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ABSTRACT

This thesis is a collection of three essays studying the relationship between borrowers and lenders in the credit market.

In the first chapter, using daily loan-level data drawn from the Bank of England (BoE) Archive, I empirically investigate whether, during the 1914 financial crisis, the BoE played the role of lender of last resort, following the Bagehot rules, or there were still elements signalling credit rationing and, hence, the applicants' identity was relevant. Following the econometric strategy of Anson et al. (2019), the results show that the BoE's policy was oriented to ration credit and its policy became even more severe as the crisis unfolded. Indeed, in line with Flandreau and Ugolini (2011 and 2013) and Anson et al. (2019), the applicant's identity seems to have played a role in the Bank's decision.

The second chapter empirically investigates the role of Italian cooperative banks (BCCs) as a driver of new business creation, in the Italian provinces, over the period 2003-2012. The results show that the presence of BCCs positively and significantly affects entry rates during the period analysed. Additionally, before the crisis, the positive impact of the BCCs presence tends to be stronger for entries in high tech industries, whilst in the post-crisis period, the estimated impact tends to become larger for low-tech firms. This evidence suggests that in normal times, BCCs might play an important role in financing innovative and risky firms, whilst when returns are more unpredictable, the BCCs risk-aversion may lead them to downsize the financing of riskier projects.

Using a large panel of Italian firms in the time span from 2003 to 2012, the third chapter examines the relationship between leverage and SMEs' financial stability, evaluating whether and to what extent this link is affected by the degree of competition characterising the local credit market in which firms operate. Using two measures of local banking competition – H-statistic and Boone indicator – my evidence shows that the negative impact of leverage on firms' financial health is greater for firms operating in more competitive banking markets. Indeed, the drawbacks of increasing banking competition seem to prevail on their expected advantages, leading banks to be less inclined to establish lending relationships with risky firms, thus increasing their financial vulnerability.

RIASSUNTO

La presente tesi è articolata in tre capitoli indipendenti che affrontano tematiche attinenti al funzionamento del mercato del credito.

Il primo capitolo analizza la politica adottata dalla Banca d'Inghilterra (BoE) durante la crisi finanziaria del 1914, utilizzando dati tratti dall'archivio storico della BoE. In particolare, l'analisi mira a verificare se la BoE svolse il ruolo di prestatore di ultima istanza a *là Bagehot*, basato su *free lending*, oppure adottò politiche di razionamento del credito basate sull'identità dei richiedenti di prestiti (*discounter*). Adottando una strategia econometrica conforme a quella di Anson et al. (2019), i risultati mostrano che la politica della BoE era orientata al razionamento del credito e divenne ancora più severa con l'intensificarsi della crisi. In linea con Flandreau e Ugolini (2011 e 2013) e Anson et al. (2019), l'identità del *discounter* sembra aver avuto un ruolo rilevante per la Banca.

Il secondo capitolo investiga il ruolo delle Banche di Credito Cooperativo (BCC) come *driver* per la creazione d'impresa nelle province italiane, durante il periodo 2003-2012. I risultati mostrano che una maggiore presenza di BCC favorisce la creazione d'impresa, tuttavia, la magnitudo dell'effetto diverge a seconda dei settori industriali. Specificatamente, nel periodo pre-crisi la presenza nel tessuto locale di BCC favorisce la nascita di imprese high-tech, mentre, nel periodo 2009-2012 la presenza nelle economie locali delle BCC sembrerebbe influenzare maggiormente le imprese low-tech. Tale evidenza suggerisce che le BCC svolgano un ruolo rilevante nel finanziamento di imprese innovative e rischiose, tuttavia, nei periodi in cui il rischio d'impresa è più elevato, la maggiore avversione al rischio di questa tipologia di banche sembra indurle a sacrificare il finanziamento dei progetti più rischiosi.

Infine, sfruttando un ampio campione di piccole e medie imprese (PMI) manifatturiere italiane osservate nel periodo 2003-2012, il terzo capitolo studia la relazione tra l'indebitamento delle PMI e la loro stabilità finanziaria (Z-score), verificando se la stessa sia influenzata dal grado di concorrenza che caratterizza il mercato del credito in cui le imprese operano. Utilizzando due indicatori per misurare la concorrenza bancaria locale – *H-statistic* e *Boone indicator* – i risultati mostrano che l'impatto negativo della leva finanziaria sulla salute finanziaria delle imprese è più severo per le imprese che operano in mercati bancari più competitivi. Sembrerebbe che i costi associati alla concorrenza tendano a prevalere sui potenziali benefici, portando le banche ad essere meno propense a stabilire rapporti di prestito con imprese a rischio, aumentando la loro vulnerabilità finanziaria.

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INTRODUCTION

In broad outline, the present thesis focusses on the relationship between borrowers and lenders in the credit market, putting the emphasis on the role of asymmetric information and moral hazard affecting the access to credit. This topic is investigated from different perspectives, therefore, this thesis consists of three self-contained works.

The first chapter assesses whether, during the 1914 financial crisis, the Bank of England (BoE) has played a role of lender of last resort, following the Bagehot rules, or there were still elements signalling credit rationing and, hence, the applicants' identity was relevant. Indeed, the academic debate on this topic assumes different positions: according to Capie (2002), the Bank based its decisions on few simple rules, looking at good collateral rather than observing the identity of the applicants, "frosted-glass discount window metaphor". Conversely, Flandreau and Ugolini (2011 and 2013) and Anson et al. (2019) argue that the Bank used to meticulously screen the discounters' identity so as to prevent moral hazard problems. The empirical analysis of the first chapter employs hand-collected daily loan-level data drawn from the BoE Archive, adopting an argumentative framework and an econometric strategy similar to Anson et al. (2019). According to my results, the BoE's policy was oriented to ration credit without strictly following Bagehot rules; moreover, its policy became even more severe as the crisis unfolded. As regards the drivers of supply restrictions, in line with Flandreau and Ugolini (2011 and 2013) and Anson et al. (2019), the discounters' identity tends to matter and the Bank decision cannot be reconducted to *pure* credit rationing.

In the second chapter, I investigate the role of Italian cooperative banks (BCCs) as a driver of business creation in the Italian provinces, over the period 2003-2012. Furthermore, I test whether the presence of cooperative banks might exert a heterogeneous impact on the birth of firms belonging to high-technology industries, naturally more opaque, and in times of economic downturns when business risk is much higher. The literature suggests that a larger presence of BCCs might stimulate new business creation because of their comparative advantage in gathering soft information and their cultural and geographical proximity to the firms, the propensity to establish customers' relationships, and their knowledge of the territory and clientele (Cassar, 2004; Alessandrini at al., 2009; Draghi, 2009; Stefani et al., 2016). These peculiarities might be crucial when interacting with high-tech start-ups, for which specific and intangible assets compound information opacity and make external financing more difficult (Paulson and Townsend, 2004), as banks have to base their decisions on soft rather than hard information (Petersen and Rajan, 2002; Backman, 2015). As a result, BCCs could promote start-ups, by requiring less formal collateral,

and acting as a substitute of a developed network of private investors and venture capitalists, in the Italian market. Conversely, according to a less extensive strand of the literature, the positive role of cooperative banks can be questioned, as they are traditionally risk-averse and present less risky portfolios (Fama and Jensen, 1983; Hesse and Cihak, 2007; Wyman, 2008). In addition, the probability to promote entrepreneurship activities might be also strongly influenced by the general economic conditions, in particular, investments in high tech firms, which are inherently riskier. The results suggest that BCCs play a positive role in stimulating business creation. During the 2003-2008 years, the effect of BCCs presence is stronger on the entries of high-tech industries, emphasizing their importance in financing innovative and risky firms. On the other hand, in the aftermath of the crisis, BCCs presence seems to affect more low-tech firm's entries or to exert a similar impact for any technological category. Indeed, when returns are more unpredictable, the BCCs risk-aversion may lead them to downsize the financing of riskier projects.

The third chapter offers an empirical analysis on the role that local banking competition might play in the relationship between indebtedness of small and medium-sized firms (hereafter SMEs) and their financial distress. Specifically, taking advantage of a large panel of Italian small and medium-sized manufacturing firms observed across the period 2003-2012, I investigate the relationship between leverage and Italian SMEs' financial stability, evaluating whether and to what extent this link is influenced by the degree of competition that typifies the local credit market in which firms operate. Indeed, Italian SMEs largely rely on banking finance essentially from local credit markets where they operate (Demirgüç-Kunt and Levine, 1999; Bonaccorsi di Patti and Gobbi, 2001). A vast amount of contributions recognises that at increasing level of debt the firms' risk of bankruptcy rises (see, among others, Warner, 1977; Kim, 1978; Jensen, 1986). Higher leverage ratio could signal potential firms financial difficulties to the credit market and induces banks to increase the cost of financing, which in turn reduces firms' investment. This vicious circle might reduce the financial stability of the firm and in turn, gradually, leads to its failure. Thus, from the indebted firms' perspective, a credit environment characterized by easier access to finance should be beneficial for their financial health. Additionally, the credit market might be characterized by different degrees of banks' monopolistic power, entailing different bank-firm interactions, and thus different credit conditions. On the theoretically ground, two opposite scenarios might be envisaged at increasing level of competition. On the one hand, the neoclassical theory, namely *market power hypothesis*, predicts that bank competition should increase access to finance, reduce interest rates and lower collateral requirements for SMEs (Besanko and Thakor, 1992; Jimenez et al., 2006; Hainz et al., 2013). Thus, higher competition might alleviate the negative effect of debt on firms' financial health. On the other hand, *the information-based hypothesis*

claims that, in the presence of information asymmetries and agency costs, higher competition might reduce bank incentives to invest in relationship lending and, thus, leads to higher financial constraints (Marquez, 2002; Dell'Ariccia and Marquez, 2006; Hauswald and Marquez, 2006). In other words, in a competitive market, banks' incentive to undertake screening and monitoring activities is lower because each financial institution knows that the other competitors might take advantages of that information. To sum up, the banking market structure might either alleviate or aggravate the negative effect of leverage on firm financial health. Using two measures of local banking competition – H-statistic and Boone indicator - my evidence confirms that the leverage negatively affects firms' financial health. In addition, the negative impact of leverage intensifies at increasing level of competition, i.e. the drawbacks possibly associated to competitive banking markets seem prevailing on their potential benefits.

Chapter 1

CENTRAL BANK'S CREDIT RATIONING. EVIDENCE FROM THE FINANCIAL CRISIS OF 1914

ABSTRACT

Using daily loan-level data drawn from the Bank of England (BoE) Archive, in this chapter I empirically investigate whether, during the 1914 financial crisis, the BoE played the role of lender of last resort, following the Bagehot rules, or there were still elements signalling credit rationing and, hence, the applicants' identity was relevant. Following the econometric strategy of Anson et al. (2019), the results show that the BoE's policy was oriented to ration credit and its policy became even more severe as the crisis unfolded. Indeed, in line with Flandreau and Ugolini (2011 and 2013) and Anson et al. (2019), the applicant's identity seems to have played a role in the Bank's decision.

Keywords: Credit rationing, Financial crisis, Bank of England.

1.1. INTRODUCTION

During periods of financial crises, the Central Bank plays a fundamental role in directing the "fate of the catastrophe", indeed, its action might be oriented in credit restriction to protect itself from the risk of failure and consequently preserve all the economic system. However, according to Calomiris and Mason (2003) and Richardson and Troost (2009), reducing the liquidity by credit rationing could involve in an *en mass* failure of the whole banking system, thus, generating a dramatic consequence for the entire economy. In this respect, the most recent great recession, beginning in 2007, renewed interest for the famous Bagehot's rules, which refer to a set of principles for successful lending of last resort operations based on "free lending", use of "good collateral" only, and reliance on "penalty rates" (Bignon et al., 2012).

According to Freixas et al. (2000), a *lender of last resort* (hereafter LLR) can be defined as an institution that helps the financial system to get out of negative situations such as an unforeseen shock that causes a huge increase in demand for liquidity that cannot be guaranteed from other sources. However, the main role of Central Banks (hereafter CBs), their response to financial crises and the associated "panic" changed over time. Indeed, before 1870, the CBs' policy during crisis times was credit rationing oriented, whilst free lending operations were an exception (Bignon et al., 2012; Jobst and Rieder, 2016). In particular, some contributions highlight that the Bank of England started to accept the role of LLR since 1870, ignoring the identity of borrowers if good collateral were brought in for discount (Fetter, 1965; Goodhart, 1988 and Ogden, 2003).

As far as the role played by the Bank of England (BoE) is concerned, opposite positions can be found in the existing literature: according to Capie (2002) the behaviour of the Bank can be explained by the "frosted-glass discount window metaphor", i.e. the Bank based its decisions on few simple rules, looking at good collateral rather than observing the identity of the applicants. On the other hand, according to Flandreau and Ugolini (2011 and 2013) and Anson et al. (2019), the Bank used to rigorously monitor the discounters' identity in order to prevent moral hazard problems.

This chapter aims to provide evidence on this debate, assessing whether, during the 1914 financial crisis, the BoE has played a role of lender of last resort, following the Bagehot rules, or there were still elements that can be associated with credit rationing and, hence, the applicants' identity was important. Specifically, the empirical analysis that I present employs daily loan-level data drawn from the BoE Archive, adopting a problematic, argumentative framework and an econometric strategy similar to Anson et al. (2019). Two main reasons drive the choice to analyse the financial crisis in the early of the 20th century: the lack of studies in this respect since this financial

turmoil has been obscured by the world war events, and the fact that this period represents a turning point soon after the Bagehot rules had been stated.

According to my evidence, during the 1914 crisis, the BoE seems oriented to ration credit and this policy tends to become more severe over the period, as its discretion seems increasing. Therefore, it appears that the Bank did not follow strictly the Bagehot rules. Indeed, concerning the determinants of the Bank's decision, consistently with Anson et al. (2019), the discounter identity seems to play a role, even though it cannot be defined as the only determinant factor.

The remainder of this chapter is organized as follows: Section 1.2 explains the features of a LLR and describes policies based on credit rationing. Section 1.3 illustrates the historical context, focusing on the London money market. Section 1.4 sets out my research hypotheses. Sections 1.5 and 1.6 describe the data used in the empirical analysis and provide descriptive statistics, respectively. Section 1.7 illustrates the empirical analysis and results. Lastly, section 1.8 concludes.

1.2. LITERATURE REVIEW ON THE ROLE PLAYED BY CENTRAL BANKS IN TIME OF CRISIS

1.2.1 Acting as a lender of last resort: The Bagehot rules

According to Freixas et. al (2000), a LLR is an institution that helps the financial system to get out of adverse situations as an unforeseen shock that causes a huge increase in demand for liquidity that cannot be guaranteed from other sources. These scenarios take place when there is an *en mass* demand for liquidation of deposit by depositors worried about an eventual contagion. Since banks keep reserves to cover only a small part of their liabilities, if all depositors of a bank withdraw their money simultaneously, the bank itself will close, and it is well-known that the failure of one bank may lead to failures of similar institutions. As LLR, the CBs should, naturally, try to: prevent failures, help financial institutions from having to sell assets at "fire sale" prices, guarantee the ability of the financial institutions to respect their loan obligations, prevent a collapse in the money stock caused by the contagion, in other words, the multiple bank failures caused by panic (Humprey, 1975; Reis 2015).

There are two primary methods to avoid the aforementioned circumstances: open market operations and loans through the discount market. Through the first ones, the CB purchases government securities, merely injecting cash into the market; the second category of operations, on which this work focuses, may take place at or above market interest rates, purchasing private sector loans and securities.

In this respect, a first attempt to describe a set of principles for successful LLR operations can be found in Bagehot (1873). The purpose of these rules was to minimise the secondary effects of severe crises affecting the whole banking system by identifying a way to provide it with extra liquidity; nevertheless, these principles were not legal rules but rather doctrinal ideologies (Lastra, 2015). Bagehot's rules are, generally, summarised in: "free lending," use of "good collateral" only, and reliance on "penalty rates". Notwithstanding, he never explicitly spelt out these rules, indeed, a debate is still open on their connotation (Bignon et al., 2012; Hoffman, 2018).

The idea of lending freely derives from the behaviour of the BoE during the crisis of 1847 characterized by a policy oriented towards credit rationing. By contrast, Bagehot advised lending freely in exchange of good collateral. Literally, Bagehot (1873, II.48) claims: "*very large loans at very high rates [being] the best remedy for the worst malady of the money market when a foreign drain is added to a domestic drain*".[1] The extent to which during a financial crisis the Bank should adopt a penalty rate is justified by two main motivations. Firstly, under the gold standard, a high-interest rate prevents a drain of gold. During a crisis there is evidence of gold outflows, hence, free supply of liquidity by the CB would create a conflict with the exchange rate regime. As a result, a policy that combines generous credit to protect the banking system and high rates to preserve the parity would be required (Martin, 2009; Bignon et al., 2012). The second argument claims that a high-interest rate helps prevent moral hazard (Sheng, 1991).[2] Indeed, banks may take on unnecessary risk if they know that, during difficult times, can borrow at a low rate. Banks could become less conservative and willing to take on higher risk. A technique used to overcome this problem was the *English route*: if a financial institution focused on activities judged to be dangerous for the system, the Bank would adopt precautionary policies, in the worst cases suppressing the company (Hirsh, 1977). Moreover, high rates tend to discourage borrowers seeking funds, implying a credit rationing by price rather than non-price methods.

1.2.2 The Credit Rationing policy

Credit rationing is a consequence of market failures driven by information asymmetries between lenders and borrowers and adverse selection dynamics. Specifically, it refers to a situation in

[1] To justify this policy, Bagehot argues that *"[a very high interest rate] will operate as a heavy fine on unreasonable timidity and will prevent the greatest number of applications by persons who don't require it. The rate should be raised early in the panic, so that the fine may be paid early; that no one may borrow out of idle precaution without paying well for it; that the banking reserve may be protected as far as possible*".

[2] Moral hazard is linked to the decline in attention taken by individuals if they know that are protected by insurance. In other words, moral hazard is due to the lack of information about the ex-post behaviour of the borrower. For instance, after signing a contract, the borrower will tend to invest in riskier projects as she does not take full responsibility for the funds (Stigler, 1967).

which lenders are unwilling to lend additional funds to borrowers at the market interest rate or even at the higher interest rate, meaning that a certain point the supply function becomes perfectly price inelastic. In other words, "*Credit rationing [is] a situation in which the demand for commercial loans exceeds the supply of these loans at the commercial loan rate quoted by the banks*" (Jaffee and Modigliani, 1969). In this case, higher interest rate cannot clear excess demand in the loan market.

From another point of view, credit rationing occurs under two circumstances: (i) among loan applicants who appear to be identical some obtain a loan and others do not, albeit they offered to pay a higher interest rate; (ii) there might be individuals that are not able to obtain a loan at any interest rate, even though with a more abundant supply of credit (Stiglitz and Weiss, 1981). In essence, the interest rate does not allow the lender to discriminate between different types of borrowers, thus, screening and monitoring systems become crucial to reduce the probability that applicants fail to repay the loans. In other words, credit rationing materializes when some borrowers are rationed out of the market, even if they would be willing to pay an interest rate higher than that prevailing in the market. Anson et al. (2019) refer to it as *pure* credit rationing.

To recapitulate, the drivers of credit rationing can be classified into three categories (Anson et al., 2019). Firstly, it could be driven by informational frictions as suggested by Stiglitz and Weiss (1981), among identical qualitative borrowers some are not suitable to receive loans. Additionally, during the crisis period, credit rationing explained by the interest rate could similarly derive from active discrimination by the CB against certain types of collaterals or applicants. It is plausible that the CB uses a specific set of rules or minimum standards when deciding whether to accept or reject loan applications. What is more, a huge number of rejections of loan applications relative to total applications could also be demand-side driven; restrictions might identify a deterioration of the quality of borrowers asking for credit or of their collaterals.

Several contributions, assessing the evolution of the CBs as LLRs, confirm that the change to LLR *per excellence* was very gradual during the years and a certain degree of credit rationing has always accompanied the Bagehot rules. Bignon et al. (2012), studying the historical behaviour of BoE and Banque de France, show that the way CBs dealt with crises changed. Before 1850, the main policy used was based on credit rationing, which has been gradually substituted by a market supporting behaviour which provided unlimited, or less restrictive, loans. Nevertheless, the increasing liquidity was not accompanied by a relaxation of prudential standards. Jobst and Rieder (2016), evaluating selected episodes of financial distress from the National bank's foundation in 1816 until the *Creditanstalt* crisis of 1931 in Austria, argue that free lending was historically the exception rather than the main rule and an evident evolution toward more "free lending" is not

observable over time. Overseas, Friedman and Schwartz (1963) evaluating the monetary historical experience of the United States, confirm this trend for the Federal Reserve behaviour also during the Great Depression.

As regards the determinants of credit rationing, Capie (2002) claims that the BoE during crises had tended to lend by applying few simple rules, looking at good collateral rather than observing the identity of the applicants (frosted-glass discount window metaphor). Conversely, Flandreau and Ugolini (2011 and 2013), analysing the crisis of 1866 in Britain (the so-called Overend-Gurney panic), argue that, to achieve financial stability, the policy of BoE was characterized by generous loans provision, accompanied by a greater degree of discretion, and strict monitoring of the identity of the discounters in order to prevent moral hazard behaviour. This implies that all the names written on the bill submitted as the discounter, the acceptor, and the first drawer were important as they were all jointly responsible for its payment (Santarosa, 2015).

Bignon et al. (2012) propose a test on the extent to which credit rationing occurred. In a nutshell, if CB behaves as a LLR, its interest rate should always be above or equal to the market rate. Indeed, in this case, rational agents would prefer to discount at the market rate, and turning to the Bank may be regarded as a decision of last resort. Therefore, an obvious test to verify whether the CB behaves as LLR (null hypothesis) is to compare the market rate and the bank rate. If the bank rate is below the market rate, the null hypothesis is rejected. It is worth highlighting that, this test - carried out in the empirical investigation (section 1.7.1) - might be weak, as merely comparing interest rates does not provide insight on the determinants of credit rationing.

In this respect, Anson et al. (2019), using hand-collected loan-level data to study the BoE's policy response to the crisis of 1847, find that credit restrictions during the crisis of 1847 cannot be associated only with pure credit rationing à la Stiglitz-Weiss (i.e., information asymmetries). Their findings show evidence of discriminatory credit rationing based on loan applicants' type and identity. Hence, these results confirm, on one side, the theory of Capie (2002) that good "collaterals" mattered in the BoE decisions, but also, as suggested by Flandreau and Ugolini (2011), the identity of applicants was relevant.

1.3. HISTORICAL BACKGROUND

The financial crisis in the summer of 1914 was the most severe that London has ever experienced until September 2008, and it spread to about 50 world countries affecting banks and generating stock market slumps.[3]

London was the world's leading international financial centre on the eve of the First World War, as it had been for more than a century (Roberts, 2015). The period until 1914 was characterized by:

i. increasing flows in international capital - the stock of foreign investment increased from under $10 billion to $50 billion between 1870 and 1913;
ii. a monetary regime of fixed exchange rates, "the gold standard";
iii. Great Britain as the world's dominant economy.

The assassination of Archduke Franz Ferdinand in Sarajevo on the 28th of June 1914 opened a diplomatic crisis. However, the perception of the risk of war by the market became tangible only after one month, the evening of Thursday 23rd of July, recognized as a Minsky moment (Roberts, 2013),[4] when Austria sent a belligerent ultimatum to Serbia. The financial world was taken totally by surprise: "*The war came like a bolt from the blue and no one was prepared"* admitted Gaspard Farrer (partner in Baring Brothers), a few days after the outbreak of hostilities (Booth, 2000). The immediate reaction was an international rush for liquidity, in other words, withdrawal of credit and dumping of assets, as a consequences stock exchanges collapsed.

In London, in the week beginning Monday 27th of July, panic absorbed all financial centres: the London Stock Exchange closed on the 31st of July and it did not reopen until the 4th of January 1915. Nothing like this had occurred since its establishment in 1773; withdrawals of funds from banks and banks' demands that loans be repaid; pressure on the foreign exchanges; drain on gold; increased interest-rate. All these events, surrounded by the risk of non-payment, completely paralyse the credit mechanism. The foreign exchange and money markets failed (Brown Jr., 1940).

Furthermore, these episodes exposed the solvency and increased the vulnerability of the banks. The assets of the English joint-stock banks[5] became even more illiquid and experienced a reduc-

[3] Nevertheless, as mentioned in the introduction, it is not much emphasised in the literature because ensuing diplomatic and military conflicts have obscured it (Cassis, 2011).
[4] A Minsky moment is a sudden major collapse of asset values which is part of the credit cycle or business cycle. Such occasions occur because long periods of prosperity and increasing amount of investments lead to increasing speculation using borrowed money.
[5] This term refers to a bank which is a public company with shares owned by investors rather than a government.

tion of the value of their loans and investments because these were mostly demand deposits. Worries about a run on deposit became tangible on the 29th of July, when many sought to convert BoE notes into gold, and the Bank's reserves of metal fell from £27 million (£3,000 per bank office) to £11 million on the 1st of August (Keynes, 1914). As a result, the banks rationed payment to depositors of gold sovereigns, £1 gold coins, and substituted by BoE £5 notes, the smallest denomination banknote at that period. Considering that £5 notes were equal to £430 in 2009 money and therefore not much convenient, beneficiaries started running to the BoE to change their notes for sovereigns, generating long queues and panic in the City (Roberts, 2013). Initially, the BoE managed the crisis, following the doctrine of LLR, increasing the interest rate from 3% to 4% and 8%. The Governor also inquired the Prime Minister and Chancellor, David Lloyd George, to suspend the Bank act[6] conditionally to a rise of the bank interest to 10%. However, suspension of the gold standard was strongly opposed. John Maynard Keynes, unofficial helper to the Treasury team during the crisis, convinced the Chancellor against this suspension, he claimed that as London was a relevant creditor to the world, the City would have been the recipient of gold flows after the crisis (Keynes, 1914).

Given the terrible situation, the management of the crisis moved to the Treasury and the bank holiday on the 3rd of August was extended for a further three days in order to find other means to control the calamity. In the meantime, Britain entered the first world war, following days of panic and interminable meetings in London that flowed into the distribution of Treasury currency notes[7] and a general moratorium[8]. Most of the population was sceptic to change gold coins with notes and even if conversion into gold was not officially banned, the Chancellor stated clearly that such actions would be unpatriotic. This campaign avoided the run to the Bank to get the gold coins and, moreover, they were replaced for the most by new Treasury notes. With this currency notes (known as Bradburys) and the general moratorium, the BoE's rate reduced to 6% on Thursday the 6th of August (Roberts, 2015).

After the war declaration, the financial markets were concerned about the £350 million of pre-war bills of exchange[9] that congested banks' balance sheets and many of these were on accounts of foreign firms.[10] In fact, drawers from the opponent site, with whom the usual trading relations had been cut, were likely to be insolvent, driving the acceptors to honour the obligation that they

[6] It prescribed a fixed ratio between the BoE's gold reserves and the volume of notes in circulation.
[7] The treasury notes were one-pound and ten-shilling banknotes in place of the sovereign and half-sovereign.
[8] It was a legalised suspension of contracts aimed to protect debtors until economic conditions returned to normality and, also, as a further safeguard for the banks against a run on deposits.
[9] For a detailed description about the bill of exchange as a money market instrument refer to the Appendix 1 and to the data section.
[10] According to Aktin (2005), sterling commercial bills financed 90% of British trade and 50% of world trade.

provided to the holders of these bills. However, merchant banks were unable to do this because their funds amounted to a mere £20 million (Cassis 2011).

To address this situation, on the 12th of August 1914, the Chancellor announced the 'Cold Storage Scheme', where the BoE, under Treasury guarantee, provided the acquisition of nearly any pre-war bill. This scheme increased the liquidity of the banks and concentrated the pre-war bills problem in the hand of the BoE. Consequently, by September, the BoE detained roughly 40% of the money market account for £133 million of bills. Another action to overcome the crisis was the 'Enlarged Scheme' on September, the 5th, aimed to recapitalise some specialist banks to allow them to endorse new bills providing finance for business. It was done, under Treasury guarantee, through loans from the BoE, again, which gave the funds with which they could pay the outstanding bills. This action provided £200 million corresponding to 9% of the GDP, and over the autumn, the foreign exchanges returned to pre-war levels (Roberts, 2015). The final normalisation step was the re-opening of the Stock Exchange on Monday the 4th of January 1915, the crisis was over (Roberts, 2013). After the war, London and New York became the world leading financial centres (Ferguson, 2008).

1.4. RESEARCH HYPOTHESES

Put in a nutshell, this work aims to verify the presence of credit rationing during the financial crisis of 1914. More in detail, building on the literature reviewed in section 1.2, my research hypotheses can be articulated as follows:

H1. If credit rationing based on information asymmetries – pure credit rationing – occurs, the discounter' identity does not affect the probability of rejection, i.e. among similar costumers some discount their bills and others do not. In addition, the value and number of bills submitted in a day should positively predict the probability of rejection.[11]

H2. If credit rationing based on fixed rules – for evaluating collateral characteristics – occurs (Capie, 2002), the discounter' identity could predict the rejection. Yet, the identity's effect should be constant over time, as a daily change of the decision rules is not reasonable.

[11] The latter prediction stems from the consideration that, at higher levels of demand in a day, given information asymmetries and time constraints, bills could be more likely rejected. The Discount Office was small and open six days a week, around 305 trading days per year, but the opening time was only from 11 am to 2 pm (Ogden 1988: 198). It is not clear if the opening hour was protracted during financial crises (Anson et al. 2017).

H3. If credit rationing based on the applicant identity and high discrimination among applicants occurs (Flandreau and Ugolini, 2011 and 2013; Anson et al., 2019), the discounter's identity should predict the Bank's decision. Moreover, the importance of a discounter identity may change over time because the Bank does not follow fixed rules but uses higher discretion to select certain types of applicants.

1.5. DATA

The data used for the econometric analysis are (hand-collected) daily loan level information, drawn from the BoE Discount office. The analysis is carried out at packet level, wherein many bills of exchange from different holders are contained. Hence the primary data sources are the daily discounts ledgers.[12] As aforementioned, these ledgers record information on the name of the person bringing in the packet (Discounter), the number and value of bills brought in, and the rate of discount on those purchased by the Bank, or the number of bills rejected otherwise.[13] The time span covers the period from July to December 1914 for a total of 3210 observations. In addition, to enrich the original data set, I hand-collected information on the specific category to which each discounter belonged. In particular, using the original documents in the Bank Archive, I matched the name of each discounter with those present in the ledger books, making them available into an analytically tractable form. So, using dummy variables, the discounters have been distinguished in the following categories: bankers, bill brokers, those who were present in the acceptor book,[14] those listed in the rating book, and discounters who had an account at the Bank. The latter three groups should be associated with a certain degree of acquaintance and previous relationships between the Bank and the applicants. Specifically, all this additional information was collected from the following Archive records: "*Drawing Office Discounters Ledgers*", that show the accounts of Drawing Office customers discounting bills with the Bank; "*Bankers Ledgers*" containing the bills purchased from, or discounted with bankers, as well as bills accepted by the bankers and bought or discounted by the Bank; "*Bill Brokers Ledgers*" that, under the brokers' names, record bills discounted with them[15]; "*list of acceptors"* giving name, trade, address and by whom introduced; "*rating book*", showing each discounter's credit limit.[16]

[12] BoE Archive (London), Cashiers' Department: C28 (73 - 74).
[13] The BoE staff has transcribed these records to excel from the original documents.
[14] Being in this book means that in past transactions the discounter has been also an acceptor.
[15] More in detail, they show the place, the drawer, the acceptor, the value, the dates of discount and the maturity.
[16] These records can be found in the BoE Archive (London) - Cashier's Department (Discount Office): *Drawing Office Discounters Ledgers* C23 (7); *Bankers Ledgers* C24 (8-9*); Bill Brokers Ledgers* C25 (6); *Ancillary Records* C29 (18-37-38). It is worth underlying that the official description of these sources does not always match with the contents of the real documents. In other words, not all the information described is available.

Furthermore, data related to the Bank and market interest rate have been hand collected from the "*daily account book*" and *The Economist,* respectively, and transcribed to excel.[17]Similarly, another set of data has been hand collected from *The Times* – daily edition – that refers to number of births, deaths and marriages reported in the newspaper daily.

1.6. DESCRIPTIVE STATISTICS

As mentioned above, the time span considered in this work goes from the 1st of July to the 31st of December 1914. Yet, since the war started at the end of July 1914, I consider as a non-crisis month July 1914; while the other months are deemed as crisis periods.[18] The packets submitted from July to December 1914 were 3210. As one can see from Figure 1.1, more than the half of packets had been totally accepted, whereas only the 4.7% had been entirely rejected. The remaining, accounting for 36.7%, was partially rejected/accepted.

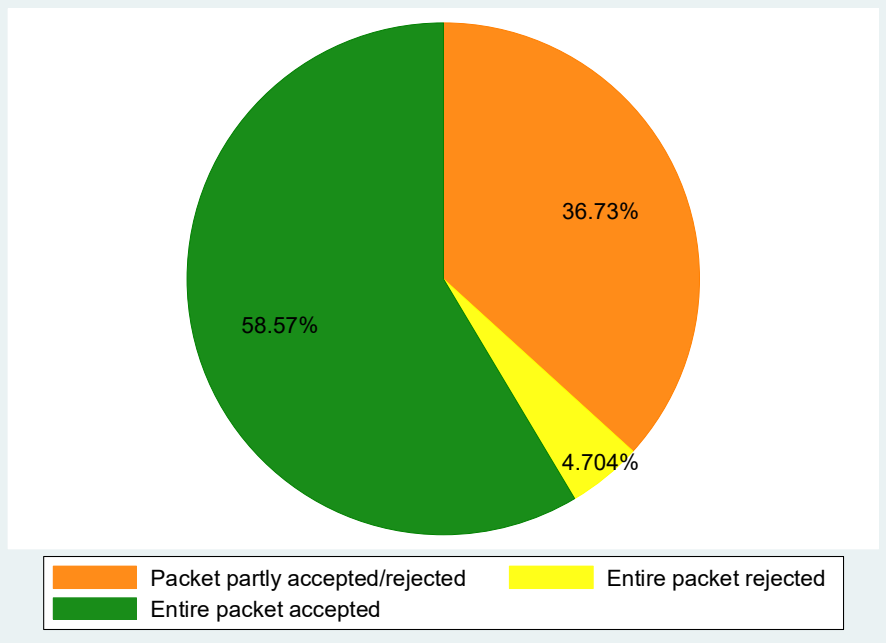
Looking at the pattern over time, Figure 1.2 shows that the percentage of packets entirely accepted decreased drastically from 94.78% in July to 45.16% in December, reaching the lowest level of 41.7% in September. This evidence might signal a possible rise in credit rationing during the crisis period. Conversely, the number of packets entirely rejected increased over time from 0.4% in July to around 21% in December. This pattern clearly suggests that the policy response of the Bank changed over time becoming more severe in conceding credit.

Considering this evidence, if the discounter identity represented the only driver of credit rationing, the packet would have been accepted or rejected entirely. Nevertheless, the increase in the number of partially rejected/accepted packets could also be driven from an excess of discount demand during the crisis window. Table 1.1 illustrates that the number of packets submitted to the Bank vividly increased from 249 in July to 1136 in August, keeping this higher level until October. Analogously, in the same period, the percentage of packets partially rejected remarkably increased.

[17] I have hand-collected these data from Cashier's Department: *Daily Accounts For 'Books'* C1(62) and *The economist* weekly edition from January to December 1914. For more information on the digitalized form of these records see: www.bankofengland.co.uk and www.economist.com.

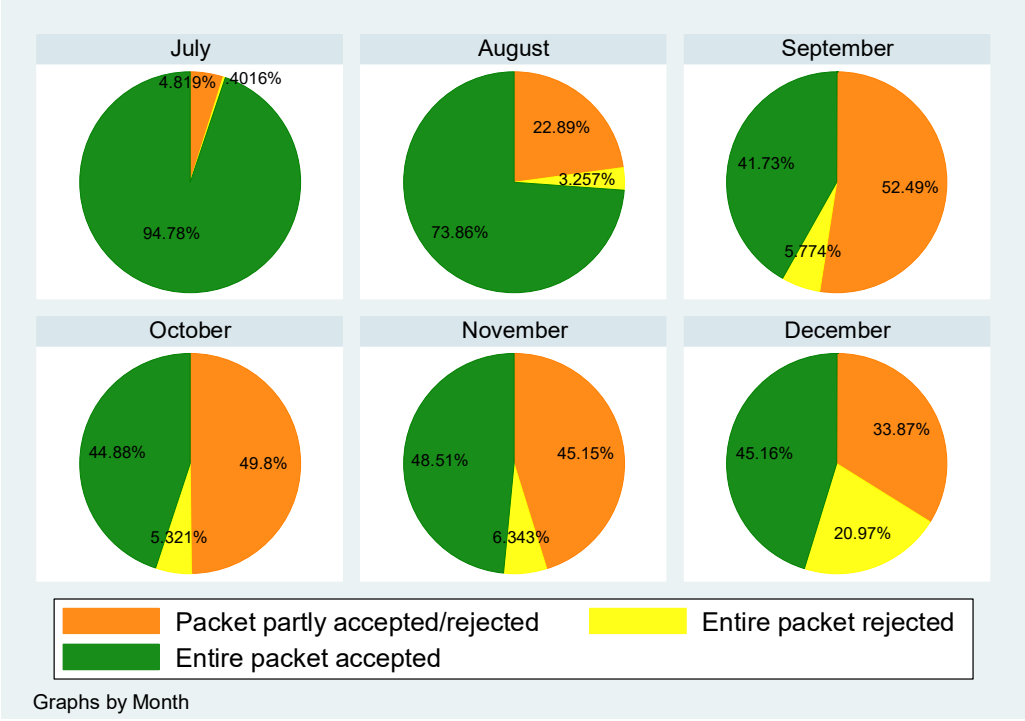
[18] In addition, as sensitivity check, following Anson et al. (2019) and Flandreau and Ugolini (2011, 2013) the financial crisis period has been further limited to those weeks where the level of discounts recorded is more than two standard deviations from the mean. According to this criterion, the crisis weeks go from August, the 7th, to the end of December (there is only one non-crisis week in the middle of December).

Figure 1.1. Packets submitted to the Bank of England's in the period July-December 1914



Sources: Author's elaborations, BoE Archive.

Figure 1.1. Packets submitted monthly to the Bank of England's in the period July-December 1914.



Sources: Author's elaborations, BoE Archive.

These elements suggest increasing credit rationing during the crisis period. On the other hand, since November, when the packets submitted drastically dropped, the percentage of packets totally rejected started to increase, reaching around 21% in December. To summarize, these patterns

might imply that the discounter identity is not the only driver of credit rationing because, as mentioned above, the Bank's decision might be related to the excess of demand in a crisis period and, at bill-level, randomly influenced. The following analysis aims to shed light on this pattern and its determinants.

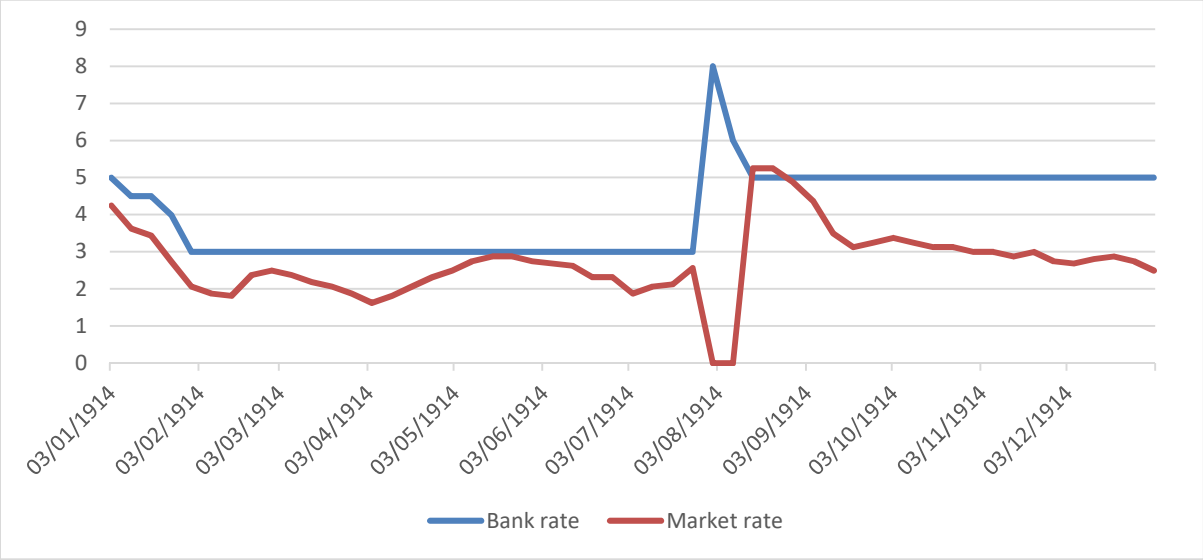
[TABLE 1.1]

1.7. THE EMPIRICAL ANALYSIS

1.7.1 A preliminary test

The empirical investigation starts by carrying out the Bignon et al. (2012) test. As illustrated in Section 1.2.2, if the Central Bank behaves as LLR (null hypothesis), the Bank's rate should be higher than the market rate. To test this hypothesis,values of interest rate during 1914 have been hand-collected from *the Economist* and the BoE Archive. The graphical test (Figure 1.3) shows that, during 1914, the BoE behaved mainly as a LLR following the doctrine of Bagehot by setting the Bank rate above the market rate and the spread dramatically increases at the end of July during the outbreak of the war. However, looking carefully, after the initial panic, from the 9th of August there is a brief spell where the Market rate is higher than the Bank's rate. Thus, there is evidence based on this graphical test that at the crisis peak the BoE reduced the interest rate below the market rate, hence, rejecting the null hypothesis, i.e. the Bank rationed credit.

Figure 1.3. Market and BoE interest rate during 1914 (weekly).



Sources: Author's elaboration from the Economist and BoE Archive.

An alternative way to look at discrimination by the CB - the opposite of free lending - is to explore the relationship between applications for discounts and the actual amounts discounted (Bignon et al., 2012). Figure A1.5 in appendix reports total monthly applications and actual discounts. As Table 1.2 shows, the rejection rate (in number of bills) increased over months from around 0.53% in July to 37% circa in December. A similar trend has been documented considering the value in pound of bills rejected. It seems to confirm that the policy of the Bank changed during the crisis as the rejection rate increased dramatically.

