly weaken the resultant transition of workers into entrepreneurship. As we have highlighted, these findings have important policy implications considering the usual clustering of product market regulations and employment protection policies as shown in the data. In fact, the cost of entry regulations for new businesses tend be positively correlated with the rigidity of employment protection policies.

We have acknowledged that our contributions are clearly not devoid of limitations. For instance, the two empirical analyses have been limited by data constraints, which in turn, have narrowed the scopes of our analyses as well as our identification strategies. Similarly, our theoretical contribution could be further improved and extended to explore other important and interesting issues. Notwithstanding, we believe that this thesis has provided a step forward in understanding the impacts of regulations, including banking regulations, product market regulations and labor market policies, on entrepreneurship. This could benefit policymakers and researchers at all levels. Indeed, this dissertation has also laid the groundwork for further exploration into related topics of interest.

BIBLIOGRAPHY

[1] Addison, J. T. and Teixeira, P. (2003). "The economics of employment protection. " *Journal of Labor Research* 24, 85-128.

[2] Adelino, M. , Schoar, A. and Severino, F. (2015). "House prices, Collateral and Self-Employment." *Journal of Financial Economics* 117(2), 288-306.

[3] Agostino, M. and Trivieri, F. (2016). "Bank Market Power and Firm Creation: A Multi-Country Analysis." *Journal of Small Business and Enterprise Development* 23(2), 562-589.

[4] Backman, M. (2015). "Banks and New Firm Formation." *Journal of Small Business and Enterprise Development* 22(4), 734-761.

[5] Bain, J. (1956). Barriers to New Competition, Cambridge: Harvard Press.

[6] Baron, R. M. and Kenny, D. A. (1986). "The Moderator-Mediator Variable Distinction on Social Psychological Research: Conceptual, Strategic, and Statistical Considerations." *Journal of Personality and Social Psychology* 51(6), 1173-1182.

[7] Barseghyan , L. and DiCecio, R (2011). "Entry costs, industry structure, and cross-country income and TFP differences." *Journal of Economic Theory* 146, 1828-1851.

[8] Barth, J. R. , Lin, C. , Lin, P. and Song, F. M. (2009). "Corruption in Bank Lending to Firms: Cross-country Micro Evidence on the Beneficial Role of Competition and Information Sharing." *Journal of Financial Economics* 91(3), 361-388.

[9] Basseto, M. , Cagetti, M. and De Nardi, M. (2015). "Credit Crunches and Credit Allocation in a Model of Entrepreneurship." *Review of Economic Dynamics* 18(1), 53-76.

[10] Bates, T. , Lofstrom, M. and Parker, S. C. (2014). "Why are Some People More Likely to Become Small-Businesses Owners than Others: En-

trepreneurship Entry and Industry-Specific Barriers." *Journal of Business Venturing* 29(2), 232-251.

[11] Baumann , F. and Brandle, T (2012). "Self-employment, educational attainment and employment protection legislation. " *Labour Economics* 19(6), 846-859.

[12] Baumol, W. J. , Panzar, J. C. and Willig, R. D. (1982). Contestable Markets and the Theory of Industry Structure. Harcourt Brace Jovanovich, Inc, New York.

[13] Bayraktar, N. (2014). "Measuring Relative Development Level of Stock Markets: Capacity and Effort of Countries." *Borsa Istanbul Review* 14(2), 74-95.

[14] Beck, T. and Cull, R. (2014a). "SME Finance in Africa." *Journal of African Economies* 23(5), 583-613.

[15] Beck, T. and Cull, R. (2014b). Banking in Africa, in Berger, A. , Molyneux, P. and Wilson, J. (Eds), Oxford Handbook of Banking, 2nd edn. Oxford University Press, New York.

[16] Beck, T. , Demirguc-Kunt, A. and Levine, R. (2006). "Bank Supervision and Corruption in Lending." *Journal of Monetary Economics* 53, 2131-2163.

