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Bank market power and incentives for firm creation in innovative industries

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Abstract

I examine the role of banking competition for transmission of incentives to the creation of innovative firms. Exploiting the 2012 Start-Up Italy Act, designed to foster firm creation through public bank guarantees, I document that the policy increased the creation of innovative firms by 24 percent between 2012 and 2015, but only in provinces where banking competition is stronger. Weaker banking competition leads to less guaranteed lending, fewer venture capital deals and lower leverage for these firms, resulting in higher entrepreneurial migration. The findings suggest that bank market power plays a crucial role in shaping the market for entrepreneurial finance.

Keywords: competition; firm creation; venture capital; guaranteed lending.
JEL classifications: G21, G30, M13, L26.

1. Introduction

Young and innovative firms account for more than 50 percent of firm-level job creation and contribute significantly to economic growth (Mollica and Zingales 2007; Puri and Zarutskie 2012; Decker et al. 2014). As a result, policymakers spend a significant amount of effort and resources designing and promoting policies to foster the creation of such firms (Bradley et al. 2021). These policies are intended to support innovative start-ups with their R&D and patenting activities on the one hand, while easing financing conditions for both debt and equity providers on the other (Lerner et al. 2018; Avramidis et al. 2022; Bazzi et al. 2023). Tax breaks can be used to stimulate equity investments (Denes et al. 2020), while public guarantees on debt are a popular way to ease young firms' access to bank funding (Petersen and Rajan 1994; Robb and Robinson 2014; Gonzalez-Uribe and Wang 2020; Bachas, Kim, and Yannelis 2021).

Public guarantees can reduce credit risk for banks (Gropp, Gruendl, and Guettler 2014) and the cost of credit for firms (Beyhaghi 2022). Therefore, a policy providing public guarantees generates a credit subsidy that, in competitive banking markets, would be passed on to the innovative firms, stimulating prospective entrepreneurs' access to credit and thus firm creation. In imperfectly competitive banking markets, the pass-through to firms would be smaller, resulting in a weaker effect of the policy and lower levels of firm creation (Kopecky and Van Hoose 2012).

In this paper, I study the role of banking competition in the transmission of incentives to stimulate the market entry of innovative firms. As a shock to the supply of innovative

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firms, I exploit the 2012 Start-Up Italy Act (SIA), a policy intervention by the Italian government that introduced the possibility for eligible young innovative firms to obtain public guarantees on their bank loans and other incentives, with the stated goal of increasing the supply of innovative entrepreneurs. I find that, while the policy is effective in stimulating innovative firm creation and publicly guaranteed lending, these effects are offset in areas with less competitive banking markets.

First, using a dataset on the quarterly number of firms created in Italy by province (105 NUTS3 areas) and industry (88 2-digit NACE codes) from 2010 to 2015, I document that the SIA increased the number of innovative firms created quarterly by 24 percent of the pre-policy mean, or 0.148 new firms per quarter-industry—corresponding to 1,100 more innovative firms created nationwide. In order to identify the effect of passing the SIA, which coincided with the turnaround of the European sovereign debt crisis, from the general macroeconomic trend, I use a difference-in-differences (DID) design. I compare the quarterly number of firms created in innovative and non-innovative industries, before and after the passage of the SIA from 2010 to 2015. The idea is that the SIA should only affect industries with a high concentration of innovative start-ups, while other time-varying confounding factors (e.g., fluctuations in the business cycle) would affect all industries similarly. I define an industry as innovative if it is over-represented, compared to the overall distribution of firms in Italy, in the sample of firms that become eligible under the SIA but are incorporated before its announcement.

Next, I find that the effect of the SIA has been lower by 0.29 fewer firms created per industry-quarter in provinces with less competitive banking sectors. Compared to the baseline effect of 0.148 new firms in the average province, it means that the SIA had no effect in provinces where banking competition is weaker. I use a difference-in-difference-in-differences (DDD) design to identify the causal effect of banking competition on the effect of the SIA on firm creation. I compare firm creation in innovative and non-innovative industries, before and after the passage of the SIA, and between provinces where banking is less and more competitive. Comparing firm creation across industries around the passage of SIA provides an estimate of the SIA's effect, and I then obtain the effect of bank market power on the effect of the SIA by comparing the differences in firm creation across industries between provinces with different degrees of banking competition.