[TABLE 1.2]

The evidence above described might be weak as, at the beginning of the 20th-century, techniques to monitor discounters became more sophisticated and could influence the way CBs operated. Indeed, as a result of better monitoring techniques, the Bank could not need to set an interest rate higher than the market rate to ration credit, focusing instead on the identity of the applicants. Also, these tests do not provide insight into the determinants of credit rationing. In fact, even if the test in comparing the market and Bank rates would have controlled for the maturity, the relative quality of loan applications mainly remains a black box. Therefore, if the discrimination was based on discounters' characteristics, it is not possible to observe it by merely comparing interest rates.

1.7.2 The Econometric Models

To investigate credit rationing, over the 1914 crisis, and its relationship with the applicants' characteristics, I adopt the empirical methods employed by Anson et al. (2019) on 1847 data, adding several robustness checks. In this respect, I estimate four models, using as the dependent variable different proxies of credit rationing:

- Model 1: Logit regression using as dependent variable a dummy equal to 1 if at least one bill of the packet submitted for discount to the Bank was rejected, 0 otherwise.
- Model 2: Ordered Logit regression using an ordered dependent variable that represents 4 degrees of credit rationing.[19]
- Model 3: Tobit model and Fractional Response regression, where the dependent variable is measured as the share of rejected bills relative to the total number of bills in the packet.

[19] Level 0 if the share of the amount of the rejected bills relative to the total value of the packet is equal to zero (entire packet accepted); Level 1 if the aforementioned share is greater than zero and less or equal than 0.5 (low credit rationing); Level 2 if the share is more than 0.5 and less than 1 (high credit rationing); Level 3 if the share is equal to 1 (entire packet rejected).

- Model 4: Tobit model and Fractional Response regression, using the share of the amount of rejected bills relative to the total value of the packet as the dependent variable.

The independent variables have been selected to account for essential characteristics of the transactions and the discounters. Therefore, the vector of covariates includes the number of bills in the packet submitted (NUM_BILL_PKT) and the monetary value of the bills contained in the packet (VAL_BILL_PKT), both considered in logarithmic form. Moreover, following Anson et al. (2019), we include a set of dummy variables, accounting for discounters characteristics: discounters that are bill brokers (BROKER); bankers (BANKER); discounters with "DO" account (DO);[20] with acceptor or rating books entries (ACCEPTOR and RATING, respectively); or top discounters (TOP).[21] Finally, the total number of bills submitted in a day (NUM_BILL_DAY), and the total monetary value of bills submitted in a day (VAL_BILL_DAY) are also accounted for. All the models aforementioned are estimated using robust standard error and clustering observations at the day level. Furthermore, as a sensitivity check, I add to the benchmark equation of each model monthly fixed effects.[22]

The examination is conducted at packet-level, i.e. the unit of analysis is the single packet submitted to the Bank for discount. When different packets from the same discounter are submitted in a day, these packets are considered as different units. Finally, in order to account for the applicants' heterogeneity, a panel analysis - at discounter level - is carried out (Section 1.7.4).

1.7.2.1 Logit regression

Formally, when adopting Model 1, I assume Rej_p^* to be a latent variable such that:

$$Rej_p^* = \beta_0 + \beta' X_p + \varepsilon_p \quad (1.1)$$
$$Rej_p = 1 \; if \; Rej_p^* > 0$$
$$Rej_p = 0 \; otherwise$$

where p is the packet submitted to the Discount Office. Rej_p is equal to one if at least one bill of the packet (p) submitted for discount to the Bank was rejected, zero otherwise; X_p is the vector of covariates above defined. Moreover, letting F(.) represent a symmetric cumulative distribution function, Model 1 is specified as follows:

[20] "DO" stands for discounter who had an open account at the Bank.
[21] Following Anson et al. (2019), top discounters are defined as those ones that have submitted packets with a value more than two standard deviations from the mean.
[22] Moreover, I divide the whole sample into two periods - crisis days and normal days – providing evidence about any differences between them. For the sack of brevity and because of limited sample in normal days (around 200 observations) the estimates on separate sample have not been reported.

$$Prob\left(Rej_p = 1|X_p\right) = Prob\left(Rej_p^* > 0|X_P\right) = Prob\left(\beta X_p + \varepsilon_p > 0|X_p\right)$$
$$= Prob\left(\varepsilon_p > -\beta X_p|X_p\right) = 1 - F\left(-\beta X_p\right) = F\left(\beta X_p\right) \qquad (1.2)$$

In the Logit model, the error term is assumed to have a standardized logistic distribution, $F\left(\beta X_p\right) = \frac{\exp(\beta X_p)}{1+exp(\beta X_p)}$ (Cameron and Trivedi, 2005). Once the distribution of the error term F(.) is specified, the model is estimated by using Maximum Likelihood Estimation (MLE).

Notwithstanding, in this evaluation, the use of the logistic model is not exempt from obvious limitations and it might be not wholly appropriate. In fact, given the construction of the dependent variable, it is straightforward to recognise that it cannot grasp the weight of the portion of packet rejected. For instance, a packet of 100 bills which had only a single bill rejected and a packet with 100 bills rejected are considered in the same way (Anson et al., 2019). Hence, to address the structural weakness of this model in this context, an ordered Logit regression is proposed using an ordered dependent variable that represents 4 degrees of credit rationing (Drj_p) and, then, other two models with fractional dependent variables (Srj_p) have been regressed using both Tobit and Fractional regression.

1.7.2.2 Ordered Logit regression

When adopting the Ordered Logit estimation, the following latent model is assumed:

$$Drj_p^* = \beta_0 + \beta' X_p + \varepsilon_p \qquad (1.3)$$

Where Drj_p^* is the latent variable, while we observe Drj_p, representing a 3 point-scale variable that describe different degrees of credit rationing for a submitted packet (p). Drj_p is defined as follows:

$Drj_p = 0$ if the share of the number of rejected bills relative to the total number of bills in the packet (p) is equal to zero (full packet accepted);

$Drj_p = 1$ if the share is greater than zero and less or equal than 0.5 (low credit rationing);

$Drj_p = 2$ if the share is more than 0.5 and less than 1 (high credit rationing);

$Drj_p = 3$ if the share is equal to 1 (full packet rejected).

Assuming that:

$$Drj_p = 0 \quad \text{if } Drj_p^* \leq \mu_1$$
$$Drj_p = 1 \quad \text{if } \mu_1 < Drj_p^* \leq \mu_2$$
$$Drj_p = 2 \quad \text{if } \mu_2 < Drj_p^* \leq \mu_3$$
$$Drj_p = 3 \quad \text{if } Drj_p^* > \mu_3$$

the model imposes a kind of censoring. The μ's are unknown parameters called cut-off points or threshold parameters to be estimated with β. The goal is to estimate the probability of observing one of the four outcomes (Greene, 2003; Verbeek, 2008).

In this model the error term $\varepsilon_p$is assumed to be Logit distributed, and, it is possible to obtain the conditional distribution of Drj given x by deriving each response probability:

$$Prob\ (Drj = 0\ |x) = \ \Lambda(\mu_1 - x'\beta)$$
$$Prob\ (Drj = 1\ |x) = \ \Lambda\ (\mu_2 - x'\beta) - \Lambda(\mu_1 - x'\beta)$$
$$Prob\ (Drj = 2\ |x) = \ \Lambda\ (\mu_3 - x'\beta) - \Lambda\ (\mu_2 - x'\beta)$$
$$Prob\ (Drj = 3|x) = \ 1 - \Lambda\ (\mu_3 - x'\beta) \qquad (1.4)$$

With $\mu_1 < \mu_2 < \mu_3$ and Λ is the Logit function.
The parameters μ and β can be estimated by MLE.

The partial effects of the regressors x on the probabilities are not equal to the coefficients. Consequently, marginal effects at each level of the dependent variable (i.e. zero to three) need to be derived[23] (Verbeek, 2008; Wooldridge, 2010b).

1.7.2.3 Two-limit Tobit Model and Fractional Response Regression

The two-limit Tobit model is based on a latent process:

$$Srj_p^* = \beta_0 + \beta' X_p + \varepsilon_p \qquad (1.5)$$

Where Srj_p^* is a latent variable that is not observed for values less than zero and greater than one, normally distributed, and X_p is the set of covariates. Srj_p represents the share of rejected bills relative to the total number of bills in packet (p) or the share of the amount on rejected bills relative to the total value of packet (p). Its value is censored from below at L= 0 and from above at U =1. Hence:

$$Srj_p = 0\ if\ Srj_p^* \ \leq \ L$$
$$Srj_p = \ Srj_p^*\ if\ L \leq \ Srj_p^* \leq U$$
$$Srj_p = 1\ if\ Srj_p^* \geq \ U$$

In this case $f^*(Srj_p)$ is the density function as $f^*(Srj_p) \sim N(x'\beta, \sigma^2)$

The probability that $Srj_p = 0$ is given by

[23] Since the dependent variable is multinomial (i.e. it has more than the values 0-1), to compute the marginal effects is required to specify which of the level in the scale we are interested in. Thus, to have a complete picture and analyse how much the marginal effects differ across the different outcomes, the marginal effects for each possible levels of the dependent variable is derived (Tables A1.3-A1.6 in the Appendix 1).

$$Pr\left[Srj_p = 0\right] = Pr\left[Srj_p^* \leq 0\right] = Pr[x'\beta + \varepsilon \leq 0] = \Phi\left(-\frac{x'\beta}{\sigma}\right) \quad (1.6)$$

Similarly:

$$Pr\left[Srj_p = 1\right] = \Phi(-(1 - x'\beta)/\sigma) \quad (1.7)$$

Where $\Phi(.)$ is the standard normal cumulative distribution function.

In addition, we have the distribution of Srj_p given that it is bounded between zero and one; this is a truncated normal distribution with expectation:

$$E\left(\, Srj_p |\, 0 < Srj_p^* < 1\right) = x'\beta + \sigma \frac{\phi\left(\frac{L - x'\beta}{\sigma}\right) - \phi\left(\frac{U - x'\beta}{\sigma}\right)}{\Phi\left(\frac{U - x'\beta}{\sigma}\right) - \Phi\left(\frac{L - x'\beta}{\sigma}\right)} \quad (1.8)$$

Where $\phi(.)$ is the density function.

Estimation of the Tobit model is usually done through maximum likelihood. The log-likelihood function for a random draw *p* can be written as:

$$\begin{aligned} \log f\left(Srj_p | x_p; \theta\right) &= 1\left[Srj_p = 0\right] \\ &= \log\left[\Phi\left(-x'_p\beta/\sigma\right)\right] + 1\left[Srj_p = 1\right] \log\left[\Phi\left(-\left(1 - x'_p\beta\right)/\sigma\right)\right] \\ &+ 1\left[0 \leq Srj_p \leq 1\right] \log(1/\sigma)\ \phi\left(\frac{\left(Srj_p - x'_p\beta\right)}{\sigma}\right) \quad (1.9) \end{aligned}$$

where *f (.)* is a generic notation for a density function. Thus, applying the appropriate expressions for the normal distribution, we get maximizing with respect to β and σ^2 yields the maximum likelihood estimates (Cameron and Trivedi, 2005; Verbeek, 2008; Wooldridge, 2010b).

According to Wooldridge (2010b, pp.748-753), it is reasonable to apply the two-limit Tobit to model fractional responses if there is a pile up both at zero and one (which is the case in my study).[24] Yet, the Tobit model is based on strict assumptions, as normality and homoscedasticity of the dependent variable, prior to censoring (Calabrese, 2012). Thus, as a sensitivity check I apply a different approach to model the proportion of rejection, bounded between zero and one: the quasi-maximum likelihood estimation method (hereafter QMLE) proposed by Papke and

[24] By contrast, fractional responses that have continuous distributions in (0, 1) cannot follow at two-limit Tobit, nor can responses that have a mass point at zero or one but not both. Besides, the two-limit Tobit imposes a parametric model on the density for $D(y_i|x_i)$; therefore, if the primary interest is the effect on the conditional mean, the two-limit Tobit could make inconsistent estimate of $E(y_i|x_i)$, even if it logically applies

Wooldridge (1996). They suggest a direct model for the conditional mean of the fractional response that allows keeping the predicted values in the bounded (0, 1) interval, using QMLE to obtain robust estimators.[25]

Formally, a generalized linear model is used to analyse the determinants x of the conditional mean μ of the fractional response variable. This model adopts a strictly monotonic and twice differentiable link function g(.) that plots the interval (0, 1) onto the real line, hence g(μ) = x' β. Moreover, G(.) represents the inverse of the link function that satisfying 0 < G(z) < 1 for all $z \in \mathbb{R}$; in this work a Logit function is used (i.e. $G(x'\beta) = \frac{1}{1+\exp -(x\prime\beta)}$).[26]

The estimation procedure of the fractional response model of Papke and Wooldridge (1996) is a quasi-likelihood method that involves the maximization of the Bernoulli log-likelihood function (Gourieroux et al., 1984; McCullagh and Nelder, 1989):

$$l_p(\beta) = Srj_p \log\left[G\left(x_p'\beta\right)\right] + \left(1 - Srj_p\right) log\left[1 - G\left(x_p'\beta\right)\right] \quad (1.10)$$

This equation belongs to the linear exponential family, hence, the Bernoulli quasi-maximum likelihood estimator $\hat{\beta}$[27] is consistent and $\sqrt{n}$ is asymptotically normal regardless of the distribution of Srj_p conditional on x_p , given that $E\left(Srj_p \middle| x_p\right) = G(x'\beta)$.[28]

1.7.3 Estimation Results

This section focuses on the econometric results of the packet-level regressions. Table A1.1 in Appendix 1 reports summary statistics of the four different dependent variables and the set of covariates. The results of the estimated models are reported by Tables 1.3-1.8. In each of those tables, the benchmark results are in columns (1) and (2) with robust standard error and clustering, respectively; in columns (3) and (4) monthly fixed effects have been added. Before describing the results, it is necessary to underline that the outcomes presented in Tables 1.3 and 1.5 to 1.8 show

[25] See, also, Wagner (2001) for a comparison between four different estimation methods: OLS, Tobit, Beta and QMLE.
[26] Commonly, other three functions are used: Probit, log-log, complementary log-log (Calabrese, 2012).
[27] This is the result of the maximization problem: $\max_{\beta} \sum_{p=1}^{n} l_p(\beta)$.
[28] See Papke and Wooldridge (1996) for detailed explanation of the estimation methodology.

the marginal effects.[29] Results in Table 1.4 about Model 2 (Ordered Logit regression) shows the coefficients.[30]

Looking at columns (1-4) in Table 1.3, there is evidence that doubling the number of bills submitted in a given day diminishes the probability of rejection by almost 0.104 (Columns 1-2). However, these effects are not statistically significant when time effects are accounted for (Columns 3-4). Instead, a 10% increment in the monetary value of the packet submitted seems to significantly reduce the probability of rejection of about 0.008 (columns 1-2), and 0.007 (columns 3-4). By contrast, the more bills in the packets, the higher the probability of rejection (about 0.02 for a 10% increase), with significance level at 1% in all cases.

What is more, the discounter identity seems to matter in the decision of the Bank: being a bill broker and a banker seems to decrease the probability of rejection, these results being statistically significant at 1% when monthly fixed effects are added (columns 3-4). Also, discounters with drawing accounts, acceptor book, and rating book entries have less probability to see a packet rejected, in particular having a DO account is associated to a drop in the probability of about 0.4. By contrast, the probability to reject the packet upsurges of about 0.04 for TOP. Observing the monthly dummies' coefficients in columns 3 and 4, credit rationing seems increasing over time, as the estimated probability of rejection upsurges from 0.13 in August to about 0.5 in November and December (compared to the baseline month July).

Turning to the Ordered Logit regression estimated coefficients in Table 1.4, we can see that the direction of the effects is similar to the logistic regression. To evaluate the covariates' effect on different levels of rejection, I examine the marginal effects for each possible value of the dependent variable, defined as a 3-point scale (Tables A1.3 to A1.6 in the Appendix 1). Consistently, the direction of the effect of each covariate on the probability to have the packet entirely accepted (level zero) and the probability to receive a partial or total rejection (level 1 to 3) is opposite. In details, the value of the packet (VAL_BILL_PKT) is positively associated to the probability of acceptance, by contrast, the effect of a higher number of bills in the packet (NUM_BILL_PKT) seems negative. Being in a certain category of discounter implies a higher probability of full acceptance (except for the dummy TOP), in particular, DO are associated with about 0.3 and 0.4 higher probability of total acceptance (Table A1.3-A1.6 in columns 1).

[29] Logit, Tobit and Ordered Logit estimated coefficients represent the marginal effects of the covariates on the unobservable latent variables aforementioned. To retrieve the impact of the corresponding variables on the probability of the event, average marginal effects have been computed after each Logit estimation. Similarly, for the Tobit models, average marginal effects on the expected value of the observable variable - that is bounded between zero and one - have been computed. Finally, for the sake of conciseness, marginal effects concerning the Ordered Logit model are reported in Appendix 1, while Table 1.4 reports estimated coefficients.

[30] See Tables (A1.3-A1.6) for average marginal effects for each possible value of the dependent variable.

Akin to the Logit model, there is a significant and negative relationship between the majority of the covariates and the probability to obtain a rejection, except for TOP and NUM_BILL_PKT. Also, it should be noticed that the magnitude of the effects tends to decline looking at the increasing level of rejection. It seems that the discounter's identity becomes less relevant at higher levels of rejection.

[TABLE 1.3]

[TABLE 1.4]

Looking at the Tobit regressions (Tables 1.5 and 1.6), analogously to what observed in the Logit Model, the value and the number of bills submitted in a day tends to not affect the rejection rate (NUM_BILL_DAY is significant at 10% only in column 1 of Table 1.5). On the other hand, an increase in the monetary value of the packet seems lessening the rejection rate; the number of bills submitted seems increasing it. These findings are robust and statistically significant at 1% in both models 3 and 4 specifications.

Considering the discounter identity, BROKER, DO, ACCEPTOR, RATING, and TOP are all statistically significant. Also, BANKER is significant (columns 1, 3 and 4 in Table 1.5), although it seems a weaker predictor when the dependent variable is the share of rejected bills (per packet) in terms of value (Table 1.6). In addition, the rejection rate seems rising over time as the monthly dummies' coefficients are positive and increasing in absolute value.

[TABLE 1.5]

[TABLE 1.6]

Fractional regressions results are reported in Tables 1.7 and 1.8. The estimated results show that the number and the total value of the packets submitted in a day do not seem to influence the rejection rate (only in columns 3 and 4 of Table 1.7 the coefficients are significant at 10% level of significance). By contrast, the number and the monetary value of the packet submitted seem to affect in opposite directions the rejection rate, confirming the patterns found in the previous models.

Moving to analyse the discounters' identity, likewise the Tobit regressions, the categories of bill brokers; bankers; discounters with drawing accounts or with acceptor book entries tend to be

negatively associated with the share of rejected bills.[31] Conversely, top discounters are characterized by higher rejection rates. These results are quite consistent with the previous ones, as only the dummy discounter with rating book is no longer statistically significant. Besides, the time effects parameters confirm that credit rationing tended to increase over the period.

[TABLE 1.7]

[TABLE 1.8]

To evaluate the evolution over time of the effects of the explanatory variables, Figure 1.4 and 1.5 show the average marginal effect over months for each variable that is found statistically significant in Model 3.[32] All the effects tend to become higher in absolute value over the period, suggesting change in the Bank policy. In particular, the discounter identity seems registering a higher influence, as the Bank seems becoming less strict with discounters having drawing accounts and acceptor book entries. Analogously, but in the opposite direction, the number of bills in a packet become more relevant in the Bank decision. Hence, the Bank's discrimination seems increasing since the weight of the applicants' identity on the Bank's decision tends to become more important, lending support to my research hypothesis H3.

Before concluding, it is worth acknowledging two potential limitations of the analysis so far performed, both depending on the nature of the data I could access. First, some theoretically relevant explanatory variables are missing in the vector of covariates, as I had no access to information concerning the characteristics of the single bills inside the packet. In fact, it is reasonable that the Bank based its decisions also at bill-level. As a consequence, missing information at bill-level in the model might lead to biased estimates and endogeneity issues. Indeed, it is plausible that the number and the monetary value of the packets submitted are correlated with bill-level information, about the *drawer* and the *acceptor* of the bill of exchange.[33]

To tackle these issues, I try to implement an instrumental variable approach, that is particularly difficult due to the lack of historical data (referring to 1914) that can be deemed as exogenous and

[31] The dummy BANKER is not statistically significant when considering as the dependent variable the share of rejected bills in terms of value (Table 1.8).
[32] For the sake of brevity and since Model 3 and Model 4 show the same pattern, only the plot of the marginal effects based on Model 3 (Tobit and Fractional regressions with dependent variable as share of rejected bills per packet in number) is reported. On the other hand, the trend of the marginal effects over time in the logit model is mainly constant. Since this model does not represent credit rationing adequately, I only focus on the effect over time of the fractional response variable.
[33] In other words, bill level data might contain information that characterized the packet submitted to the BoE, who could extract this information to infer the provenience and the financial situation of the discounters.

are characterized by high variability, since my dataset contains daily information. My idea is to use the births, deaths and marriages numbers reported by *The Times* - daily edition - as instruments.[34]Indeed, events such as marriages, births or funerals are reasonably connected with an increase in the demand for liquidity, but they can be considered uncorrelated with the decision of the Bank to accept or reject a bill.

Table A1.7 in Appendix 1 shows the estimates obtained from an IV Probit regression for Model 1 and an IV Tobit regression for either Model 3 or 4.[35] As the requirements for the validity of the instrumental variables are satisfied,[36] the results mainly confirm those obtained previously: accounting for endogeneity, the discounter identity appears to influence the Bank decision. Indeed, DO, ACCEPTOR and RATING are statistically significant in all the models; BROKER and TOP are significant in both the models 3 and 4. Finally, results on NUM_BILL_PKT and VAL_BILL_PKT, as shown in columns 2 and 3 of Table A1.7, are in line with those illustrated in Tables 1.5 and 1.6.

The other limitation I have to acknowledge might arise as I could only observe institutions or individuals that presented bills to the BoE in the historical period under analysis. Thus, my sample does not include those potential discounters that never addressed the Bank in that period. I acknowledge that such a non-random selection could affect my estimates.[37]

To sum up, in all regressions the number and value of bills submitted in a day do not seem to matter in the Bank's decision to accept or reject bills. However, the value of a single packet seems decreasing the probability of rejection, while the number submitted seems rising it. Furthermore, consistently with Flandreau and Ugolini (2011 and 2013) and Anson et al. (2019), the identity of the discounter seems an important factor in the Bank's decision, as belonging to a specific category, i.e. Bill Broker, Banker, discounter with Do account, acceptor and rating book entries, is associated with a lower probability of rejection. In particular, the most relevant category seems

[34] This data has been hand-collected from the digitalized form of the daily edition of *the Times* from the 1st of July to 31st December 1914 (for more information see https://www.gale.com/intl/c/the-times-digital-archive) and transcribed into excel form. The daily edition of *The Times* shows the births, marriages and deaths notices.

[35] The endogenous variables considered are NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT. The set of instruments used are: the number of marriages, births and deaths reported daily into *The Times*. Since we deal with the endogeneity of several variable, we also use the square of the number of births and deaths, and the interaction between the number of births and deaths to increase the number of overidentifying restrictions.

[36] First, controlling for all exogenous variables in the model, the instrumental variables are correlated to the endogenous regressors. Second, as shown in Table A1.7, the Amemiya-Lee-Newey Test is satisfied.

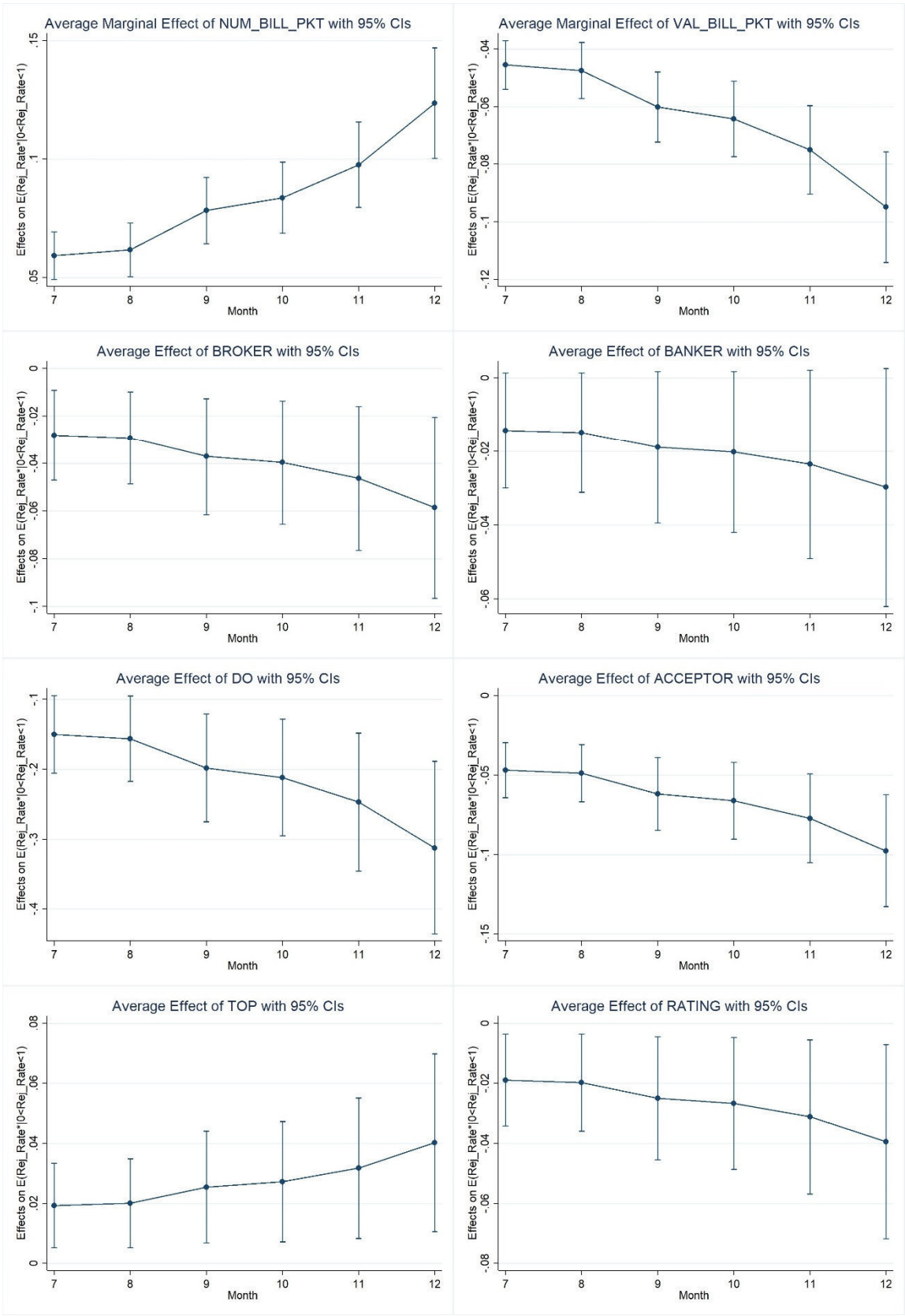
[37] To partially overcome this issue, I tried to estimate a Heckman model, considering the demand of discount as a separate process from that of rejection. Indeed, even though I am not able to observe institutions or individuals that never presented bills for discount, I can consider the probability of demanding discount (for the discounters that addressed the Bank at least once in the period under study), separately from the probability of rejection. Unfortunately, these estimations are omitted as presented severe problems of convergence.

the discounter with a Do account. This evidence may be ascribed to a deeper knowledge and closer relationships between the Bank and this category of applicants. Moreover, from a technical point of view, the Bank could grant credit directly on their accounts. By contrast, being a top discounter seems associated with a higher probability of rejection. This finding could be justified by the fact that, according to Flandreau and Ugolini (2011), during crises, sudden huge requests of liquidity derived from institutions that were not regular customers of the Bank (i.e institutions experiencing liquidity shock). Finally, it is also worth underlining that, as the Ordered Logit marginal effects show, the discounter identities became less relevant for higher levels of rejection.

Besides, observing the monthly dummies' coefficients, there is an indication that from July to December the policy of the bank might have changed, increasing credit rationing. Consistently with this evidence, the graphical analysis about the evolution over time of the effects of the explanatory variables corroborates the idea that the Bank intensified its discretion. Indeed, applicant's identity effects tend to become higher in absolute value over the period. Probably, these findings might be associated with a Bank strategy mainly focused on protecting itself from moral hazard during the crisis distress.

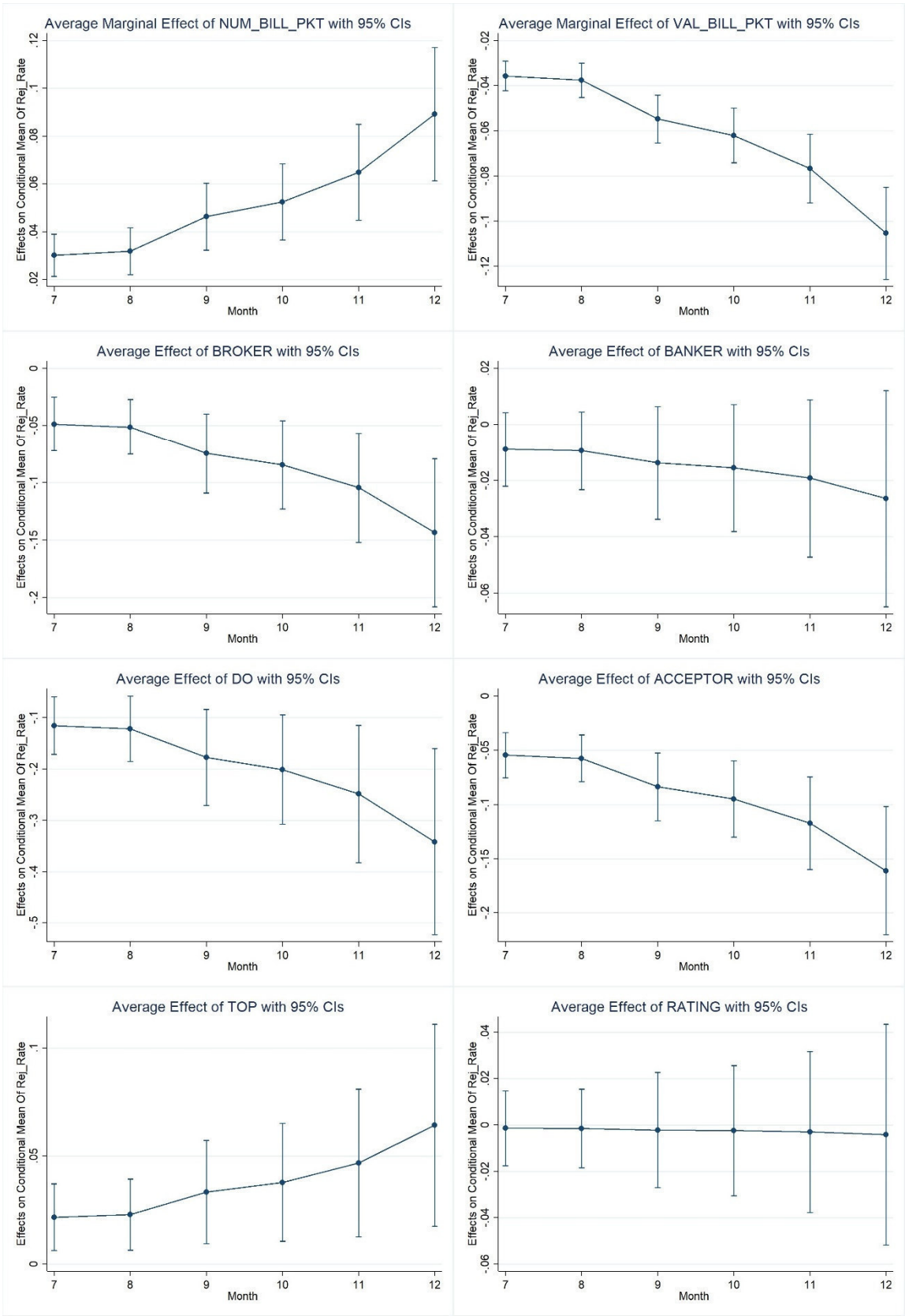
To conclude, it seems that during the 1914 crisis the Bank never followed strictly the Bagehot rules, becoming over time more likely to address the crisis by rationing credit. Indeed, concerning the determinants of the Bank's decision, in line with Flandreau and Ugolini (2011 and 2013) Anson et al. (2019) discounter identity seems to play an increasing role, supporting my research hypothesis H3.

Figure 1.4. Average (marginal) effect of covariates over time. Tobit regression with dependent variable as share of rejected bills per packet (number).



Source: Author's elaboration from dataset.

Figure 1.5. Average (marginal) effect of covariates over time. Fractional regression with dependent variable as share of rejected bills per packet (number).



Source: Author's elaboration from dataset.

1.7.4 Robustness checks: Panel analysis

In order to account for the applicants' heterogeneity, the analysis has been enriched by adopting panel data methods, using the day as the time dimension, and the discounters as units.[38] When the dependent variable is binary, the *Random Effect Logit Estimator* is adopted (Model 5), whilst the *Random Effect Ordered Logit Estimator* (Model 6) is run when the dependent variable is ordered. Finally, when considering proportional dependent variables, a *Random Effect Tobit Estimator* (Models 7 and 8) is used.[39]

Since the present study is particularly interested in assessing the relevance of time-invariant characteristics of the discounters, I adopt Random effects rather than Fixed effects estimators, as the latter ones would eliminate the mentioned key variables. A caveat is in order here: the individual-specific unobservable effects could be correlated with the explanatory variables. As a result, the random effects estimates could be inconsistent since the coefficients would pick up some effects of the unobservable individual effect. To address this issue, I also employ the *Mundlak correction,* adding to the explanatory variables the mean of the time-varying regressors (Wooldridge, 2010a).[40] Testing the jointly significance of these means (Mundlak terms) allows verifying whether the key Random Effect assumption is satisfied.[41]

1.7.4.1 Results

Table 1.9 summarizes Model 5 to 8 results.[42] Once again, the amount and the monetary value of the packets submitted in a day do not predict the probability of rejection (columns 1 and 2). Only in model 7 the monetary value submitted in a day is positive and statistically significant at 10%

[38] The packets submitted in a day by the same discounter have been summed. See Table A1.2 in Appendix 1 for summary statistics.

[39] To deal with the proportional nature of the dependent variable in panel data, Papke and Wooldridge (2008) define a nonlinear panel data model for fractional response variables. Alternatively, to a pooled QMLE (Hausman and Leonard, 1997; Wagner, 2003), they propose a generalized estimation equation (GEE) approach combined with the Mundlack-Chamberlain model to produce consistent estimator and account for unobserved heterogeneity that is possibly correlated with the explanatory variables in balanced panel. Econometricians are still working to define a solution to deal with fractional response variable in unbalanced panel (Wooldridge, 2010a).

[40] Mundlak (1978) models the dependence between the individual-specific unobservable effects ($\varepsilon_{i)}$ and the other explanatory variables by assuming that ε_i is linear function of the means of all the time-varying covariates: $\varepsilon_i = a_0 + a_1 + \alpha_i$, where a_1 is the mean of time varying-covariates, and α_i is normally distributed and independent of the explanatory variables and of the regression error term for each *i* and *t.*

[41] As it can be seen from Table A1.8 in the Appendix 1, the Mundlak terms are never jointly significant (except in the Logit regression's case, at 10% level). This result does not support the presence of correlation between the individual-specific unobservable effects and the explanatory variables.

[42] For the sake of brevity and because the aim of this section is to verify the robustness of the pooled estimations results, Table 1.9 shows the estimated coefficients, omitting marginal effects. In addition, since the Mundlak terms are not jointly significant, I do not report the estimates obtained with Mundlak correction, even though the latter ones are consistent with those reported.

level (column 3). Furthermore, in line with the cross-sectional analysis, an increasing of bills submitted in the packet positively affects the rejection rate in all models; by contrast, the monetary value influences negatively the rejection rate (yet, the coefficients are not statistically significant in model 5 and 6).

The parameter of DO is negative and statically significant at 1% effect in all the models. Similarly, the dummy bill broker is significant at 5% in Model 5 and 6 and at 10% in Model 7 and 8. What is more, discounters in rating book entries appear characterized by a lower probability of rejection (columns 1 and 2, significant at 10%) and a lower rejection rate (column 3 - Tobit model with dependent variable the share - of the number - of rejected bills). Lastly, consistently with the previous section, being a top discounter seems to positively influence the rejection rate in both Tobit specifications (at 10% level of significance).

To summarize, these findings tend to confirm the evidence obtained employing pooled data, as four applicant's categories over six tend to be relevant in the Bank decision. As expected, employing panel data (i.e. accounting for time-invariant individual unobserved characteristics) tends to weaken the significance of the time-invariant dummies related to the applicant identity.

[TABLE 1.9]

1.8. CONCLUSION

Historically, financial crises were addressed by Central Banks through credit restrictions rather than free lending operations. Explaining the drivers of past supply restrictions might help to elucidate the conceptual framework behind the Central Banks' policy, trying to understand why some choices ended up in catastrophic crises. In other words, this may support the design of prevention policies able to promptly react to economic crises of different nature and severity, without considering austerity and liquidity restrictions as the primary response and, hence, avoiding to fall into the same traps of the past.

This chapter analyses the response of the BoE to the most severe crisis that hit London until September 2008, namely the 1914 financial crisis. The latter dramatically spread across 50 countries around the World – affecting banks and generating stock market slumps – but it has not been much investigated in the literature as ensuing diplomatic and military conflicts have obscured it.

In doing so, this work makes present a historical event, on which very little is known, by employing econometric methodologies. Specifically, we attempt to evaluate whether the Bank

operated as LLR following the Bagehot rules or there were elements that signal credit rationing, shedding light on the academic debate about the role played by the discounters' identity.

Following the test proposed by Bignon et al. (2012) - if a CB behaves as a LLR its interest rate should always be above or equal to the market rate - my findings show evidence that during 1914 the Bank interest rate was over the market rate except at the culmination of the crisis. To deepen the analysis, an econometric examination has been carried out using different dependent variables in order to measure credit rationing.

The results of this analysis show that the discounter's identity plays a role in the Bank's decision to supply credit. Specifically, being a discounter with drawing accounts, or one with acceptor book entries, or with rating book entries or being a bill broker seems to reduce remarkably the probability to receive a rejection. Besides, observing the monthly dummies' coefficients, there is an indication that from July to December the policy of the Bank might have changed, increasing credit rationing. Consistently with this evidence, applicant's identity effects tend to become higher in absolute value over the period.

To summarize, according to my evidence, during the crisis of summer 1914 the BoE did not follow strictly the Bagehot rules. As regards the drivers of supply restrictions, my findings seem in line with those of Flandreau and Ugolini (2011 and 2013) and Anson et al. (2019): the discounters' identity tends to matter and the Bank decision cannot be associated with *pure* credit rationing.

In conclusion, a caveat is in order which might suggest directions for future research. The investigation is carried out at packet-level – potentially omitting some predictors – but a challenge would be to expand the analysis by retrieving information concerning the single bills inside the packet since the Bank could have based its decisions also on bill-level characteristics.

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TABLE 1.1 - Packet submitted to the Bank of England discount office. Period July – December 1914

	Total Packets submitted	Total Packets accepted	Total Packets partially rejected	Total Packets totally rejected
July				
Number	249	236	12	1
Percentage		94.78%	4.82%	0.40%
August				
Number	1136	839	260	37
Percentage		73.86%	22.89%	3.26%
September				
Number	762	318	400	44
Percentage		41.73%	52.49%	5.77%
October				
Number	733	329	365	39
Percentage		44.88%	49.80%	5.32%
November				
Number	268	130	121	17
Percentage		48.51%	45.15%	6.34%
December				
Number	62	28	21	13
Percentage		45.16%	33.87%	20.97%
Total				
Number	3210	1880	1179	151
Percentage		58.57%	36.73%	4.70%

Sources: Author's elaborations, BoE Archive.

TABLE 1.2 - Number and value of bills during July-December 1914

	Total bills submitted	Bills discounted	Bills rejected	Value bills accepted (thousand £)	Value bills rejected (thousand £)
July					
Number	6667	6632	35	1.21E+04	40.523
Percentage		99.48%	0.53%		0.34%
August					
Number	64174	61978	2196	8.12E+04	1,993.439
Percentage		96.58%	3.42%		2.46%
September					
Number	26334	21682	4652	3.08E+04	2,720.374
Percentage		82.34%	17.67%		8.83%
October					
Number	16735	14127	2608	1.98E+04	1,565.539
Percentage		84.42%	15.58%		7.91%
November					
Number	3460	2767	693	4.32E+03	340.812
Percentage		79.97%	20.03%		7.89%
December					
Number	434	273	161	2.66E+02	55.826
Percentage		62.90%	37.10%		21.00%
Total					
Number	117804	107459	10345	1.48E+05	6,716.513
Percentage		91.22%	8.78%		4.52%

Sources: Author's elaborations, BoE Archive.

TABLE 1.3 - Logit regressions (Packet Level). Marginal effects on the probability of rejection

	1	*2*	*3*	*4*
NUM_BILL_DAY	-0.104***	-0.104*	0.024	0.024
	(0.031)	*(0.054)*	*(0.030)*	*(0.043)*
VAL_BILL_DAY	0.024	0.024	-0.025	-0.025
	(0.030)	*(0.053)*	*(0.027)*	*(0.038)*
NUM_BILL_PKT	0.200***	0.200***	0.200***	0.200***
	(0.012)	*(0.019)*	*(0.011)*	*(0.017)*
VAL_BILL_PKT	-0.081***	-0.081***	-0.071***	-0.071***
	(0.010)	*(0.015)*	*(0.010)*	*(0.012)*
BROKER	-0.070***	-0.070**	-0.075***	-0.075***
	(0.026)	*(0.031)*	*(0.024)*	*(0.028)*
BANKER	-0.033*	-0.033	-0.049***	-0.049***
	(0.020)	*(0.020)*	*(0.019)*	*(0.019)*
DO	-0.383***	-0.383***	-0.325***	-0.325***
	(0.070)	*(0.074)*	*(0.063)*	*(0.068)*
ACCEPTOR	-0.089***	-0.089***	-0.074***	-0.074***
	(0.023)	*(0.025)*	*(0.022)*	*(0.025)*
RATING	-0.083***	-0.083***	-0.064***	-0.064***
	(0.021)	*(0.023)*	*(0.021)*	*(0.021)*
TOP	0.045**	0.045**	0.046**	0.046**
	(0.019)	*(0.020)*	*(0.019)*	*(0.020)*
AUGUST			0.132***	0.132***
			(0.029)	*(0.034)*
SEPTEMBER			0.470***	0.470***
			(0.029)	*(0.030)*
OCTOBER			0.485***	0.485***
			(0.030)	*(0.026)*
NOVEMBER			0.510***	0.510***
			(0.043)	*(0.050)*
DECEMBER			0.499***	0.499***
			(0.498)	*(0.561)*
Observations	3,087	3,087	3,087	3,087
PseudoR-2	0.143	0.143	0.22	0.22
SE	*robust*	*clustering*	*robust*	*clustering*

For the description of variables see Table A1.1. Dependent variable: probability of (partial) rejection; (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms.