[17] Bennett, H. Z. (2011). "Labor's liquidity service and firing costs. " *Labour Economics* 18(1), 102-110.

[18] Bergantino, A. S. and Capozza, C. (2012). "The Effect of Bank Concentration on Entrepreneurship in Central and Eastern European Transition Countries." *Working Paper Series 0043, University of Bari*

[19] Berger, A. N. and Udell, G. F. (1995). "Relationship Lending and Lines of Credit in Small Firm Finance." *The Journal of Business* 68(3), 351-381.

[20] Bernheim, B. D. and Whinston, M. D. (1990). "Multimarket Contact and Collusive Behavior." *The RAND Journal of Economics* 21(1), 1-26.

[21] Besanko, D. and Thakor, A. V. (1992). "Banking Deregulation: Allocational Consequences of Relaxing Entry Barriers." *Journal of Banking and Finance* 16(5), 909-932.

[22] Black, B. and Gilson, R. (1998). "Venture capital and the Structure of Capital Markets: Banks versus Stock Markets." *Journal of Financial Economics* 47, 243-277.

[23] Black, S. E. and Strahan, P. E. (2004). Business Formation and the Deregulation of the Banking Industry. In Holtz-Eakin, D. and Rosen, H. D. (eds) Public Policy and the Economics of Entrepreneurship, Cambridge, MA, MIT Press, 59-82.

[24] Blanchard, O. and Giavazzi, F. (2003). "Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets" *The Quarterly Journal of Economics* 118(3), 879-907.

[25] Blanchflower, D. G. (2004) "Self-Employment: More May Not Be Better." *Swedish Economic Policy Review* 11(2), 15-73.

[26] Block, J. H. , Darnihamedani, P. , Hessels, J. and Simonyan, A. (2015). "Start-up Costs, Taxes and Innovative Entrepreneurship." *Tinbergen Institute Discussion Paper* 2015-013/VII

[27] Bloemen, H. , Hochguertel, S., Mastrogiacomo, M. and Li, Y. (2016). "The Role of Wealth in the Start-up Decision of New Self-Employed: Evidence from a Pension Policy Reform." *Labour Economics* 41, 280-290.

[28] Boedo, H. J. and Mukoyama, T. (2012). "Evaluating the effects of entry regulations and firing costs on international income differences." *Journal of Economic Growth* 17, 143-170.

[29] Bonaccorsi di Patti, E. and Dell' Ariccia, G. (2004). "Banking Competition and Firm Creation." *Journal of Money, Credit and Banking* 36(2), 225-251.

[30] Boone, J. (2008). "A New Way to Measure Competition." *The Economic Journal* 118(531), 1245-1261.

[31] Boone, J. , Van Ours, J. C. and Van Der Wiel, H. (2013). "When is the Price Cost Margin a Safe way to Measure Changes in Competition?" *De Economist* 161(1), 45-67.

[32] Bosch, M. and Maloney, W. (2008). "Cyclical Movements in Unemployment and Informality in Developing Countries." *World Bank Policy Research Working Paper* 4648.

[33] Branstetter, L. , Lima, F. , Taylor, L. J. and Venancio, A. (2013). "Do Entry Regulations Deter Entrepreneurship and Job Creation? Evidence from recent reforms in Portugal." *The Economic Journal* 124(577), 805-832.

[34] Buera, F, J. (2009). "A Dynamic model of entrepreneurship with borrowing constraints: theory and evidence." *Annals of Finance* 5, 443-464.

[35] Buera, F, J., Kaboski, J. P. and Shin, Y. (2015a). "Entrepreneurship and Financial Frictions: A Macro-Development Perspective." *Annual Review of Economics* 7, 409-436.

[36] Buera, F, J., Fattal Jaef, R. N. and Shin, Y. (2015b). "Anatomy of a credit crunch: From capital to labor markets." *Review of Economic Dynamics* 18, 101-117.