To measure banking competition in a province, I introduce the rate spread—a new measurement of bank market power at the local level estimated using aggregated data. The rate spread is the difference between the average rate of return of short-term loans in a province and the competitive rate of return, as implied by the average probability of default of these loans in the same province. The idea behind the rate spread is that in a competitive banking market the average rate and the competitive rate should coincide. I validate this new measure by showing that it is highly correlated with more traditional measures of banking competition (e.g., the HHI of bank branches) and that the main results are robust to use these alternative measures.

Next, I investigate the channel through which banking competition affects the policy's transmission, focusing specifically on publicly guaranteed lending. Using the aforementioned DDD framework, I find that after the SIA, the number and volume of guaranteed loans granted to firms in innovative industries grow less, as compared to credit to firms in non-innovative industries located in provinces where bank market power is higher. This result shows that bank market power weakens the pass-through of the main policy incentive and causes the policy to be ineffective in areas where banking competition is weaker. These results are consistent with a mechanism whereby potential innovative entrepreneurs do not enter the market due to the lack of bank funding (Bustamante and D'Acunto 2021; Bazzi et al. 2023; Kampanelis, Chronopoulos, and Wilson 2024).

Moreover, I document that in provinces where banks are less competitive the weaker pass-thorough of the incentives for guaranteed lending is not compensated by other sources

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of funding. I find that in these provinces the difference in the number and volume of venture capital (VC) deals between innovative and non-innovative industries after the SIA is smaller (or more negative) than where banks are more competitive. These results show that banks and venture capitalists can act as complements rather than substitutes (Berger and Schaeck 2011): lower banking competition leads to the creation of fewer viable innovative firms, which in turn depresses VC activity. This demonstrates that competition among debt-based financiers can have different (i.e., beneficial) effects compared to competition among equity investors (Ersahin, Huang, and Khanna 2021), and it represents a new contribution to the literature on the delineation and dynamics of markets for financing innovative young firms.

Lastly, I study how the policy and bank market power affect individual firms. I find that the weaker pass-through of the SIA results in lower leverage and likelihood of having any leverage for firms in innovative industries and in areas of high bank market power. As a result of fewer funding opportunities, I also show that firms in innovative industries become less likely to be founded by non-local-born founders in areas with weaker banking competition, following the policy. High bank market power acts as a push factor for entrepreneurial migration, potentially widening regional divides by significantly affecting the supply of (innovative) entrepreneurs, and suggesting that part of the lower effect of the SIA in less competitive provinces is demand-driven.

My results are robust to an array of tests. First, I saturate the DDD model with fixed effects for province, industry, and quarter, and their interactions, controlling for systematic and time-varying differences across provinces (industries) that affect all industries (provinces) simultaneously. Moreover, I find no effects when using the outcome of firms not eligible under the SIA (i.e., incumbent older firms and unlimited liability partnerships) in placebo tests. Furthermore, the results are robust to using alternative measures of bank market power (e.g., HHI of bank branches) and definitions of innovative industries (i.e., using the OECD definition of high-technology manufacturing or knowledge-intensive service industries). Lastly, I provide evidence supporting the DDD identifying assumption of parallel trends in outcome differences between industry groups across provinces in the absence of the SIA. Although this assumption is not directly testable, I find no evidence of pre-trends using a dynamic DDD specification. This mitigates concerns that provinces with varying bank market power differ systematically in other relevant dimensions (e.g., economic development), and it suggests that the results are unlikely to be driven by unobserved factors correlated with treatment.

My paper is related to Manaresi, Menon, and Santoleri (2022), who document that the SIA allowed eligible firms to better access VC and bank funding, but I focus on the role of banking competition in the transmission of the policy's incentives. I contribute to the literature about the role of public guarantees for small- and medium-sized enterprises (de Blasio et al. 2018; Gonzalez-Uribe and Wang 2020) by showing that public guarantees fosters the creation of innovative firms by strengthening both creditors' and debtors' rights and shifting credit risk onto the public. My results complement those of Ughetto, Scellato, and Cowling (2017) and Cowling, Ughetto, and Lee (2018), who document that high-technology firms experience a higher penalty on the cost of debt when accessing public guarantees, and those of Cerqueiro et al. (2017) showing that stronger debtor protection harms innovation.