TABLE 1.4 - Ordered Logit regression (Packet level). Estimated coefficients

	1	*2*	*3*	*4*
NUM_BILL_DAY	-0.403***	-0.403*	0.106	0.106
	(0.148)	*(0.231)*	*(0.098)*	*(0.128)*
VAL_BILL_DAY	0.053	0.053	-0.092	-0.092
	(0.141)	*(0.227)*	*(0.089)*	*(0.119)*
NUM_BILL_PKT	0.958***	0.958***	0.493***	0.493***
	(0.070)	*(0.108)*	*(0.043)*	*(0.062)*
VAL_BILL_PKT	-0.533***	-0.533***	-0.275***	-0.275***
	(0.057)	*(0.088)*	*(0.033)*	*(0.046)*
BROKER	-0.268**	-0.268*	-0.199***	-0.199**
	(0.117)	*(0.151)*	*(0.071)*	*(0.091)*
BANKER	-0.161*	-0.161	-0.133**	-0.133**
	(0.093)	*(0.102)*	*(0.056)*	*(0.061)*
DO	-2.029***	-2.029***	-0.901***	-0.901***
	(0.373)	*(0.406)*	*(0.213)*	*(0.226)*
ACCEPTOR	-0.464***	-0.464***	-0.267***	-0.267***
	(0.105)	*(0.118)*	*(0.066)*	*(0.073)*
RATING	-0.343***	-0.343***	-0.151**	-0.151**
	(0.096)	*(0.104)*	*(0.060)*	*(0.059)*
TOP	0.190**	0.190**	0.107**	0.107*
	(0.086)	*(0.089)*	*(0.054)*	*(0.057)*
AUGUST			0.633***	0.633***
			(0.163)	*(0.141)*
SEPTEMBER			1.439***	1.439***
			(0.156)	*(0.126)*
OCTOBER			1.465***	1.465***
			(0.158)	*(0.124)*
NOVEMBER			1.545***	1.545***
			(0.180)	*(0.168)*
DECEMBER			1.694***	1.694***
			(0.264)	*(0.273)*
Observations	3,087	3,087	3,087	3,087
PseudoR-2	0.0986	0.0986	0.126	0.126
SE	*robust*	*clustering*	*robust*	*clustering*

For the description of variables see Table A1.1. Dependent variable: degree of rejection defined on a 3-point scale; (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms.

TABLE 1.5 - Tobit Regression (Packet level). Marginal effects on the share of rejected bills (number)

	1	*2*	*3*	*4*
NUM_BILL_DAY	-0.027*	-0.027	0.021	0.021
	(0.016)	*(0.022)*	*(0.017)*	*(0.021)*
VAL_BILL_DAY	-0.001	-0.001	-0.017	-0.017
	(0.015)	*(0.021)*	*(0.016)*	*(0.020)*
NUM_BILL_PKT	0.075***	0.075***	0.075***	0.075***
	(0.007)	*(0.010)*	*(0.007)*	*(0.009)*
VAL_BILL_PKT	-0.058***	-0.058***	-0.055***	-0.055***
	(0.006)	*(0.008)*	*(0.006)*	*(0.007)*
BROKER	-0.036***	-0.036**	-0.038***	-0.038**
	(0.012)	*(0.015)*	*(0.012)*	*(0.015)*
BANKER	-0.018*	-0.018	-0.023**	-0.023**
	(0.010)	*(0.011)*	*(0.010)*	*(0.011)*
DO	-0.190***	-0.190***	-0.162***	-0.162***
	(0.038)	*(0.040)*	*(0.037)*	*(0.039)*
ACCEPTOR	-0.059***	-0.059***	-0.053***	-0.053***
	(0.011)	*(0.012)*	*(0.011)*	*(0.012)*
RATING	-0.024**	-0.024**	-0.019*	-0.019**
	(0.010)	*(0.011)*	*(0.010)*	*(0.010)*
TOP	0.024***	0.024**	0.022**	0.022**
	(0.009)	*(0.010)*	*(0.009)*	*(0.010)*
AUGUST			0.045***	0.045***
			(0.010)	*(0.011)*
SEPTEMBER			0.170***	0.170***
			(0.011)	*(0.010)*
OCTOBER			0.175***	0.175***
			(0.012)	*(0.011)*
NOVEMBER			0.192***	0.192***
			(0.023)	*(0.023)*
DECEMBER			0.248***	0.248***
			(0.058)	*(0.062)*
Observations	3,087	3,087	3,087	3,087
PseudoR-2	0.126	0.126	0.174	0.174
SE	*robust*	*clustering*	*robust*	*clustering*

For the description of variables see Table A1.1. Dependent variable: share of rejected bills per packet (number); (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms.

TABLE 1.6 - Tobit Regression (Packet level). Marginal effects on the share of rejected bills (monetary value)

	1	*2*	*3*	*4*
NUM_BILL_DAY	-0.018	-0.018	0.025	0.025
	(0.015)	*(0.021)*	*(0.017)*	*(0.019)*
VAL_BILL_DAY	-0.006	-0.006	-0.021	-0.021
	(0.014)	*(0.020)*	*(0.015)*	*(0.018)*
NUM_BILL_PKT	0.072***	0.072***	0.072***	0.072***
	(0.007)	*(0.009)*	*(0.006)*	*(0.008)*
VAL_BILL_PKT	-0.057***	-0.057***	-0.055***	-0.055***
	(0.006)	*(0.008)*	*(0.006)*	*(0.007)*
BROKER	-0.030***	-0.030**	-0.031***	-0.031**
	(0.011)	*(0.015)*	*(0.011)*	*(0.015)*
BANKER	-0.012	-0.012	-0.017*	-0.017*
	(0.010)	*(0.010)*	*(0.009)*	*(0.010)*
DO	-0.177***	-0.177***	-0.153***	-0.153***
	(0.035)	*(0.039)*	*(0.034)*	*(0.038)*
ACCEPTOR	-0.050***	-0.050***	-0.044***	-0.044***
	(0.011)	*(0.012)*	*(0.011)*	*(0.012)*
RATING	-0.021**	-0.021**	-0.016*	-0.016*
	(0.010)	*(0.010)*	*(0.010)*	*(0.009)*
TOP	0.021**	0.021**	0.019**	0.019**
	(0.009)	*(0.010)*	*(0.009)*	*(0.010)*
AUGUST			0.043***	0.043***
			(0.010)	*(0.010)*
SEPTEMBER			0.158***	0.158***
			(0.011)	*(0.011)*
OCTOBER			0.159***	0.159***
			(0.012)	*(0.011)*
NOVEMBER			0.170***	0.170***
			(0.022)	*(0.023)*
DECEMBER			0.219***	0.219***
			(0.056)	*(0.065)*
Observations	3,087	3,087	3,087	3,087
PseudoR-2	0.121	0.121	0.166	0.166
SE	*robust*	*clustering*	*robust*	*clustering*

For the description of variables see Table A1.1. Dependent variable: share of rejected bills per packet (value); (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms.

TABLE 1.7 - Fractional Regression (Packet level). Marginal effects on the share of rejected bills (number)

	1	*2*	*3*	*4*
NUM_BILL_DAY	-0.015	-0.015	0.026	0.026
	(0.015)	*(0.016)*	*(0.018)*	*(0.018)*
VAL_BILL_DAY	-0.004	-0.004	-0.022	-0.022
	(0.014)	*(0.015)*	*(0.016)*	*(0.017)*
NUM_BILL_PKT	0.044***	0.044***	0.047***	0.047***
	(0.007)	*(0.010)*	*(0.007)*	*(0.009)*
VAL_BILL_PKT	-0.052***	-0.052***	-0.052***	-0.052***
	(0.005)	*(0.007)*	*(0.005)*	*(0.006)*
BROKER	-0.071***	-0.071***	-0.071***	-0.071***
	(0.017)	*(0.021)*	*(0.017)*	*(0.022)*
BANKER	-0.013	-0.013	-0.019**	-0.019*
	(0.010)	*(0.011)*	*(0.009)*	*(0.011)*
DO	-0.170***	-0.170***	-0.138***	-0.138***
	(0.045)	*(0.047)*	*(0.043)*	*(0.044)*
ACCEPTOR	-0.080***	-0.080***	-0.074***	-0.074***
	(0.015)	*(0.016)*	*(0.015)*	*(0.017)*
RATING	-0.002	-0.002	0.002	0.002
	(0.012)	*(0.013)*	*(0.012)*	*(0.013)*
TOP	0.032***	0.032**	0.026**	0.026**
	(0.012)	*(0.013)*	*(0.012)*	*(0.013)*
AUGUST			0.047***	0.047***
			(0.014)	*(0.013)*
SEPTEMBER			0.154***	0.154***
			(0.013)	*(0.012)*
OCTOBER			0.157***	0.157***
			(0.013)	*(0.012)*
NOVEMBER			0.174***	0.174***
			(0.023)	*(0.020)*
DECEMBER			0.202***	0.202***
			(0.049)	*(0.049)*
Observations	3,087	3,087	3,087	3,087
PseudoR-2	0.13	0.13	0.135	0.135
SE	robust	clustering	robust	clustering

For the description of variables see Table A1.1. Dependent variable: share of rejected bills per packet (number); (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms.

TABLE 1.8 - Fractional Regression (Packet level). Marginal effects on the share of rejected bills (monetary value)

	1	*2*	*3*	*4*
NUM_BILL_DAY	0.001	0.001	0.036*	0.036**
	(0.015)	*(0.015)*	*(0.019)*	*(0.018)*
VAL_BILL_DAY	-0.014	-0.014	-0.031*	-0.031*
	(0.014)	*(0.014)*	*(0.016)*	*(0.016)*
NUM_BILL_PKT	0.040***	0.040***	0.042***	0.042***
	(0.007)	*(0.009)*	*(0.007)*	*(0.008)*
VAL_BILL_PKT	-0.052***	-0.052***	-0.052***	-0.052***
	(0.005)	*(0.007)*	*(0.005)*	*(0.006)*
BROKER	-0.061***	-0.061***	-0.061***	-0.061***
	(0.017)	*(0.022)*	*(0.017)*	*(0.022)*
BANKER	-0.004	-0.004	-0.01	-0.01
	(0.010)	*(0.011)*	*(0.009)*	*(0.010)*
DO	-0.154***	-0.154***	-0.128***	-0.128***
	(0.043)	*(0.048)*	*(0.042)*	*(0.046)*
ACCEPTOR	-0.062***	-0.062***	-0.058***	-0.058***
	(0.015)	*(0.016)*	*(0.015)*	*(0.017)*
RATING	0.002	0.002	0.006	0.006
	(0.012)	*(0.013)*	*(0.012)*	*(0.013)*
TOP	0.027**	0.027**	0.022*	0.022*
	(0.012)	*(0.013)*	*(0.012)*	*(0.013)*
AUGUST			0.044***	0.044***
			(0.014)	*(0.013)*
SEPTEMBER			0.136***	0.136***
			(0.014)	*(0.012)*
OCTOBER			0.133***	0.133***
			(0.013)	*(0.012)*
NOVEMBER			0.141***	0.141***
			(0.022)	*(0.021)*
DECEMBER			0.162***	0.162***
			(0.047)	*(0.053)*
Observations	3,087	3,087	3,087	3,087
PseudoR-2	0.132	0.132	0.136	0.136
SE	robust	clustering	robust	clustering

For the description of variables see Table A1.1.Dependent variable: share of rejected bills per packet (value); (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms.

TABLE 1.9 - Panel regressions. Estimated coefficients

	1	*2*	*3*	*4*
	Model 5 RE Logit	***Model 6 RE Ord. Logit***	***Model 7 RE Tobit***	***Model 8 RE Tobit***
NUM_BILL_DAY	-0.123	-0.139	-0.029	-0.012
	(0.241)	*(0.214)*	*(0.042)*	*(0.042)*
VAL_BILL_DAY	0.31	0.307	0.063*	0.043
	(0.215)	*(0.190)*	*(0.038)*	*(0.037)*
NUM_BILL_PKT	0.749***	0.542***	0.051***	0.061***
	(0.069)	*(0.059)*	*(0.012)*	*(0.011)*
VAL_BILL_PKT	0.035	-0.041	-0.022***	-0.030***
	(0.046)	*(0.042)*	*(0.008)*	*(0.008)*
BROKER	-0.590**	-0.462**	-0.101*	-0.097*
	(0.274)	*(0.236)*	*(0.056)*	*(0.053)*
BANKER	0.033	0.057	0.029	0.035
	(0.219)	*(0.190)*	*(0.043)*	*(0.041)*
DO	-1.405***	-1.400***	-0.284***	-0.268***
	(0.433)	*(0.389)*	*(0.078)*	*(0.076)*
ACCEPTOR	-0.23	-0.191	-0.047	-0.044
	(0.243)	*(0.211)*	*(0.048)*	*(0.046)*
RATING	-0.406*	-0.365*	-0.078*	-0.067
	(0.232)	*(0.200)*	*(0.046)*	*(0.043)*
TOP	0.279	0.222	0.064*	0.067*
	(0.193)	*(0.166)*	*(0.038)*	*(0.036)*
Observations	2,149	2,149	2,149	2,149

For the description of variables see Table A1.2. Dependent variable of the models: Model 5 - probability of (partial) rejection, Model 6 - degree of rejection, Model 7 - share of rejected bills per packet (number), Model 8 - share of rejected bills per packet (value); time dummies included but not reported; (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms.

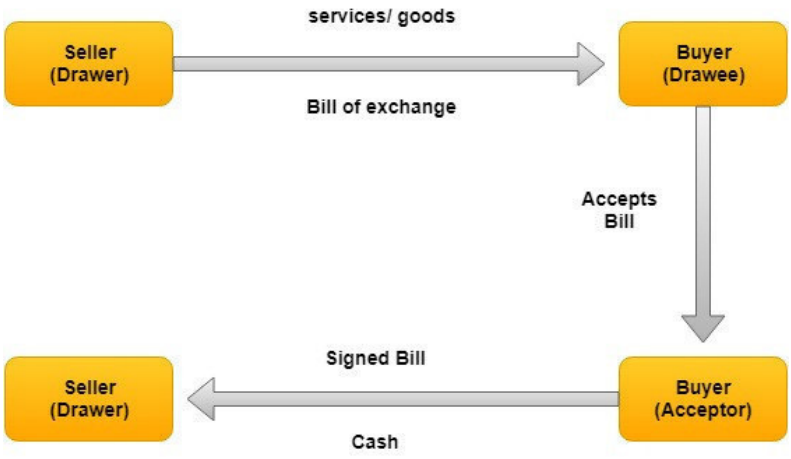
APPENDIX 1

The money market instrument "bill of exchange"

In the 19th and the beginning of the 20th century, the primary money market instrument equivalent to cash was the bill of exchange. It is 'drawn' by one party (a 'drawer') to another (a 'drawee') instructing them to pay either the drawer or a third party (a 'payee'), although it is not necessarily 'drawn on' a bank. Bills of exchange were negotiable instruments, consequently, they could be transferred from one party to another without explicit consensus from the drawee/acceptor, especially being money market instruments with short maturity (Anson et al., 2017)

The Anson et al. (2017) example clarifies how the bills of exchange work. Let us suppose that a merchant needs to buy goods from a firm but is unable to pay cash, then, they could opt to use a bill of exchange in order to finalize the transaction. In this example, the bill acts like an invoice tangibly documenting the trade credit that had been extended in the transaction between the two parties. The seller, in this case the firm (the drawer), would send a bill to the merchant/buyer (the drawee). If the merchant 'accepts' that he owes a debt to the firm, he would sign his name on the bill. After this step, he is referred to as the 'acceptor' of the bill instead of the drawee (Figure A1.1).

Figure A1.1. Trade transaction using bills of exchange.



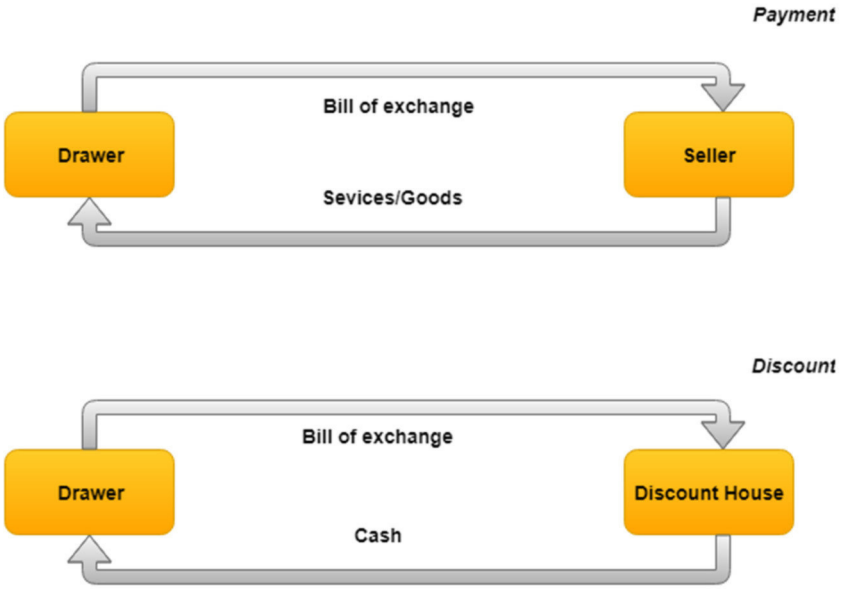
Source: Author's adaptation from Anson et al. (2017).

As Anson et al. (2017) illustrate, the seller could decide to cash the bill before the maturity in two main ways: use the bill of exchange directly as currency when paying for goods and services or sell it to a financial firm (Figure A1.2). In the former case, the new holder of the bill transfers it to another that has to sign his name on the back of the bill as the original acceptor. If the original

acceptor did not pay totally or partially the bill, all endorsers - the original drawer included - were obliged to pay whoever currently held it.

Another way to encash bills before maturity was to sell it to a financial firm. Differently from the previous case, the holders of bills used to sell via bill brokers, which connected holders from around the world and banks. In this situation, the brokers' role was crucial since banks were organized as single institutions, without any branches and, moreover, ensuring this service, they earned income from commissions (Banks, 1999). As the demand for cash equivalent increased over time, bill brokers evolved in discount houses which financed their portfolio of bills with funds borrowed from banks (King, 2013).

Figure A1.2. Methods for trading a bill of exchange before maturity.



Source: Author's adaptation from Anson et al. (2017).

The main tools used by the Bank Discount Office to lend were "discounts" and "advances" operations. "Discounts" means that the Discount Office acquires bills of exchange at discount on their face value. With "advances", the Bank takes in bills or bundles of bills defined "parcels", although the counterparty should repurchase the security from the Bank at a specific date. In other words, advances were collateralized loans by the Bank.[43] Generally, the debt securities used as collateral involved government bonds and railway stocks. The number of securities entitled for advances increased during the decades (Flandreau and Ugolini 2011).

[43] This methodology is analogous to modern day repos, a form of short-term borrowing, based on government securities. The dealer sells the security to investors and, then, buys them back, at a slightly higher price, shortly afterwards, usually the following day.

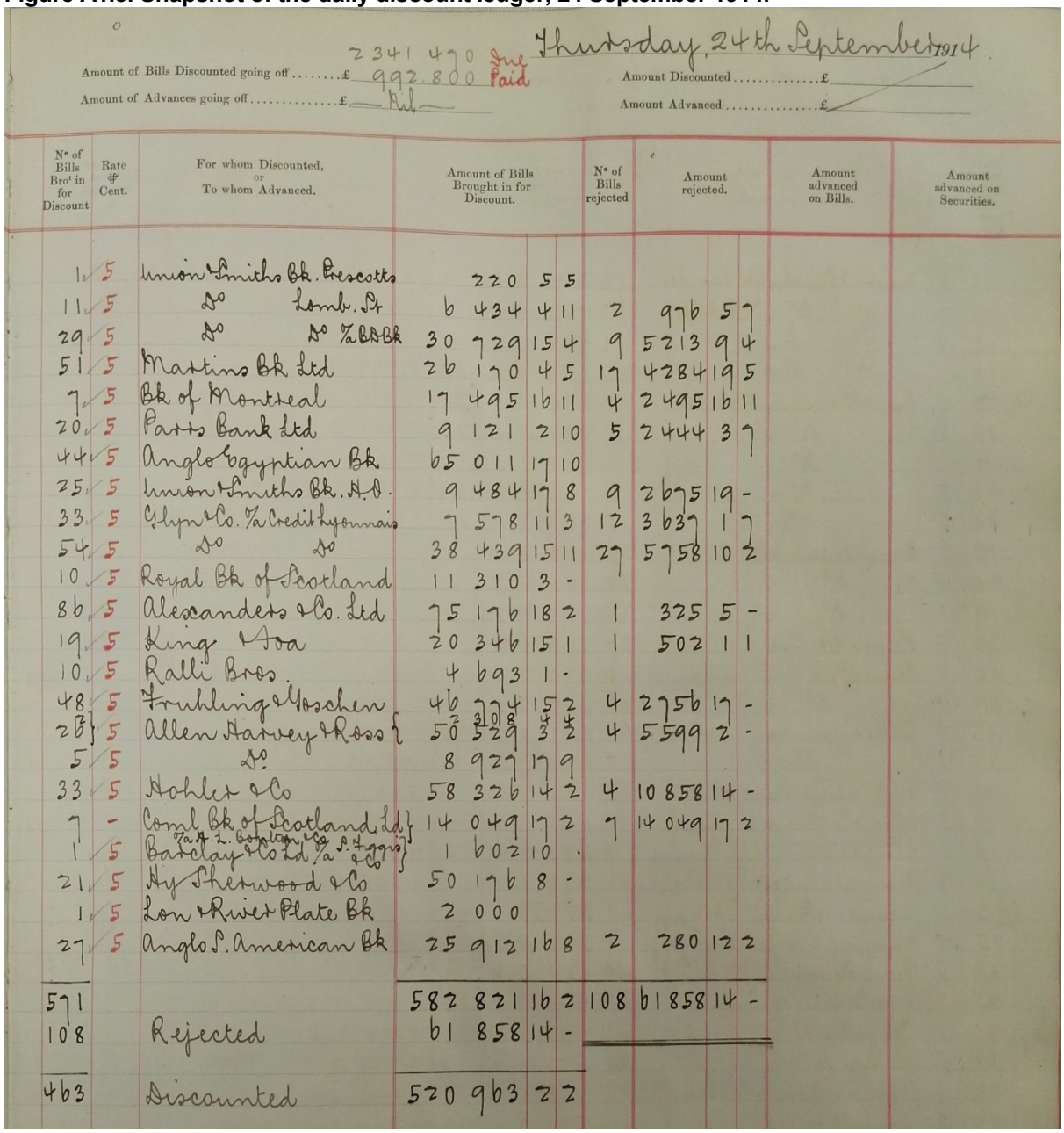
The procedure of bills submission can be briefly summarised by following Anson et al. (2017). The discounters present the bills to the Bank in "packets", that contain many bills from different holders. Then, the Discount Office decides which of the bills in a packet can be accepted, and which has to be rejected.[44] All packets of bill brought in for discount are recorded in daily discount ledgers. As it can be seen from the snapshot in figure A1.3, for each day in a given year, these ledgers contain information about: the number of bills in the submitted packet, the discount rate eventually charged for the accepted bills inside the packet, the name of the discounter who applied for a loan and the loan amount applied for. These daily transactional ledgers also document the number of bills and the relative sterling amount rejected inside each packet. By 1866, the ledgers also included the amount and rate charged on advances.[45] Figure A1.4 shows that the number of packets submitted during the period from July to December 1914 rose at the outbreak of the crisis, lowering back to a pre-crisis level in November.

Since bills are guaranteed by the acceptor's and the discounter's signatures, two entries in other ledgers were created each time a bill was discounted: one in the discounter's account and the other in the acceptor's. Hence, ledgers were used to monitor the position of customers, showing for each entity the amount of credit guaranteed as a discounter or as an acceptor.[46] In the beginning, all Bank's customers were included in the same ledger books, but over time some categories of costumers were placed in special ledgers. For instance, "Bill brokers" had their own, which contained: "bill brokers", "discount houses", "discount brokers", "credit companies" and until 1864 the "bankers", after this time they had an own ledger. Furthermore, applicants that used to be customers regularly and were consequently allowed to have a current account opened at the Bank were included in the Drawing Office discounter ledgers, and they were marked as "DO" (Flandreau and Ugolini, 2011). Besides, the BoE's window was open only to certain categories of applicants such as banks, recognised bill brokers and costumers with an account at the Bank. Hence, for new applicants to become eligible, they needed a recommendation by some authority, and the so-called "rating books" mentions the authority that had provided that, usually a senior merchant or a bank director (Flandreau and Ugolini, 2011). The use of several ledgers seems confirming that the BoE recognized differences among customers.[47] The econometric analysis carried

[44] These bills were recorded in the "Bills Rejected ledger".
[45] Advances have not been used in the econometric analysis because of the lack of a reasonable amount of observations.
[46] In this work, only packet level data, contained in the daily books, have been used.
[47] For instance, a discounter with an account at the Bank could have an advantage over other discounters, firstly because the Bank had more information on the financial situation of the discounter; furthermore, the Bank could just credit the customer's account, instead, of giving credit by using notes.

out in this paper will help to assess whether there is a link between this Bank's scrupulous procedure and its decision to ration credit.

Figure A1.3. Snapshot of the daily discount ledger, 24 September 1914.



Thursday, 24th September 1914.

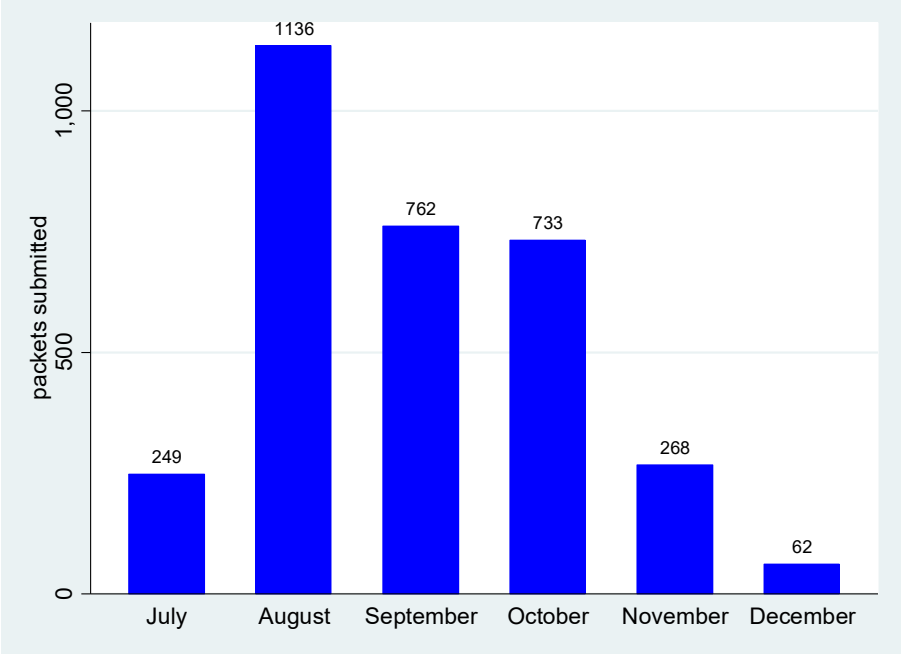
Amount of Bills Discounted going off ..... £ 992.800 Paid 2 341 470 Due — Amount Discounted ..... £

Amount of Advances going off ..... £ Nil — Amount Advanced ..... £

N° of Bills Bro^t in for Discount	Rate ₱ Cent.	For whom Discounted, or To whom Advanced.	Amount of Bills Brought in for Discount.			N° of Bills rejected	Amount rejected.			Amount advanced on Bills.	Amount advanced on Securities.
1	5	Union Smiths Bk. Prescotts	220	5	5						
11	5	Do Lomb. St	6 434	4	11	2	976	5	7		
29	5	Do Do % BBBk	30 729	15	4	9	5213	9	4		
51	5	Martins Bk Ltd	26 170	4	5	17	4284	19	5		
7	5	Bk of Montreal	17 495	16	11	4	2495	16	11		
20	5	Parrs Bank Ltd	9 121	2	10	5	2444	3	7		
44	5	Anglo Egyptian Bk	65 011	17	10						
25	5	Union Smiths Bk. N.O.	9 484	19	8	9	2695	19	-		
33	5	Glyn & Co. % Credit Lyonnais	7 578	11	3	12	3639	1	7		
54	5	Do Do	38 439	15	11	27	5758	10	2		
10	5	Royal Bk of Scotland	11 310	3	-						
86	5	Alexanders & Co. Ltd	75 176	18	2	1	325	5	-		
19	5	King & Foa	20 346	15	1	1	502	1	1		
10	5	Ralli Bros.	4 693	1	-						
48	5	Fruhling & Goschen	46 294	15	2	4	2756	17	-		
26	5	Allen Harvey & Ross	50 529	3	2	4	5599	2	-		
5	5	Do	8 927	17	9						
33	5	Hohler & Co	58 326	14	2	4	10 858	14	-		
7	-	Comml Bk of Scotland Ltd	14 049	17	2	7	14 049	17	2		
1	5	Barclay & Co Ltd % A. T. Bowlby Esq & F. Higgins & Co	1 602	10	.						
21	5	Hy Shetwood & Co	50 176	8	-						
1	5	Lon & River Plate Bk	2 000								
27	5	Anglo S. American Bk	25 912	16	8	2	280	12	2		
591			582 821	16	2	108	61858	14	-		
108		Rejected	61 858	14	-						
463		Discounted	520 963	2	2						

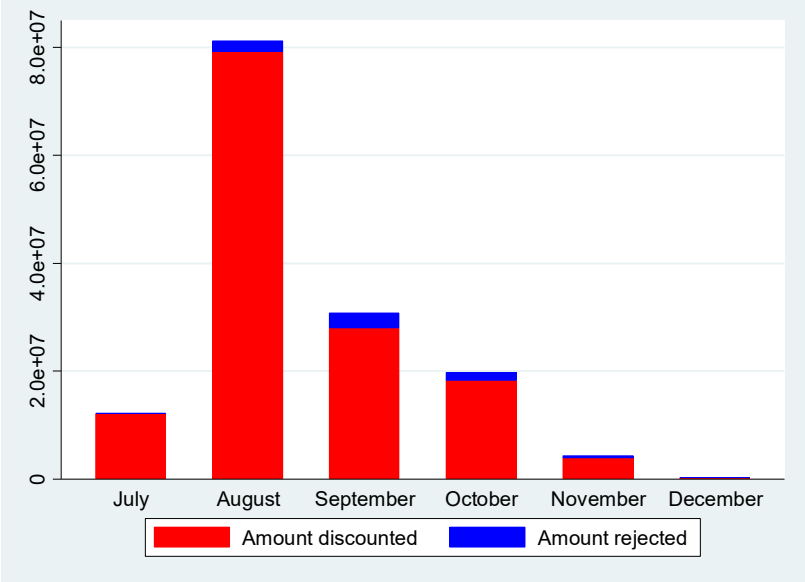
Source: BoE Archive, Cashiers' Department: C28 (74)

Figure A1.4. Number of bills submitted over the period July – December 1914.



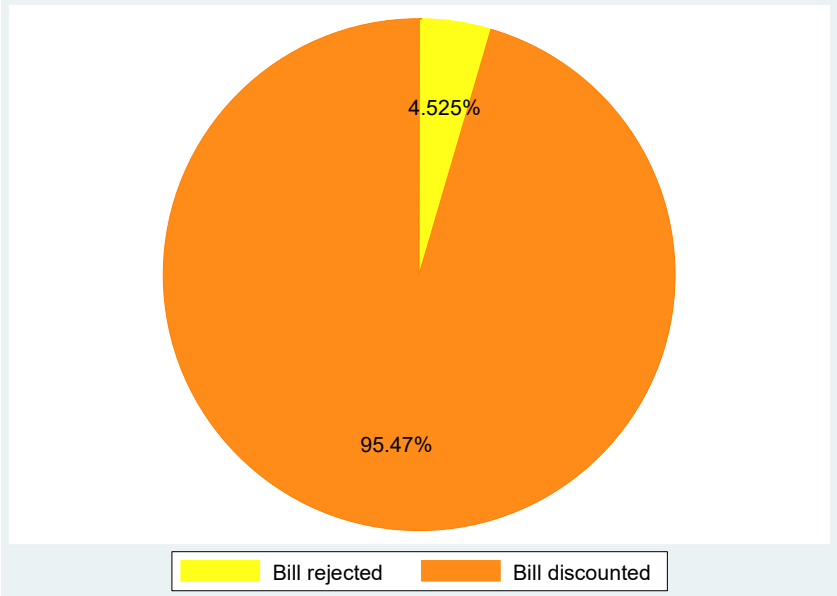
Sources: Author's elaborations, BoE Archive.

Figure A1.5. Monthly totals for bill discounted and rejected, July- December 1914.



Sources: Author's elaborations, BoE Archive.

Figure A1.6. Total value of bills accepted rejected.



Sources: Author's elaborations, BoE Archive.

TABLE A1.1 - Description and summary statistics of the variables used in the estimations

VARIABLE	DESCRIPTION	Mean	StdD	Min	Max	Obs
DUM_REJ	Dummy = 1 if at least one bill of the packet submitted for discount to the Bank was rejected	0.414	0.493	0	1	3,210
SH_REJ_NUM	The share of rejected bills relative to the total number of bills in the packet	0.128	0.257	0	1	3,193
SH_REJ_VAL	The share of the amount of rejected bills relative to the total value of the packet	0.116	0.257	0	1	3,087
DEG_REJ	Level of credit rationing expressed in 3 point-scale	0.551	0.785	0	3	3,210
NUM_BILL_DAY	The total number of bills submitted in a day	7.068	1.363	1	6670	3,210
VAL_BILL_DAY	The total monetary value of bills submitted in a day	14.099	1.445	242	9.55E+06	3,210
NUM_BILL_PKT	The number of bills contained in the packet submitted	2.8047	1.4157	1	1904	3193
VAL_BILL_PKT	The monetary value of the bills contained in the packet submitted	9.6885	1.7507	20	1.85E+06	3087
BROKER	Dummy = 1 if discounter was a bill broker	0.280	0.449	0	1	3,210
BANKER	Dummy = 1 if discounter was a banker	0.421	0.494	0	1	3,210
DO	Dummy = 1 if discounter had an open account at the Bank	0.035	0.183	0	1	3,210
ACCEPTOR	Dummy = 1 if the discounter had an acceptor book entry	0.386	0.487	0	1	3,210
RATING	Dummy = 1 if the discounter had a rating book entry	0.610	0.488	0	1	3,210
TOP	Dummy = 1 if the discounter was a Top discounter	0.439	0.496	0	1	3,210

TABLE A1.2 - Description and summary statistics of the variables used in the estimations (discounter-level regressions)

VARIABLE	DESCRIPTION	Mean	StdD	Min	Max	Obs
DUM_REJ	Dummy = 1 if at least one bill of the packet submitted for discount to the Bank was rejected	0.467	0.499	0	1	2,149
SH_REJ_NUM	The share of rejected bills relative to the total number of bills in the packet	0.120	0.232	0	1	2,149
SH_REJ_VAL	The share of the amount of rejected bills relative to the total value of the packet	0.101	0.226	0	1	2,149
DEG_REJ	Level of credit rationing expressed in 3 point-scale	0.572	0.722	0	3	2,149
NUM_BILL_DAY	The total number of bills submitted in a day	6.813	1.257	34	6001	2,149
VAL_BILL_DAY	The total monetary value of bills submitted in a day	13.822	0.360	17007	7.69E+06	2,149
NUM_BILL_PKT	The number of bills contained in the packet submitted	2.945	1.551	1	353	2,149
VAL_BILL_PKT	The monetary value of the bills contained in the packet submitted	9.697	2.065	23	4.02E+05	2,149
BROKER	Dummy = 1 if discounter was a bill broker	0.263	0.441	0	1	2,149
BANKER	Dummy = 1 if discounter was a banker	0.376	0.485	0	1	2,149
DO	Dummy = 1 if discounter had an open account at the Bank	0.049	0.217	0	1	2,149
ACCEPTOR	Dummy = 1 if the discounter had an acceptor book entry	0.412	0.492	0	1	2,149
RATING	Dummy = 1 if the discounter had a rating book entry	0.451	0.498	0	1	2,149
TOP	Dummy = 1 if the discounter was a Top discounter	0.680	0.466	0	1	2,149

TABLE A1.3 - Average marginal effect of Model 2 (Ordered Logit Regression). Baseline specification

	1	*2*	*3*	*4*
		Level of credit rationing (CR)		
	No CR	Low CR	High CR	All CR
NUM_BILL_DAY	0.082***	-0.052***	-0.013***	-0.017***
	(0.030)	*(0.019)*	*(0.005)*	*(0.006)*
VAL_BILL_DAY	-0.011	0.007	0.002	0.002
	(0.029)	*(0.018)*	*(0.005)*	*(0.006)*
NUM_BILL_PKT	-0.196***	0.123***	0.032***	0.041***
	(0.012)	*(0.008)*	*(0.003)*	*(0.004)*
VAL_BILL_PKT	0.109***	-0.068***	-0.018***	-0.023***
	(0.011)	*(0.007)*	*(0.002)*	*(0.003)*
BROKER	0.055**	-0.034**	-0.009**	-0.012**
	(0.024)	*(0.015)*	*(0.004)*	*(0.005)*
BANKER	0.033*	-0.021*	-0.005*	-0.007*
	(0.019)	*(0.012)*	*(0.003)*	*(0.004)*
DO	0.415***	-0.260***	-0.067***	-0.088***
	(0.074)	*(0.047)*	*(0.014)*	*(0.017)*
ACCEPTOR	0.095***	-0.059***	-0.015***	-0.020***
	(0.021)	*(0.013)*	*(0.004)*	*(0.005)*
RATING	0.070***	-0.044***	-0.011***	-0.015***
	(0.019)	*(0.012)*	*(0.003)*	*(0.004)*
TOP	-0.039**	0.024**	0.006**	0.008**
	(0.018)	*(0.011)*	*(0.003)*	*(0.004)*

*** Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level.

TABLE A1.4 - Average marginal effect of Model 2 (Ordered Logit Regression). Baseline specification with clustering

	1	*2*	*3*	*4*
		Level of credit rationing (CR)		
	No CR	Low CR	High CR	All CR
NUM_BILL_DAY	0.082*	-0.052*	-0.013*	-0.017*
	(0.047)	*(0.030)*	*(0.008)*	*(0.010)*
VAL_BILL_DAY	-0.011	0.007	0.002	0.002
	(0.046)	*(0.029)*	*(0.008)*	*(0.010)*
NUM_BILL_PKT	-0.196***	0.123***	0.032***	0.041***
	(0.019)	*(0.012)*	*(0.006)*	*(0.005)*
VAL_BILL_PKT	0.109***	-0.068***	-0.018***	-0.023***
	(0.017)	*(0.010)*	*(0.004)*	*(0.004)*
BROKER	0.055*	-0.034*	-0.009*	-0.012*
	(0.031)	*(0.020)*	*(0.005)*	*(0.007)*
BANKER	0.033	-0.021	-0.005	-0.007
	(0.021)	*(0.013)*	*(0.003)*	*(0.004)*
DO	0.415***	-0.260***	-0.067***	-0.088***
	(0.078)	*(0.047)*	*(0.016)*	*(0.019)*
ACCEPTOR	0.095***	-0.059***	-0.015***	-0.020***
	(0.024)	*(0.015)*	*(0.004)*	*(0.005)*
RATING	0.070***	-0.044***	-0.011***	-0.015***
	(0.021)	*(0.013)*	*(0.004)*	*(0.005)*
TOP	-0.039**	0.024**	0.006*	0.008**
	(0.018)	*(0.011)*	*(0.003)*	*(0.004)*

Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively.