[37] Buera, F, J. and Shin, Y. (2013). "Financial Frictions and the Persistence of History: A Quantitative Exploration." *Journal of Political Economy* 121(2), 221-272.

[38] Cagetti, M. and De Nardi, M. (2006). "Entrepreneurship, Frictions, and Wealth." *Journal of Political Economy* 114(5), 835-870.

[39] Cagetti, M. and De Nardi, M. (2009). "Estate Taxation, Entrepreneurship, and Wealth." *American Economic Review* 99(1), 85-111.

[40] Carrasco, R. and Ejrnaes, M. (2003). "Self-Employment in Denmark and Spain: Institution, Economic Conditions and Gender Differences." *CAM Working Papers* No 2003-06, University of Copenhagen.

[41] Cetorelli, N. and Strahan, P. E. (2006). "Finance as a Barrier to Entry: Bank Competition and Industry Structure in Local US Markets." *The Journal of Finance* 61(1), 437-461.

[42] Chaffai, M. E. , Dietsch, M. and Lozano-Vivas, A. (2001). "Technological and Environmental Differences in the European Banking Industries." *Journal of Financial Services Research* 19(2/3), 147-162.

[43] Chiappori, P. , Perez-Castrillo, D. and Verdier, T. (1995). "Spatial Competition in the Banking System: Localization, Cross Subsidies and the Regulation of Deposit Rates." *European Economic Review* 39, 889-918.

[44] Christelis, D. and Fonseca, R. (2015). "Labor Market Policies and Self-Employment Transitions of Older Workers." *CIRANO Working Papers* 2015s-50, CIRANO.

[45] Claessens, S. and Laeven, L. (2004). "What Drives Bank Competition? Some International Evidence." *Journal of Money, Credit and Banking* 36(3), 563-583.

[46] Clerides, S. , Delis, M. and Kokas, S. (2015). "A New Data Set on Bank Competition in National Banking Markets." *Financial Markets, Institutions & Instruments* 24, 267-311.

[47] Corradin, S. and Popov, A. (2015). "House Prices, Home Equity Borrowing, and Entrepreneurship." *The Review of Financial Studies* 28(8), 2399-2428.

[48] Degryse, H. , Kim, H. and Ongena, S. (2009). Microeconometrics of Banking: Methods, Applications and Results. Oxford University Press, New York.

[49] Delacroix, A. (2006). "A Multisectorial Matching Model of Unions." *Journal of Monetary Economics* 53, 573-596.

[50] Delacroix, A. and Samaniego, R. M. (2009). "Joint Determination of Product and Labor Market Policies in a Model of Rent Creation and Division." *mimeo.*

[51] Delis, M. D. , Iosifidi, M. and Tsionas, E. (2014). "On the Estimation of Marginal Cost." *Operations Research* 62(3), 543-556.

[52] Demsetz, H. (1973). "Industry Structure, Market Rivalry and Public Policy." *Journal of Law and Economics* 16(1), 1-9.

[53] De Soto, H. (1989). The Other Path: The Invisible Revolution in the Third World. New York, USA: Harper and Row.

[54] Djankov, S. , La Porta, R. , Lopez-de-Silanes, F. and Shleifer, A. (2002). "The Regulation of Entry." *Quaterly Journal of Economics* 117(1), 1-37.

[55] Drukker, D. M. (2003). "Testing for Serial Correlation in Linear Panel Data Models." *The Stata Journal* 3(2), 168-177.

[56] Elitcha, K. and Fonseca, R. (2018). "Self-Employment, Wealth and Start-up Costs: Evidence from a Financial Crisis." *The B. E. Journal of Eco-*

nomic Analysis & Policy 18(3), 1-28.

[57] Evans, D. S. and Jovanovic, B. (1989). "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints." *Journal of Political Economy* 97(4), 808-827.

[58] Fairlie, R. (2013). "Entrepreneurship, Economic Conditions and the Great Recession." *Journal of Economics and Management Strategy* 22(2), 207-231.