My paper also contributes more generally to the literature about bank market power, credit availability, firms' investment (Petersen and Rajan 1994, 1995; Boot and Thakor 2000; Fields et al. 2006; DeYoung, Glennon, and Nigro 2008; Dass and Massa 2011), and innovation (Amore, Schneider, and Žaldokas 2013; Benfratello, Schiantarelli, and Sembenelli 2008; Bircan and De Haas 2020; Herrera and Minetti 2007; Kerr and Nanda 2009; Krishnan, Nandy, and Puri 2015; Hombert and Matray 2017; Qi and Ongena 2020; Robb and Robinson 2014). While previous literature has linked banking competition

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to more innovation in established firms (Chava et al. 2013; Cornaggia et al. 2015; Hombert and Matray 2017; Bircan and De Haas 2020), I study innovative firm creation. Unlike Black and Strahan (2002) and Kerr and Nanda (2009) who use changes in banking competition as a shock to firm creation, I use banking competition as a mediator for the effectiveness of subsidies to bank lending, and thus to firm creation. Moreover, by showing that bank market power acts as a push factor in entrepreneurial migration, my results complement those of Kampanelis, Chronopoulos, and Wilson (2024) on how banking competition fosters intergenerational mobility through entrepreneurship for disadvantaged individuals. Lastly, my paper contributes to the literature on the measurement of competition and competitive intensity in the banking industry, by providing a novel non-data intensive measure of bank market power at the local level, as an alternative to concentration indexes (Lerner 1934; Dickson 1979; Feinberg 1980), the H-statistic (Panzar and Rosse 1987) and structural-estimation measures (Claessens and Laeven 2003; Boone 2008).

The remainder of the paper proceeds as follows: In Section 2, I describe the different parts of the empirical investigation: the policy intervention, how I measure bank market power and the rate spread, and the estimation strategy. In Section 3, I discuss the data and present the summary statistics. In Section 4, I explain and discuss the results. I conclude in Section 5.

2. Empirical framework

In this section, I describe the empirical investigation. Section 2.1 gives an overview of the SIA, while Section 2.2 details how I construct the rate spread as a measure of bank market power. Lastly, in Section 2.3, I illustrate the estimation and identification strategies.

2.1 The policy intervention

The Italian government passed the SIA in December 2012 to foster the creation of firms with innovative and high-growth potential.[1] The law created a special registry of new and young firms that qualify as innovative according to a set of criteria. To be included in the special registry, a firm must satisfy all of the following conditions:

1) Be incorporated in Italy as a limited-liability company and be operational for less than five years;
2) Have the development, production, and commercialization of innovative products or services with a clear technological component as the main business objective;
3) Have annual turnover below €5 million as per the last available balance sheet;
4) Have not distributed any dividends;
5) Not be the result of a company merger, split-up, or selling-off.

In addition, at least one of the following conditions must be met:

1) R&D expenses that account for at least 15% of the greater of turnover or total annual costs;
2) Have filed an application for an industrial property right (e.g., a patent or a registered software);
3) At least one-third of the total workforce holds a Ph.D. or at least two-thirds hold a Master's degree.

As of the end of 2015, 6,850 start-ups have been included in the registry: 64 percent of them satisfied the requirement for R&D expenses, 22 percent had filed a patent

[1] According to the Italian Ministry of Economics Development the SIA is "*[…] aimed at facilitating the creation and the growth of new hi-tech companies.*"

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application, and 29 percent had at least one-third of PhD holders in the workforce (requirements are not mutually exclusive).[2] Firms included in the registry are called innovative start-ups and are eligible for support in the form of the following incentives:

- Easier and faster access to the public guarantee scheme, for 80 percent of their bank debt;
- Incentives for work-for-equity compensation: innovative start-ups under the SIA can deduct from their earnings before taxes the amount of vested equity assigned to their employees as part of work-for-equity packages;[3]
- Tax breaks for individual and professional investors in the start-up's equity: individual investors (e.g., angel investors) can deduct 19 percent of the amount invested (up to €500,000) from their tax bill, while professional investors (e.g., VC investors), can deduct 20 percent of the amount invested (up to €1,800,000) from the company's earnings before taxes;
- An easier and faster procedure for filing for bankruptcy and being liquidated and the exemption from several bureaucratic duties and expenses (e.g., incorporation usually entails a fee but it is free for firms in the SIA registry).

This paper focuses specifically on the public guarantee scheme, which, according to the first policy report on the SIA by the Italian Ministry of Economic Development (Calenda 2017), has been the most popular incentive with the start-ups in the SIA registry. Between 2013 and 2017, 2,410 innovative start-ups obtained at least one loan with a public guarantee, for a total of €688.5 million. During the same time span, only 137 start-ups obtained equity financing by either professional or individual investors for a total of €64.7 million, and 45 percent of them also got a guaranteed loan. Furthermore, the public guarantee on debt has been voted the most useful tool of the program by the entrepreneurs who participated (Calenda 2017).

In Italy, the public guarantee scheme, is not new. It is provided by the Fondo di Garanzia per le PMI, financed by the Italian Ministry of Economic Development, and began operations in 2000. It has supported SME lending in the aftermath of the financial crisis (de Blasio et al. 2018) and the COVID-19 pandemic (Core and De Marco 2023). The SIA significantly eases and broadens the scope of the guarantee fund for innovative start-ups.

First, the SIA states that loans to innovative start-ups are always eligible for having an 80 percent guarantee coverage ratio. The coverage ratio of the guarantee on regular operations varies between 80 percent and 30 percent and it is set by the Guarantee Fund depending on the firm's and loan's characteristics. The coverage ratio can be 80 percent only for firms head-quartered in the South, for firms majority-owned by women, and other minor occurrences, while for all other firms it can be up to 70 percent for loans with a maturity longer than 36 months, and up to 50 percent for shorter maturity loans. Lastly, the coverage ratio can be no higher than 30 percent if the purpose of the new loan is to refinance short-term existing exposures with the same bank. In 2012 (i.e., the year before the SIA), the average (median) coverage ratio of guarantee loans was 62 percent (70 percent), with only 243 loans out of 10,820, 2.2 percent of the total, having a coverage ratio of 80 percent.

Next, the SIA imposes that loans to innovative start-ups are exempt from the Fund's credit check. The guarantee on regular loans can be obtained only after a formal evaluation of the firm's credit quality done by the Guarantee Fund following a specific benchmarking

[2] As reported by the Ministry of Economic Development. Unfortunately, since no information on education of the workforce or R&D expenses at the firm-level is available in Italy I cannot leverage these threshold to build a regression discontinuity design.

[3] Furthermore, the SIA exempts innovative start-ups from several legal provisions regarding the dealing in own shares by insiders, which normally severely limit a company's ability to compensate executives using equity.

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model. Importantly, this model is particularly strict for firms in their initial stages, as one of the main criteria is a satisfactory ratio between the firm's debt payments and its cash-flows. Moreover, firms are considered ineligible for the guarantee if the amount of the guarantee exceeds 25 percent of the firm's revenue. Lastly, new firms that cannot provide at least three consecutive balance sheets have to provide a detailed business plan spanning the next 3 years and are ineligible if the size of the investments provisioned in the business plan exceeds 25 percent of the firm current equity. It is thus clear that, without the credit check exemption provisioned by the SIA, innovative start-ups were unlikely to get access to the Guarantee Fund.

Lastly, the SIA prescribes that guarantees for loans to innovative start-ups are free of charge. In fact, regular operations are subject to a fee, to be paid by the firm to the fund, which varies from 0.25 percent to 3 percent of the amount of the guarantee, depending on the firm's size and loan type. Moreover, regular applications are evaluated in chronological order leading to a delay between application and approval up to two months (Core and De Marco 2023). The SIA provisions that applications for loans to innovative start-ups must take precedence and be evaluated by the fund momentarily, resulting in faster and cheaper access to the fund.