TABLE A1.5 - Average marginal effect of Model 2 (Ordered Logit Regression). Specification with Monthly fixed effect

	1	*2*	*3*	*4*
	Level of credit rationing (CR)			
	No CR	Low CR	High CR	All CR
NUM_BILL_DAY	-0.035	0.02	0.005	0.01
	(0.032)	*(0.018)*	*(0.005)*	*(0.009)*
VAL_BILL_DAY	0.03	-0.017	-0.005	-0.008
	(0.029)	*(0.017)*	*(0.005)*	*(0.008)*
NUM_BILL_PKT	-0.161***	0.092***	0.025***	0.045***
	(0.013)	*(0.008)*	*(0.003)*	*(0.004)*
VAL_BILL_PKT	0.090***	-0.051***	-0.014***	-0.025***
	(0.010)	*(0.006)*	*(0.002)*	*(0.003)*
BROKER	0.065***	-0.037***	-0.010***	-0.018***
	(0.023)	*(0.013)*	*(0.004)*	*(0.007)*
BANKER	0.044**	-0.025**	-0.007**	-0.012**
	(0.018)	*(0.010)*	*(0.003)*	*(0.005)*
DO	0.295***	-0.168***	-0.046***	-0.082***
	(0.069)	*(0.039)*	*(0.012)*	*(0.019)*
ACCEPTOR	0.088***	-0.050***	-0.014***	-0.024***
	(0.021)	*(0.012)*	*(0.004)*	*(0.006)*
RATING	0.050**	-0.028**	-0.008**	-0.014**
	(0.020)	*(0.011)*	*(0.003)*	*(0.005)*
TOP	-0.035**	0.020**	0.005*	0.010**
	(0.018)	*(0.010)*	*(0.003)*	*(0.005)*

*** Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level.

TABLE A1.6 - Average marginal effect of Model 2 (Ordered Logit Regression). Specification with Monthly fixed effect - cluster

	1	*2*	*3*	*4*
	Level of credit rationing (CR)			
	No CR	Low CR	High CR	All CR
NUM_BILL_DAY	-0.035	0.02	0.005	0.01
	(0.042)	*(0.024)*	*(0.006)*	*(0.012)*
VAL_BILL_DAY	0.03	-0.017	-0.005	-0.008
	(0.039)	*(0.022)*	*(0.006)*	*(0.011)*
NUM_BILL_PKT	-0.161***	0.092***	0.025***	0.045***
	(0.018)	*(0.012)*	*(0.004)*	*(0.004)*
VAL_BILL_PKT	-0.161***	0.092***	0.025***	0.045***
	(0.013)	*(0.008)*	*(0.003)*	*(0.004)*
BROKER	0.065**	-0.037**	-0.010**	-0.018**
	(0.030)	*(0.017)*	*(0.005)*	*(0.009)*
BANKER	0.044**	-0.025**	-0.007**	-0.012**
	(0.020)	*(0.011)*	*(0.003)*	*(0.005)*
DO	0.295***	-0.168***	-0.046***	-0.082***
	(0.071)	*(0.040)*	*(0.013)*	*(0.020)*
ACCEPTOR	0.088***	-0.050***	-0.014***	-0.024***
	(0.024)	*(0.014)*	*(0.004)*	*(0.007)*
RATING	0.050**	-0.028**	-0.008**	-0.014**
	(0.019)	*(0.011)*	*(0.003)*	*(0.005)*
TOP	-0.035*	0.020*	0.005*	0.010*
	(0.019)	*(0.010)*	*(0.003)*	*(0.005)*
AUGUST	-0.150***	0.126***	0.012***	0.012***
	(0.033)	*(0.027)*	*(0.003)*	*(0.004)*
SEPTEMBER	-0.426***	0.304***	0.052***	0.071***
	(0.028)	*(0.024)*	*(0.006)*	*(0.007)*
OCTOBER	-0.435***	0.308***	0.053***	0.074***
	(0.026)	*(0.022)*	*(0.007)*	*(0.008)*
NOVEMBER	-0.464***	0.320***	0.059***	0.085***
	(0.046)	*(0.028)*	*(0.010)*	*(0.016)*
DECEMBER	-0.516***	0.338***	0.069***	0.109***
	(0.086)	*(0.034)*	*(0.019)*	*(0.042)*

Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively.

TABLE A1.7 - IV-Regressions. Marginal effects

	1	*2*	*3*
	Model 1 IV Probit	***Model 3 IV Tobit***	***Model 4 IV Tobit***
NUM_BILL_DAY	0.037	0.015	0.018
	(0.265)	*(0.087)*	*(0.093)*
VAL_BILL_DAY	-0.067	-0.023	-0.025
	(0.274)	*(0.093)*	*(0.099)*
NUM_BILL_PKT	0.195	0.048***	0.048***
	(0.359)	*(0.005)*	*(0.005)*
VAL_BILL_PKT	-0.084	-0.036***	-0.037***
	(0.251)	*(0.007)*	*(0.008)*
BROKER	-0.056	-0.023***	-0.020**
	(0.061)	*(0.008)*	*(0.008)*
BANKER	-0.043	-0.014**	-0.01
	(0.068)	*(0.007)*	*(0.007)*
DO	-0.323***	-0.111***	-0.108***
	(0.101)	*(0.018)*	*(0.018)*
ACCEPTOR	-0.086**	-0.035***	-0.031***
	(0.043)	*(0.008)*	*(0.008)*
RATING	-0.077**	-0.015**	-0.013**
	(0.039)	*(0.007)*	*(0.007)*
TOP	0.031	0.015**	0.013**
	(0.036)	*(0.006)*	*(0.006)*
Observations	3,087	3,087	3,087
Amemiya-Lee-Newey Test	0.5563	0.7338	0.6383

For the description of variables see Table A1.1. Dependent variable of the models: Model 1 - probability of (partial) rejection, Model 3 - share of rejected bills per packet (number), Model 4 - share of rejected bills per packet (value); (robust) standard errors in parentheses. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. NUM_BILL_DAY, VAL_BILL_DAY, NUM_BILL_PKT and VAL_BILL_PKT are in log terms. The intrumental variables are: the number of births, deaths and marriages reported (daily) by *The Times;* the square of the number of births and deaths, and the interaction between the number of births and deaths. The results are obtained by using the conditional maximum-likelihood estimator. Amemiya-Lee-Newey Test is distributed as a Chi-squared with (L-K) degrees of freedom, under the null the instruments are valid.

TABLE A1.8 - Generalised LR tests on Mundlak term

Null hypothesis H0: λ1 = λ2 = λ3 = λ4 = λ5 = 0 (No Mundlak terms)		
Restricted vs. Unrestricted model	**LR χ2(5)**	**Prob > χ2**
Model 5 vs Model 5 Mundlak	9.49	0.091
Model 6 vs Model 6 Mundlak	8.61	0.126
Model 7 vs Model 7 Mundlak	5.99	0.307
Model 8 vs Model 8 Mundlak	8.00	0.156

Chapter 2

DO COOPERATIVE BANKS MATTER FOR NEW BUSINESS CREATION? EVIDENCE ON ITALIAN MANUFACTURING INDUSTRY

ABSTRACT

This chapter empirically investigates the role of Italian cooperative banks (BCCs) as a driver of new business creation, in the Italian provinces, over the period 2003-2012. The results show that the presence of BCCs positively and significantly affects entry rates during the period analysed. Additionally, before the crisis, the positive impact of the BCCs presence tends to be stronger for entries in high tech industries, whilst in the post-crisis period, the estimated impact tends to become larger for low-tech firms. This evidence suggests that in normal times, BCCs might play an important role in financing innovative and risky firms, whilst when returns are more unpredictable, the BCCs risk-aversion may lead them to downsize the financing of riskier projects.

Keywords: Entrepreneurship, business creation, BCC, Italy, crisis

2.1. INTRODUCTION

An increasing number of works focus their attention on entrepreneurial activities and new business creation. This growing interest is due to the role that firms may play as drivers of employment creation, economic growth, innovation and market competition (Baumol, 1990; Murphy et al., 1991; Acs, 2006; Schumpeter, 2017). Hence, enhancing the conditions that foster new businesses and their successful development might be relevant for policymakers. Several factors connected to the peculiarities of the territory – e.g. availability of motivated and capable individuals, regional conditions, business environment and access to capital – can affect firms' formation (Davidsson et al., 1994). Specifically, many contributions highlight access to finance as an important determinant, since external funds are often required for business creation and entrepreneurial activities (Davidsson et al., 1994; Bonaccorsi di Patti and Dell'Ariccia, 2004; Sutaria and Hicks, 2004; Rogers, 2012; Backman, 2015).

In this line of inquiry, according to the literature, entrepreneurs can obtain external financing to start their business via numerous channels such as family and friends, industrial partners, venture capitalists and banks (Bates and Bates, 1997; Cressy and Olofsson, 1997; Berger and Udell, 1998; Eliasson, 2016).[48] The latter channel is predominant in Italy, a bank-based country (Demirgüç-Kunt and Levine, 1999). Indeed, the network of private investors, venture capitalists and business angels is limited, making the Italian context an interesting laboratory to analyse whether the peculiarities of the banks somehow affect new business formation.

Besides, the Italian banking system is characterized by the presence of a peculiar category of national cooperative banks, Banche di Credito Cooperative (hereafter BCCs), that are local banks *par excellence*. According to Draghi (2009), BCCs have a comparative advantage over other types of banks in acquiring *soft information* and in evaluating creditworthiness, because of the strong connection with the territory that they serve and the proximity between the bank's decision-making center and its members/customers. This allows them to trigger a mechanism of efficient screening processes on potential borrowers and to assess qualitative aspects of medium and long-term business projects (Alessandrini et al., 2009), hence fostering better access to credit for marginal clients (Stefani et al., 2016).

A coordinated system of *soft information* gathering and processing plays a crucial role in the first stage of a firm's life, when funds are required to start the business. At this step, firms are

[48] Funds can be obtained from informal ways such as family and friends because they are altruistic (Basu and Parker, 2001) or because that they may have private information about the manager which banks do not have and they may be able to monitor the entrepreneur more closely (Casson, 2003; Parker, 2004). However, proprietary information on firms can be obtained by banks, establishing the so-called relationships lending.

characterized by high information asymmetries because of the lack of information available about their historical records and financial statements (Cassar, 2004). As a result, a larger presence of BCCs might foster new business creation because of their comparative advantage in gathering soft information and their cultural and geographical proximity to the firms, the propensity to establish customers' relationships, and their knowledge of the territory and clientele

Soft information and the knowledge of the territory become even more important to reduce information asymmetries and overcome moral hazard and adverse selection problems when funds are needed for R&D and innovative projects, that are intrinsically *opaque* and risky (Jensen and Meckling, 1976; Diamond, 1984, 1991; Weinstein and Yafeh, 1998; Chiesa et al., 2009). Moreover, formal bank finance for start-ups seems to be largely limited to low-risk cases and when collateral is provided. It is therefore unlikely that banks will be major financiers of start-ups in high-technology and science-based industries, preferring low-risk firms, especially those that have existed for a while so as to have a reputation and/or collateral (Audretsch et al., 2006). In this respect, BCCs, because of their capability to grasp soft information, could require less formal collateral, to new born firms, acting as a substitute for a developed network of private investors and venture capitalists.

According to a strand of the literature, however, the positive role of cooperative banks can be questioned, as they are traditionally risk-averse and present less risky portfolios (Fama and Jensen, 1983; Hesse and Cihak, 2007; Wyman, 2008). Consequently, cooperative banks may not represent a relevant channel for supporting the birth of entrepreneurial activities, especially for those firms that embody highly specific assets. In addition, their propensity to finance new projects might dramatically change during economic turmoil when returns are more volatile and business risk much higher.

Moving from these insights, this work investigates the role of BCCs as a driver of firm creation, an open empirical question which, to the best of my knowledge, has not been addressed by the literature. What is more, I aim to test whether the presence of cooperative banks might exert a various effect on the birth of firms belonging to high-technology industries, naturally more opaque, and in times of economic downturns when business risk is much higher.

Specifically, this investigation focuses on the relationship between annual entry rate of manufacturing firms and BCCs' presence in Italy, at provincial level, in the years 2003-2012. With regard to the dependent variable, a wide literature justifies the use of entry rate as a proxy for entrepreneurship, in particular, Lumpkin and Dess (1996) affirm that the *new entry* strongly embodies the essence of entrepreneurship. To assess the incidence of BCCs in the local credit market,

I employ two different indexes based on total loans and the number of branches of BCCs, at the provincial level.

On a methodological ground, given the nature of the dependent variable bounded between zero and one, I adopt both pooled and random effect Tobit estimators, and as a sensitivity check a Fractional Probit model. Lastly, to address concerns of endogeneity, I also use instrumental variable methods.

My evidence suggests that the presence of BCCs fosters firm creation in the span of years examined, though the size of the estimated impact differs for high and low tech firms. On one hand, during the 2003-2008 years, the effect of BCCs presence is stronger on the entries of high-tech firms suggesting that, in *normal times*, BCCs may play an important role in financing innovative and risky firms. On the other hand, in the post-crisis period, the positive effect of BCCs presence tends to be higher for low-tech firm entry. These findings corroborate the idea that cooperative banks could represent a channel to promote firm creation; nevertheless, during negative economic conjunctures, when returns are more unpredictable, the BCCs prudential orientation might lead to a lower propensity to fund riskier projects.

The remaining of this chapter is organized as follows: after this introduction, Section 2.2 briefly describes the Cooperative Banks, Section 2.3 provides an overview of the related literature. Section 2.4 sets up the research hypothesis. Section 2.5 illustrates the estimating model, the econometric methodology and the dataset. Section 2.6 shows the results, while Section 2.7 concludes.

2.2. COOPERATIVE BANKS

Cooperative banks show heterogeneous features across countries, falling in the categories of *local banks*, *territory banks*, *relationship banks*, *community banks*, *development banks*, or *district banks* (Bonfanti, 2009; Baccarani et al., 2013). These appellations stand for national banks characterized by a solid interdependence with the social and economic community (regional or sub-regional area) in which they operate (Alessandrini, 1994; Quintiliani, 2017).

According to Cesarini et al. (1997) and Pagano (2000) "banking localism" is a phenomenon associated to the small size credit institutions focused in a specific administrative context (Province or Region). In this regard, Pastrè (2001) defines "six directives" for small banks' survival: (i) avoid businesses where economies of scales are predominant; (ii) be specialized; (iii) be flexible; (iv) avoid taking too much risk; (v) develop banking networks; (vi) price risk correctly. Similarly, Comana (2004) defines "regional bank" those intermediaries which focus their activities in a territorial area, even if not geographically enclosed within the boundaries of a region.

Empirically, Bonaccorsi Di Patti et al. (2005) introduce a quantitative parameter in order to distinguish a local bank: the local bank would have an active less than 7 billion euros, including in this process both small banks (assets between 1 and 7 billion euros) and the minor banks (assets less than 1 billion euros). Indeed, according to the Bank of Italy, the delineation between small and medium banks is set at € 7 billion of total assets. Banks with total assets below this threshold are defined as "small and minor" banks, amounting to 778 banks in 2004. Specifically, "minor banks" belong mainly to credit cooperatives operating in just one province with one or few branches; instead, "small banks" generally take part to large groups or banks specialized in private banking, consumer credit and investment.

Besides having specific features in terms of asset size, local banks are characterized by long-term relationships, peer monitoring and functional proximity with the operating offices and business centres of their clients (Bongini et al., 2007). Local banks might take advantage from cultural and geographical proximity with the firms, customers' relationship, information on the territory and clientele. Furthermore, these banks mostly present a simple organizational structure, that is useful to acquire information ensuring quicker responses to credit applications (Farabullini and Gobbi, 2000; Guiso et al., 2004).

In other words, local banks are more likely to maintain relationship lending because they operate in a small community and are owned and/or managed by community members. Indeed, local banks take advantage from: the "functional proximity" (Alessandrini et al., 2009), as local banks are an integrated part of the local community, they are able to grasp not just economic information; "peer monitoring" (Hoff and Stiglitz, 1990; Stiglitz, 1990), facilitated by the small size and the small area of operations of most credit cooperatives; "long-term interactions" (Banerjee et al., 1994; Besley and Coate, 1995).

Cooperative banks have developed during the second half of the 19th century. They were established as a response to various forms of market failure, however, nowadays, being active in non-retail activities and domestic purposes, these institutions, observed superficially, are for the most indistinguishable from their commercial bank competitors. However, their nature is explicable by their internal statutes that explain the operation guidelines and the insurance of members and third parties. Cooperative banks are characterized by substantial differences in the way they are defined and regulated by countries. In Belgium, France, Italy, Switzerland and the UK, they are delimited by appropriate chapters of wide laws, such as the Civil Code; in Germany, cooperatives are recognised as a distinct form of business and detailed laws exist (Ayadi et al., 2010), whilst there is not a specific law in Denmark and Norway. In this respect, to simplify the cross-

border activities of cooperatives within the European Union, the EU proposes the European Co-operative Society (SCE) in 2003 (into force from 2006). Nevertheless, the cooperation between cooperative banks across the EU still remains not entirely overcome. According to Ayadi et al. (2010), the basic features of cooperative banks can be summarized as follows: firstly, they do not focus on maximising short term shareholder value. In fact, the cooperative bank aims to guarantee the benefit of its members, that induces to keep a long-term relationship with their bank. Furthermore, cooperative banks are owned by their associates who are private citizens and individual entrepreneurs and, usually, ownership is defined at the local or regional level. Governance arrangements are based commonly on the principle of one member one vote, instead of in proportion to the size of ownership stakes. Members cannot sell their ownership stakes in an open secondary market, in some cases could be sold back to the bank. In other words, the ownership stakes in cooperative banks are not marketable. The source of capital for a cooperative bank is taken profits, that are retained within the bank and are added to the capital and dividends are generally not paid. However, sometimes members could vote for the limited distribution of profits. Cooperative banks are generally part of a network with an integrated extensive vertical and horizontal cooperation. That helps to centralize the endowment of services and production processes. The philosophy for Cooperative banks is to creating banking relationships with SMEs and households, which is taken in by close proximity to customers.[49]

Looking at their business, cooperative banks tend to involve in less risky activity (Hesse and Cihak, 2007), at the same time cooperative bank facilitated access to finance to SMEs, farmers or craftsmen (excluded from other banks) because their proximity to the customer allows them to have a greater understanding about needs and the potential risk of their customers and diminishes asymmetric information (De Bruyn and Ferri, 2005).

2.2.1 The Italian case

The development of the modern Italian credit system is linked to the name of Luigi Luzzatti,[50] who founded the *Banca Popolare di Milano* in the mid-1860s by using his own savings as initial capital. This bank became quickly one of the ten principal banks in Italy at that period (Polsi, 1996).

[49] In Europe some cooperatives have non-cooperative subsidiaries and can operate with different business models. This is the case of Banche Popolari in Italy that is listed on a stock exchange which means that some of the arguments that apply to cooperative banks in general may not always apply in this case. Similar is the context for Crédit Agricole in France.

[50] Luigi Luzzatti was Italian first minister for a short time and worked in various cabinet governments.

Later in 1883, Leone Wollemborg, a disciple of Luzzatti, founded the first rural credit society, called Banche di Credito Cooperativo (BCCs), these were based mostly in rural areas and were smaller than other banks. In addition, BCCs were set as unlimited liability institutions. The BCCs business model allows them to spread rapidly, reaching 700,000 members at the beginning of the first world war (Herrick and Ingalls, 1916). After a period of contraction due to the financial crisis and the introduction of 1936 Banking Law,[51] that restricted the activity for credit banks, in the aftermath of the second world war, the BCCs and savings banks were the main instrument involved in helping the economy by providing long-term credit to start-ups and small and medium-sized enterprises (SMEs), furthermore, the proximity of these banks in rural area was beneficial in order to stop 'capital drain' from rural and poorer regions to richer areas (Goglio, 2007). Until 1990 the banking cooperative sector remains stable, the market shares of *Banche Popolari* (hereafter BPs) and BCCs remained between 10-15% and 5% of total bank assets, respectively.

During the 1990s the government introduced deregulation and privatisation. All of the savings banks, namely the "Cassa di Risparmio", were transformed and assigned joint-stock status. Furthermore, the Consolidated Law on Banking of 1993,[52] inserted to applicate the EU's Second Banking Directive (89/646/EEC), conducts, in the second half of the 1990s, to the contraction in their total figures because a huge amount of cooperative banks merged with or were acquired by other cooperative banks; specifically the number of cooperative banks decreased from around 700 to 289, while their branches increased from 2,226 to 4,257. Notwithstanding, the concentration of the Italian banking sector endured unaffected when compared to other EU-15 countries and, moreover, the BP and BCC groups have regularly expanded their activity at the local level. In this respect, at the end of 2007, the Italian cooperative banking sector accounted for a quarter of total assets and one-third of private loans and deposits (Ayadi et al. 2010). Focusing on BCCs, one-third of all the BCC branches are located in very small towns (less than 5,000 inhabitants) which helps them achieve greater proximity and provide better access in these areas.

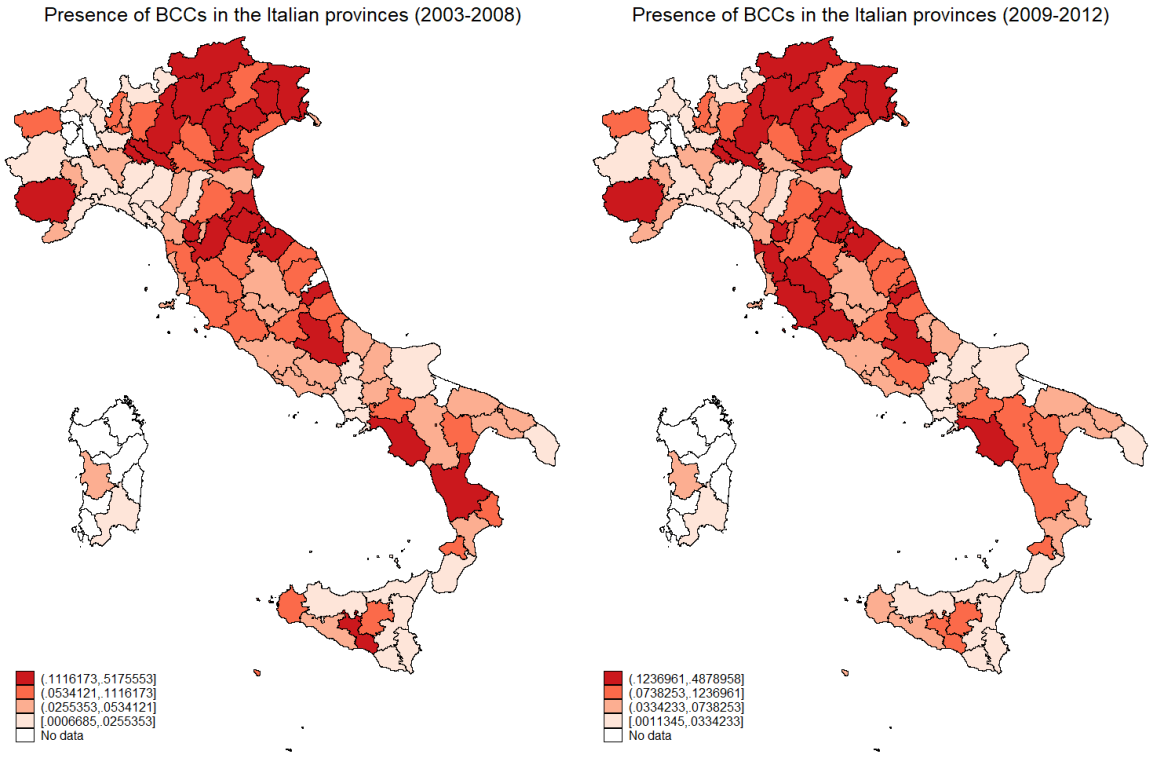
After 2008, the most recent financial crisis has had a relatively moderate initial impact on the Italian's banking sector and, as well as on cooperative bank because of banks' lower exposures to toxic assets and greater reliance on own-resources. However, the deteriorating credit conditions, accomplished with a predictable jump in non-performing loans generate an important problem for cooperative banks due to their traditionally riskier loan portfolio (Moody's, 2009). Despite the

[51] Decree No. 375 of 12 March 1936.
[52] Legislative Decree No. 385 of 1 September 1993.

contraction experienced during the crisis, the credit cooperative system increased noticeably compared to the '90s. By the end of 2016, BCCs' loans accounted for about 20% (11% in 1995) of total banking funds granted to Italian SMEs, and for about 10% (6% in the earlier '90s) of those allowed to households (Agostino, Ruberto and Trivieri, 2019).

Figure 2.1 depicts the average BCCs' loans - over the average total loans - in the Italian provinces in the two periods (2003-2008) and (2009-2012). The areas where the presence of BCCs is more relevant are north-east (the province of Cuneo being an exception in the western area of the north), the center, and some provinces of the *Mezzogiorno*. Across the two periods of analysis, an increase in the Centre of Italy is depicted, contrariwise, a slight decrease is registered for the province of Salerno, Cosenza and Caltanissetta.

Figure 2.1. Presence of BCCs in the Italian provinces.



Author's Elaboration.

Nowadays, the Italian Cooperative credit system is based on a network including 404 cooperative banks. BCCs, albeit independent banks, are coordinated by 15 regional federations – which represent, promote, support and monitor their members – and a national federation (*Federcasse*) that provide legal, fiscal, and organisational assistance, as well as define the strategic guidelines for the whole network. Furthermore, the extensive range of financial products and services supplied by BCCs are wholly provided by three central institutions (*ICREA*, *Cassa Centrale Banca* and

Cassa Centrale Raiffeisen), aiming to develop banks' efficiency and competition in local markets (Agostino, Ruberto and Trivieri, 2019).[53]

The legal conduct of the Italian cooperative model is determined by the 1993 Consolidated Law on Banking (Testo Unico Bancario of 1993): each member of a BCC, which must be domiciled or have its ongoing business in the territory where the bank operates, has only one vote in the shareholders' general meeting, irrespectively of the amount of shares owned; at least 51% of the BCCs' risky activity must be carried out with members, and no less than 95% of their total loans must be granted in the catchment area, that is in the municipalities where the bank has a branch and in the neighbouring ones; BCCs must allocate at least 70% of their profits to legal reserve, and assign a share of those residuals for purposes of social utility maximization.[54] The law disciplines that BCCs benefit from a fiscal exemption on retained profits that are allocated to reserves, in particular, retained profits allocated to legal reserves are not taxed, the amounts distributed to members in the form of interest cost relief on borrowed funds (i.e. the so-called 'ristorni') are deductible from taxable income (Ayadi et al. 2010).[55]

According to this regulatory requirements BCCs are characterized as mutualistic banks, with not-for-profit goals, mainly devoted to finance economic agents in local communities (stakeholders-value-oriented institutions) by following traditional intermediation. Coco and Ferri (2010) show that the cooperative banks have given an important contribution to keep the financial system more sustainable.[56]

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[53] A recent law (n.49/2016) - transforming the central institutions in bank holdings -states that all BCCs with equity capital not exceeding 200 million Euros must belong to a Cooperative Banking Group (Gruppo Bancario Cooperativo – GBC). As noted by Bank of Italy (2017) "The new regulations will provide all the entities involved in establishing cooperative banking groups with a clear, definite and complete regulatory framework. This will help them to make the most appropriate business and organizational decisions to meet the capital, governance, internal control, efficiency and competitiveness requirements set for cooperative credit." Nonetheless, the new regulation preserves the local nature of BCCs, their traditional role in providing mutual funding, as well as their managerial autonomy, according to the level of risk settled with the Parent Company of the GBC. The Parent Company monitors – also from a prudential point of view – the BCCs based on a contract (c*ontratto di coesione)*, with the following aims: supporting the BCCs' service to shareholders and customers, developing the local area, and fostering the BCCs' ability to generate income. What is more, the Parent Company may open up to the participation of external capital up to 49% of its capital. Under certain circumstances, it might strengthen the capital of the BCCs by using guarantee funds (Fondi di garanzia del Credito Cooperativo and Fondi Mutualistici). Finally, the law n. 49/2016 states that, during the establishment phase of the GBC and up to the date of adhesion, the BCCs adhere to a temporary fund so as to support consolidation and concentration processes.

[54] More precisely, there is an upper limit for individual participation, set at €50,000 per member. Furthermore, clear restrictions on bank operations apply. Assets eligible for a zero risk-weighting under the Capital Requirements Directive (Directive 2006/48/EC) need to account for at least half of the risk-weighted assets. What is more, loans are mainly granted to members. Expansions into non-contiguous regions are conceivable only if the cooperatives reach a sufficient number of members in the area.

[55] These gains were denoted by the Italian Supreme Court first to the European Commission in January 2006. Having received no response, the Supreme Court referred the case (Case 80/08) to the European Court of Justice (ECJ) in February 2008, which is still pending.

[56] See the Appendix 2 for more details about the economic effects of Credit Cooperative Banks.

2.3. LITERATURE REVIEW

2.3.1 The determinants of Firm Creation: an overview

According to Davidsson et al. (1994), who studies regional development in Sweden, firm formation rate is affected by several factors mainly connected to the peculiarities of the territory: availability of motivated and capable individuals, regional conditions, supportive environment and access to capital. The first feature depends on the *socio-demographic structure,* which captures the proportion of the population in the 25-44 age group, education level, the share of the workforce in technical professions and unemployment rate. Regional conditions are explained by company size structure and sectoral distribution of employment in the local economy, these elements are captured by population size and density, trends for population, per capita income, and unemployment. With regard to access to capital, it is sectioned into accessibility of private capital (explained by per capita income), percentage owner-occupied housing, governmental business support expenditures and local bank market structure. Lastly, the variables for the supportive environment are related to the entrepreneurial culture (political preferences, ownership autonomy of the regional economy), and living conditions (indicators related to taxes, education, culture and health care). However, studies of firm creation had divergent results in the literature.

In this respect, Armingtonand and Acs (2002), investigating the role of human capital, training and education, and entrepreneurial environment on new firm formation, discover that firm creation is affected by industry intensity, population growth and income, moreover, it varies noticeably across the region. Similarly, Reynolds (1994) and Guesnier (1994) show that population change has a positive influence on new firm entry, while Audretch and Fritsch (1994) and Garofoli (1994) do not find such influence. On the other hand, Highfield and Smiley (1987) and Audretsch and Fritsch (1994) illustrate that unemployment rate is positively related to new firm formation, instead, Guesnier (1994) and Garofoli (1994) found the impact to be strongly negative. In this respect, Caree et al. (2008), investigating the influence of the unemployment rate on firm entry, exit and net entry in Italian provinces, show that the effects of unemployment on entry and exit vary across sectors, but are mainly negative.

Sutuaria and Hicks (2004), analysing variation in rates of new manufacturing firm formation across both place (Texas metro-regions) and time (1976–1991), show that new firm formation is not related to population or income dynamics, unemployment level, or local government spending. However, it can be explained by variation in unemployment change rates, mean establishment size and the availability of local financial capital. In particular, the greater availability of financial capital, explained as local per capita bank deposits, the faster the rate of new firm formation. Local

entrepreneurial activity benefits, not only to local financial capital per se, but also from institutional relationships able to direct funds to start-ups. Similarly, according to Nyström (2007), agglomeration, in terms of localisation economies, positively influences regional new firm formation. A recent study of Gajewski and Kutan (2018), employing Poland data, discovers that in the long run, the number of new firms is smaller in regions dominated by agriculture-intensive firms and it is higher in regions with a significant share of labour in services. On the other hand, observing the short-run, changes in the share of the industry sector are insignificant as other sectors and play an important role. Instead, population change, unemployment, and the number of exiting firms are statistically significant for the firm-creation dynamics.

A field of literature focuses on investigating the link between personal characteristics and the propensity to become an entrepreneur. In this respect, Wärneryd et al. (1987), using Sweden data, show that better-educated individuals are more likely to begin entrepreneurial activities; contrariwise, Johansson (2000) illustrates that in Finland, being less educated is positively related to become entrepreneurs. Furthermore, Kihlstrom and Laffont (1979) indicate that more risk-averse individuals are expected to become workers, while the less risk averse become entrepreneurs. According to Evans and Leighton (1989), individuals with greater assets are more likely to take self-employment activity, likewise, Lindh and Ohlsson (1996) illustrate that individuals who have received an inheritance or won the lottery are expected to be self-employed. What is more, according to Lazear (2002), skills matter, persons with experience in numerous roles would be more likely to turn into entrepreneurship.

Another aspect that could influence firm creation is the economic environment. Many studies illustrate that the level of taxation affects the decision to be self-employed (Carroll et al., 2001; Gordon and Cullen, 2002; Schuetze and Bruce, 2004). Moreover, regulations as the cost of entry, have a significant outcome on the level of entrepreneurship initiatives (Fonseca et al., 2001; Djankov et al., 2002; Klapper et al., 2004). Safety of creditor rights, the level of enforcement of the law (Giannetti, 2003; Gompers et al., 2005) and bankruptcy laws (Fan and White, 2003) play also a crucial role. Crum and Gohmann (2016), exploring US state border counties, find that firm birth rates are not affected by the state taxation levels and minimum wages, however, there is evidence of a negative relationship between state union densities and firm birth rates. Besides, state education and public welfare expenditures negatively influence firm birth rates.

In addition, a bunch of literature indicate that entrepreneurial activity is more concentrated in areas that exhibit a *regional advantage* in terms of agglomeration economies (Krugman, 1991;

Glaeser et al., 1992; Rauch, 1993).[57] The evidence of Giannetti e Simonov (2004), show that individual characteristics and business environment are the main factors in influencing entrepreneurial choice. Notwithstanding, other important factors are cultural values and social norms.

Firm creation seems also connected to the urban dimension. Delfmann et al. (2014) show a positive relationship between new firm formation and population change in rural regions but negative in urban regions. Significant role of urbanization has been found by Faggio and Silva (2014), investigating the UK, on firm formation and innovation. Using spatial tools in analysing Italian regions, Piacentino et al. (2017) explain that innovation strongly influences new business formation in the region but also in the neighbours, however, population change does not imply a significant effect. Considering the degree of urbanization, population change has a significant effect on regions with lower urbanization. Similarly, Parajuli and Haynes (2017), using data of New England, found that population density, population growth and human capital positively influence firm creation in the county and its neighbours. Contrariwise a negative effect derives from the ratio of large to small firms in terms of employment size and the unemployment rate.

Several studies investigate the determinants of start-up rates. In developed countries, profits, education, access to finance and agglomeration positively affect start-up formation (Kangasharju 2000; Lawton Smith et al., 2005; Sternberg and Wennkers, 2005; Naude´ and van der Walt, 2006; Acs et al., 2007). Formal bank finance for start-ups also seems to be largely limited to low-risk cases and where collateral is provided. It is therefore unlikely that banks will be major financiers of entrepreneurial ventures in high-technology and science-based industries, preferring low-risk firms, preferably ones that have been existing for some time so as to have a reputation and/or collateral (Audretsch et al., 2006). The latter requirements may not be very large in developing countries where capital requirements could be relatively small (Lingelbach et al., 2005).

Naude et al. (2008), using data from a developing country (South Africa) prove that important determinants of start-up rates across South Africa's magisterial districts are profit rates, educational levels, agglomeration (i.e. the economic size of a district) and access to finance. In this regard, the number of bank branches in a district is significantly and positively connected with the start-up rate in that district, suggesting that the increase of the number of banks per person (or potential entrepreneurs) intensifies access to finance. These features derive from bank branches

[57] According to Glaeser et al. (1992) and Rauch (1993) in areas where human capital is more concentrated there might be knowledge spillovers across individuals, and individual productivity may be higher.

competition and inferior monitoring costs. According to Calà et al. (2016), using data from Argentina, demonstrate that also poverty, the size of the informal economy and the existence of idle capacity play a role in firm creation in developing countries.

Several works investigate the role of the access to finance as a driver of business creation (Davidsson et al, 1994; Bonaccorsi di Patti and Dell'Ariccia, 2004; Sutaria and Hicks, 2004; Rogers, 2012; Backman, 2015). There are numerous ways in which an entrepreneur can obtain external financing to start their business, funds can be obtained from informal ways such as family and friends (Bates and Bates, 1997; Cressy and Olofsson, 1997; Berger and Udell, 1998) because they are altruistic (Basu and Parker, 2001) or because that they may have private information about the manager which banks do not have and they may be able to monitor the entrepreneur more closely (Casson, 2003; Parker, 2004); from industrial partners, venture capitalists and banks. Italy external finance rely mainly on banks; in fact, it is defined as a bank-based country (Demirgüç-Kunt and Levine, 1999).

Focusing on private equity, like venture capitalists and business angels, those tend to finance spatially close firms (Klagge and Martin, 2005; Martin et al., 2005; Berggren and Silver, 2010) because this commitment requires close contact, management and monitoring (Martin et al., 2005; Chen et al., 2010).[58] What is more, only a limited number of firms being able to receive private equity financing because private investors are more inclined to invest in pioneering and innovative firms that present high growth potential (Hall and Hofer, 1993; Berggren et al., 2001; Romano et al., 2001; Berger and Udell, 2002; Cassar, 2004; Winton and Yerramilli, 2008; Berggren and Silver, 2010). On the other hand, manufacturing firms, that present more tangible assets used as collateral for loans, usually based their source of finance in banks hands (Berggren and Silver, 2010).

Another factor that affects the firm creation is the number of bank branches which are located in the area, evidence shows that more branches should be beneficial for credit availability and new firm formation (Backman, 2015). In fact, Bonaccorsi di Patti and Gobbi (2001) show that branch density, i.e. the number of bank branches per capita, has a positive effect on the amount of credit granted to small firms in Italian provinces.[59]

[58] Many works show that the supply of private equity is concentred to one or limited spatial clusters in a country (Sorenson and Stuart, 2001; Mason and Harrison, 2002; Klagge and Martin, 2005; Martin et al., 2005; Berggren and Silver, 2010; Chen et al., 2010).

[59] According to Thakor (1996), the probability of receiving credit increases with the number of independent banks in a location. Rogers (2012) proves that the number of bank branches per capita in the United States has a positive effect in firm formation rate on a state level. A similar relationship has been found in Sweden by Backman (2015). Moreover, banking development, measured as branch density has a significant and important effect on process innovation. Eliasson (2016), analysing the Sweden case, discovers a positive relationship between the number of

Besides, several studies support the idea that bank competition is positive for new firms (Dinc, 2000; Black and Strahan, 2002; Cetorelli, 2003; Beck et al., 2004; Cetorelli, 2004; Dell'Ariccia and Marquez, 2004; Cetorelli and Strahan, 2006; Backman, 2015). Conversely, a lower level of competition in the financial market acts as a barrier to new entrants because established relationships between firms and banks could, hence, negatively affect the probability of new firms accessing funds (Spagnolo, 2000; Cestone and White, 2003). A positive relation between creation and the degree of local bank concentration has been found by Jacksson and Thomas (1995).

In this respect, different studies show that the size of the local bank branches might also influence the local firm creation. On one hand, larger bank branches may have comparative advantages in processing information as a result of their specialized offices and employees. With increased knowledge and information about a local market, new firms are less likely to receive a deny due to asymmetric information (Parker, 2004). Instead, small bank branches could experience disadvantages if they do not have adequate skills to evaluate the quality of a financial request. On the other hand, the size of banks influences relationship lending, based on the accumulation of soft information by meetings with the owner, employees, and local community. Small banks are more equipped to face soft information and personal relationships. According to Berger and Udell (2002), generally, small banks present few managers and it helps to decrease the agency problems coming from soft information. Furthermore, smaller banks depend more on personal characteristics of small firms than larger banks do. Instead, larger banks count on standardised information as financial statements (Cole et al., 2004). Backman (2015) discovers a positive relationship between the average size of bank branches and start-up rate. Similarly, Jackson and Thomas (1995) show that the rates of birth and growth of new manufacturing firms are negatively related to average bank size. However, these patterns depend also on the urban-rural division. Kittiakarasakun (2010) shows that banks situated in rural areas, during the loan decision process, rely more on personal knowledge about the borrower rather than banks in the urban area.

In this regard, a field of literature shows that, in the early life of firms, knowing the entrepreneur plays a crucial role more than financial information, hence, close relationship and spatial proximity are crucial in supporting the birth of new business (Cole, 1998; Boot, 2000; Cassar, 2004; Storper and Venables, 2004; Elyasiani and Goldberg, 2004; Gereffi et al., 2005; Agarwal and Hauswald, 2010b). The spatial proximity is advantageous because it allows the bank to understand the local circumstances in which the company operates, such as market conditions and the degree

bank branches per capita and the total new firm formation rate. Moreover, the average bank branch size and concentration level are not found to have any significant effect.

of competition and, at the same time, acquiring that formation is easier referring to local community network (Pollard, 2003; Michelacci and Silva, 2007; Dahl and Sorenson, 2009; Agarwal and Hauswald, 2010b); in other words, local banks have competitive advantage in grasping soft information (Agarwal and Hauswald, 2010b), thus entrepreneurs refer to local and regional bank (Berger et al., 1999; Kwast, 1999; Collender and Shaffer, 2003). In this respect, spatial proximity and relationship lending are the main features that characterise the operation of *local banks* and *small banks*

2.3.2 Mutual banks and firms' creation

Although the evidence on the relationship between mutual banks and firms' creation is scant, several works investigate the link between firms and local (or small or cooperative) banks, from different perspectives. For instance, numerous papers show that local banks enhance access to finance for firms (especially for SMEs),[60]or that banking markets for small firms are very local (Kwast et al., 1997; Kwast, 1999; Dermine, 2000; Bonaccorsi di Patti and Gobbi, 2001; Fritsch and Schilder, 2008). A similar conclusion is considered to hold also for new firms, as most of them are small (Eliasson, 2016).

According to Cesarini et al. (1997), local banks are more likely than other banks to support nascent entrepreneurships, because of the stable links with the local community, that ensures them a position of advantage in gathering better information on entrepreneurs and in monitoring the appropriate use of the funds. These mechanisms can be even more effective when the bank has a cooperative corporate structure, leading to greater availability and lower cost of credit. Indeed, the establishment of a local bank, especially if cooperative, is likely to derive from the emerging of local entrepreneurial micro-forces, that aim to generate an elementary capital market, channelling the community's savings towards local entrepreneurs at a lower cost. What is more, local banks and specifically cooperative banks are able to reduce the transaction costs associated with screening and monitoring borrowers - enforcing repayments and providing credit to lower income individuals and businesses that do not have important collateral - because of their business model based on relationship lending and spatial proximity (Hansmann, 1996).[61] Relationship lending and

[60] Some Bank of Italy Annual Reports (2004, 2005) show that smaller banks increased rates of growth in lending to firms and households. Specifically, in 2004, small banks provide funds for three-quarters of new business; in 2005 they accounted for around half of the growth in lending to the private sector. Their market share increased both in lending to small firms and in loans to medium-sized and large companies. Indeed, SMEs, for the collection of funds, rely exclusively on bank loans because their access to the instruments of the financial markets is precluded. Big firms, instead, are often registered on the stock exchange and have access to all the capital instruments on the financial markets.

[61] Boot (2000) defines relationship banking as "the provision of financial services by financial intermediaries who: i) carry out expensive investments to acquire confidential information about each customer funded; ii) estimates

proximity – combined with a flat organizational structure [62] – ensure to local banks a greater capability to gather soft information (Jayaratne and Wolken, 1999; Berger and Udell, 2002; Stein, 2002; Takats, 2004; Berger et al., 2005). Additionally, proximity reduces the costs of multiple face-to-face interactions and other transaction costs, with positive effects on the availability of credit, and on the possibility to establish lasting relationships (Kwast, 1999; Ghatak, 2000; Bonaccorsi di Patti and Gobbi, 2001; Collender and Shaffer, 2003; Pollard, 2003; Michelacci and Silva, 2007; Alessandrini et al., 2008; Dahl and Sorenson, 2009; Agarwal and Hauswald, 2010a; Agarwal and Hauswald, 2010b).