[59] Fairlie, R. and Krashinsky, H. (2012). "Liquidity Constraints, Household Wealth and Entrepreneurship Revisited." *Review of Income and Wealth* 58(2), 279-306.

[60] Fernandez de Guevara, J. and Maudos, J. (2011). "Banking Competition and Economic Growth: Cross-country Evidence." *The European Journal of Finance* 17(8), 739-764.

[61] Fonseca, R., Lopez-Garcia, P. and Pissarides, C. A. (2001). "Entrepreneurship, Start-up Costs and Employment." *European Economic Review* 45(4-6), 697-705.

[62] Fonseca, R., Michaud, P. C. and Sopraseuth, T. (2007). "Entrepreneurship, Wealth, Liquidity Constraints and Start-up Costs." *Comparative Law and Policy Journal* 28(4), 637-674.

[63] Fonseca, R. and Utrero, N. (2017). "Financial markets and firm size: The role of employment protection laws and barriers to entrepreneurship." *Applied Economics* 49(26), 2515-2531.

[64] Freixas, X. and Rochet, J. (1997). Microeconomics of Banking, Cambridge: MIT Press.

[65] Frid, C. J. , Wyman, D. M. , Gartner, B. and Hechavarria, D. H. (2016). "Low-Wealth Entrepreneurs and Access to External Financing." *International Journal of Entrepreneurial Behavior and Research* 22(4), 531-555.

[66] Gagliardi, F. (2009). "Banking Market Structure, Creation and Activity of Firms: Early Evidence for Cooperatives in the Italian Case." *Annals of Public and Cooperative Economics* 80(4), 605-640.

[67] Gehrig, T. and Stenbacka, R. (2007). "Information Sharing and Lend-

ing Market Competition with Switching Costs and Poaching." *European Economic Review* 51, 77-99.

[68] Gompers, P. (1996). "Grandstanding in the Venture Capital Industry." *Journal of Financial Economics* 42, 133-156.

[69] Gompers, P. and Lerner, J. (1999). The Venture Capital Cycle, Cambridge, MA: MIT Press.

[70] Gonzalez Menendez, M. C. and Cueto, B. (2015). "Business Start-Ups and Youth Self-Employment in Spain: A Policy Literature Review." *STYLE Working Papers* STYLE-WP7.1/ES. CROME, University of Bighton.

[71] Guzman, M. (2000). Bank Structure, Capital Accumulation and Growth: A Simple Macroeconomic Model. *Economic Theory* 16(2), 421-455.

[72] Hainz, C. , Weill, L. and Godlewski, C. J. (2013). "Bank Competition and Collateral: Theory and Evidence." *Journal of Financial Services Research* 44(2), 131-148.

[73] Hatfield, I. (2015). "Self-Employment in Europe." *Institute for Public Policy Resarch Report*

[74] Hicks, J. R. (1935). "Annual Survey of Economic Theory: The Theory of Monopoly." *Econometrica* 3(1), 1-20.

[75] Hobijn , B. and Sahin, A (2013). "Firms and Flexibility." *Economic Inquiry* 51(1), 922-940.

[76] Hochguertel, S. (2010). "Self-Employment Around Retirement Age." *Tinbergen Institute Discussion Paper* (TI) 2010-067/3.

[77] Hopenhayn, H. (1992). "Entry, Exit, and Firm Dynamics in Long Run Equilibrium." *Econometrica* 60, 1127-1150.

[78] Hopenhayn, H. and Rogerson, R. (1993). "Job Turnover and Policy Evaluation: A General Equilibrium Analysis." *Journal of Political Economy* 101(5), 915-938.

[79] Hsieh, C. , Parker, S. C. and Van Praag, C. M. (2017). "Risk, Balanced Skills and Entrepreneurship." *Small Business Economics* 48, 287-302.

[80] Hurst, E. and Lusardi, A. (2004). "Liquidity Constraints, Household

Wealth and Entrepreneurship." *Journal of Political Economy* 112(2), 319-47.