Through proximity and easier access to soft information, BCCs could also support start-ups, by requiring less formal collateral, and acting as a substitute of a developed network of private investors and venture capitalists, in the Italian market. As a matter of fact, start-ups with higher *inalienable* human capital and highly specific assets rely firstly on internal finance, and have a lower probability of using bank debt, due to the lower collateral value of their assets (Sanyal and Mann, 2010).[63]

Hence, in a nutshell, a higher presence of BCCs can stimulate new business creation because of their deeper knowledge of the areas in which firms operate, and their greater capability to collect soft-information on clients. The latter ability may be crucial when interacting with start-ups, for which specific and intangible assets compound information opacity and make external financing more difficult (Paulson and Townsend, 2004), as banks have to base their decisions on soft rather than hard information (Petersen and Rajan, 2002; Backman, 2015).

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the profitability of the *informative* investments done and the opportunity to repeat them later." Ongena and Smith (2000) refer to it as "relationship that goes beyond the execution of simple and anonymous financial transaction". Elsas (2005) defines the characteristic of a bank relationship as an implicit long term contract between a bank and its debtor. Trusted relationships bank-customer, associated to existing loan contracts and/or deposit, are characterized by "direct" and "confidential" information, renewed and enriched during the relationship. The gathering of qualitative information usually reserved, namely soft information, is one of the keys that explains the importance of relationship lending, in fact, Berger and Udell (2002, 2006) refer to the long-term banking relationship as "credit assignment technology that depends on the production of soft information."

[62] In this respect, Stein (2002) finds that organizational forms characterized by multiple decision levels, compared with flat organizations typical of a small bank, are more likely to use standardized information (namely hard-information). Berger et al. (2005) show how, compared to small banks, larger intermediaries tend to provide loans to customers located further away, to larger companies by using hard information. Berger et al. (2001) investigate the extent to which small businesses receive scarcer loans from foreign banks based at a substantial distance from the borrower's location using Argentinean cross-sectional data. Their evidence support that the foreign-owned banks lend less to small businesses, particularly if the banks' headquarters is located in a foreign country and the businesses are opaque.

[63] Formal bank finance for start-ups appears mainly restricted to low-risk cases and where collateral is provided; it is unlikely that banks will be major financiers of high-tech start-ups, preferring low-risk firms, particularly those with good collateral and reputation (Audretsch et al., 2006). Indeed, the greater the banks' tendency to provide credit to more transparent companies, the lower the financing of innovative SMEs (Alessandrini et al., 2007; Jimenez et al., 2009).

On the other hand - according to a less extensive strand of the literature - the prevalence of BCCs in the local credit markets could have a negative effect on new businesses formation. According to Cihak and Hesse (2007), cooperative banks tend to support less risky activities and those firms without risky assets in their balance sheets. Indeed, spatial proximity could imply an informational advantage on the needs and potential risks of borrowers, ensuring BCCs a greater ability to discard risky projects (De Bruyn and Ferri, 2005). Notwithstanding, this *modus-operandi* may simply derive from a risk-averse attitude (Fama and Jensen, 1983; Wyman, 2008).

Additionally, as mentioned above, local banks might face relatively less competitive local markets mainly due to informational barriers that they can impose on non-local intermediaries (Benvenuti and Del Prete, 2019). Consequently, local banks may "capture" firms (hold-up) imposing higher interest rates (Alessandrini et al., 2006). Hence, under certain circumstances, proximity could generate higher financial constraints (Alessandrini et al., 2006), curtailing business creation.[64]

Finally, the target-costumers of mutual banks are likely to be traditional businesses, and BCCs could lack the specific capabilities required to evaluate the quality of high tech investments - when compared to private investors, larger banks or venture capitalists. Furthermore, it is worth highlighting that the BCCs' propensity to finance less risky projects might be compounded during economic downturns, when investment uncertainty dramatically rises.

To recapitulate, the BCCs' ability to foster firm creation- and in particular high tech firms' formation during economic turmoil - is still an open empirical question, which justifies this work.

2.4. RESEARCH HYPOTHESES

In the light of the previous review, my working hypotheses are:

H1: O*n a theoretical ground, the relationship between the presence of BCC and business creation is ambiguous. Thus, I do not posit any a priori expectation on the sign of the relationship under study.*

On one hand, a higher presence of BCCs should increase new business formation given their comparative advantage in gathering soft information, due to their proximity to clients, organizational structure, and employees spending their working life in the same area where the bank is

[64] On the other hand, mutual banks, taking advantage from their greater market power, could have higher incentives to screen and monitor, to better discriminate among borrowers (Diamond, 1984; Udell, 2008) thus facilitating the financing of firms (Stiglitz and Weiss 1981). Indeed, they might require a lower interest rate, aiming to lock-in the firm into a relationship and to gain rents in the future. In this respect, Petersen and Rajan (1995) argue that market power allows banks to sacrifice any interest rate premiums they might otherwise have to charge when lending to firms that are relatively opaque or risky (young, small and/or distressed firms).

situated. On the other, the relationship might be negative if BCCs can exert market power - and limit access to finance - or as a result of BCCs' risk-averse attitude.

H2. *The BCCs' presence can exert a heterogeneous influence on the birth of firms belonging to high-technology industries, naturally more opaque, and in times of crisis when business risk is much higher.*

Given that Italy is a bank-based country in which the role of private investors is limited, BCCs, taking advantage of their peculiar features, could play a key role in providing funds to high tech firms, which are hardly financed by formal banks. Therefore, cooperative banks might be a valuable channel able to support high tech firm creation. On the other hand, BCCs may be less likely to support high tech firms' creation as the latter represents a higher risk investment, because of the specificity and low collateral value of their assets. Finally, the probability to promote entrepreneurship activities might be also strongly influenced by the general economic conditions, in particular, investments in high tech firms, which are inherently riskier, might be sacrificed in times of crisis when uncertainty prevails. The following econometric analysis aims to assess the above working hypotheses.

2.5. EMPIRICAL ANALYSIS

2.5.1 The estimating model

Following Agostino et al. (2019), the estimating model is:

$$ENTRY_{pkt} = \alpha + \beta_1 BCC_{p(t-1)} + \beta_2 HMTI_k + \beta_3 INTE_{pk(t-1)} + \phi X_{p(t-1)} + EXIT_{pk(t-1)} + ENTRYOT_{pk(t-1)} + \sum_k \gamma_k IND_k + \sum_t \varphi_t T_t + \epsilon_{pkt} \quad (2.1)$$

Where the dependent variable is the gross entry rate (ENTRY)[65] of manufacturing firms in province *p*, industry *k* at time *t*, calculated as the ratio of newly registered firms over the stock of existing ones. It is worth acknowledging that the main analysis focuses on limited liability (LL) companies because, following the current Italian legislation, new enterprises "of high technological value" (Italian Ministry of Economic Development, 2015, p. 2) are required to assume that explicit legal form. Focusing on the right-hand side variables, BCC is one of the indexes that measure the presence of BCC in the province *p,* either BCCLOAN (ratio between total loans of

[65] According to Fotopoulos and Spence (1997) and Agostino et al. (2019), gross entry rates (controlling for exits) should be preferred to net entry rates. Indeed, adding entry and exit into a net measure implies that the two process are determined by the same factors. Furthermore, by using a net measure, the interpretation of regression coefficients does not allow to sort out the influence of explanatory variables on entries and exits because important information on the absolute values of entries and exits are hidden.

BCCs in province *p* over total loans of all the banks located in the province *p*) or BCCBR (ratio between total number of BCCs in province *p* and total number of banks located in the province *p*).[66] HMTI is a dummy taking value 1 for industries characterized by high and medium-high technological intensity according to the OECD (2011) classification, and zero otherwise;[67] INTE is the interaction term between the BCC index and HMTI. X is a vector of control variables accounting for provincial characteristics that includes: real gross domestic product (GDP); the unemployment rate (UNRATE); the business density (DENS) measured as the stock of existing firms over the provincial surface (sq. km); a proxy of industrial structure in terms of firm size (FSIZE), defined as the average number of employees in manufacturing firms; patent applications filed to the European Patent Office per million inhabitants (PATENT); an index of economic and social infrastructure endowment (INFRA) provided by Tagliacarne Institute (2012); a measure of provincial trade intensity (OPEN) defined as the ratio between the sum of provincial imports and exports and GDP; the Herfindahl-Hirschman index computed on bank branches (HHIbr) as a measure of provincial bank concentration (e.g. Carbò Valverde et al., 2003; Degryse and Ongena, 2005); furthermore, the ratio between the provincial BCC's deposits and the province population (DEP) is added. Moreover, the control vector includes a proxy of human capital (EDU) calculated as the share of the population (20-24 years) with high school diploma at regional level. In order to take into account firms' turnover and "turbulence" phenomena, equation (2.1) includes a firm exit rate (EXIT) and the entry rate of firms other than the limited liability ones (ENTRYOT). Lastly, IND_k are industry dummies, controlling for unobserved heterogeneity at the industry level, T_t is a set of time fixed effects and ϵ_{pkt} is the error term. To avoid simultaneity bias, all explanatory variables (with the exception of HMTI) are lagged once.

2.5.2 Econometric Methodology

Given the nature of the dependent variable, defined as a proportion, taking on the zero value for a substantial number of observations, a censored Tobit model is used because boundedness is not the result of a truncation (Rosenthal and Strange, 2003; Gagliardi, 2009; Kalmi, 2013). The two-limit Tobit model is based on a latent process:

$$ENTRY^{*}_{pkt} = \alpha + \beta' X_{pkt} + \epsilon_{pkt} \qquad (2.2)$$

[66] As robustness check, the same set of regressions has been implemented by using BCCASS, defined as the ratio between the total asset of the BCCs in province *p* over the total asset of all the banks situated in the province *p*.
[67] High-technology industries are detailed in Table A2.1 note.

Where $ENTRY^*_{pkt}$ is a latent variable that is not observed for values less than zero and greater than one, normally distributed, and X_{pkt} is the set of covariates above described. The value of the observed variable $ENTRY_{pkt}$ is censored from below at L = 0 and from above at U = 1. Hence:

$$ENTRY_{pkt} = 0 \; if \; ENTRY^*_{pkt} \leq L$$
$$ENTRY_{pkt} = ENTRY^*_{pkt} \; if \; L \leq ENTRY^*_{pkt} \leq U$$
$$ENTRY_{pkt} = 1 \; if \; ENTRY^*_{pkt} \geq U$$

In this case $f^*(ENTRY_{pkt})$ is the density function as $f^*(ENTRY_{pkt}) \sim N(x'\beta, \sigma^2)$.The probability that $ENTRY_{pkt} = 0$ is given by:

$$Pr\left[ENTRY_{pkt} = 0\right] = Pr\left[ENTRY^*_{pkt} \leq 0\right] = Pr\left[x'_{pkt}\beta + \varepsilon \leq 0\right] = \Phi\left(-\frac{x'_{pkt}\beta}{\sigma}\right) \quad (2.3)$$

Similarly:

$$Pr\left[ENTRY_{pkt} = 1\right] = \Phi\left(-\left(1 - x'_{pkt}\beta\right)/\sigma\right) \quad (2.4)$$

Where $\Phi(.)$ is the standard normal cumulative distribution function.

The distribution of $ENTRY_{pkt}$ is a truncated normal distribution with expectation:

$$E\left(\, ENTRY_{pkt} | \, 0 < ENTRY^*_{pkt} < 1\right) = x'\beta + \sigma \frac{\phi\left(\frac{L - x'_{pkt}\beta}{\sigma}\right) - \phi\left(\frac{U - x'_{pkt}\beta}{\sigma}\right)}{\Phi\left(\frac{U - x'_{pkt}\beta}{\sigma}\right) - \Phi\left(\frac{L - x'_{pkt}\beta}{\sigma}\right)} \quad (2.5)$$

Where $\phi(.)$ is the density function.

Estimation of the Tobit model is usually done through maximum likelihood (Cameron and Trivedi, 2005; Verbeek, 2008; Wooldridge, 2010b).

Besides, as a robustness check, I apply a Fractional Probit Regression model (Papke and Wooldridge, 1996), that allows to overcome the downsides of linear models for fractional data (i.e., OLS estimated coefficients are constant throughout the range of the relative explanatory variables, and OLS predicted values are unbounded). Specifically, Papke and Wooldridge (1996) suggest a direct model for the conditional mean of the fractional response that allows keeping the predicted values in the bounded (0, 1) interval,[68] using a quasi-maximum likelihood method to obtain robust estimators.[69]

[68] See Wagner (2001) for a comparison between four different estimation methods: OLS, Tobit, Beta and QMLE.

[69] Formally, a generalized linear model is used to analyse the determinants x of the conditional mean μ of the fractional response variable. This model adopts a strictly monotonic and twice differentiable link function g(.) that plots the interval (0, 1) onto the real line, hence $g(\mu) = x'_{pkt}\,\beta$. Moreover, G(.) represents the inverse of the link

What is more, to control for unobserved time-invariant heterogeneity at sector/province level, a random effect Tobit model is used, based on the assumption that the sector/province specific effects are uncorrelated with the regressors. According to Wooldridge (2002), the fixed effects method (allowing this correlation) in limited dependent variable models is somewhat challenging, as it involves an incidental problem which leads to an inconsistent estimation of parameters with *T* fixed and $N \rightarrow \infty$.[70]

In addition, there might arise reverse causality between firm creation and the presence of BCCs. In fact, on one hand, higher presence of BCCs is expected to influence the birth of new firm, on the other firm creation may affect the presence of banks in a geographical area due to increasing demand for credit. Furthermore, some unobservable cultural and historical factors might determinate both the birth of new businesses and BCCs. Hence, in order to control for endogeneity problems, I use instrumental variable Tobit model. Following several contributions (such as Guiso et al., 2004; Agostino et al., 2012; De Bonis et al., 2015) the external instruments are some indicators of the geographical distribution of banks and branches in 1936 in Italy. Indeed, Guiso et al. (2004, p. 946) show that the territorial structure of the Italian banking system in 1936[71] "*was the result of historical accidents and forced consolidation, with no connection to the level of economic development at that time*". Moreover, the 1936 regulation, were not driven by different regional needs, "*but it was random*" (2004, p. 943). Therefore, the geographical distribution of banks and branches in 1936 can be considered exogenous concerning firm performance in subsequent years, while the geographical distribution of banking is significantly correlated with local banking development in the 1990s (Guiso et al., 2004).[72]

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function that satisfies 0 < G(z) < 1 for all $z \in \mathbb{R}$; in this work a Logit function is used (i.e. $G(x'_{pkt}\beta) = \frac{1}{1+\exp -(x'_{pkt}\beta)}$).

The estimation procedure of the fractional response model of Papke and Wooldridge (1996) is a quasi-likelihood method that involves the maximization of the Bernoulli log-likelihood function (Gourieroux et al., 1984; McCullagh and Nelder, 1989):

$$l_p(\beta) = ENTRY_{pkt} \log[G(x'_{pkt}\beta)] + (1 - ENTRY_{pkt})\, log[1 - G(x'_{pkt}\beta)]$$

This equation belongs to the linear exponential family, hence, the Bernoulli quasi-maximum likelihood estimator $\hat{\beta}$ is consistent and $\sqrt{n}$ is asymptotically normal regardless of the distribution of $ENTRY_{pkt}$ conditional on x_p , given that $E(ENTRY_{pkt}|x_{pkt}) = G(x'_{pkt}\beta)$.

[70] Besides, as Agostino et al. (2019) point out, the fixed effect approach is not appropriate when the repressors of interest do not vary substantially over time. Therefore, several variables at provincial level and sector fixed effects are included in order to overcome the assumption stated above.

[71] In this year, in response to the crisis of 1930–36, strict banking regulations were introduced and that remained substantially unchanged until the second half of the 1980s.

[72] Following the above considerations, the variable BCC and INTE are instrumented by variables defined in 1936 at provincial level: the share of banks owned by cooperative Popolari, the number of cooperative banks, total number of banks in the province, the share of branches owned by cooperative Popolari, the share of branches owned by saving banks in a province, the number of cooperative banks per million inhabitants, the share of banks owned by large banks and the total number of branches in a province. The Amemiya-Lee-Newey Test for the validity of the instruments is satisfied. However, the Wald test on the exogeneity of the BCC indexes (and their

Finally, bank distribution and economic conditions of nearby geographical areas could influence each other and, hence, spill-over effects across provinces might occur. What is more, firms operating in close provinces might establish network relationships, consequently, the new business entry rate in a province may be influenced by the analogous rate in adjacent areas (Agostino et al., 2019). Applying spatial econometrics to capture "neighbourhood effects" is challenging, given the sector/province and the longitudinal dimension of the data (e.g. McMillen, 2010; Gibbons and Overman, 2012). Following Agostino et al. (2019), I apply the Pesaran (2004) test of cross-sectional dependence for panel data (with small T and large N) to take into account the presence of potential spill-over effects. The test allows verifying whether there is cross-sectional dependence across provinces, considering each sector at time. When I perform this test, the null hypothesis of independence across provinces cannot be rejected for 66% of the sectors in the pre-crisis period and 74% in the post-crisis period, corroborating the estimators adopted.

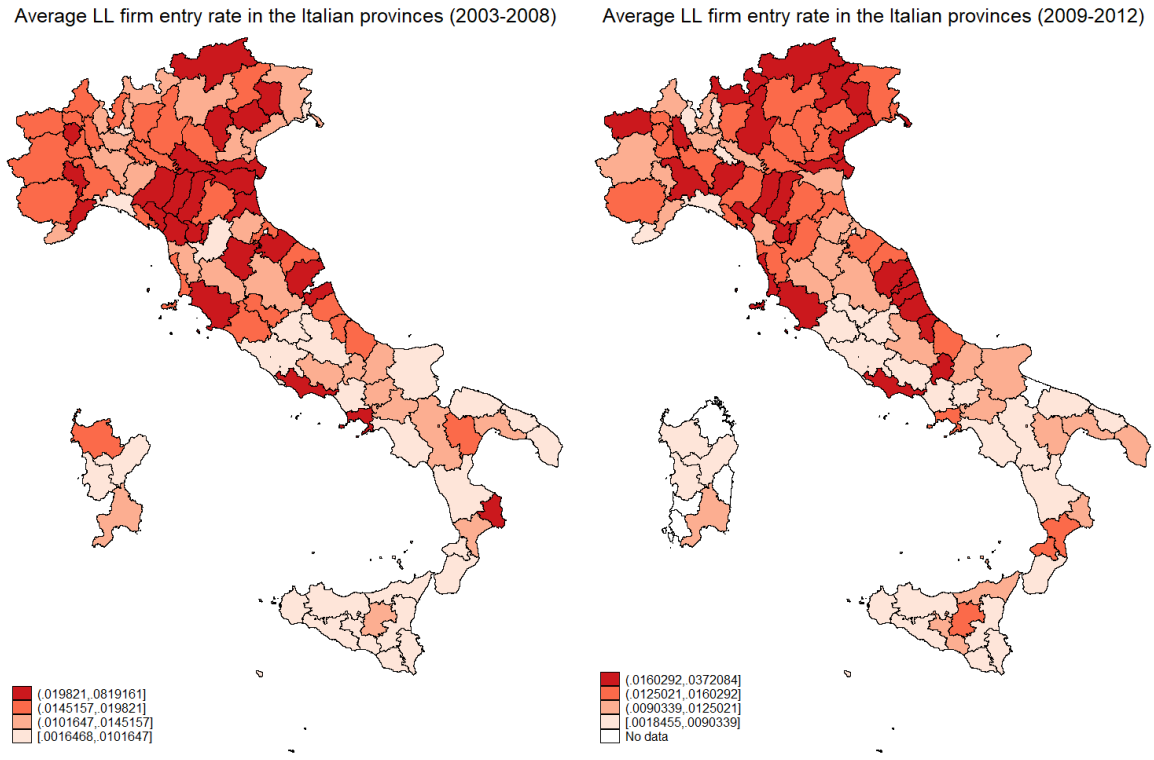
2.5.3 Data

Several sources have been used to build the dataset. First of all, the *Movimprese-InfoCamere* dataset - held by the information service consortium of the Italian Chambers of Commerce - offers quarterly and annual data at provincial, regional and industrial level on all registered, active and ceased enterprises in Italy since 1995. Firms are assembled into four categories given their legal status: limited liability companies, unincorporated partnerships, sole proprietors and enterprises with other forms of ownership. Regarding industries, data are available for the two-digit ATECO 2002 (Nace Rev. 1.1) classification until 2008, and for the two-digit ATECO 2007 (Nace Rev. 2) classification afterwards. The dependent variable (ENTRY) is defined at the province and industry level, which represents the unit of analysis. Because of lack of firm-level information, in this analysis key micro-level determinants of new businesses creation, such as firm-specific features (e.g., age, size), and socio-demographic characteristics of entrepreneurs (such as sex, age, education) cannot be considered.

Figure 2.2 displays the average entry rate of new (limited liability) firms across the Italian provinces during the two periods under scrutiny. As expected, higher entry rates characterize the north and centre-north of Italy. What is more, between the two periods, the entry rate decreases in the centre and south of the country, as well as in Piedmont and Liguria.

interaction terms) is never statistically significant, hence, the null hypothesis of exogeneity of the instrumented variables cannot be rejected, indicating that the other estimators employed can be deemed as reliable. Therefore, for the sake of conciseness, the results obtained by employing the IV approach are not reported.

Figure 2.2. Average (LL) firm entry rate in the Italian provinces.



Author's Elaboration on Movimprese-InfoCamere data.

Data on all the Italian BCCs (666 banks, observed for the period 2003-12) and information on the provincial distribution of their branches, come from the *ABI Banking dataset* provided by the Italian Banking Association. It is worth highlighting that balance sheet data are only available at bank-level, therefore, in order to retrieve information about the local market, i.e. provincial level, that is the focus of the analysis, I employ the criterion suggested by Carbò Valverde et al. (2003): formally, each variable of interest x for the branches (BRs) in province p of BCC i in year t is obtained as $x_{ipt} = X_{it} * \left(BR_{ipt}/BR_{it}\right)$, where X_{it} is the same variable as it is provided by the balance-sheet of bank i at time t; BR_{ipt} is the number of branch offices of BCC i in province p in year t; finally, BR_{it} is the total number of branch offices of i at time t. This methodology allows to build the key indexes in my analysis, measuring the weight of BCCs in each province. Lastly, information on provincial and regional features used as control variables are collected from the Italian National Institute of Statistics (ISTAT, 2017).

Equation (2.1) is estimated considering first the period 2003-2008 and then the years 2009-2012. The sample is split for three reasons. First, to analyse whether and to what extent the crisis has affected the role of BCCs as a determinant of entrepreneurship. What is more, a new regulation (named "Single Communication") occurred in October 2009, in order to facilitate business registration. Finally, industrial level data are available with different sectoral nomenclatures before and

after 2008, an exact matching between the two classifications being precluded by the fact that information is provided at two-digit level only. In Appendix 2, Table A2.1 reports the main summary statistics for both my sub-samples, while Table A2.2 shows the correlation matrix of the variables entering equation (2.1).

2.6. ESTIMATION RESULTS

Table 2.1 shows the Tobit models estimates for the first period of analysis, 2003-2008. While in columns 1 and 3 the entry rate is defined on all firms, in the other columns the analysis focuses on limited liability (LL) companies. To test H1, I first estimate equation (2.1) without interaction term. As columns 1 to 4 show, the coefficients of the key indexes (BCCLOAN and BCCBR) are both positive and statistically significant when considering LL firms (columns 2 and 4), while only the BCCLOAN parameter is positive and significant when considering all firms (columns 1 and 3). Furthermore, the coefficients of the two indexes tend to noticeably rise considering only LL firms. Since the LL is the legal form preferred by enterprises of high technological value (being mandatory since 2009), this result suggests that the presence of BCC may be particularly important for high tech firm.

To shed more light on this issue, and verify H2, columns 5 to 8 in Table 2.1 show the results of models including an interaction term between the key indexes (BCCLOAN in columns 5-6 and BCCBR in columns 7-8) and the High tech dummy (HMTI).[73] Consequently, the estimated impact of each index on the entry rate of the high-tech firms is the sum of the coefficient of the index parameter and the relative interaction term, while it is just the estimated coefficient of the index for the other firms. In columns 5 and 7 pooled Tobit model estimates are shown, while columns 6 and 8 report results obtained by employing a Random Effect Tobit estimator, to account for the panel structure of the data.

[73] To test H2, computing and interpreting the interactions effects is needed. However, it is worth recalling that in non-linear models the interactions marginal effects do not coincide with the first derivative of the multiplicative terms. The full interaction effect is the cross-partial derivative of the expected value of the outcome variable E(y) with respect to the constitutive terms (for instance, x_1 and x_2), which is different from the first derivative of E(y) with respect to the multiplicative term ($x_1 * x_2$). In addition, the statistical significance of the entire cross derivative must be calculated. Moreover, like all marginal effects in non-linear model, the interaction effect is conditional on the other independent variables, and it may have different signs for different values of covariates. Given its complexity, different ways of interpreting interaction effects in non-linear models have been advocated. Ai and Norton (2003) and, Cornelißen and Sonderhof (2009) compute correct marginal effects, respectively, for a change in two or three interacted variables for a Logit or Probit model, whilst Buis (2010) present effects as odds ratios for Logit models. I prefer following the Williams's (2012) suggestion, computing predicted or expected values for hypothetical or prototypical cases. By doing so, I avoid the critical features of the other approaches mentioned above and make the results "more tangible" (Williams, 2012, p. 308). To sum up, I only deal with the computation of the adjusted predictions of the interaction term included in the equation (2.1), that are reported in figures A2.1 to A2.6 in the Appendix 2.

Looking at columns 5 and 7, the coefficients of BCCLOAN and BCCBR are positive and statistically significant at 1% and 10% level, respectively, signalling that a higher presence of BCCs in the provinces leads to higher entry rate of firms in low-tech sectors. What is more, these indexes show a higher positive influence on the entry rate of high-tech firms. In fact, the coefficient of the interaction term is always positive and jointly statistically significant with the BCCs indicators, as shown by the F-test reported at the bottom of Table 2.1.[74]

Besides, the sum of the coefficients of each indicator (BCCLOAN, BCCBR) and the relative interaction term is always statistically significant, as shown by the t-test reported in the final rows of Table 2.1 (at 1% level of significance considering BCCLOAN). To visually assess these results, Figures A2.1 and A2.2 in the Appendix 2 plot fitted values for the two groups of firms individuated by the dummy variable HMTI, for each measure of institutional quality.[75] These results are confirmed also when employing a Random Effect Tobit (columns 6 and 8). Furthermore, looking at the Wald test on the exogeneity[76] of the BCC indexes (and their interaction terms) is never statistically significant (columns 5 and 7 of Table 2.1), hence, the null hypothesis of exogeneity of the instrumented variables cannot be rejected, indicating that the other estimators employed can be deemed as reliable. To sum up, in the pre-crisis period higher presence of BCCs seems to positively influence new business creation, moreover, the effect is even stronger on the entries of high-tech firms.

[TABLE 2.1]

On the other hand, notable differences arise when focusing on the period 2009-2012 (Table 2.2). Firstly, looking at the results without interaction term (column 1 to 4), BCCLOAN is positive and statistically significant and the magnitude of the effect seems to be higher for (LL) firms. Similarly, the indexes' coefficient is positive when adding the interaction term (columns 5, 6, 7 and 8), although not significant in the BCCBR case.

[74] Inconsistency between individual and joint significance may be occur because of multicollinearity due to the inclusion of interaction terms (Brambor et al., 2006).

[75] Figure A2.1 shows that at low level of BCCLOAN there is not significant difference between the (fitted) entry rate relative to HMTI firms and the entry rate of the other firms, in other words the presence of BCCs in the provinces affects firms' creation similarly for any technological category. However, as the BCCs' presence intensifies, the difference between HMTI and other firms becomes bigger and statistically significant (the confidence bands do not overlap). HMTI firms seem to benefit more than other firms from an increase in the presence of BCC. Figure A2.2 depicts a similar pattern.

[76] The Wald test on the exogeneity is obtained by employing the IV Tobit, as already metioned, the results of these estimates are not reported for the sake of brevity.

The main difference compared to the pre-crisis period concerns the negative sign of the interaction term between the key indexes and the high tech dummy (HMTI). More in detail, BCCLOAN is jointly significant with its interaction term both in the pooled and RE estimates (columns 5 and 6). The sum $(\hat{\beta}_1 + \hat{\beta}_3)$ is also significant (as shown by the t-test BCCLOAN+INTE). These results still signal the positive effect of BCCs for both low and high tech firms entry, but the estimated impact of the BCCs' presence is now slightly lower for the latter category. On the other hand, looking at the index BCCBR (columns 7 and 8) the previous outcomes are not entirely confirmed; indeed, the sum of the coefficient of BCCBR and the relative interaction term is never statistically significant.[77]

Furthermore, the regressor HMTI itself becomes negative and statistically significant in both pooled and RE Tobit models. In line with Agostino et al. (2019), this evidence supports the idea that entry in high tech industries is particularly difficult in times of economic turmoil. In addition, these results suggest that in the aftermath of the crisis, high technology firms are the first to be "sacrificed" by the BCCs, as they represent riskier investments. The Wald-test of exogeneity, reported at the bottom of Table 2.2, implies that the results based on pooled and RE Tobit are consistent.

[TABLE 2.2]

Observing the control variables in the estimates that include the interaction term, as expected, the level of GDP positively impacts on the new business formation both in the pre and post-crisis periods, as well as the business density (that is not strongly robust in the period 2009-2012). As regards the level of unemployment, UNRATE shows a negative impact on business formation in the pre-crisis period (in line with Guesnier, 1994; Garofoli, 1994; Caree et al., 2008), becoming not significant (as in Sutuaria and Hicks, 2004) in the aftermath of the crisis. In line with Agostino et al. (2019), in the pre-crisis the province innovation capability, proxied by EDU and PATENT, positively affects the entry rate (statistically significant at 1% in both Tobit estimates and fractional). In the aftermath of the crisis, an analogous pattern is confirmed by PATENT only. Moreover, unexpectedly, the infrastructures' endowment (INFRA) seems to negatively influence new firm formation, while a positive and significant effect is shown in the post-crisis considering fractional results in Table A2.3.

[77] Figure A2.2 and A2.3 illustrate that in the post crisis period the BCC presence exerts a similar impact on firms' creation for any technological category as the confidence bands overlap at any level of the BCC indexes.

The level of trade intensity (OPEN) seems to be positively associated with the new firm entry in both periods, while the measure of bank concentration (HHIbr) does not affect the entry rate (it is negative and significant at 10% only in one specification in the post-crisis period, columns 8 of table 2.2). Lastly, observing the level of deposit, there is weak evidence that DEP negatively impacts on the new business formation in both periods under scrutiny. However, this finding is not robust in all specifications.

To summarize, while the presence of BCC seems to be beneficial for firm creation in both periods, the estimated effect varies according to the industry sector to which firms belong. On one hand, in the pre-crisis period, the effect of BCCs presence is stronger on the entries of high-tech firms supporting the idea that, in *normal times*, BCCs represent an important source of finance for innovative and risky firm, and they might play the role of venture capitalist or business angels in a bank-based system. On the other hand, in the aftermath of the crisis, BCCs' presence has a slightly lower impact or tends to become an insignificant determinant for high-tech firms' creation. Thus, during economic turmoil the BCCs risk aversion could prevail, leading to downsize credit to riskier projects.

2.6.1 Robustness checks

As a first robustness check, I adopt a fractional regression model (Table A2.3); then, I replicate the analysis by using an alternative BCC index - BCCASS - defined as the ratio between the total assets of the BCCs in province *p* and the total assets of all banks operating in province *p* (Table A2.4).

Focusing on the pre-crisis period, the estimates obtained by Pooled and RE Tobit are confirmed by the fractional regression results (Table A2.3 columns 1 and 2). Although only the BCCLOAN parameter is individually positive and significant at 1% level, the sum ($\hat{\beta}_1 + \hat{\beta}_3$) of each indicator (BCCLOAN, BCCBR) and the relative interaction term is statistically significant.

Consistently with my main findings, the BCCASS coefficient is positive and significant (columns 1, 2 and 3 of Table A2.4), in addition, the sum of the coefficient of BCCASS and the relative interaction term is always statistically significant at 1% level. These results are confirmed across all the estimation methods adopted (Pooled, RE Tobit and Fractional). Figure A2.3 graphically illustrates these results.

Turning to analyse the results obtained in the post-crisis period, in line with the results obtained employing BCCLOAN, the BCCASS coefficient is positive for the low-tech sector (columns 4 and 5 of Table A2.4). Yet, the interaction term between the BCCASS and the high tech dummy (HMTI) is negative, the index being jointly significant with its interaction term both in the pooled

and RE estimates (columns 4 and 5). This evidence further confirms that in the aftermath of the crisis BCCs presence has a lower influence on high-tech firms' entry (compared to that on low-tech firms). On the other hand, by employing fractional regression (Table A2.3) all the key variables are never individually significant. Analogously, the test of jointly significance and the sum $(\hat{\beta}_1 + \hat{\beta}_3)$ are always not significant.

To summarize, this set of robustness checks corroborates the hypothesis that the BCCs' advantage in gathering soft information may promote business creation. Moreover, BCCs appear to favour high tech firms more than other categories in normal times, whilst in the aftermath of the crisis BCCs' presence seems to foster more low tech firm's entries or to exert a similar impact for any technological category. That is, economic uncertainty might discourage BCCs from investing in riskier projects, preferring low-risk investments.

2.7. CONCLUSION

This chapter investigates whether the higher presence of BCCs affects the birth of new firms, in the Italian provinces during the period 2003-2012. This investigation aims to fill the gap in the literature by analyzing a particular kind of cooperative banks, BCCs, that are local banks *par excellence* and represent a significant part of the Italian banking system.

According to my evidence, BCCs, although traditionally risk-averse, play a role in fostering entrepreneurship activities, presumably thanks to their proximity to the clients and comparative advantage in gathering soft information. More in details, the results, robust to several estimation methods, suggest that the effect of a higher presence of BCCs on business creation is related to the kind of industry sector (low or high tech) and, to the general economic conditions. Whilst the presence of BCCs appears to foster firms' creation, regardless of industry sector and period examined, the size of the estimated impact tends to be heterogeneous for low and high-tech firms in the two spans of years considered. On one hand, in the pre-crisis period, the influence of BCCs is stronger for high-tech firms, hence in *normal times*, BCCs appear a relevant source of finance for innovative and risky firm. On the other hand, in the aftermath of the crisis, the presence of BCCs tends to affect the entry of low-tech firms more than that of high-tech ones. These results corroborate the idea that high technology firms may be the first to be *sacrificed* in a crisis period, when the BCCs risk-aversion might prevail, persuading them to ration riskier projects.

To conclude, this empirical work highlights that BCCs might represent a relevant channel to support new business creation, and therefore develop local economies. The important role played by the local banking market seems to have been recognized by the Italian policy-makers with the introduction of a reform in 2016, that aims to ensure stability to cooperative banks preserving their local nature and traditional role.

Future research is called for to expand the analysis to other countries, characterized by different level of financial development, and to investigate the role of potential spill-over effects among close provinces.

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TABLE 2.1 - Tobit results (2003-2008)

	1	2	3	4	5	6	7	8
	No Interaction				BCCLOAN*HMTI		BCCBR*HMTI	
	Entry (All)	Entry (LL)	Entry (All)	Entry (LL)	Pooled	RE	Pooled	RE
BCCLOAN	0.0017**	0.0079***			0.0077***	0.0078***		
	0.0261	*0.0000*			*0.0000*	*0.0000*		
BCCBR			-0.0009	0.0034**			0.0031*	0.0032*
			0.2772	*0.0347*			*0.0714*	*0.0906*
HMTI		0.0159***		0.0157***	0.0171***	0.0177***	0.0174***	0.0179***
		0.0002		*0.0002*	*0.0023*	*0.0093*	*0.0016*	*0.0075*
INTBCCLOAN					0.0004	0.0005		
					0.7412	*0.7215*		
INTBCCBR							0.0007	0.0008
							0.6436	*0.6548*
GDP	0.0016***	0.0088***	0.0014**	0.0080***	0.0088***	0.0092***	0.0080***	0.0085***
	0.0073	*0.0000*	*0.0210*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
UNRATE	-0.0001	-0.0012***	0.0000	-0.0012***	-0.0012***	-0.0013***	-0.0012***	-0.0012***
	0.551	*0.0004*	*0.8122*	*0.001*	*0.0004*	*0.0003*	*0.0010*	*0.0007*
DENS	-0.0014**	0.0025***	-0.0014**	0.0023***	0.0025***	0.0025	0.0024***	0.0024
	0.0131	*0.0046*	*0.0112*	*0.0076*	*0.0044*	*0.1596*	*0.0071*	*0.1782*
EDU	0.0012***	0.0028***	0.0012***	0.0028***	0.0028***	0.0026***	0.0028***	0.0026***
	0.0014	*0.0001*	*0.0011*	*0.0001*	*0.0001*	*0.0012*	*0.0001*	*0.0010*
FSIZE	-0.0014	-0.0043*	-0.0016	-0.0050**	-0.0044*	-0.0039*	-0.0050**	-0.0045*
	0.2623	*0.0684*	*0.1921*	*0.0356*	*0.068*	*0.0935*	*0.0353*	*0.0533*
PATENT	0.0018***	0.0047***	0.0016**	0.0047***	0.0047***	0.0048***	0.0047***	0.0047***
	0.0035	*0.0001*	*0.0134*	*0.0001*	*0.0001*	*0.0002*	*0.0001*	*0.0003*
INFRA	-0.0003	-0.0046***	-0.0003	-0.0048***	-0.0046***	-0.0042***	-0.0048***	-0.0044***
	0.7203	*0.0016*	*0.6624*	*0.001*	*0.0016*	*0.0032*	*0.001*	*0.002*
OPEN	0.0001***	0.0002***	0.0001***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***
	0.0001	*0.0000*	*0.0001*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
HHIbr	0.0037	-0.0087	0.0009	-0.0088	-0.0087	-0.0109	-0.0087	-0.0099
	0.7488	*0.7423*	*0.9391*	*0.7476*	*0.7445*	*0.6542*	*0.7508*	*0.6911*
DEPPOP	-0.0027	-0.0172***	0.0031	-0.0051	-0.0172***	-0.0179***	-0.0051	-0.0056
	0.2075	*0.0000*	*0.1042*	*0.1605*	*0.0000*	*0.0002*	*0.1622*	*0.1776*
EXIT	0.0785***	0.0749***	0.0789***	0.0775***	0.0748***	0.0697***	0.0774***	0.0719***
	0.0000	*0.0027*	*0.0000*	*0.0020*	*0.0028*	*0.0007*	*0.0020*	*0.0005*
ENTRYOT	0.1579***	0.1201***	0.1584***	0.1227***	0.1201***	0.0870***	0.1228***	0.0884***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Observations	7,354	7,305	7,354	7,305	7,305	7,305	7,305	7,305
F-test (BCCLOAN, INTE)					12.852	20.889		
					0.0000	*0.0000*		
t-test (BCCLOAN+INTE)					4.786	4.233		
					0.0000	*0.0000*		
F-test (BCCBR, INTE)							2.381	4.171
							0.0924	*0.1242*
t-test (BCCBR+INTE)							2.116	1.943
							0.0171	*0.0260*
Wald test of exogeneity					0.625		1.939	
					0.7316		*0.3791*	

For the description of variables see Table A2.1. Except for column 1 and 3, the dependent variable is always ENTRYLL. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. The statistical significance of the sums of random variables (BCCLOAN+INTE; BCCBR+INTE) is assessed by computing the relative standard errors. Years and sector dummies always included but not reported. Wald test of exogeneity is obtained from the IV estimates, not reported in this table.

TABLE 2.2 - Tobit results (2009-2012)

	1	2	3	4	5	6	7	8
	No Interaction				BCCLOAN*HMTI		BCCBR*HMTI	
	Entry (All)	Entry (LL)	Entry (All)	Entry (LL)	Pooled	RE	Pooled	RE
BCCLOAN	0.0047***	0.0061**			0.0062**	0.0059**		
	0.0000	*0.0141*			*0.0164*	*0.0146*		
BCCBR			-0.0006	0.0016			0.0023	0.0022
			0.5785	*0.4514*			*0.3276*	*0.3188*
HMTI		-0.0121***		-0.0123***	-0.0129**	-0.0129*	-0.0163***	-0.0165**
		0.0076		*0.0067*	*0.0385*	*0.0547*	*0.0067*	*0.0121*
INTBCCLOAN					-0.0003	-0.0002		
					0.8737	*0.893*		
INTBCCBR							-0.0016	-0.0017
							0.3447	*0.3754*
GDP	0.0015**	0.0062***	0.0007	0.0052***	0.0062***	0.0062***	0.0053***	0.0054***
	0.018	*0.0000*	*0.2244*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
UNRATE	-0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0001
	0.6934	*0.9436*	*0.9926*	*0.8399*	*0.943*	*0.9668*	*0.8353*	*0.8699*
DENS	-0.0014*	0.0034***	-0.0016*	0.0033***	0.0034***	0.0034	0.0033***	0.0033
	0.0721	*0.0048*	*0.0641*	*0.0077*	*0.005*	*0.1388*	*0.0089*	*0.1525*
EDU	0.0002	-0.0011*	0.0003	-0.001	-0.0011*	-0.0012*	-0.001	-0.0011*
	0.5212	*0.0821*	*0.4548*	*0.1044*	*0.0821*	*0.0725*	*0.1045*	*0.0934*
FSIZE	-0.0009	0.0021	-0.0011	0.0015	0.0021	0.0025	0.0015	0.002
	0.5133	*0.3899*	*0.3887*	*0.5334*	*0.3892*	*0.2952*	*0.5303*	*0.4098*
PATENT	0.0034***	0.0062***	0.0030***	0.0061***	0.0062***	0.0060***	0.0061***	0.0059***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
INFRA	0.0013*	0.0011	0.0016**	0.0015	0.0011	0.001	0.0015	0.0014
	0.0926	*0.407*	*0.0472*	*0.2742*	*0.4067*	*0.3655*	*0.2735*	*0.2277*
OPEN	0.0000	0.0001*	0.0000	0.0001*	0.0001*	0.0001*	0.0001*	0.0001**
	0.3737	*0.0932*	*0.2360*	*0.0553*	*0.0931*	*0.0558*	*0.0552*	*0.0388*
HHIbr	-0.0082	-0.0353	-0.0259*	-0.0501	-0.0353	-0.0405	-0.0501	-0.0546*
	0.6031	*0.2594*	*0.0928*	*0.1014*	*0.2591*	*0.1644*	*0.1014*	*0.0587*
DEPPOP	-0.0091***	-0.0091*	0.0013	0.0000	-0.0091*	-0.0088*	0.0000	-0.0004
	0.0002	*0.0747*	*0.5539*	*0.9953*	*0.0745*	*0.0729*	*0.9977*	*0.9166*
EXIT	0.0258*	-0.0229	0.0264**	-0.0222	-0.0229	-0.0276	-0.0219	-0.027
	0.0512	*0.2987*	*0.0466*	*0.3126*	*0.2993*	*0.1823*	*0.3195*	*0.1918*
ENTRYOT	0.1714***	0.0955***	0.1749***	0.0998***	0.0954***	0.0839***	0.0997***	0.0871***
	0.0000	*0.0006*	*0.0000*	*0.0003*	*0.0006*	*0.0003*	*0.0003*	*0.0002*
Observations	5,226	5,183	5,226	5,183	5,183	5,183	5,183	5,183
F-test (BCCLOAN, INTE)					3.017	6.236		
					0.0490	*0.0442*		
t-test (BCCLOAN+INTE)					2.264	2.215		
					0.0118	*0.0133*		
F-test (BCCBR, INTE)							0.697	1.358
							0.4981	*0.5069*
t-test (BCCBR+INTE)							0.269	0.24
							0.3937	*0.4051*
Wald test of exogeneity					1.148		3.683	
					0.5631		*0.1585*	

For the description of variables see Table A2.1. Except for column 1 and 3, the dependent variable is always ENTRYLL. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. The statistical significance of the sums of random variables (BCCLOAN+INTE; BCCBR+INTE) is assessed by computing the relative standard errors. Years and sector dummies always included but not reported. Wald test of exogeneity is obtained from the IV estimates, not reported in this table.

APPENDIX 2

Economic Effects of Credit Cooperative Banks

The relationship between a bank and its borrowers plays a crucial role in financing smaller firms, as it may simplify the collection of relevant information. Hence, cooperative banks are more likely to finance smaller local enterprises than larger and less regionally focused banks (Stein, 2002; Williamson, 1967). What is more, cooperative banks are significantly related to local/regional economic development by mobilising members' deposit, i.e. savings and invest these funds in the region of provenience, preventing 'capital drain from less developed area to richer ones (Hakenes and Schnable, 2006; Hakenes et al., 2009). Furthermore, this allows to support local businesses and even attract entrepreneurship creating local employment, as a consequence, making these areas attractive for people. As explained by Demirgüç-Kunt and Huizinga (2001), local banks contribute to high and stable tax revenue, which help to raise the local economy.

Since the nature of cooperative banks is not strictly profit-oriented, their managers are more likely to create reserves in good times and unlock them if there is a need to do so, this allows to reduce intertemporal risk (Allen and Gale,1997 and 2000).

The literature also confirms that cooperative banks have less risky assets in their balance sheets. This could be a result of the informational advantages that these banks have about their customers or a risk-averse attitude in general. There is also evidence that these risk characteristics translate into further stable earnings streams for cooperative banks (Hansmann, 1996; Chaddad and Cook, 2004; O'Hara, 1981; Esty, 1997; Fraser and Zardkoohi, 1996; Hesse and Cihák, 2007; Iannotta et al., 2007; Kick and von Westernhagen, 2009)

Different studies show that the presence of cooperative banks influences economic growth. Cosci and Mattesini (1997) discover a positive relationship between local growth and the number of cooperative banks operating in various parts of Italy. Similarly, using regional data from 1970 to 1993, Usai and Vannini (2005) display that cooperative banks and special credit institutions are relevant for financial development and regional growth. Specifically, smaller and less complex cooperative banks are more appropriate for providing funds for locally based SMEs, rather than the large hierarchical privately owned banks. According to Ayadi et al. (2010) cooperative bank presence appears to have a significant pro-growth effect in Austria, Finland, Germany and the Netherlands. For Germany, more growth augments activity and increases additional growth. In Austria and the Netherlands, cooperatives operate in areas facing low growth and help income inequality.

More recently, Hakenes et al., (2009), using data from Germany, proves that the presence of savings and cooperative banks has encouraged regional economic growth through SME lending,

particularly in poorer regions. These findings are confirmed in Ayadi et al. (2010) for Austria, Germany and Spain, where savings banks are omnipresent. Hence cooperative banks are more willing to establish a long-term relationship with their clients, especially with SMEs, making them an integral player in enhancing regional growth.

Figures A2.1-A2.3. Tobit results (2004-2008)

Figure A2.1. BCCLOAN*HMTI (2003-2008) – Adjusted Predictions

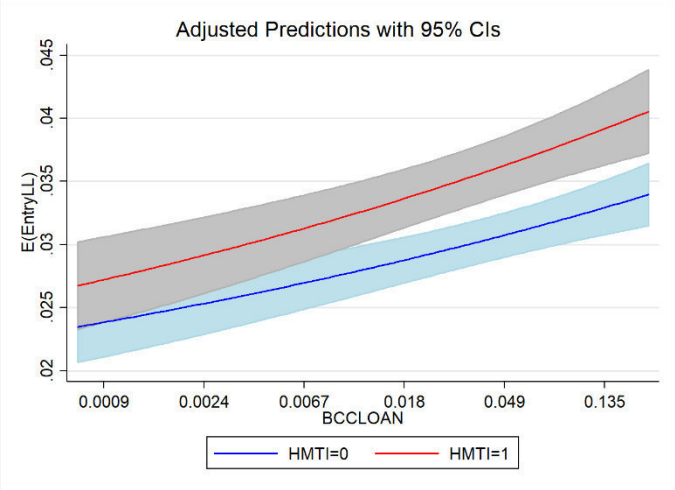


Figure A2.2. BCCBR*HMTI (2003-2008) – Adjusted Predictions

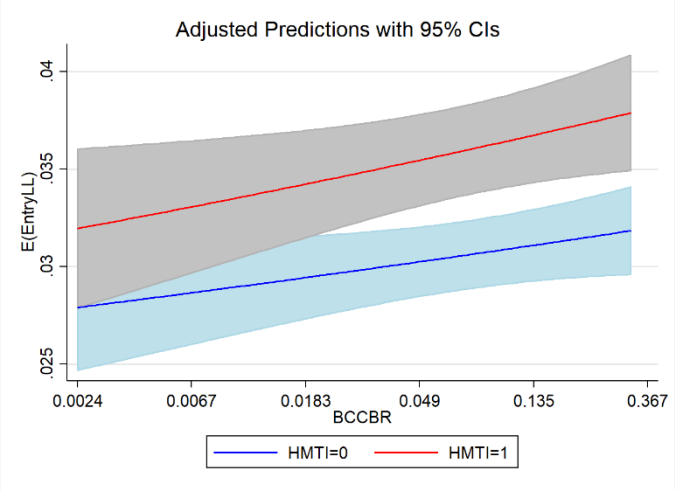
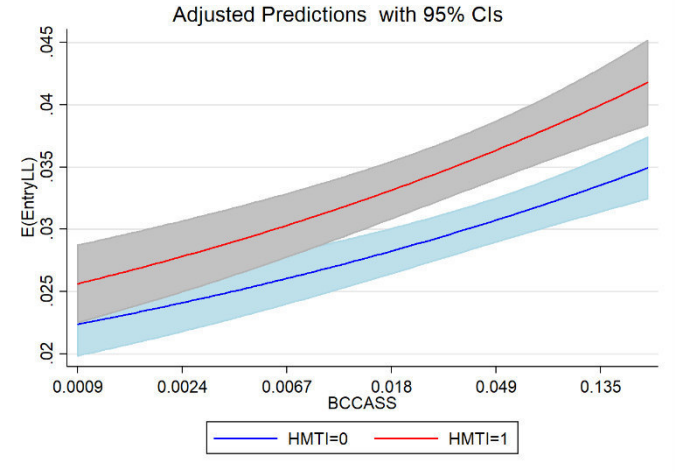


Figure A2.3. BCCASS*HMTI (2003-2008) – Adjusted Predictions



Figures A2.4-A2.6. Tobit results (2009-2012)

Figure A2.4. BCCLOAN*HMTI (2009-2012) – Adjusted Predictions

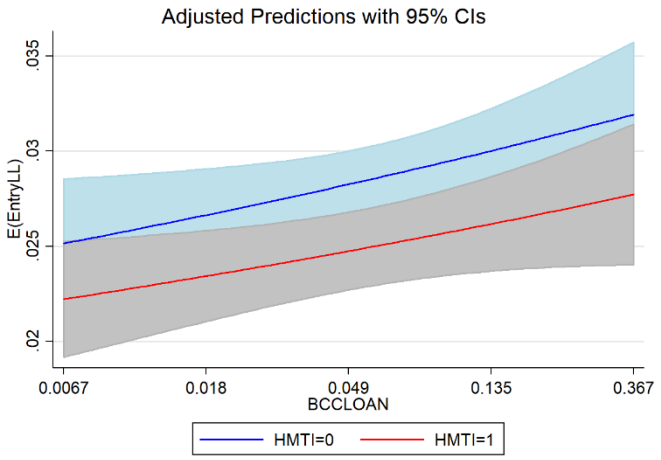


Figure A2.5. BCCBR*HMTI (2009-2012) – Adjusted Predictions

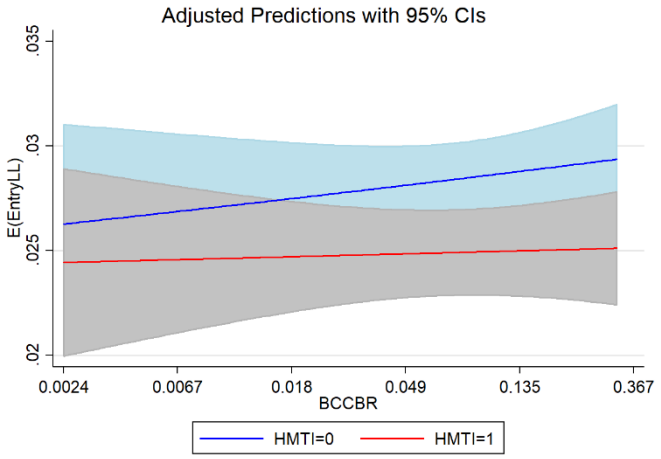


Figure A2.6. BCCASS*HMTI (2009-2012) – Adjusted Predictions

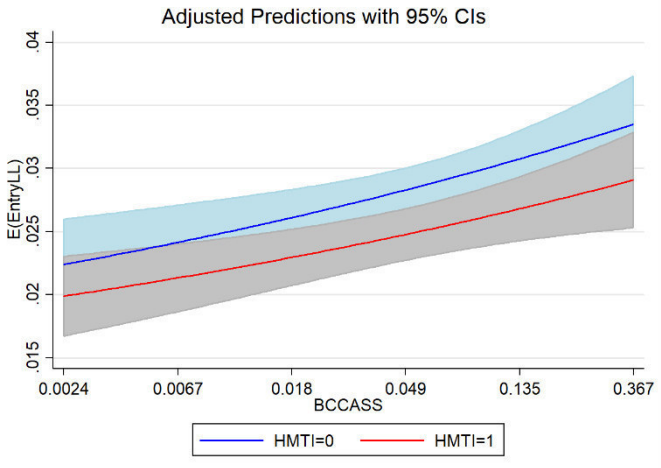


TABLE A2.1 - Description and summary statistics of the variables used in the estimations

VARIABLE	DESCRIPTION	Mean	StdD	Min	Max	Obs	Mean	StdD	Min	Max	Obs
		2003-2008					2009-2012				
ENTRY[a]	Entry rate: newly registered firms over the stock of existing firms	3.23	2.87	0	19.74	12,443	2.55	2.88	0	17.86	8,449
ENTRYLL[a]	Entry rate: newly registered limited liability (LL) firms over the stock of existing LL firms	1.35	2.63	0	23.53	12,334	1.18	2.30	0	18.92	8,374
BCCLOAN[a]	Bcc provincial total loan over Bank provincial total loan	7.07	5.35	0.07	22.85	12,233	7.96	5.44	0.31	24.07	8,382
BCCBR[a]	Bcc provincial number of branches over Bank provincial number of branches	10.86	7.19	0.31	32.43	12,256	12.11	7.37	0.78	32.77	8,382
BCCASS[a]	Bcc provincial total asset over Bank provincial total asset	6.83	5.04	0.06	21.36	12,233	7.73	5.25	0.25	23.33	8,382
HMTI	Dummy = 1 for high and medium technology industries (see table note)	0.35	0.48	0	1	12,974	0.33	0.47	0	1	8,856
GDP[b]	Provincial real gross domestic product	12,122	16,642	1,385	123,069	12,951	12,920	18,954	1,446	153,616	8,856
UNRATE[a]	Provincial unemployment rate	7.05	4.17	1.87	20.66	10,717	8.78	4.05	2.09	26.78	8,808
DENS[c]	Business Density: Provincial stock of firms over provincial surface (sq.km)	0.15	0.43	0	14	12,951	0.12	0.36	0	11	8,856
EDU[b]	Share of population (20–24 years) with high school diploma (regional level)	8.24	1.32	5.58	12.08	12,951	9.52	1.33	7.10	12.80	8,856
FSIZE[c]	Average number of employees in manufacturing firms headquartered in province	33.91	22.29	5	226	10,606	17.65	9.37	4	74	8,856
PATENT[c]	Provincial patent applications to the EPO (per million inhabitants)	72.12	67.04	1	310	10,717	62.79	58.71	1	290	6,540
INFRA	Provincial economic and social infrastructure endowment (index number, Italy=1)	1.00	0.63	0.25	5.74	10,717	0.98	0.66	0.24	5.98	8,624
OPEN[a]	Provincial export and import over GDP	38.47	24.58	1.75	190.93	12,233	39.27	26.95	1.90	162.17	8,808
HHIbr	Herfindahl-Hirschman index on bank number of branches	0.11	0.05	0.06	0.51	12,256	0.11	0.04	0.06	0.42	8,382
DEPPOP	Number of BCCs deposit in province over provincial population	1.17	0.94	0.02	3.99	12,233	1.46	1.10	0.06	4.56	8,382
EXIT[a]	Exit rate: ceased firms over the stock of existing firms	5.49	4.14	0	31.25	12,443	5.49	4.48	0	37.50	8,449
ENTRYOT[a]	Entry rate of firms others than the LL ones (OT), over the stock of existing OT firms	4.04	3.91	0	27.27	12,185	3.27	3.76	0	23.53	8,077

Both dependent variables ENTRY and ENTRYLL are defined at sector level (two-digit ATECO code: ATECO_2002 for the years from 2003-2008 and ATECO_2007 for the period 2009-2012), in each Italian province. (a) In percentage; (b) In millions of euro; (c) In unit. To rule out potential outliers, we eliminate the observations lying in the first and last percentile of the distributions of ENTRY, EXIT, ENTRYOT and of the three BCC indexes . High-technology industries include: aircraft and spacecraft; pharmaceuticals; office, accounting and computing machinery; radio, TV and communications equipment; medical, precision and optical instruments. Medium-high technology sectors are: electrical machinery and apparatus; motor vehicles, trailers and semi-trailers; chemicals excluding pharmaceuticals; railroad and transport equipment; machinery and equipment. While the OECD taxonomy relies on four-digit sectors, our HMTI dummy is defined considering industries at the two-digit level, as our data are available only at such level of disaggregation.

TABLE A2.2a - Correlation matrix (2003-2008)

	BCCLOAN	BCCBR	HMTI	GDP	UNRATE	DENS	EDU	FSIZE	PATENT	INFRA	OPEN	HHIbr	DEPPOP	ENTRYOT	EXIT
BCCLOAN	1														
BCCBR	0.8706	1													
HMTI	0.002	-0.0012	1												
GDP	-0.1246	-0.1391	-0.0037	1											
UNRATE	-0.2681	-0.0779	-0.0058	-0.1474	1										
DENS	-0.0241	-0.0537	-0.0067	0.2933	-0.1104	1									
EDU	0.0678	-0.0579	0.0031	0.1376	-0.5157	0.0497	1								
FSIZE	0.0556	0.0337	0.0012	0.1262	-0.3527	0.0717	-0.0323	1							
PATENT	0.1615	0.0234	0.0078	0.298	-0.6462	0.147	0.2223	0.3099	1						
INFRA	-0.0371	-0.1076	0.0029	0.2176	-0.2032	0.1521	0.1742	0.3732	0.181	1					
OPEN	0.1105	-0.0379	0.0069	0.1839	-0.4744	0.1646	0.1944	0.221	0.4834	0.1773	1				
HHIbr	-0.248	-0.2548	0.0009	-0.2581	0.0616	-0.1171	-0.1278	0.0453	-0.2275	-0.1715	-0.1806	1			
DEPPOP	0.9251	0.8033	0.002	-0.0235	-0.3999	0.0115	0.1542	0.1297	0.2826	-0.0022	0.1933	-0.2809	1		
ENTRYOT	0.0248	-0.0079	-0.0757	-0.0145	-0.0537	0.0552	0.1031	-0.0723	-0.0019	0.0784	0.0184	-0.009	0.0218	1	
EXIT	0.0298	-0.0027	0.0693	-0.0065	-0.0807	0.0789	0.0579	0.0371	0.0675	0.0258	0.0829	-0.0237	0.0424	0.1823	1

For the description of the variables see Table A2.1.

TABLE A2.2b - Correlation matrix (2009-2012)

	BCCLOAN	BCCBR	HMTI	GDP	UNRATE	DENS	EDU	FSIZE	PATENT	INFRA	OPEN	HHIbr	DEPPOP	ENTRYOT	EXIT
BCCLOAN	1														
BCCBR	0.8749	1													
HMTI	-0.0016	-0.0041	1												
GDP	-0.1548	-0.1382	0.0018	1											
UNRATE	-0.2902	-0.0982	-0.0103	-0.0949	1										
DENS	-0.0239	-0.0557	0.0123	0.2907	-0.1172	1									
EDU	0.0706	-0.0465	0.0048	0.1882	-0.4789	0.0537	1								
FSIZE	0.1403	0.065	0.0089	0.2324	-0.5536	0.1208	0.1785	1							
PATENT	0.2084	0.0859	0.0109	0.2177	-0.6189	0.1663	0.2193	0.5166	1						
INFRA	-0.0215	-0.1011	0.0088	0.2237	-0.2151	0.1421	0.0984	0.4751	0.1405	1					
OPEN	0.0972	0.0125	0.0078	0.1043	-0.5052	0.1335	0.2295	0.4416	0.4454	0.1999	1				
HHIbr	-0.2414	-0.2461	-0.0015	-0.2433	0.0848	-0.127	-0.0317	-0.0718	-0.2417	-0.1524	-0.1721	1			
DEPPOP	0.9324	0.8173	0.0018	-0.032	-0.4062	0.0114	0.143	0.2604	0.3469	0.02	0.1752	-0.3019	1		
ENTRYOT	-0.0209	-0.0214	-0.0525	-0.0034	0.011	0.0621	-0.0485	0.032	0.0005	0.0486	0.0027	0.0112	-0.0342	1	
EXIT	0.05	0.0162	-0.1386	-0.0101	-0.0975	0.0797	0.0617	0.0679	0.0926	0.0191	0.0854	-0.0371	0.052	0.2009	1

For the description of the variables see Table A2.1.

TABLE A2.3 - Fractional probit regressions (2003-2008 and 2009-2012)

	1	*2*	*3*	*4*
	2003-2008		**2009-2012**	
	BCCLOAN*HMTI	BCCBR*HMTI	BCCLOAN*HMTI	BCCBR*HMTI
BCCLOAN	0.0650***		0.043	
	0.0021		*0.2673*	
BCCBR		0.0148		0.0285
		0.4931		*0.3938*
HMTI	0.4449***	0.4371***	0.0332	-0.0059
	0.0000	*0.0000*	*0.7041*	*0.9433*
INTBCCLOAN	0.0236		0.0043	
	0.139		*0.8531*	
INTBCCBR		0.0256		-0.0106
		0.1652		*0.6688*
GDP	-0.0241*	-0.0309**	-0.0382**	-0.0432***
	0.0932	*0.0269*	*0.0229*	*0.0055*
UNRATE	-0.0106**	-0.0094**	-0.0021	-0.0019
	0.0213	*0.0374*	*0.7227*	*0.75*
DENS	0.0157**	0.0142*	-0.0031	-0.0047
	0.0405	*0.0737*	*0.892*	*0.8407*
EDU	0.0406***	0.0423***	-0.0101	-0.009
	0.0000	*0.0000*	*0.2876*	*0.3453*
FSIZE	-0.0454	-0.0512*	0.0446	0.0392
	0.1279	*0.0857*	*0.1931*	*0.2535*
PATENT	0.0458***	0.0448***	0.0558***	0.0571***
	0.0014	*0.0019*	*0.0017*	*0.0019*
INFRA	-0.0369**	-0.0386**	0.0323*	0.0355**
	0.0368	*0.0302*	*0.0513*	*0.0337*
OPEN	0.0024***	0.0026***	0.0004	0.0005
	0.0000	*0.0000*	*0.4145*	*0.3425*
HHIbr	0.2009	0.2029	-0.348	-0.407
	0.5441	*0.555*	*0.4431*	*0.3621*
DEPPOP	-0.1623***	-0.036	-0.0573	-0.0122
	0.0015	*0.4183*	*0.4475*	*0.8435*
EXIT	0.9084***	0.9352***	-0.2021	-0.1907
	0.0020	*0.0015*	*0.5203*	*0.5433*
ENTRYOT	1.1687***	1.1894***	1.1032***	1.1271***
	0.0000	*0.0000*	*0.0039*	*0.0029*
Observations	7,305	7,305	5,183	5,183
F-test (BCCLOAN, INTE)	16.075		1.482	
	0.0003		*0.4764*	
t-test (BCCLOAN+INTE)	4.003		1.197	
	0.0000		*0.1155*	
F-test (BCCBR, INTE)		3.532		0.75
		0.171		*0.6872*
t-test (BCCBR+INTE)		1.77		0.522
		0.0383		*0.3007*

For the description of variables see Table A2.1. The dependent variable is always ENTRYLL. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. The statistical significance of the sums of random variables (BCCLOAN+INTE; BCCBR+INTE) is assessed by computing the relative standard errors. Years and sector dummies always included but not reported.

TABLE A2.4 - Results using BCCASS (2003-2008 and 2009-2012)

	1	*2*	*3*	*4*	*5*	*6*
	2003-2008			**2009-2012**		
	Pooled	RE Tobit	Fractional	Pooled	RE Tobit	Fractional
BCCASS	0.0096***	0.0097***	0.0829***	0.0082***	0.0078***	0.0446
	0.0000	*0.0000*	*0.0001*	*0.0005*	*0.0004*	*0.2406*
HMTI	0.0169***	0.0174**	0.4427***	-0.0123**	-0.0125*	0.0976
	0.0027	*0.0104*	*0.0000*	*0.0489*	*0.0632*	*0.2165*
INTBCCASS	0.0002	0.0003	0.0219	-0.0001	-0.0001	0.0073
	0.8527	*0.8265*	*0.1714*	*0.9542*	*0.9566*	*0.7577*
GDP	0.0100***	0.0103***	-0.0134	0.0073***	0.0073***	-0.0374**
	0.0000	*0.0000*	*0.3792*	*0.0000*	*0.0000*	*0.0297*
UNRATE	-0.0015***	-0.0016***	-0.0135***	-0.0001	-0.0001	-0.003
	0.0000	*0.0000*	*0.0041*	*0.7396*	*0.7269*	*0.6233*
DENS	0.0031***	0.0031*	0.0209***	0.0038***	0.0038*	0.0116
	0.0001	*0.0756*	*0.0021*	*0.0009*	*0.0957*	*0.3764*
EDU	0.0027***	0.0025***	0.0399***	-0.0008	-0.0009	-0.0094
	0.0001	*0.0013*	*0.0000*	*0.1936*	*0.1606*	*0.3286*
FSIZE	-0.0047**	-0.0043*	-0.0495*	0.0021	0.0025	0.0397
	0.0469	*0.067*	*0.0961*	*0.3946*	*0.2938*	*0.2274*
PATENT	0.0047***	0.0049***	0.0455***	0.0066***	0.0064***	0.0539***
	0.0001	*0.0002*	*0.0015*	*0.0000*	*0.0000*	*0.0023*
INFRA	-0.0043***	-0.0039***	-0.0339*	0.001	0.0009	0.0333*
	0.0031	*0.006*	*0.054*	*0.4569*	*0.4158*	*0.0512*
OPEN	0.0002***	0.0002***	0.0026***	0.0001*	0.0001**	0.0004
	0.0000	*0.0000*	*0.0000*	*0.0621*	*0.0380*	*0.3995*
HHIbr	0.0027	0.0003	0.3054	-0.0215	-0.0274	-0.2847
	0.9185	*0.9896*	*0.3614*	*0.4975*	*0.3518*	*0.3585*
DEPPOP	-0.0214***	-0.0221***	-0.2017***	-0.0131***	-0.0127***	-0.062
	0.0000	*0.0000*	*0.0001*	*0.0050*	*0.0054*	*0.4027*
EXIT	0.0737***	0.0687***	0.9021***	-0.0223	-0.027	-0.1894
	0.0032	*0.0009*	*0.0022*	*0.3135*	*0.1917*	*0.5067*
ENTRYOT	0.1188***	0.0866***	1.1549***	0.0935***	0.0826***	3.1637***
	0.0000	*0.0000*	*0.0000*	*0.0008*	*0.0004*	*0.0000*
Observations	7,305	7,305	7,305	5,183	5,183	5,183
F-test (BCCASS, INTE)	20.465	32.893	23.419	6.58	13.491	1.767
	0.0000	*0.0000*	*0.0000*	*0.0014*	*0.0011*	*0.4132*
t-test (BCCASS+INTE)	5.94	5.209	4.786	3.369	3.266	1.318
	0.0000	*0.0000*	*0.0000*	*0.0003*	*0.0005*	*0.0937*
Wald test of exogeneity	1.532			1.63		
	0.4646			*0.4426*		

For the description of variables see Table A2.1. The dependent variable is always ENTRYLL. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. The statistical significance of the sums of random variables (BCCASS+INTE) is assessed by computing the relative standard errors. Years and sector dummies always included but not reported. Wald test of exogeneity is obtained from the IV estimates, not reported in this table.

Chapter 3

LEVERAGE, BANKING COMPETITON AND SMEs FINANCIAL STABILITY. EVIDENCE FROM THE ITALIAN PROVINCES

ABSTRACT

Using a large panel of Italian firms in the time span from 2003 to 2012, this chapter examines the relationship between leverage and SMEs' financial stability, evaluating whether and to what extent this link is affected by the degree of competition characterising the local credit market in which firms operate. Using two measures of local banking competition – H-statistic and Boone indicator – my evidence shows that the negative impact of leverage on firms' financial health is greater for firms operating in more competitive banking markets. Indeed, the drawbacks of increasing banking competition seem to prevail on their expected advantages, leading banks to be less inclined to establish lending relationships with risky firms, thus increasing their financial vulnerability.

Keywords: Local banking competition, leverage, Z-score, SMEs, Italian provinces.

3.1. INTRODUCTION

The role of market competition in the banking sector has been largely debated in the economic literature. Theoretical contributions have failed to provide a univocal prediction on this topic, and several works have ended up to mixed results: competition in the banking industry has been shown to affect the credit market either positively or negatively. This evidence challenges the classical view, according to which higher competition leads unequivocally to welfare gains.

My work contributes to this strand of literature by providing empirical evidence on the role that local banking competition might play in the relationship between indebtedness of small and medium-sized firms (hereafter SMEs) and their financial distress. More in detail, this chapter investigates the relationship between leverage and Italian SMEs' financial stability, appraising whether and to what extent this link is influenced by the degree of competition that characterises the local credit market in which firms operate.

To test this conditional hypothesis, I refer to the results obtained by the field of literature investigating the influence of banking market structure on firms' financial health, taking into account that Italian SMEs largely rely on banking finance (Demirgüç-Kunt and Levine, 1999). Besides, a large body of research (i.e. Petersen and Rajan, 1995; Bonaccorsi di Patti and Gobbi, 2001) suggests that SMEs bank financing originates essentially from local credit markets, even in the presence of deregulation, consolidation of banking structure and technological innovations (i.e. Alessandrini et al., 2009; Castelli et al., 2012).

The other strand of literature that is relevant for the present study investigates the impact of debts on firms' financial stability. Contributions widely recognise that at increasing level of debt the firms' risk of bankruptcy rises (see, among others, Warner, 1977; Kim, 1978; Jensen, 1986). As noted by Guariglia (1999), higher leverage ratio tends to decrease firm investments because of increased costs of external funding due to higher default risk. This vicious circle reduces the financial stability of the firm and in turn, gradually, leads to its failure. My contribution is examining to what extent the magnitude of this effect is influenced by the degree of competition characterising local credit markets, taking into consideration that Italian SMEs rely largely on banks having branches in the same market where they operate.

The expected results are not obvious, as two opposite scenarios can be envisaged on a theoretical ground. On one hand, if banking competition stimulates more favourable credit conditions, this should reduce borrowing costs, which might be beneficial for both healthier and indebted firms, as they can easier access credit and pursue their investment projects. Indeed, the neoclassical theory, namely *market power hypothesis*, predicts that bank competition should increase access to finance, reduce interest rates and lower collateral requirements for SMEs (Besanko and

Thakor, 1992; Jimenez et al., 2006; Hainz et al., 2013). Therefore, higher competition might alleviate the negative effect of debt on firms' financial health.

On the other hand, *the information-based hypothesis* argues that, in the presence of information asymmetries and agency costs, higher competition might reduce bank incentives to invest in relationship lending and, thus, leads to higher financial constraints (Marquez, 2002; Dell'Ariccia and Marquez, 2006; Hauswald and Marquez, 2006). Petersen and Rajan (1995) claim that banks that operate in a less competitive market, exploiting their higher market power, may avoid applying an extra interest rate than they might otherwise have to charge when lending to firms that are relatively opaque or risky (young, small and/or distressed firms). Furthermore, as competition increases, the effectiveness of banks' screening technology tends to diminish to the point that, ceteris paribus, the expected benefits of the competition become negative (Gomez and Ponce, 2014). In such cases, increasing competition might reinforce the effect of leverage on firms' risk of failure, in particular for those firms that are riskier due to higher indebtedness.

Moving from these insights, this work takes advantage of a large panel of Italian small and medium-sized manufacturing firms observed across the period 2003-2012. The indicator of financial health here employed is the Z-score, commonly adopted as a measure of the distance from insolvency (e.g., Laeven and Levine, 2009; Houston et al., 2010; Kanagaretnam et al., 2012; Mihet, 2012; Jin et al., 2013; Agostino and Trivieri, 2018).

As suggested by previous contributions, in this work local credit markets correspond to the existing administrative provinces. Indeed, according to Bonaccorsi di Patti and Dell'Ariccia (2004), Italian provinces are characterised by a different banking structure providing relevant cross-section variability within a single institutional framework. As measures of local banking competition (LBC), I employ the H-statistic, a non-structural indicator proposed by Panzar and Rosse (1987), and the recent developed Boone (2008) indicator. Both indicators have been proved to be precise and robust measures of bank market power and are often uncorrelated with concentration measures (Claessens and Laeven, 2004; Maudos and Fernandez de Guevara, 2004, 2006 and 2007)

The main results, robust to different econometric methodologies, indicate that the leverage always negatively and significantly affects firms' financial health, confirming the theoretical prediction on this relationship. What is more, I find that the negative impact of leverage intensifies at increasing level of competition. According to this evidence, the drawbacks seem prevailing on the benefits potentially associated to competitive banking markets, strengthening the negative effect of higher indebted levels on firms' financial stability. Indeed, increasing banking competition may

reduce the incentive to invest in monitoring and screening activities because of free-riding problems, and curtail the propensity to establish relationship lending as firms may easily switch bank. These factors could lead banks to ration risky firms, deteriorating, in turn, their financial health. Thus, my results suggest that a certain degree of monopolistic power in local banking markets does not necessarily entail welfare losses, corroborating the strand of literature that challenges the neoclassical theory.

The remaining of this chapter is organized as follows: after this introduction, Section 3.2 provides an overview of the related literature. Section 3.3 briefly describes the Italian banking system. Section 3.4 sets up the research hypotheses and illustrates the estimating model, the econometric methodology and the dataset. Section 3.5 shows the results, while Section 3.6 concludes.

3.2. LITERATURE REVIEW

3.2.1 Leverage and firms' default risk

Although a large debate is still open about the optimal capital structure for firms value (see, among others, Modigliani and Miller, 1958 and 1963; Jensen and Meckling, 1976; Ross, 1977; Heinkel,1982; Myers, 1984; Jensen 1986; Baker and Wurgler, 2000)[78] and about the effect of leverage on firm performance (Jensen and Meckling, 1976; Grossman and Hart 1982; Jensen 1986; Williams 1987; Bond and Meghir 1994; Nickell and Nicolitsas, 1999),[79] in the economic literature

[78] The debt finance and equity finance are main source of external finance in corporate finance theory. Nevertheless, there is a large debate about how them to be composed of to minimize the agency costs and maximize the firm value. Starting from the capital structure theories, the M&M (1958) capital structure irrelevance theorem proves that there exists an appropriate contingency for debt and equity finance. According to the trade-off theory, Modigliani and Miller (1963) show a leveraged firm and an unleveraged firm differ in terms of value, that derives from the interest tax shield. Indeed, firms would pursue more debt as long as the present value of the tax shield is greater than the present value of bankruptcy, agency costs and all other costs associated with higher leverage. Based on the agency cost theory, as debt is sold, the agency costs of debt also increase with leverage, while the proportion of equity, and agency costs of equity decreases. The result is a decrease in the total agency costs. Jensen and Meckling (1976) argue that exists an optimum quantity of leverage that would be associated with a minimum amount of total agency costs. Further, Jensen (1986) claim that debt may reduce the agency costs of free cash flow by reducing the amount of cash under management control. Based on the pecking order theory, Myers (1984) argued that, when using external financing, the firm prefer the debt finance to the equity finance. According to Ross (1977) and Heinkel (1982) a firm with positive prospects will raise new capital through debt financing, while a firm with inauspicious prospects will go through equity financing. Based on the market timing theory, Baker and Wurgler (2000) claimed that when equity prices are too high, existing shareholders profit by supplying overvalued equity, and when equity prices are too low, issuing debt is preferable.

[79] Building on the large literature about this topic, leverage might have three sorts of impact on firms' performances. According to Nickell and Nicolitsas (1999), a first effect is directly linked to the cost of borrowing, in other words, any firm activity is negatively influenced by a rise in borrowing costs. Secondly, firm performance may be related to the managerial incentives. In this respect, building on the pioneering work of Jensen and Meckling (1976), greater financial leverage may reduce the agency costs arising from the conflict of interest intervening between shareholders and managers. More in detail, debt financing motivates managers to perform better, for instance through the threat of liquidation (e.g., Grossman and Hart, 1982; Williams, 1987) or through increased pressure to generate cash flow in order to pay interest expenses (Jensen, 1986). However, since the potential presence of divergent interests between shareholders and debtholders, leverage may also exert a perverse

there is general consensus about the positive relationship between firm debt and probability of failure.

In this respect, Warner (1977) and Kim (1978), exploring the link between leverage level and bankruptcy probabilities, found that when increasing the level of debt usage, the probability that financial distress occurs is also expected to increase. As noted by Jensen (1986), a higher level of leverage increases the bankruptcy probability, and if this happens, managers are more likely to be penalized than owners. Guariglia (1999) shows that a higher leverage ratio of UK firms negatively affects their investment due to higher default risk and this, in turn, leads to raising the cost of external funding. Similarly, by using the firm's debt rating as a proxy for the default probabilities and correcting for the endogeneity, Molina (2005) confirms that leverage has a negative effect on debt ratings. Bridges and Guariglia (2008), using a panel of 61,496 UK firms over the period 1997–2002, find that purely domestic firms with lower collateral and higher leverage experience a higher failure than globally engaged firms. Firms having higher financial distress are expected to have a higher probability of bankruptcy (Hovakimian et al., 2012), and higher leverage level is associated with higher default probability (Bonaccorsi di Patti et al., 2015).

Since bankruptcy occurs when firms cannot satisfy their debt payments, an obvious way of reducing the probability of financial distress is decreasing the firm's leverage (Verwijmeren and Derwall, 2010). Indeed, firms with a higher bankruptcy probability will be demanded to pay higher interest on debt and comply with more constrains in debt covenants. These additional requirements may further increase the firm's bankruptcy probability and bankruptcy costs (Cheng and Tzeng, 2011). In this respect, Chan and Chen (1991, pag.1468) defined financially distressed firms as those that "*have lost market value because of poor performance, they are inefficient producers, and they are likely to have high financial leverage and cash flow problems. They are marginal in the sense that their prices tend to be more sensitive to changes in the economy, and they are less likely to survive adverse economic conditions*". Consequently, investors should demand a higher interest rate for embedding these risky stocks expecting to be rewarded for taking the risk in the future (Bhattacharjee and Han, 2014). As noted by Bottazzi et al. (2011), in proximity to default event the leverage ratio increases, showing a disproportionate financial structure. This gives signals that the cost of debt is one of the main determinants in explaining firm default. Chung et al. (2013), based on a panel data study of oil exploration firms, show that firms are more likely to fail when they are highly levered and when high leverage is a recent phenomenon. Indeed,

effect in terms of the agency costs. In addition to this beneficial effect, generated by the. Specifically, this divergence might encourage the shareholders to behave opportunistically by operating without maximise the firm value. For instance, investing in projects riskier than those preferred by debtholders.

high levels of debt financing are associated with higher probabilities of both acquisition and failure. Gul and Cho (2019), studying the effect of the capital structure of Korean manufacturing firms on default risk, suggest that the rise in short-term debt leads to increase the risk of default, whereas, the increase in long-term debt leads to decrease the default risk.

To summarize, according to this short overview of the last fifty years of research, it seems clear that higher level of debt reduces the financial health of the firm. However, what does it happen when changing the outside environment, specifically, the structure of the banking market?

3.2.2 Banking competition

This section offers a brief review of the literature analysing banking competition, starting from the studies that investigate the issue of competition and stability in the banking sector itself. Indeed, contributions on the relationship between bank competition and firms access to finance originate from the aforementioned strand of literature. Mixed and conflicting results have been discovered. Overall, these studies can be grouped into two blocks.

The primary contributions belong to the neoclassical theory. Pagano (1993) and Guzaman (2000) show that in the banking sector the monopoly market leads to welfare losses because banks with higher market power might charge higher interest rates on loans and pay lower interest rates on deposits. Boyd and De Nicolò (2005) prove that, ceteris paribus, as competition declines, banks earn more rents in loan markets by using their market power to charge higher loan rates. Consequently, this increases the bankruptcy risk for borrowers who, when confronted with higher interest costs, hence lower profits, optimally adjust their investment policies in favour of more risk. These predictions conform the conclusion of former works on the role of bank competition on bank risk-taking (Keeley, 1990; Allen and Gale, 2000; Hellmann et al., 2000; Repullo, 2004). Similarly, Koskela and Stenbacka (2000) claim that greater competition increases the probability that borrowers repay their loans as a result of lowering interest rates. In other words, the so-called *market power hypothesis* suggests that the bank competition should increase access to finance, reduce interest rates and lower collateral requirements for SMEs (Besanko and Thakor, 1992; Jimenez et al., 2006; Hainz et al., 2013).

On the other hand, in the last decades numerous theoretical and empirical works, following *the information-based hypothesis,* have challenged the neoclassical theory. This stand of literature highlights the role of asymmetric information problems in the relationships between lenders and borrowers introduced by Stiglitz and Weiss (1981). These investigations prove that credit rationing can be an equilibrium outcome in competitive lending markets. In detail, they claim that higher competition reduces bank incentive to invest in relationship lending and, thus, higher financial

constraints due to more asymmetric information between banks and borrowers (Marquez, 2002; Dell'Ariccia and Marquez, 2006; Hauswald and Marquez, 2006)

Petersen and Rajan (1995) represent the pioneering study in line with this research. They show that when bank monopoly power is relatively higher, younger firms may receive more credit, and at better rates. They argue that a monopolistic bank might help young or distressed firm in order to extract rents from eventually successful ones. The monopolistic bank relies on upon maintain lending relationships in the future, avoiding the firms to be attracted by rival banks. While, in a competitive credit market, banks are less likely to presume to obtain firm's surplus in the future, as a consequence, they might apply an additional interest rate to protect the riskiness of distressed or young firms. Consequently, default risk should be higher when bank competition is higher. In this regard, Shaffer (1998) and Dell'Arriccia (2000) show that a higher banking competition might lead to negative effects in terms of efficient funds allocation in an economy. Actually, this market scenario might diminish the number of banks active in performing screening and competing in supplying credit, consequently leading to higher interest rates and smaller credit quantities in a market (Cao and Shi, 2001).

Based on this literature, a plethora of works investigates the economic effects of banking competition. Amid the above explained two different lines of research, several contributions discover mixed results both on a theoretical and empirical basis. On the theoretically ground, Cetorelli (1997) and Cetorelli and Peretto (2000), by using a dynamic general equilibrium model, recognise a trade-off between quantity of credit made available in a market and banks' role in allocating funds efficiently: at decreasing level of competition the quantity of credit offered is smaller. Nevertheless, considering that banks screening activity involve a positive informational externality implying free-riding problem, less competition generates more incentive for them to pay the cost of screening, thus, it is more likely that funds are mainly allocated efficiently to high-quality firms. Jayaratne and Strahan (1996), studying the U.S. branching deregulation, show that this policy enhanced both personal income and output growth, underlining the beneficial effects of banking competition. Black and Strahan (2002) claim that in a monopoly banking market the number of new firms and new business incorporations is smaller. Beck et al. (2004), analysing developed and developing countries, illustrate that, in the latter, bank concentration increases financing obstacles, in particular for SMEs as compared to large firms. Likewise, Deidda and Fattouh (2005) find a negative relationship between banking concentration and economic growth in low-income countries. Agostino et al. (2012), focusing on Italian SMEs, show that bank market concentration positively affects SME default riskiness when these firms borrow heavily from their main bank and have few credit relationships with other intermediaries. In addition, this evidence on firm

default probability is greater as the duration of (close) credit relationships lengthens. Recently, Papanikolaou (2019) reveals that boosted competition decreases lending cost, promoting the entry of new customers in credit markets. Malafronte et al. (2014) show that bank market power obstacles access to credit for SMEs considering 53 developing countries. Notwithstanding, this negative effect of bank market power is reduced depending on the countries that have well-structured credit market.