[81] Kaiser, H. F. (1960). "The Application of Electronic Computers to Factor Analysis." *Educational and Psychological Measurement* 20, 141-151.

[82] Kaufmann, D. , Kraay, A. and Mastruzzi, M. (2010). "The Worldwide Governance Indicators: Methodology and Analytical Issues." *World Bank Policy Research Working Paper No 5430.*

[83] Kihlstrom, R. E and Laffont, J. J. (1979). "A General Equilibrium Entrepreneurial Theory of Firm Formation Based on Risk Aversion. " *Journal of Political Economy* 87(4), 719-748.

[84] Klapper, L. , Laeven, L. and Rajan, R. (2006). "Entry Regulation as a Barrier to Entrepreneurship." *Journal of Financial Economics* 82(3), 591-629.

[85] Klapper, L. , Love, I. and Randall, D. (2015). "New Firm Registration and the Business Cycle." *International Entrepreneurship and Management Journal* 11(2), 287-306.

[86] Klein, M. A. (1971). "A Theory of the Banking Firm." *Journal of Money, Credit and Banking* 3(2), 205-218.

[87] Koetter, M. , Kolari, J. W. and Spierdijk, L. (2012). "Enjoying the Quiet Life under Deregulation? Evidence from Adjusted Lerner Indices for U. S. Banks." *The Review of Economics and Statistics* 94(2), 462-480.

[88] Krull, J. L. and McKinnon, D. P. (2001). "Multilevel Modeling of Individual and Group Level Mediated Effects." *Multivariate Behavioral Research* 36(2), 249-277.

[89] Lazear, E. P. (1990). "Job Security Provisions and Employment." *The Quarterly Journal of Economics* 105(3), 699-726.

[90] Lazear, E. P. (2005). "Entrepreneurship" *Journal of Labor Economics* 23, 649-680.

[91] Lerner, A. P. (1934). "The Concept of Monopoly and the Measurement of Monopoly Power." *The Review of Economic Studies* 1(3), 157-175.

[92] Liebregts, W. and Stam, E. (2019). "Employment protection legislation

and entrepreneurial activity. " *International Small Business Journal: Researching Entrepreneurship* 37(6), 581-603.

[93] Lin, T. and Smith, R. (1998). "Insider Reputation and Selling Decisions: The Unwinding of Venture Capital Investments during Equity IPOs." *Journal of Corporate Finance: Contracting, Governance and Organization* 4, 241-263.

[94] Loayza, N. V. and Rigolini, J. (2011). "Informal Employment: Safety Net or Growth Engine?" *World Development* 39(9), 1503-1515.

[95] Love, I. and Martinez-Peria, M. (2015). "How Bank Competition Affect Firms' Access to Finance." *The World Bank Economic Review* 29(3), 413-448.

[96] Lucas, R. E. (1978), "On the Size Distribution of Business Firms." *The Bell Journal of Economics* 9(2), 508-523.

[97] Luo, Y., Gong, L. and Zou, H. (2010). "A Note on Entrepreneurial Risk, Capital Market Imperfections, and Heterogeneity. " *Macroeconomic Dynamics* 14, 269-284.

[98] Mason, E. (1939). "Price and Production Policies of Large-Scale Enterprise." *The American Economic Review* 29(1), 61-74.

[99] Michelacci, C. and Suarez, J. (2004)." Business Creation and the Stock Market." *Review of Economic Studies* 71(2), 459-481.

[100] Mirzaei, A. and Moore, T. (2014). "What are the Driving Forces of Bank Competition across Different Income Groups of Countries?" *Journal of International Financial Markets, Institutions and Money* 32(C), 68-71.

[101] Monteiro, J. C. M. and Assuncao, J. J. (2012). "Coming out of the Shadows? Estimating the Impact of Bureaucracy Simplifications and Tax Cut on Formality in Brazilian Microenterprises." *Journal of Development Economics* 99(1), 105-115.