On the other hand, many studies indicate detrimental effects due to higher competition among banks. As aforementioned, Petersen and Rajan (1995), investigating credit availability for a cross-section of U.S. small firms located in markets with different degrees of banking concentration, find that in higher banking concentrated market young firms have both fewer credit constraints and pay lower loan rates. In this regard, Shaffer (1998) illustrates where higher is the number of banks, the higher loan charge off rates in Metropolitan Statistical Areas. Marquez (2002) evidences that higher banking competition leads to less efficient screening and most likely in higher interest rates because each bank becomes informed about a little group of debtors, thus, the borrower-specific information becomes more disperse. Bonacorrsi di Patti and Gobbi (2001), using Italian provincial data, show that increasing the number of bank has a significant negative effect on lending to small firms. What is more, banking concentration has a positive effect on the firm's birth rate (Bonacorrsi di Patti and Dell'Ariccia, 2001). Zarutskie (2003), using U.S. data, proves that monopoly banking market is related to an increase in firms' usage of bank debt and decrease in firms' usage of the private savings of their owners to finance investments. Besanko and Thakor (1993) show that increased competition erodes informational rents originated from relationship banking and leads to greater risk-taking by banks. According to Boot and Thakor (2000), in lower concentrated market, banks have fewer motivations to provide loans based on relationship banking, in fact, in this type of environment a borrower might easily switch from one bank to another. It is clear that banks do not take any advantage in investing in relationship lending. In a context of asymmetric information, Marquez (2002) confirms that an increase in the number of banks in a market disperses the borrower-specific information and results in both higher funding costs and greater access to credit for low-quality borrowers. Fischer (2000) also finds that higher bank concentration is associated with improved information flows and better credit access for a cross-section of German manufacturing firms. In this respect, Ryan et al. (2014), using a sample of SMEs from 20 European countries, argue that bank competition can increase the cost of credit. The pricing of loans is influenced strongly by firms' information opacity, and they find that small and medium firms pay higher interest rates on their borrowing than large firms. Thus, competition has a severer effect on firms that depend on relationship-based lending. Gomez and Ponce (2014)

examine the effect of competition on the efficiency of banks to screen potential borrowers, and on the consequences on borrowers' incentives to exert effort and to repay their loans. Their findings show that higher competition leads to a lower level of loanable funds. Thus, as competition increases, this reduces the effectiveness of banks' screening technology to the point that, ceteris paribus, the expected benefits become negative. Similarly, Rahman et al. (2019) conclude that bank competition is associated with higher cost of credit; higher bank competition increases financial constraints on SMEs, rejecting the theory that bank competition can enhance lending terms and boost access to finance.

What is more, as explained by Cetorelli (2001), banking market structure may have multiple effects on the economy, both positive and negative, making it difficult to identify the predominant effect. In this respect, Cetorelli and Gambera (2001) discover a twofold opposite effect: on the one hand, monopolistic banking structure has on average a depressive effect on industry growth; on the other hand, industries more dependent on external finance grow relatively faster in those countries where the banking sector is more concentrated, specifically, this positive effect is stressed for younger firms than for the more mature ones. In this line, Hauswald and Marquez (2006) show that more banking competition reduces the interest rates on loans, conversely, it also negatively affects the investments for borrowers' information acquisition. Less information production means that banks are more prone to make errors in their lending decisions as competition intensifies. Consequently, banks become more likely to occur in lending mistake and, in turn, lead to a deterioration in the aggregate loan quality. Zarutskie (2004) uses U.S. data and finds that for firms it is both more likely and faster to receive outside debt in less competitive banking markets, but new firms which receive outside finance in less competitive banking markets are worse performers than those receiving outside debt in more competitive markets. Agostino and Trivieri (2008), examining whether local differences in banking competition impact on the amount of bank debt used by Italian small and medium-sized manufacturing firms, show that more competitive banking markets are linked with relatively higher usage of bank debt by less transparent firms. However, a higher banking competition seems to have no effect on the probability of receiving bank loans. Recently, Carbó-Valverde et al. (2017) illustrate that bank market power negative influences credit availability and the firm investment rate in the short run; however, the negative relationship holds in the short term but investment rate grows again in the long term.

3.2.2.1 Measuring Banking competition

The economic literature has always investigated causes and consequences of market competition, despite the fact that its level is not directly observable, therefore involving the development of many methods for its measure and estimation. In other words, there is no consensus on the best approach to be used for measuring the degree of competition, and the relative literature can be divided into the structural and non-structural (namely new empirical industrial organization - NEIO) approaches.

In the structural approach, authors use concentration measures as proxies for competition such as the Hirschman-Herfindahl Index and n-firm concentration ratios (Lloyd-Williams et al., 1994; Berger and Hannan, 1998). The structural approach is based on the Structure-Conduct-Performance (SCP) paradigm (Bain, 1951), which hypothesizes that an exogenously market structure stimulates the conduct of banks and their performance as well as that of firms and every agent in the market. Focusing on banks, the SCP paradigm suggests that increasing levels of bank concentration generate higher profits because concentration allows them to exercise market power and collude with each other. In other words, a higher degree of concentration is associated with market power to incumbent firms allowing them to collude with each other, which results in higher profits. According to the SCP, the degree of market concentration measures the competition level, with higher values of market concentration indicating a lower degree of competition (see among others Berger and Hannan,1998 and Bikker and Haaf, 2002). Notwithstanding, this negative relationship between market concentration and competition is widely criticised in the literature leading to develop the non-structural approaches, that do not take into account the structural features of the market when measuring competition.

The criticisms are mostly directed to the implicit one-way causality from market structure to conduct and, then, to performance. Indeed, according to Vessala (1995) market structure and conduct are endogenously determined as it is unreasonable not taking into account the feedback effects from possible strategic behaviour of firms. For instance, entry decisions in an industry could be related to the conduct of the existing participants in the market such as the price they charge, the actual degree of competition and some non-price aspects of competition.

In addition, a field of literature highlights the incompatibility between the SCP with some of the existing theories, since not all the theories predict a positive relationship between market power and concentration (Vesala, 1995). As noted by Lipczynski et al. (2005), on one hand, the Cournot equilibrium is in line with the SCP, affirming that a smaller number of firms is associated with lower industrial output and higher prices, thus, it expects a positive relationship between market concentration and performance. On the other hand, considering the Bertrand equilibrium

the price competition might be efficient as long as there are at least two firms in the market. In this regard, each firm will tend to set prices below the prices charged by its rivals in order to gain rivals' customers. As it is well-known, the sequence of price undercutting will continue until price declines to the level of the marginal cost, where firms do not have any incentive to undertake further price reductions.

Concerning the banking sector, another relevant critique of the SCP paradigm derives from the perspective of the asymmetric information theories introduced by Shaffer (2002). As aforementioned, the SCP hypothesis assumes that an increase in the number of banks reduces the market power of banks who would then charge lower loan interest rates. Contrariwise, screening theories argue that if the number of competitors increases, banks have lower incentives to screen potential borrowers. In this context, the market share of each bank tends to decrease. Consequently, banks could weaken their screening procedures and offer easier access to credit to their clients so as to increase their market share. This implies a high probability of conceding credit to lower-quality borrowers leading to higher credit risk for the banking sector. The higher credit risk, in turn, leads to an increasing level of possible insolvency and thus higher credit risk might be prevented by higher interest rates charged by banks.

Cetorelli (1999) claims that the conduct of firms operating in markets with a low level of concentration can be close to competitive, and an increase of concentration from this low level will generate an increase in the market power. Nevertheless, at the high degree of concentration, firms are assumed to be already distant from the competitive behaviour, hence, an additional rise of concentration is not likely to be related with a further increase of market power.

According to Carlton and Perloff (2000), although market concentration may explain properly the competitive conditions, concentration indices might not indicate market competition in an industry whose products compete closely with the products of another industry. In other words, whether a considerable quantity of loans is managed by microfinance institutions, the concentration index for the banking loans market might underestimate competition in the lending market.

Similarly, Maudos and Fernandez de Guevara (2004, 2006 and 2007) show that non-structural measures are more precise and robust measures of bank market power and are often uncorrelated with concentration measures. Claessens and Laeven (2004) also argue that the degree of contestability (i.e., the threat of entry) determines bank competition and that concentration is not a good predictor of competition, suggesting that concentration and competition should not be used interchangeably. Indeed, the *Efficient-Structure Hypothesis* claims that a greater concentration emerges as a consequence of more vigorous competition in the market, as the most efficient firms

might increase their market shares at the expense of their less efficient competitors (Gilbert and Zaretsky, 2003 and Berger et al., 2004).

Focusing on the banking sector competition, the extant empirical research mainly followed the structure-conduct-performance (SCP) paradigm, employing bank concentration measures as a proxy for bank market power (Petersen and Rajan, 1995; Fischer, 2000; Beck et al., 2004; Chong et al., 2011). Nevertheless, a second and more recent wave of research has moved away from structural concentration indexes (see among others Carbò et al., 2009 and Love and Peria, 2014). It has been showed that banking sectors are simultaneously concentrated and competitive, therefore, concentration might be considered a poor proxy for explaining market power (Ryan et al., 2014).

The non-structural approaches measure competition (or market power) by directly quantifying the competitive behaviour of the firm, avoiding to infer it from the analysis of the degree of market concentration. These parameters are equations based on microeconomic models, such as the price-cost margins (Tabak et al. 2012).

The most-widely used non-structural approach for the measurement of banking sector competition is the Panzar and Rosse (1987) H-statistic (or H test). Derived from static (oligopoly) models, which determine the equilibrium output and the equilibrium number of firms by maximising profits both at the firm and industrial level, this model requires firm-specific variables, which are commonly available. This model applies a reduced form revenue equation to build the H-statistic, defined as the sum of the elasticities of the total revenues with respect to factor input prices.

According to Panzar and Rosse (1987), H is equal to 1 when firms operate under perfect competition, zero (or negative) in the case of monopoly or perfectly collusive oligopoly, and any value in between denotes monopolistic competition with freedom of entry. The H-statistic is an increasing function of the absolute price elasticity of demand (Vessala, 1995), thus, according to Bikker and Haaf (2002), values of H between 0 and 1 can be interpreted as a continuous measure of the level of competition.

The H-statistic shows several advantages over other types of measurement. As above mentioned, the data for its implementation is relatively easy to obtain. In addition, the H-test avoids the potential bias due to misspecification of market boundaries because it does not require an a priori definition of the geographic market. Lastly, as noted by Bikker and Haaf (2002), the H-statistic is a direct measure of the degree of competition and observations of non-bank financial institutions are not needed when applied to a credit market.

On the other hand, the H-test also has some limitations. Since the test was developed on the basis of static models, there are no predictions on the value of the Panzar and Rosse statistic for

dynamic oligopoly models. Consequently, the proper specification of the H-statistic is based on the hypothesis of observations generated in long-run equilibrium (Agostino and Trivieri, 2010). In fact, this hypothesis is strictly required in case of perfect competition and monopolistic competition, while it is not necessary in the case of monopoly (Panzar and Rosse, 1987).

Empirically, the equilibrium test can be derived out by assuming that competitive markets equalise the return rates across firms, thus in equilibrium, these rates should not be correlated with input prices (Agostino and Trivieri, 2010). To test this hypothesis, an indicator of firm return (ROA, ROE) is used as dependent on the estimation of H. If H = 0, the data are consistent with a situation of equilibrium (Shaffer 1982).[80] Section 3.4.2.1 illustrates the estimation of the H-test.

A recent developed non-structural method for the measurement of competition is the Boone Indicator, introduced by Boone (2008).[81] The Boone Indicator allows estimating the level of competition supposing that competition increases the market shares of more efficient firms and reduces the market shares of inefficient firms. Indeed, the larger the impact of efficiency on the increase of firms' market shares, the higher is considered to be the degree of competition in that market and *vice versa*. In this context, banks' products are close substitutes and/or the market's low entry costs are referred to presence of competition. This assumption is an advantage of this indicator over the concentration measures and some other competition proxies.[82]

What is more, differently from the Panzar-Rosse method, the Boone Indicator allows the estimation of the degree of competition not only for the entire market but also for separate product markets. In this regard, Van Leuvensteijn et al. (2011) is considered the pioneering study that applies the Boone Indicator to measure the competition in the banking sector in a sample of EU countries. They show that commercial banks appear to face more competition than cooperative and savings banks, especially in Germany and the US.

[80] On the theoretical derivation of the H statistic refer to Panzar and Rosse (1987) and Vesala (1995), instead for an extensive literature review of the studies that, starting with Shaffer (1981 and 1982), apply this statistic to the banking industry, see Koutsomanoli-Fillipaki and Staikouras (2006).

[81] Another broadly used method is the Lerner Index (Lerner, 1934); similar to the latter approaches, it does not take into account the structural features of the market when measuring the degree of market power. The Lerner Index measures the mark-up of price over the marginal costs for each bank. Higher values of the index indicate a higher degree of market power being exerted by the investigated banks.

[82] As explained by Tabak et al. (2012) if bank product substitution increases, the efficient banks increase the market share and, thus competition in the market increases. If these ''efficient banks'' were those that already have a dominant position, the HHI would increase rather than decrease. As the authors illustrate, at increasing product substitutability, consumers will prefer banks that charge less for their services. Theoretically, efficient banks are those with lower marginal costs, so they are able to apply lower prices than less efficient banks. This competition in prices allows efficient banks to gain higher shares of the market, which may result in increased concentration by the eventual reduction in the number of banks in operation and not only by the larger market share of one specific group of banks but also the HHI would then increase when competition is higher.

Nevertheless, the Boone Indicator is not able to distinguish whether the competitive behaviour of banks is consistent with monopoly, monopolistic competition, or perfect competition, although it measures the intensity of competition. Furthermore, because of efficiency improvement and decrease in marginal costs, banks could choose to decrease the price they charge to gain market share or to increase their profits and maintain the same share as before. Hence, using the Boone indicator implies that that banks give at least part of their efficiency gains to their clients. Section 3.4.2 provides details on the estimation procedure of the indexes so far described.

3.2.3 Can banking competition affect the relationship between leverage and firm financial health?

The literature above explained provides a puzzling picture about the possible effects of bank competition on firms' failure risk. Albeit a wide amount of contributions confirms that higher indebtedness level increases the firms' risk to fail, it is not clear whether banking competition matters in shaping this relationship.

According to Sharabani (2004), firms' risk to fail may increase because of a combination of determinants, such as industry risk (shock to a specific industry, such as an imports reform), macroeconomic risk (monetary factors), and management effectiveness and adequacy of firms' capital. Focusing on the latter factor, to prevent the risk of failure an indebted firm needs to carry on its business, try to seize growth opportunities with optimal investments and have funds to repay possible debts. As noted by several works, liquidity constraints and cash-flow problems often precipitate financial distress and failure (Wilson et al., 2000; Sharabani, 2004). A credit market characterized by easier access to finance and lower interest rate should be favourable for indebted firms.

However, credit market equilibrium results from the matching of firms' credit demand and banks' credit supply, and is conditional on the market power of the agents. Stated differently, a credit market might be characterized by different degrees of banks' monopolistic power, entailing different bank-firm interactions, and thus different credit conditions.

In particular, when considering a scenario characterized by high monopolistic power, banks might charge higher interest rates on loans (Pagano, 1993; Guzaman, 2000; Boyd and De Nicolò, 2005). In this case, banks might ration especially indebted firms, more opaque and risky, thus requiring particularly monitoring and screening activities. On the other hand, according to *the information-based hypothesis*, monopolistic banks, taking advantage from their market power, could have higher incentives to screen and monitor, to better discriminate among borrowers (Di-

amond, 1984; Udell, 2008) thus facilitating the financing of firms (Stiglitz and Weiss 1981). Indeed, they might require a lower interest rate by establishing strong lending relationships, aiming to *lock-in* the firm into the relationship and to gain rents in the future. In this respect, Petersen and Rajan (1995) argue that market power allows banks to sacrifice any interest rate premiums they might otherwise have to charge when lending to firms that are relatively opaque or risky (young, small and/or distressed firms). Consistently, Delis et al. (2017) find that firms poorly performing tend to match with banks that have higher market power.[83]

To sum up, a credit market characterized by higher monopolistic power entails both benefits and drawbacks for indebted firms. If the gains prevail, they may alleviate the pressure of debt repayment.

On the other hand, in banking markets characterized by higher competition, firms could play a role in determining the behaviour of banks. Indeed, in such a context, firms might borrow from several banks or switch banks, matching to those that offer the most advantageous loan terms. From the supply side, banks might lower interest rates in order to grab customers. In this respect, following the *market power hypothesis,* bank competition should reduce interest rates and lower collateral requirements for SMEs, thus, increasing access to finance (Besanko and Thakor, 1992; Jimenez et al., 2006; Hainz et al., 2013). By contrast, according to *the information-based hypothesis,* higher competition may reduce bank incentive to invest in relationship lending because of free-riding problems (Marquez, 2002; Dell'Ariccia and Marquez, 2006; Hauswald and Marquez, 2006). Stated differently, in a competitive market, banks' incentive to undertake screening and monitoring activities is lower because each financial institution knows that the other competitors might take advantages of that information. Furthermore, banks have fewer motivations to provide loans based on relationship banking as a borrower might easily switch from a bank to another one (Boot and Thakor, 2000).[84]

To conclude, the banking market structure might either alleviate or aggravate the negative effect of leverage on firm financial health. Indeed, the controversial results in the literature about the economic effects of bank market power justify this empirical research. Before illustrating it, in the following section, a concise overview of the Italian banking system is presented, to understand the changes in the recent past, underlining how these transformations have impacted the local banking competition and the consequence for SMEs.

[83] According to Delis et al. (2017), a bank with higher market power might favour a liquidity-constrained firm by offering additional funds; restructuring the debt repayment schedule, and finally, offer valuable assistance beyond their creditor role, as the bank is likely to be a specialized lender in the sector in which the firm operates.
[84] Borrower-specific information may be dispersed as the number of banks in a market increases, entailing higher cost of funds and greater access to credit for low-quality borrowers (Marquez, 2002).

3.3. THE ITALIAN BANKING SYSTEM

"Petrified forest" has been described the Italian banking system until the 1990s as the main features were the results of the regulation introduced in 1936 in order to avoid banking instability. The system was subject by local oligopolies characterized by the presence of a huge number of banks and a small number of branches. New entry for banks was harsh where their competitors were traditionally already established. There were relevant restrictions on banks' activities: branch openings were regulated and rationed and, furthermore, since the huge incidence of state-owned banks, bank mergers were not stimulated or, better, were totally forbidden.

Since 1990, a radical regulation reform based on liberalization of branching and the increase in mergers and acquisitions has transformed the physiognomy of the Italian banking sector (Costi, 2007). The number of branches increases from 16,600 in 1990 to 33,600 in 2010: more new branches were introduced in these twenty years than in the previous sixty when barriers discouraged to open into local markets. What is more, between 1990 and 2006, mergers and acquisitions redistributed the market shares accounting to a third of total banking assets. As a consequence, the number of banks decreased from 1,200 in 1990 to under 800 in 2012. (De Bonis and Ferrando, 2000; Angelini and Cetorelli, 2003; Messori et al., 2003; Panetta, 2004; Silipo, 2009). After this reform, the overall competition in the Italian banking sector has become considerably more vigorous (Bank of Italy, 1994, 1997, 2000, 2001, 2005–2007; Messori 2001; Angelini and Cetorelli, 2003; Saccomanni 2006).

According to De Bonis et al. (2011), in spite of the mergers and acquisitions, Italy still has a comparatively high number of banks: less than half in Germany but somewhat greater than in France and more than twice as many as in Spain. However, the level of competition seems yet lower, the Herfindahl index for Italian bank assets is less than 400, and the five largest intermediaries hold just over one-third of all bank assets.[85]

The reform of the Italian banking system influences the growth of the average number of banks per province, although, according to the report of FinMonitor-University of Bergamo (2006), geographical expansion and consolidation activities generated disparity of banking concentration in the Italian provinces. In addition, it has been reported that the market shares of the biggest banks increase in about half of the provinces, although, in the other ones, the relative weight of local banks is still predominant. Consequently, local banking competition and its influence on credit availability to SMEs are likely to be not uniform across Italian provinces. In this respect, according

[85] The greatest concentration among the main countries is present in France, with a Herfindahl index of over 600 and five banks holding nearly half of all assets (De Bonis et al., 2011)

to Berger et al. (1995), large banks are less likely to lend to small firms, by contrast, these entrepreneurs mainly rely on small banks. Thus, if banking consolidation increases large banks' size, small businesses might experience lending restrictions (e.g., Peek and Rosengren 1998; Strahan and Weston 1998; Berger et al. 1998; Avery and Samolyk 2000; Berger et al. 2005); on the other hand, increasing competition in the credit market might smooth this negative effect, as new rivals may focus on lending to small firms (Berger et al.1998; De Young et al. 1999; Berger et al. 2001). Nevertheless, according to Strachan and Weston (1998) when mergers and acquisitions happen among small banks, SMEs' credit availability might surge. Lastly, according to the literature above explained, it is not possible to affirm that heterogeneity of concentration in local credit markets implies different degrees of banking competition in the same markets.

This short overview underlines that credit availability and bank competition are likely to differ at the provincial level. Consequently, the conflicting theories mentioned in the literature along with the Italian experience suggest a valuable scenario to support an empirical investigation in order to shed light on the effects of banking competition on SMEs, in the context of the literature discussed in the previous section. The following section focuses on explaining the empirical investigation and the econometric strategy.

3.4. EMPIRICAL QUESTION AND METHODOLOGY

Building on the previous literature, this chapter analyses the effect of leverage on firm's financial stability as banking competition changes. As widely recognized, firm's financial stability tends to be jeopardized by increasing level of leverage (Jensen, 1986; Guariglia, 1999; Molina, 2005; Bridges and Guariglia, 2009; Hovakimian et al., 2012; Bonaccorsi di Patti et al., 2015), thus:

H1: the leverage ratio is expected to have a negative impact on firm financial stability, therefore the higher the level of leverage, the lower the Z-score.

The debate between "*market power hypothesis"* and *"information-based hypothesis"* leads to controversial predictions about the influence of bank market power on the link between leverage and firms' default. As a consequence, I verify the following hypothesis:

H2: the negative effects of leverage on firm financial stability could be either amplified or reduced by higher competition levels in local banking markets.

The econometric analysis implemented to test these hypotheses is described in the next sub-section.

3.4.1 The estimating model

To answer my research question, I estimate the following model:

$$ZSCORE_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 LBC_{pt} + \beta_3 INTE_{it} + \phi X_{it} + \sum_s \gamma_s IND_s + \sum_t \varphi_t T_t + \epsilon_{it} \quad (3.1)$$

Where the dependent variable is the Z-score (ZSCORE) of firms *i* at time *t*, calculated as the sum of return on assets plus the capital asset ratio divided by the standard deviation (S.D.) of return on assets, the latter being computed over three-year rolling time windows (Panetta and Pozzolo 2010; Schaeck et al. 2011; Agostino and Trivieri, 2018).[86]

This Z-score is widely used as a measure of distance from insolvency (Roy, 1952), as it can be shown that - if profits follow a normal distribution - its value is negatively associated with the probability of insolvency. In other words, higher values of Z-score individuate healthier and stable firms (Roy 1952; Laeven and Levine 2009; Schaeck et al. 2012; Mihet 2013). Indeed, the *Z*-score increases with profitability and solvency and decreases as the standard deviation of the return increases. A higher *Z*-score implies a lower probability of failure (insolvency) (Kasmann and Carvallo, 2014).[87]

Focusing on the right-hand side variables, the leverage ratio of the firm (LEV), expressed as the sum of current and non-current liabilities over total assets, has been used to account for the level of firm debt.[88] Furthermore, LBC denotes one of the local banking competition measure computed at the provincial level either the H-test (Panzar and Rosse, 1987) or the Boone indicator.[89] INTE is the interaction term between one of the LBC measure and LEV.

X is a vector of control variables that can be categorized into two groups. The first accounts for firm characteristics and includes: total sales (SALES) measuring the size of the firm, CASHFLOW, collateralizable assets (TANGIBLE), productivity (PRODU), debt sustainability

[86] As a sensitivity check, the z-score has been also computed considering a larger time window of 5 years (ZSCORE2).

[87] In the literature, financial health at an individual firm level is measured in different ways. Broadly, it is possible to distinguish between measures based on accounting data and other ones employing market data. My choice has been induced by data availability. Firstly, I do not have information on yearly firm bankruptcy, hence, logit or probit models to predict firm failure cannot be employed. Similarly, applying Altman Z-scores (Altman 1968; Altman, Hartzell, and Peck 1998; Altman and Hotchkiss 1993) originally developed for different time periods, countries and industries is precluded because of missing information about some financial ratios (such as retained profits to total assets).

[88] Unfortunately, the use of bank debt level has been precluded because lack of a reasonable number of observations.

[89] As already mentioned in this work I focus on non-structural approaches to measure banking competition as they present several strengths compared to concentration measurements (see section 3.2.2.1). However, as a sensitivity check, I also have run a regression by inserting the HHI index (and its square). The results are in line with those obtained from the other measures: the marginal effect of HHI is negative for high levels of concentration.

(DEBT_SUST) and AGE. Previous contributions show that small firms are more likely to fail because their accessibility to credit markets is limited (Bernanke and Gertler, 1995; Geroski and Gregg, 1996; Caves 1998; Pakes and Ericson, 1998; Jovanovic and Rousseau, 2002). Cash flow from operations is an important determinant of a firm's financial health. Nevertheless, cash is as well a relatively free financial resource that might foster agency cost (Jensen, 1986). Furthermore, a low debt to equity ratio is an attractive factor for investors as it signals a lower financial risk ensuring higher chances of debt financing in the future (Bhattacharjee and Han, 2014). Finally, Altman and Hotchkiss (1993), among others, show that young companies are more likely to fail than experienced companies.

The second group contains provincial characteristics: real gross domestic product (GDP) and Jacob index, used to proxy inter-industry externalities.[90] Lastly, IND_s are sector dummies, controlling for unobserved heterogeneity at the sector level, T_t is a set of time fixed effects and ϵ_{it} is the error term. In Appendix 3, Table A3.1 reports the main summary statistics of the sample, while Table A3.2 shows the correlation matrix of the variables entering equation (3.1).

Equation (3.1) is estimated either with or without the interaction term. The estimation without interaction is implemented to test the first hypothesis. The estimated coefficient of LEV will provide evidence on the relation between LEV and ZSCORE, *ceteris paribus*. The estimation with interaction is carried out to test the second hypothesis. In this case, the partial effect of leverage is conditional on the level of local banking competition (LBC). Formally, the marginal effect of leverage is computed as follows:

$$\frac{\partial ZSCORE}{\partial LEV} = \widehat{\beta_1} + \widehat{\beta_3} * LBC \qquad (3.2)$$

Where $\widehat{\beta_3} * LBC$ is the estimated coefficient of the interaction term multiplied by the local banking competition indicator, while the term $\widehat{\beta_1}$ is the estimated coefficient of LEV, indicating the marginal effect of leverage on Z-score when the LBC measure is zero. Finally, I test the significance of (3.2) by calculating the relative standard errors:

$$\hat{\sigma} = \sqrt{var\widehat{\beta_1} + (LBC)^2 * var\widehat{\beta_3} + 2LBC * cov(\widehat{\beta_1}, \widehat{\beta_3})} \qquad (3.3)$$

Since both (3.2) and (3.3) depend on the level of LBC, the marginal effect of LEV may change sign and gain or lose significance according to the value of the competition variable. In order to

[90] A bunch of literature examining the determinants of firms' failure (or insolvency) suggests the use of this set of firm level characteristics along with macroeconomic factors (see, among others, Taffler 1982; Cuthbertson and Hudson 1996; Lennox 1999; Bhattacharjee et al. 2009; Agostino and Trivieri, 2018).

summarise this rich piece of information, I will graph the marginal effect of LEV along with its 95% confidence intervals across the range of the LBC variable.

Finally, to further deepen the investigation, the same set of regression has been implemented by reducing the sample size considering different Italian macro-areas: Northwest, Northeast, Centre and South (this includes Sicilia and Sardinia).

3.4.2 Estimating banking competition

In Italy, as in most European countries, banking data at disaggregated-level are not publicly available: hence, in order to retrieve information about the local market, i.e. province, that is the focus of the present analysis, I employ the criterion suggested by Carbò Valverde et al. (2003). Each variable of interest *x* for the branches (BRs) of bank *i* in province *p* in year *t* is obtained as $x_{ipt} = X_{it} * \left(BR_{ipt}/BR_{it}\right)$, where X_{it} is the same variable as it is provided by the balance-sheet of bank *i* at time *t*; BR_{ipt} is the number of branch offices of bank *i* in province *p* in year *t*; finally, BR_{it} is the total number of branch offices of *i* at time *t*.

3.4.2.1 H-statistic

For each year considered I derive the H-test, measure of provincial banking competition, by estimating the following model:

$$logTGR_{ipt} = \alpha + \beta_1 logUPL_{ipt} + \beta_2 logUPF_{ipt} + \beta_3 logUPF_{ipt} + \beta_4 logTA_{ipt} + \\ + \beta_5 logLTA_{ipt} + \beta_6 logDTF_{ipt} + \mathcal{E}_{ipt} \qquad (3.4)$$

All the variables appearing in Eq.(3.4) are described in Table 3.1, and are analogous to those employed by De Bandt and Davis (2000) and Agostino and Trivieri (2010). Then, the H-test is obtained as: $H_{it} = \beta_1 + \beta_2 + \beta_3$ for each province *p* at time *t*.

To calculate the equilibrium test in equation (3.4), TGR has been replaced by ROA. The results show that in 65% of the case there is equilibrium.[91]

[TABLE 3.1]

[91] F-test of this regression has been calculated. Under the null hypothesis, there is equilibrium.

3.4.2.2 Boone Indicator

To derive the Boone indicator, I adopt the empirical specification of Schaeck and Cihàk (2010), who used a modified version of the original indicator proposed by Boone et al. (2004) and further developed by Boone (2008). Thus, I describe the Boone model for bank *i* as follows:

$$\pi_{it} = \alpha_i + \beta_1 \, log\,(c_{it}) + \varepsilon_{it} \tag{3.5}$$

where π_{it} measures profits of bank *i* at time *t*, β refers to the Boone indicator, and c_{it} represents the marginal costs. Since marginal costs are not directly observable, average costs are used to proxy marginal costs (Planbureau, 2000; Boone et al., 2004; Bikker e Van Leuvensteijn, 2008; Schaeck e Cihàk, 2010).[92]

Following the specification of Schaeck and Cihàk, 2010, the dependent variable is the ROA. The authors justify this choice highlighting that *"...an increase in costs reduces profits in all markets, however, in a more competitive market the equivalent percentage increase leads to a greater decline in profits since banks are penalised more severely for being inefficient. Consequently, this indicator exploits this property because it measures the extent to which differences in efficiency affect performance differences. In other words, the Boone indicator expresses the reduction of profits that arises from cost inefficiencies. The indicator is well suited for the objective of expressing competition as a function of efficiency because cost inefficiencies often reflect poor lending decisions*."

Profits rise for banks with lower marginal costs (β <0). Thus, an intensification in competition increases profits of a more efficient bank relative to a less efficient one. The stronger the effect, the stronger is competition. In other words, building on the definition of the indicator, banks with low marginal costs expand their market share, i.e., $\beta < 0$. Competition tends to increase this effect; as a consequence, more efficient banks overcome less efficient banks. A more negative β indicates a higher competition level in the banking market. Nonetheless, positive values for β are also possible, implying that the higher the marginal costs, the larger the market share banks will earn (Van Leuvensteijin et al., 2011; Kasmann and Carvallo, 2014). Positive values indicate either that the market is characterized by an extreme level of collusion or that banks are competing on quality. Indeed, competing on quality might reflect strong collusion, as noted by Dick (2007), banks could increase their costs to obtain additional demand via the quality channel as the total market grows, which obstacles the entry of competitors into this same market.[93]

[92] Average cost is expressed by the ratio between variable costs to total income.

[93] H-test and Boone indicator move in the opposite direction (i.e. as the H-test increases, competition increases, on the contrary, the more negative the Boone indicator is, the more competitive the banking sector). In this work

3.4.3 Data

The econometric analysis is based on data coming from several sources. Information on Italian manufacturing firms is retrieved from the database Orbis *Historical* held by *Bureau van Dijk* that provides balance-sheet data. As mentioned above, this work focuses on small and medium-sized firms, which are bound to ask credit from banks with branches in the same local market where they operate.[94] The final sample consists of an unbalanced panel in the period 2003-2012, for a total of 573,653 observations.

Data on all the Italian banks (666 banks, observed for the period 2003-12) and information on the provincial distribution of their branches in order to build the LBC measures, come from the *ABI Banking dataset* provided by the Italian Banking Association. Lastly, information on provincial features used as control variables are collected from the Italian National Institute of Statistics (ISTAT, 2017). Finally, it is worth highlighting that the different availability of data on different variables will restrict the estimation sample to 296,828 observations.[95]

3.4.4 Econometric strategy

On a methodological ground, I adopt a Pooled OLS, Random and Fixed effect estimators to take into account the panel structure of the data. In addition, I run a mixed model, to take into account the hierarchal structure of the data. Indeed, in this work, the dependent variable (individual firms' Z-score) is related to explanatory variables defined at different levels (i.e at firms and provinces level). Using mixed models ensure to properly examine the influence of specific provincial characteristics (such as provincial banking competition) on firm financial stability.

Mixed (or multilevel) models have been widely adopted in social and medical sciences when treating hierarchical or clustered data to overcome some methodological limitations of the traditional single-equation models, based on the restrictive assumption of independence among errors (De Leeuw and Meijer, 2008). Indeed, in economic investigation, firms can be nested within geographical areas (such as regions or provinces) or, as well, productive sectors. Inference problems might occur avoiding to control for cluster because the estimated parameter variance will be underestimated (Hox, 2013).[96]

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in order to standardize the two measures, I use the opposite of the Boone indicator, to make it positively proportional to competition, following Tabak et al. (2012), Leon (2015) and Djalilov and Piesse (2019).

[94] Firms with more than 250 workers have been dropped.

[95] To take into account the presence of potential outliers, the observations lying in the first and last percentile of the distribution of each variable involved in the econometric analysis have been dropped.

[96] Nevertheless, as noted by Robinson (2009), considering clusters as statistical units may involve the so-called "ecological fallacy" because correlations that are valid at the aggregated level do not necessarily hold true at the individual level.

Linear mixed models are models containing both fixed effects and random effects. They are a generalization of linear regression allowing for the inclusion of random deviations (effects) other than those associated with the overall error term.[97] Specifically, mixed models allow correlation among the residuals of observations belonging to the same cluster, leading to more efficient estimates.

In this analysis, firms represent level one units, clustered within administrative provinces, which represent the second level, thus the general mixed model adopted can be formally specified as follows:

$$y_{ip} = \beta_{0p} + \beta_{1p} x_{ip} + \epsilon_{ip} \tag{3.6}$$

where *i* refers to firms, and *p* refers to provinces; y is a measure of firm financial stability (Z-score), and *x* is an explanatory variable defined at the first level of analysis. At level two, both intercept β_{0p} and coefficient β_{1p} can be modelled to let random components definite at the provincial level:

$$\begin{aligned} \beta_{0p} &= \gamma_{00} + e_{0p} \\ \beta_{1p} &= \gamma_{10} + e_{1p} \end{aligned} \tag{3.7}$$

where γ_{00} and γ_{10} are second-level means, and e_{0p} and e_{1p} are normally distributed random effects.

Including model (3.7) in equation (3.6) leads to a mixed equation:

$$y_{ip} = \gamma_{00} + \gamma_{10} x_{ip} + (e_{0p} + e_{1p} x_{ip} + \epsilon_{ip}) \tag{3.8}$$

where the dependent variables are explained by a deterministic part and a stochastic part, in parentheses, which accounts for the hierarchical structure of data.

Finally, it has to be highlighted that the models above described do not take into account potential endogeneity problems. Indeed, some unobservable cultural and historical determinants might influence both the financial stability of the firm and the banking market structure. Furthermore, some firm characteristics as knowhow, managers' experience that may represent a valued-added, are not observable. In this regard, Thompson (2005) finds that a relevant role for unob-

[97] For a comprehensive treatments of mixed models see, among others, Searle et al. (1992), Pinheiro and Bates (2000), Raudenbush and Bryk (2002), McCulloch et al. (2008), De Leeuw and Meijer (2008) and Demidenko (2013).

served variation is played by initial experience. Other important factors analysed are human capital (Bhattacharjee et al., 2009) or intangibles and R&D investments. Thus, in order to control for endogeneity problems, I use an instrumental variable approach.[98]

Following, among others, Guiso et al. (2004), Agostino et al. (2012) and De Bonis et al. (2015) some indicators of the geographical distribution of banks and branches in 1936 in Italy have been used as external instruments. In this respect, Guiso et al. (2004, p. 946) argue that the territorial structure of the Italian banking system in 1936[99] "*was the result of historical accidents and forced consolidation, with no connection to the level of economic development at that time*". Moreover, the 1936 regulation was not driven by different regional needs, "*but it was random*" (2004, p. 943). Hence, the geographical distribution of banks and branches in 1936 can be considered exogenous concerning firm performance in subsequent years, while it is significantly correlated with local banking development in the 1990s (Guiso et al., 2004).[100]

3.5. ESTIMATION RESULTS

Table 3.2 reports the estimates obtained without considering the interaction term between LEV and LBC measures, so as to test H1. Columns (1) and (3) show the results obtained by employing the H-test (H) and Boone indicator (BOONE), respectively. Columns (2) and (4) report the estimates computed by an IV approach. Since the Durbin-Wu-Hausman test on the exogeneity of the LBC measures is never statistically significant, the null hypothesis of no-endogeneity of the instrumented variable cannot be rejected, indicating that the other estimators employed can be deemed as reliable.

[TABLE 3.2]

As Table 3.2 shows, the LEV parameter is negative and statistically significant at 1% level. In other words, in line with H1, leverage increases the probability of default increases (as the Z-score measures the distance from insolvency or failure), *ceteris paribus*.

[98] To tackle the potential endogeneity problem, I also estimated the Blundell and Bond (1999) system GMM procedure. Unfortunately, given the huge number of observations, this method has been discarded because of computational problems.

[99] In this year, in response to the crisis of 1930–36, strict banking regulations were introduced and that remained substantially unchanged until the second half of the 1980s.

[100] Following these considerations, the variable LBC is instrumented by instruments defined in 1936 at provincial level: the share of banks owned by cooperative Popolari, the share of branches owned by cooperative Popolari, the number of mutual cooperative banks per million inhabitants, the share of branches owned by mutual cooperative, the total number of banks in the province. The Sargan-Hansen test of overidentifying restrictions.is satisfied, implying these instruments are valid.

Table 3.3 estimations are carried out to verify H2, clarifying which is the effect of LEV on ZSCORE as LBC changes. While columns 1-4 in Table 3.3 consider the H-test, columns 5-8 consider the Boone indicator as LBC measure. As displayed by the title of each column, results are obtained by employing different estimators: Pooled, RE, FE and Mixed model.

[TABLE 3.3]

Again, the LEV parameter is negative and significant in all the estimations. Moreover, the interaction term's coefficient is negative and statistically significant in all equations.[101] Therefore, Table 3.3 estimates suggest that the level of leverage exerts a negative effect on firm financial stability when the local banking market is a monopoly (i.e., the H-statistic is zero or Boone is zero hence the interaction term is zero), a case never occurring in my sample.[102] To assess what happens to the negative relationship between LEV and ZSCORE at increasing level of competition, I compute the marginal impact of LEV for all sample levels of banking market competition. These marginal effects are summarized by means of Figures 3.1 and 3.2 for the H statistics and the Boone indicator, respectively. Both figures show that the negative marginal effect of LEV on ZSCORE is always statistically significant, and it rises in absolute value as the LBC measures increase. Thus, it seems that when the banking market becomes more competitive, the negative effect of the leverage on the financial health of a firm is harsher. In other words, banking competition sharpens the positive effect of leverage on the probability of failure.

[101] The LBC measure terms are jointly significant with the LEV when implementing an F-test in all circumstances.
[102] On the other way round, in my analysis, competition seems decreasing the probability of default when the firm shows leverage equal to zero (when LEV=0, the estimated influence of H is 0.0386 – columns 1 of Table 3.3). However, in this sample no firm presents a value of leverage equal to zero, hence, this result provides no valuable information.

Figure 3.1. Marginal Effect of LEV on ZSCORE as H Statistics changes.

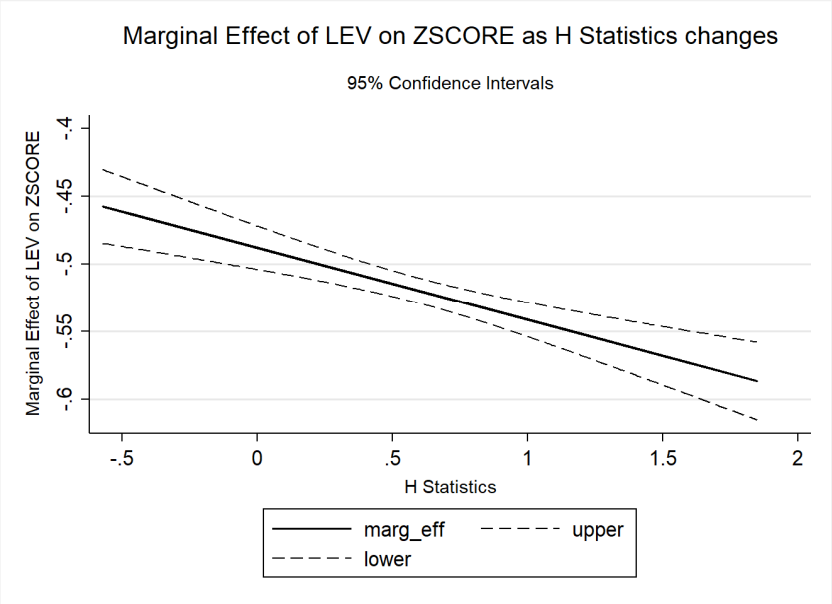
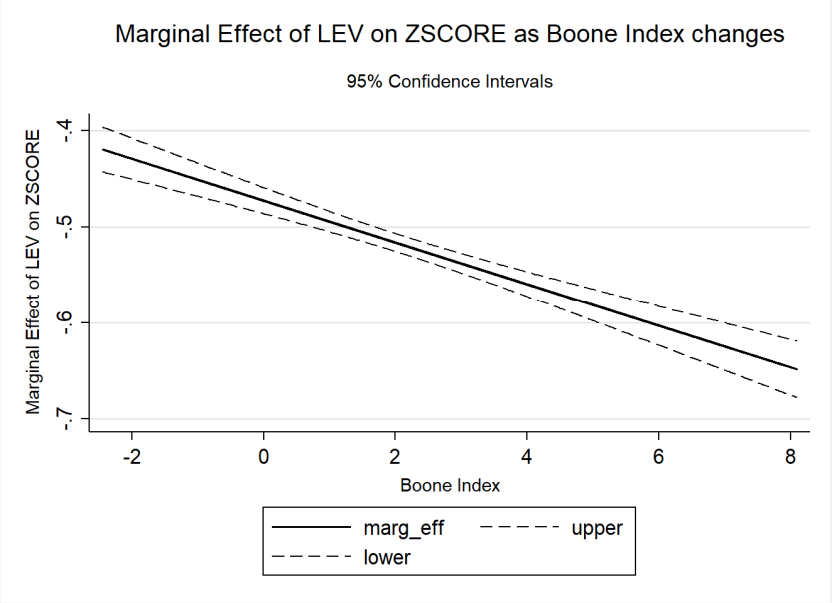


Figure 3.2. Marginal Effect of LEV on ZSCORE as Boone Index changes.



To summarize, this evidence suggests that the benefits of higher degrees of monopolistic power could overcome their costs. Indeed, in line with *the information based hypothesis*, banks with market power may be more inclined to finance distressed firm, mitigating, in turn, the negative effect of high debt on their financial health.

Finally, findings on the other control variables fall along expected lines: indeed, increasing level of SALES and AGE improves the financial health of the firm. As expected, in line with

Bhattacharjee and Han (2014), higher CASHFLOW reduces the default risk. This result is consistent with the idea that the financial strength obtained from a higher cash flow overcomes potential agency costs related to free cash flow. What is more, in line with Agostino and Trivieri (2018), TANGIBLE and PRODU show a positive effect on firm financial health. The impact of debt sustainability on Z-score seems to be positive until a certain point, after that it decreases. Finally, agglomeration spillovers (JACOB) exert a negative influence on Z-score, by contrast, increasing level of the provincial real GDP reduces the firm probability of insolvency.

3.5.1 Robustness checks

As sensitivity check, I employ as a dependent variable the Z-score computed over a five-year rolling time window (ZSCORE2). In this case, the original specification of the model has been preserved, as well as the use of the two LBC measures and the estimation methods.

[TABLE 3.4]

As Table 3.4 shows, the results are in line with those obtained when employing Z-score (three years' window) as dependent variable. Specifically, LEV negatively and statistically significant influences ZSCORE2, furthermore, this negative effect tends to be amplified (in absolute value) at increasing level of competition (except in the case of pooled estimation considering H-test - columns 1 of Table 3.5).[103]

Lastly, to deepen the investigation, I consider four sub-samples according to the Italian macro-areas: Northeast, Northwest, Central and Southern Italy.[104] As can be seen from tables A3.4 to A3.7 in the Appendix 3, the greater number of firm belongs to the northern part of Italy.

The main results obtained in the whole sample are confirmed in the different macro-areas. Indeed, the marginal effect of LEV on ZSCORE - summarized by means of Figure A3.1-A3.4 in the Appendix 3- is always statistically significant, increasing in absolute value as the LBC measure increase.[105] Looking at these figures, slight differences in terms of the magnitude of the effect

[103] For the sake of brevity, and also as they lead to the same conclusions, the graphs with marginal effect of LEV conditional on the value of both LBC measures obtained when using the Z-score (5-year window) are omitted.
[104] For these estimates I consider ZSCORE (3-year) as a dependent variable.
[105] These figures refer to the marginal effect of LEV on ZSCORE as H Statistics changes. Figures on the marginal effect computed when Boone Index changes are available upon request.

arise. The effect of LEV on ZSCORE appears stronger in Central and Southern Italy compared to the Northern part.[106]

To summarize, the influence of the leverage ratio on Z-score, as the level of banking competition changes, seems to differ slightly among macro-areas. The negative effect of leverage appears somewhat related to the economic condition in which the firm operates. In other words, in a more developed and stable economic area such as Northern Italy, the leverage might play a less significant role in determining the firm failure compared to the poorer area of Southern Italy.

[106] What is more, the slope of the line (showing the marginal effect) seems to be steeper for both Northeast and Northwest Italy than the other areas. These results suggest that the conditional influence of banking market competition is higher in the North part of Italy than in the other two areas.

3.6. CONCLUSION

Using a large panel for the period 2003-2012, this chapter has investigated the impact of leverage on the financial stability of Italian small and medium-sized firms, evaluating whether this impact varies with the level of competition characterising local credit markets.

In line with the extant literature, my evidence confirms the role played by the leverage in deteriorating firms' financial stability (Warner, 1977; Kim, 1978 and Jensen, 1986). A possible interpretation of this finding is that higher leverage ratio could signal potential firms financial difficulties to the credit market. Consequently, to protect themselves from this risk, banks may require additional collaterals and interest premium, increasing the cost of external financing, which in turn reduces firms' investment. Thus, this mechanism may trap the firms in a vicious cycle that could deteriorate their financial stability.

Additionally, according to my results, the relationship between leverage and financial stability seem to be affected by the degree of monopolistic power characterizing the local credit market, which implies different bank-firm interactions and thus shapes different credit conditions. More in detail, my contribution shows that the negative effect of leverage on firm health is further amplified by increasing banking competition. Indeed, the drawbacks of increasing banking competition could overcome their expected advantages leading banks to be less inclined to finance risky firms. This presumably because, consistent with *the information-based hypothesis,* increasing competition reduces the incentive to invest in relationship lending as firms might easily switch bank, thus, excluding also the chance for banks to *lock-in* firms and gain rents in long-term relationships.

These findings are confirmed when splitting the sample according to four Italian macro areas. Besides, the effect of leverage seems to be more severe in poorer areas such as southern Italy, giving further support to the idea that local conditions matter.

To conclude, this work corroborates the idea that local credit markets play a role in influencing SMEs financial stability. Future research is called to deepen the investigation by using other measures of firm financial stability and debt usage, and by extending the analysis to other countries where the credit market might differ from the Italian case.

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TABLE 3.1 - Description of variables used in the calculation/estimation of the H-statistic

VARIABLE		DESCRIPTION
GIR	Gross interest revenues	Interest received
IBS		Income from banking service
TGR	Total gross revenues	GIR + IBS (exceptional items exluded)
TA		Total Asset
UPL	Unit price of labour	Personnel expenses to number of employees
UPC	Unit price of capital	[Physical capital expenditure (depreciation, write down on on intagible and tangible assets)+other operating expenses (exceptional items exluded)] to total assets
UPF	Unit price of funds	Total interest paid to total funds, where total funds = customer deposits+interbank deposits+money market liabilities, the latter including subordinated debt)
LTA		Total loans to to total assets
DTF		(Customer deposits + interbank deposits) to total funds

TABLE 3.2 - Results without interaction - Dependent Variable: Z-SCORE (3 YEARS)

	1	*2*	*3*	*4*
	H INDEX		**BOONE INDEX**	
	Pooled	IV	Pooled	IV
H	0.0185***	0.0085		
	0.0000	*0.4890*		
BOONE			0.0047***	-0.0059
			0.0000	*0.1150*
LEV	-0.5164***	-0.5184***	-0.5170***	-0.5230***
	0.0000	*0.0000*	*0.0000*	*0.0000*
SALES	0.0112***	0.0110***	0.0110***	0.0099***
	0.0000	*0.0000*	*0.0000*	*0.0000*
CASHFLOW	0.0755***	0.0662***	0.0736***	0.0428***
	0.0000	*0.0000*	*0.0000*	*0.0000*
TANGIBLE	0.0771***	0.0763***	0.0777***	0.0793***
	0.0000	*0.0000*	*0.0000*	*0.0000*
PRODU	0.0332***	0.0331***	0.0335***	0.0332***
	0.0000	*0.0000*	*0.0000*	*0.0000*
DEBT_SUST	0.0258***	0.0262***	0.0257***	0.0256***
	0.0000	*0.0000*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1914***	-0.1952***	-0.1914***	-0.1919***
	0.0000	*0.0000*	*0.0000*	*0.0000*
AGE	0.0005***	0.0006***	0.0005***	0.0006***
	0.0000	*0.0000*	*0.0000*	*0.0000*
JACOB	-0.0026***	-0.0026***	-0.0030***	-0.0029***
	0.0000	*0.0000*	*0.0000*	*0.0000*
GDP	0.0056***	0.0046**	0.0109***	0.0039
	0.0000	*0.0200*	*0.0000*	*0.1240*
Observations	296,828	269,812	296,828	269,812
Durbin-Wu-Hausman test		0.8455		2.0651
		0.3578		*0.1507*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported. In the IV regressions, the intrumental variables, defined in 1936 at provincial level, used are: the share of banks owned by cooperative Popolari, the share of branches owned by cooperative Popolari, the number of mutual cooperative banks per million inhabitants, the share of branches owned by mutual cooperative, the total number of banks in the province.

TABLE 3.3 - Results with interaction - Dependent Variable: Z-SCORE (3 YEARS)

	1	2	3	4	5	6	7	8
	H INDEX				BOONE INDEX			
	Pooled	FE	RE	Mixed	Pooled	FE	RE	Mixed
H	0.0386***	0.0506***	0.0431***	0.0380***				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
BOONE					0.0160***	0.0183***	0.0170***	0.0151***
					0.0000	*0.0000*	*0.0000*	*0.0000*
LEV	-0.4878***	-0.5097***	-0.4742***	-0.4809***	-0.4724***	-0.4976***	-0.4592***	-0.4669***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
LEV*H	-0.0533***	-0.0696***	-0.0598***	-0.0529***				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
LEV*BOONE					-0.0218***	-0.0252***	-0.0232***	-0.0211***
					0.0000	*0.0000*	*0.0000*	*0.0000*
SALES	0.0102***	0.0329***	0.0108***	0.0107***	0.0102***	0.0332***	0.0109***	0.0107***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
CASHFLOW	0.0529***	0.2435***	0.1323***	0.0620***	0.0527***	0.2454***	0.1328***	0.0618***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
TANGIBLE	0.0810***	0.0584***	0.0803***	0.0779***	0.0807***	0.0581***	0.0799***	0.0777***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
PRODU	0.0335***	0.0142***	0.0314***	0.0360***	0.0333***	0.0140***	0.0312***	0.0358***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
DEBT_SUST	0.0252***	0.0021	0.0207***	0.0244***	0.0252***	0.0024	0.0207***	0.0244***
	0.0000	*0.1640*	*0.0000*	*0.0000*	*0.0000*	*0.1200*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1889***	-0.0429***	-0.1571***	-0.1865***	-0.1885***	-0.0437***	-0.1568***	-0.1861***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
AGE	0.0005***	0.0090***	0.0006***	0.0008***	0.0005***	0.0088***	0.0006***	0.0008***
	0.0000	*0.0010*	*0.0000*	*0.0000*	*0.0000*	*0.0010*	*0.0000*	*0.0000*
JACOB	-0.0032***	-0.0004	-0.0032***	-0.001	-0.0032***	-0.0003	-0.0032***	-0.0009
	0.0000	*0.5960*	*0.0000*	*0.1200*	*0.0000*	*0.6930*	*0.0000*	*0.1680*
GDP	0.0098***	-0.0041	0.0090***	-0.0042	0.0094***	-0.0026	0.0084***	-0.0052
	0.0000	*0.7880*	*0.0000*	*0.4200*	*0.0000*	*0.8650*	*0.0000*	*0.3140*
Observations	296,828	296,828	296,828	296,828	296,828	296,828	296,828	296,828
test (H, LEV)	5295.76	1234.26	8843.57	11239.24				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
test (BOONE, LEV)					5557.88	1288.25	9242.71	12354.53
					0.0000	*0.0000*	*0.0000*	*0.0000*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported.

TABLE 3.4 - Results with interaction - Dependent Variable: Z-SCORE2 (5 YEARS)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
	H INDEX				**BOONE INDEX**			
	Pooled	FE	RE	Mixed	Pooled	FE	RE	Mixed
H	0.008	0.0167***	0.0139***	0.0090*				
	0.1660	*0.0000*	*0.0010*	*0.0690*				
BOONE					0.0059***	0.0042***	0.0048***	0.0050***
					0.0000	*0.0000*	*0.0000*	*0.0000*
LEV	-0.3416***	-0.3585***	-0.3359***	-0.3361***	-0.3306***	-0.3568***	-0.3315***	-0.3263***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
LEV*H	-0.0107	-0.0219***	-0.0189***	-0.0108*				
	0.1230	*0.0000*	*0.0010*	*0.0820*				
LEV*BOONE					-0.0078***	-0.0064***	-0.0068***	-0.0073***
					0.0000	*0.0000*	*0.0000*	*0.0000*
SALES	0.0031***	0.0136***	0.0048***	0.0036***	0.0031***	0.0136***	0.0048***	0.0036***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
CASHFLOW	0.0905***	0.2392***	0.1985***	0.0977***	0.0902***	0.2398***	0.1987***	0.0974***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
TANGIBLE	0.0619***	0.0355***	0.0609***	0.0597***	0.0620***	0.0354***	0.0608***	0.0598***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
PRODU	0.0244***	0.0099***	0.0200***	0.0263***	0.0243***	0.0099***	0.0199***	0.0262***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
DEBT_SUST	0.0153***	-0.0031***	0.0076***	0.0147***	0.0153***	-0.0030***	0.0076***	0.0147***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1189***	-0.0023	-0.0670***	-0.1173***	-0.1188***	-0.0027	-0.0670***	-0.1173***
	0.0000	*0.7090*	*0.0000*	*0.0000*	*0.0000*	*0.6610*	*0.0000*	*0.0000*
AGE	0.0000	0.0039***	-0.0001**	0.0002***	0.0000	0.0045***	-0.0001**	0.0002***
	0.6520	*0.0010*	*0.0450*	*0.0000*	*0.6710*	*0.0010*	*0.0430*	*0.0000*
JACOB	-0.0023***	0.0018***	-0.0020***	0.0012**	-0.0023***	0.0019***	-0.0020***	0.0012***
	0.0000	*0.0000*	*0.0000*	*0.0110*	*0.0000*	*0.0000*	*0.0000*	*0.0080*
GDP	0.0059***	0.0169**	0.0026**	-0.0134***	0.0059***	0.0179**	0.0023*	-0.0135***
	0.0000	*0.0220*	*0.0340*	*0.0010*	*0.0000*	*0.0140*	*0.0630*	*0.0000*
Observations	267,567	267,567	267,567	267,567	267,567	267,567	267,567	267,567
test (H, LEV)	6284.09	1967.44	9178.36	13656.76				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
test (BOONE, LEV)					6515.86	1979.94	9393.08	14842.01
					0.0000	*0.0000*	*0.0000*	*0.0000*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE2. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported.

APPENDIX 3

Figure A3.1. Marginal Effect of LEV on ZSCORE as H Statistics changes. Sample: Northeast

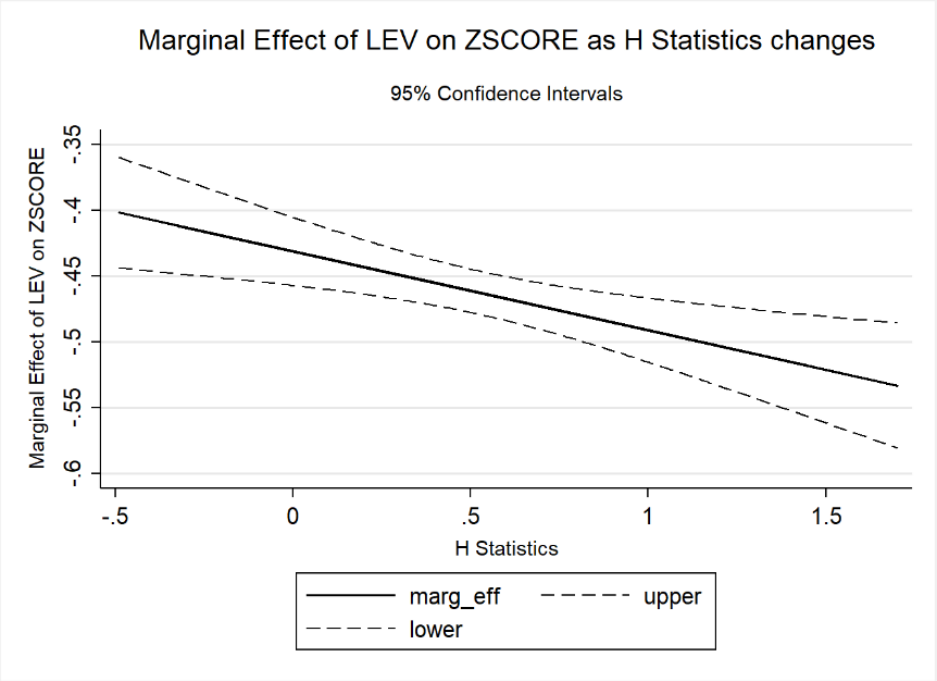

Figure A3.2. Marginal Effect of LEV on ZSCORE as H Statistics changes. Sample: Northwest

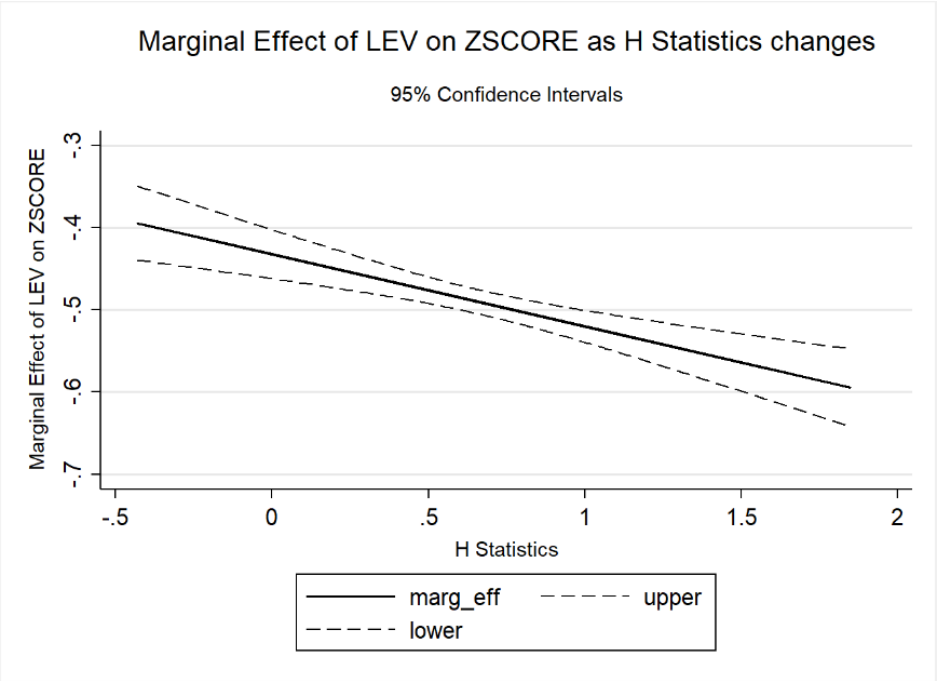

Figure A3.3. Marginal Effect of LEV on ZSCORE as H Statistics changes. Sample: Centre

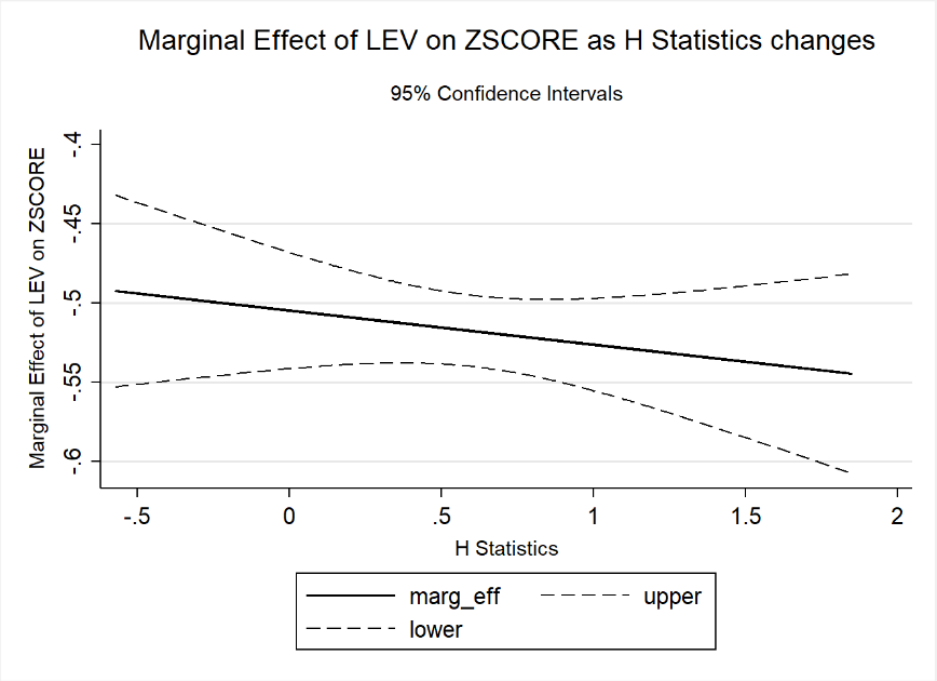

Figure A3.4. Marginal Effect of LEV on ZSCORE as H Statistics changes. Sample: South

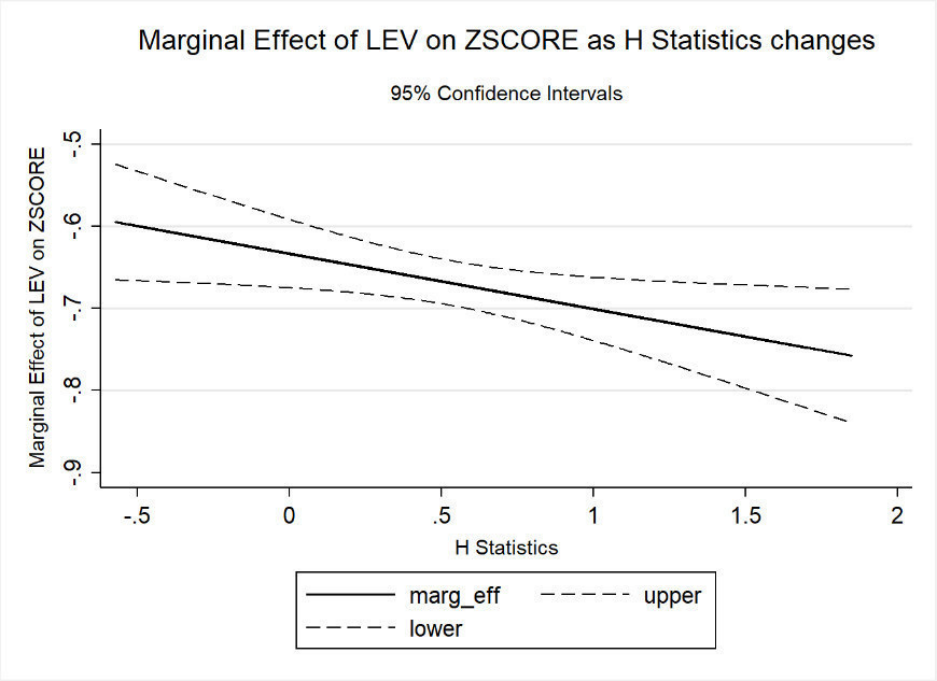

TABLE A3.1 - Description and summary statistics of the variables used in the estimations

VARIABLE	DESCRIPTION	Mean	StdD	Min	Max	Obs
ZSCORE	Firm's Z-Score (3 Years)	0.22	0.38	-0.06	4.16	305,770
ZSCORE2	Firm's Z-Score (5 Years)	0.15	0.23	-0.06	2.20	275,533
H	Panzar and Rosse H statistic at provincial level	0.679	0.380	-0.572	1.848	461,799
BOONE	Boone Index at provincial level	2.312	1.558	-2.444	8.100	461,799
LEV[(e)]	(Current plus non-current liabilities) to total assets	75.71	18.48	22.36	99.10	461,799
SALES[(a)]	Firm's total sales	4,922	7,791	24	60,368	461,781
CASHFLOW[(e)]	Cash flow to total assets	5.12	6.61	-51.61	30.26	457,586
TANGIBLE[(e)]	Tangible fixed assets to total assets	21.78	18.84	0.00	82.11	461,772
PRODU[(a)]	Total sales to employees	225.88	210.59	7	1,748	461,781
DEBT_SUST[(e)]	Interest paid to total sales	1.85	2.02	0.00	18.16	454,480
AGE[(d)]	Current year minus firm's year of establishment	17.69	12.81	0	65	461,220
JACOB [(c)]	Jacob index: number of sectors (2-digit level) in each province, with more than 10 firms	9.31	6.56	0	21	454,257
GDP[(b)]	Provincial real gross domestic product	31,820	36,849	1,388	153,616	458,446

See section 3.4.1 for the description of Z-SCORE and Z-SCORE2. (a) in thousands of euro; (b) in millions of euro; (c) in unit; (d) in years; (e) in percentage. To rule out potential outliers, we eliminate the observations lying in the first and last percentile of the distributions of all the variables .

TABLE A3.2 - Correlation matrix

	H	BOONE	LEV	SALES	CASHFLOW	TANGIBLE	PRODU	DEBT_SUST	AGE	JACOB	GDP
H	1										
BOONE	0.0132	1									
LEV	0.0201	0.0217	1								
SALES	0.0564	0.0133	-0.1171	1							
CASHFLOW	0.0304	0.0268	-0.2764	0.0608	1						
TANGIBLE	-0.0406	0.0029	-0.181	-0.009	0.0249	1					
PRODU	0.0365	0.0008	-0.0026	0.3389	0.0457	-0.143	1				
DEBT_SUST	-0.0023	0.0154	0.2787	-0.1104	-0.2726	0.2416	-0.1201	1			
AGE	0.0302	-0.0097	-0.2733	0.2627	-0.058	0.1515	0.0425	0.0038	1		
JACOB	0.1487	-0.1988	-0.002	0.0813	0.0282	-0.1081	0.0653	-0.0816	0.0832	1	
GDP	0.0739	-0.2631	0.0017	0.0125	-0.0041	-0.1002	0.0333	-0.0539	0.0516	0.6719	1

For the description of the variables see Table A3.1.

TABLE A3.3 - Results without interaction - Dependent Variable: Z-SCORE (5 YEARS)

	1	*2*	*3*	*4*
	H INDEX		**BOONE INDEX**	
	Pooled	IV	Pooled	IV
H	0.0072***	0.0140***		
	0.0000	*0.0030*		
BOONE			0.0017***	-0.0036*
			0.0000	*0.0990*
LEV	-0.3460***	-0.3486***	-0.3463***	-0.3497***
	0.0000	*0.0000*	*0.0000*	*0.0000*
SALES	0.0035***	0.0033***	0.0034***	0.0030***
	0.0000	*0.0000*	*0.0000*	*0.0000*
CASHFLOW	0.0984***	0.0888***	0.0978***	0.0827***
	0.0000	*0.0000*	*0.0000*	*0.0000*
TANGIBLE	0.0607***	0.0605***	0.0609***	0.0610***
	0.0000	*0.0000*	*0.0000*	*0.0000*
PRODU	0.0243***	0.0240***	0.0244***	0.0242***
	0.0000	*0.0000*	*0.0000*	*0.0000*
DEBT_SUST	0.0155***	0.0156***	0.0155***	0.0155***
	0.0000	*0.0000*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1198***	-0.1229***	-0.1198***	-0.1222***
	0.0000	*0.0000*	*0.0000*	*0.0000*
AGE	0.0000	0.0000	0.0000	0.0000
	0.6300	*0.8350*	*0.7480*	*0.9370*
JACOB	-0.0021***	-0.0020***	-0.0022***	-0.0023***
	0.0000	*0.0000*	*0.0000*	*0.0000*
GDP	0.0042***	0.0020*	0.0064***	0.0024
	0.0000	*0.0540*	*0.0000*	*0.1200*
Observations	267,567	242,232	267,567	242,232
Durbin-Wu-Hausman test		2.2587		2.5469
		0.1328		*0.1105*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE2. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported. In the IV regressions, the intrumental variables, defined in 1936 at provincial level, used are: tthe share of banks owned by cooperative Popolari, the share of branches owned by cooperative Popolari, the number of mutual cooperative banks per million inhabitants, the share of branches owned by mutual cooperative, the total number of banks in the province.

TABLE A3.4 - Results with interaction - Dependent Variable: Z-SCORE (3 YEARS). Sample: Northeast Italy

	1	2	3	4	5	6	7	8
	H INDEX				BOONE INDEX			
	Pooled	FE	RE	Mixed	Pooled	FE	RE	Mixed
H	0.0526***	0.0489***	0.0534***	0.0446***				
	0.0010	*0.0020*	*0.0000*	*0.0020*				
BOONE					0.0171***	0.0177***	0.0175***	0.0146***
					0.0000	*0.0000*	*0.0000*	*0.0000*
LEV	-0.4312***	-0.4760***	-0.4158***	-0.4319***	-0.4131***	-0.4510***	-0.3941***	-0.4131***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
LEV*H	-0.0600***	-0.0682***	-0.0650***	-0.0591***				
	0.0020	*0.0010*	*0.0000*	*0.0010*				
LEV*BOONE					-0.0204***	-0.0250***	-0.0227***	-0.0205***
					0.0000	*0.0000*	*0.0000*	*0.0000*
SALES	0.0085***	0.0365***	0.0088***	0.0086***	0.0085***	0.0371***	0.0088***	0.0086***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
CASHFLOW	0.0577***	0.2202***	0.1348***	0.0609***	0.0573***	0.2221***	0.1355***	0.0607***
	0.0000	*0.0000*	*0.0000*	*0.0020*	*0.0000*	*0.0000*	*0.0000*	*0.0020*
TANGIBLE	0.0680***	0.0763***	0.0703***	0.0713***	0.0684***	0.0750***	0.0702***	0.0711***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
PRODU	0.0367***	0.0168***	0.0345***	0.0360***	0.0366***	0.0165***	0.0344***	0.0358***
	0.0000	*0.0010*	*0.0000*	*0.0000*	*0.0000*	*0.0020*	*0.0000*	*0.0000*
DEBT_SUST	0.0220***	0.0053*	0.0180***	0.0220***	0.0219***	0.0057*	0.0180***	0.0220***
	0.0000	*0.0740*	*0.0000*	*0.0000*	*0.0000*	*0.0540*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1762***	-0.0836***	-0.1504***	-0.1765***	-0.1760***	-0.0849***	-0.1503***	-0.1762***
	0.0000	*0.0010*	*0.0000*	*0.0000*	*0.0000*	*0.0010*	*0.0000*	*0.0000*
AGE	0.0010***	-0.0015	0.0012***	0.0010***	0.0010***	-0.0014	0.0012***	0.0010***
	0.0000	*0.2880*	*0.0000*	*0.0000*	*0.0000*	*0.2690*	*0.0000*	*0.0000*
JACOB	0.0013***	0.002	0.0013***	0.001	0.0012***	0.0019	0.0013***	0.0009
	0.0000	*0.2500*	*0.0050*	*0.2830*	*0.0010*	*0.2860*	*0.0050*	*0.3230*
GDP	-0.0082**	-0.0055	-0.0089*	-0.0001	-0.0076*	-0.0038	-0.0087*	0.0005
	0.0340	*0.8670*	*0.0860*	*0.9940*	*0.0500*	*0.9080*	*0.0930*	*0.9520*
Observations	89,626	89,626	89,626	89,626	89,626	89,626	89,626	89,626
test (H, LEV)	1352.94	345.35	2167.83	2939.34				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
test (BOONE, LEV)					1373.41	348.98	2149.1	2945.81
					0.0000	*0.0000*	*0.0000*	*0.0000*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported.

TABLE A3.5 - Results with interaction - Dependent Variable: Z-SCORE (3 YEARS). Sample: Northwest Italy

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
	H INDEX				**BOONE INDEX**			
	Pooled	FE	RE	Mixed	Pooled	FE	RE	Mixed
H	0.0521***	0.0809***	0.0625***	0.0565***				
	0.0010	*0.0000*	*0.0000*	*0.0000*				
BOONE					0.0168***	0.0201***	0.0182***	0.0174***
					0.0000	*0.0000*	*0.0000*	*0.0000*
LEV	-0.4320***	-0.4459***	-0.4157***	-0.4337***	-0.4493***	-0.4750***	-0.4363***	-0.4494***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
LEV*H	-0.0880***	-0.1167***	-0.0981***	-0.0869***				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
LEV*BOONE					-0.0239***	-0.0275***	-0.0256***	-0.0244***
					0.0000	*0.0000*	*0.0000*	*0.0000*
SALES	0.0097***	0.0291***	0.0096***	0.0090***	0.0098***	0.0297***	0.0097***	0.0090***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
CASHFLOW	0.0552***	0.2274***	0.1265***	0.0550***	0.0562***	0.2310***	0.1282***	0.0558***
	0.0000	*0.0000*	*0.0000*	*0.0010*	*0.0000*	*0.0000*	*0.0000*	*0.0010*
TANGIBLE	0.0796***	0.0722***	0.0802***	0.0792***	0.0785***	0.0707***	0.0790***	0.0781***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
PRODU	0.0357***	0.0149***	0.0332***	0.0362***	0.0355***	0.0145***	0.0330***	0.0360***
	0.0000	*0.0020*	*0.0000*	*0.0000*	*0.0000*	*0.0020*	*0.0000*	*0.0000*
DEBT_SUST	0.0236***	-0.0011	0.0191***	0.0233***	0.0237***	-0.0007	0.0192***	0.0234***
	0.0000	*0.6490*	*0.0000*	*0.0000*	*0.0000*	*0.7710*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1747***	-0.0190	-0.1423***	-0.1738***	-0.1748***	-0.0205	-0.1425***	-0.1739***
	0.0000	*0.3570*	*0.0000*	*0.0000*	*0.0000*	*0.3220*	*0.0000*	*0.0000*
AGE	0.0007***	0.0103**	0.0008***	0.0008***	0.0007***	0.0113***	0.0008***	0.0008***
	0.0000	*0.0190*	*0.0000*	*0.0000*	*0.0000*	*0.0100*	*0.0000*	*0.0000*
JACOB	-0.0009	-0.0006	-0.0007	-0.001	-0.0004	-0.0003	-0.0002	-0.0005
	0.1320	*0.6940*	*0.3570*	*0.4030*	*0.4860*	*0.8480*	*0.7640*	*0.6590*
GDP	-0.0003	-0.0066	-0.0024	0.0044	-0.0042	-0.0053	-0.0059	0.0009
	0.9430	*0.8000*	*0.6030*	*0.6050*	*0.2710*	*0.8350*	*0.1920*	*0.9140*
Observations	113,682	113,682	113,682	113,682	113,682	113,682	113,682	113,682
test (H, LEV)	1651.4	461.42	2806.47	3562.8				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
test (BOONE, LEV)					1988.96	508.95	3433.51	4802.23
					0.0000	*0.0000*	*0.0000*	*0.0000*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported.

TABLE A3.6 - Results with interaction - Dependent Variable: Z-SCORE (3 YEARS). Sample: Central Italy

	1	2	3	4	5	6	7	8
	H INDEX				BOONE INDEX			
	Pooled	FE	RE	Mixed	Pooled	FE	RE	Mixed
H	0.0196	-0.0238	0.0102	0.0192				
	0.3420	*0.3040*	*0.5650*	*0.2780*				
BOONE					0.0125**	0.0201***	0.0147***	0.0134***
					0.0190	*0.0000*	*0.0010*	*0.0040*
LEV	-0.5047***	-0.5663***	-0.5038***	-0.5021***	-0.4766***	-0.4906***	-0.4651***	-0.4750***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
LEV*H	-0.0216	0.0257	-0.013	-0.0234				
	0.3750	*0.3860*	*0.5630*	*0.2900*				
LEV*BOONE					-0.0169***	-0.0246***	-0.0187***	-0.0169***
					0.0060	*0.0000*	*0.0010*	*0.0030*
SALES	0.0122***	0.0268***	0.0131***	0.0129***	0.0122***	0.0272***	0.0131***	0.0129***
	0.0000	*0.0010*	*0.0000*	*0.0000*	*0.0000*	*0.0010*	*0.0000*	*0.0000*
CASHFLOW	0.0792***	0.2723***	0.1343***	0.0820***	0.0779***	0.2706***	0.1336***	0.0810***
	0.0000	*0.0000*	*0.0000*	*0.0020*	*0.0000*	*0.0000*	*0.0000*	*0.0020*
TANGIBLE	0.0659***	0.0431	0.0659***	0.0655***	0.0662***	0.0422	0.0662***	0.0659***
	0.0000	*0.1040*	*0.0000*	*0.0000*	*0.0000*	*0.1110*	*0.0000*	*0.0000*
PRODU	0.0292***	0.0064	0.0275***	0.0286***	0.0292***	0.0062	0.0274***	0.0285***
	0.0000	*0.3550*	*0.0000*	*0.0000*	*0.0000*	*0.3680*	*0.0000*	*0.0000*
DEBT_SUST	0.0253***	0.0005	0.0215***	0.0249***	0.0253***	0.0006	0.0216***	0.0249***
	0.0000	*0.8740*	*0.0000*	*0.0000*	*0.0000*	*0.8670*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1890***	-0.0232	-0.1602**	-0.1865***	-0.1893***	-0.0234	-0.1604***	-0.1868***
	0.0000	*0.4160*	*0.0000*	*0.0000*	*0.0000*	*0.4120*	*0.0000*	*0.0000*
AGE	0.0008***	-0.0048***	0.0008***	0.0008***	0.0008***	-0.0045***	0.0008***	0.0008***
	0.0000	*0.0060*	*0.0000*	*0.0000*	*0.0000*	*0.0040*	*0.0000*	*0.0000*
JACOB	-0.0014**	-0.0002	-0.0014*	0.0002	-0.0013**	0.0000	-0.0013*	0.0002
	0.0250	*0.9240*	*0.0560*	*0.8410*	*0.0330*	*0.9880*	*0.0660*	*0.8510*
GDP	0.0004	-0.002	-0.0001	-0.0058	0.0002	-0.0005	-0.0002	-0.0054
	0.8780	*0.9590*	*0.9710*	*0.3250*	*0.9250*	*0.9900*	*0.9480*	*0.3550*
Observations	51,719	51,719	51,719	51,719	51,719	51,719	51,719	51,719
test (H, LEV)	966.45	187.22	1696.73	2053.83				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
test (BOONE, LEV)					924.21	197.37	1650.65	2049.76
					0.0000	*0.0000*	*0.0000*	*0.0000*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported.

TABLE A3.7 - Results with interaction - Dependent Variable: Z-SCORE (3 YEARS). Sample: Southern Italy

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
	H INDEX				**BOONE INDEX**			
	Pooled	FE	RE	Mixed	Pooled	FE	RE	Mixed
H	0.0584**	0.0557**	0.0548**	0.0496**				
	0.0190	*0.0380*	*0.0100*	*0.0200*				
BOONE					0.0116**	0.0144***	0.0126***	0.0107**
					0.0170	*0.0020*	*0.0020*	*0.0120*
LEV	-0.6331***	-0.6827***	-0.6308***	-0.6308***	-0.6285***	-0.6749***	-0.6235***	-0.6269***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
LEV*H	-0.0674**	-0.0791**	-0.0692**	-0.0671**				
	0.0250	*0.0230*	*0.0110*	*0.0130*				
LEV*BOONE					-0.0174***	-0.0213***	-0.0186***	-0.0170***
					0.0020	*0.0000*	*0.0000*	*0.0020*
SALES	0.0182***	0.0403***	0.0205***	0.0188***	0.0183***	0.0403***	0.0206***	0.0189***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
CASHFLOW	0.1100***	0.2983***	0.1830***	0.1072***	0.1111***	0.3037***	0.1852***	0.1086***
	0.0000	*0.0000*	*0.0000*	*0.0030*	*0.0000*	*0.0000*	*0.0000*	*0.0030*
TANGIBLE	0.0850***	0.009	0.0799***	0.0847***	0.0852***	0.0118	0.0802***	0.0848***
	0.0000	*0.7810*	*0.0000*	*0.0000*	*0.0000*	*0.7150*	*0.0000*	*0.0000*
PRODU	0.0406***	0.0169**	0.0381***	0.0408***	0.0405***	0.0170**	0.0380***	0.0407***
	0.0000	*0.0190*	*0.0000*	*0.0000*	*0.0000*	*0.0180*	*0.0000*	*0.0000*
DEBT_SUST	0.0247***	0.0046	0.0209***	0.0024***	0.0248***	0.0046	0.0209***	0.0245***
	0.0000	*0.2640*	*0.0000*	*0.0000*	*0.0000*	*0.2610*	*0.0000*	*0.0000*
DEBT_SUST2	-0.1813***	-0.0468	-0.1551***	-0.1797***	-0.1811***	-0.0464	-0.1548***	-0.1797***
	0.0000	*0.1090*	*0.0000*	*0.0000*	*0.0000*	*0.1120*	*0.0000*	*0.0000*
AGE	0.0000	-0.0063***	0.0001	0.0001	0.0000	-0.0058***	0.0001	0.0001
	0.9530	*0.0020*	*0.6440*	*0.7610*	*0.9420*	*0.0020*	*0.6480*	*0.7470*
JACOB	0.0011	-0.0023	0.0003	0.0016	0.0008	-0.0021	0.0002	0.0018
	0.3470	*0.4250*	*0.8450*	*0.3910*	*0.4530*	*0.4620*	*0.8630*	*0.3330*
GDP	0.0084*	-0.0349	0.0114**	0.0026	0.0104**	-0.0375	0.0114**	0.0006
	0.0880	*0.4670*	*0.0370*	*0.7440*	*0.0210*	*0.4320*	*0.0260*	*0.9380*
Observations	41,801	41,801	41,801	41,801	41,801	41,801	41,801	41,801
test (H, LEV)	1077.05	215.28	1819.46	2223.17				
	0.0000	*0.0000*	*0.0000*	*0.0000*				
test (BOONE, LEV)					1069.77	215.85	1781.25	2220.98
					0.0000	*0.0000*	*0.0000*	*0.0000*

For the description of variables see Table A3.1. The dependent variable is always Z-SCORE. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The pvalues of the tests are given In italics. The standard errors (not reported) are robust to heteroskedasticity and autocorrelation. Years and sector dummies always included but not reported.