[102] Monti, M. (1972). Deposit, Credit and Interest Rate Determination under Alternative Bank Objectives. In Szego, G. P. and Shell, K. eds, Mathematical Methods in Investment and Finance, Amsterdam: North Holland.

[103] Nicoletti, G. , Scarpetta, S. and Boylaud, O. (1999). "Summary Indicators

of Product Market Regulation with an Extension to Employment Protection Legislation." *OECD Economics Department Working Paper 225*

[104] Parker, S. C. (2004). The Economics of Self-Employment and Entrepreneurship, Cambridge: Cambridge University Press.

[105] Parker, S. C. (2009). The Economics of Entrepreneurship, Cambridge: Cambridge University Press.

[106] Peltzman, S. (1977). "The Gains and Losses from Industrial Concentration." *Journal of Law and Economics* 20(2), 229-263.

[107] Petersen, M. and Rajan, R. (1994). "The Benefits of Lending Relationships: Evidence from Small Business Data." *The Journal of Finance* 49(1), 3-37.

[108] Petersen, M. and Rajan, R. (1995). "The Effect of Credit Market Competition on Lending Relationships." *Quarterly Journal of Economics* 110, 407-443.

[109] Quadrini, V. (2000). "The Importance of Entrepreneurship for Wealth Concentration and Mobility." *Review of Income and Wealth* 45(1), 1-19.

[110] Quadrini, V. (2009). "Entrepreneurship in Macroeconomics." *Annals of Finance* 5(3-4), 295-311.

[111] Quinn, J. F. (1980). "Labor Force Patterns of Older Self-Employed Workers." *Social Security Bulletin* 43(4), 17-28.

[112] Rissman, E. R. (2007). "Labor Market Transitions and Self-Employment." *Working Paper No. 2007-14, Federal Reserve Board of Chicago.*

[113] Rogers, T. M. (2012). "Banking Market Structure and Entrepreneurship." *Small Business Economics* 39(4), 909-920.

[114] Rostam-Afschar, D. (2013). "Entry Regulation and Entrepreneurship: A Natural Experiment in German Craftsmanship." *Empirical Economics*, December, 1-35.

[115] Sobel, M. E. (1986). "Some New Results on Indirect Effects and their Standard Errors in Covariance Structure." *Sociological Methodology* 16, 159-186.

[116] Schumpeter, J. A. (1934). The Theory of Economic Development: An In-

quiry into Profits, Capital, Credit, Interest and the Business Cycle. Cambridge, MA: Harvard University Press.

[117] Spector, D. (2004). "Competition and the capital-labor conflict." *European Economic Review* 48, 25-38.

[118] Torrini, R. (2005). "Cross-Country Differences in Self-Employment Rates: The Role of Institutions." *Labour Economics*, 12(5), 661-683.

[119] Van Stel, A. (2005). "COMPENDIA: Harmonizing Business Ownership Data across Countries and Over Time." *International Entrepreneurship and Management Journal* 1(1), 105-123.

[120] Wall, H. J. (2004)." Entrepreneurship and the Deregulation of Banking." *Economic Letters* 82(3), 333-339.

[121] Wheelock, D. C. and Wilson, P. W. (2012). "Do Large Banks Have Lower Costs? New Estimates of Returns to Scale for US Banks." *Journal of Money, Credit and Banking* 44(1), 71-199.

[122] Wooldridge, J. M. (2002). Econometric Analysis of Cross Section and Panel Data, Cambridge, Massachusetts: The MIT Press.

[123] Zissimopoulos, J. M. and Karoly, L. A. (2007). "Transition to Self-Employment at Older Ages: The Role of Wealth, Health, Health Insurance and Other Factors." *Labour Economics*14(2), 269-295.

[124] Zissimopoulos, J. M. , Maestas, N. and Karoly, L. A. (2007). "The Effect of Retirement Incentives on Retirement Behavior: Evidence from the Self-Employed in the United States and England." *RAND Working Paper* WR-528.