2.2 Measuring bank market power

Popular ways to measure bank market power are the Herfindahl-Hirschman Index (HHI) and measures based on the difference between the marginal revenue and marginal cost of banks.[4] While several studies underline the HHI's limitations in the banking context when used cross-sectionally, estimating the marginal cost of a bank within a local banking market is challenging, and oftentimes impossible without access to detailed confidential data (e.g., a credit registry).[5]

For these reasons, I develop a new measure of bank market power called the rate spread (RS), based on the difference between the observed rate of return of loans and the rate of return on loans as implied by perfect competition. In fact, when banks have market power the terms of credit are too expensive so that the rate of return of a loan does not reflect the true probability of the entrepreneur repaying it (i.e., competitive rate). Assuming banks are risk-neutral and perfectly competitive, they would make zero profits from lending in equilibrium:

$$p(1+r)-1=0 \;\Rightarrow\; r^{\star}=\frac{1-\bar{p}}{\bar{p}}, \tag{1}$$

where $\bar{p}$ is the average probability of success, and $r^{\star}$ is the (net) rate of return that a competitive lender sets to lend one unit of funds for one period of time to the average borrower (normalizing the bank's outside option to zero). If the observed average rate of return on loans ($\bar{r}$) is greater than $r^{\star}$, banks could be extracting a monopolistic rent in equilibrium. The greater the difference between the observed and the competitive average rate, the higher the rents and market power. I define RS as:

$$RS=\bar{r}-r^{\star}, \tag{2}$$

RS measures rents for non-collateralized loans that are homogeneous in maturity, under the assumption of risk-neutral intermediaries (Nishiyama 2007). It must be measured in

[4] Examples include the Lerner index (Lerner, 1934; Dickson 1979) and the Panzar-Rosse H (Panzar and Rosse 1987).

[5] Among others, Rhoades (1995) shows that the HHI does not fully account for inequality of market shares and the number of firms in the local banking market, while Hannan (1997) demonstrates that this problem is more relevant when explaining loan rates.

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the relevant local banking market, where banks should make zero profits. To calculate *RS*, one needs to observe measures of $\bar{r}$ and $\bar{p}$ at the relevant level of aggregation.

In accordance with previous studies, I choose the province level as the appropriate local banking market in Italy (Herrera and Minetti 2007; Alessandrini, Presbitero, and Zazzaro 2009; Presbitero and Zazzaro 2011). Moreover, I focus on short-term loans, defined by the Bank of Italy (BoI) as Finanziamenti per Cassa. These are non-collateralized loans with maturities shorter than 12 months, for which *RS* is more likely to be a good indicator of bank market power.

I measure the average probability of repayment for short-term loans as the inverse of the average delinquency rate (d_i). This corresponds to the share of loans that become delinquent (i.e., delinquencies), which is when the borrower experiences a judicial or substantial state of default and the lender cannot expect the loan to be repaid. Delinquency rates are recorded by the type of counter-party: limited liability companies (LLCs) and unlimited liability partnerships (ULPs), with the former accounting for 92.6 percent of the total volume of outstanding short-term loans. For every province, I calculate the weighted average delinquency rate, using as weights the total volume in euros of short-term loans to each counterparty (L_i):

$$\bar{d} = \frac{d_{LLC}L_{LLC} + d_{ULP}L_{ULP}}{L_{LLC} + L_{ULP}}, \tag{3}$$

I then calculate the competitive average rate of return, $r^\star$, as:

$$r^\star = \frac{\bar{d}}{1-\bar{d}} = \frac{1-\bar{p}}{\bar{p}}, \text{ where } \bar{d} = 1-\bar{p}, \tag{4}$$

Next, the BoI collects data on rates offered by banks for the three main categories of short-term loans: revocable loans (*R*, loans that can be unilaterally terminated by the bank; e.g., credit lines); fixed-term loans (*F*, unsecured loans that cannot be terminated by either parties before maturity; e.g., term loans); self-liquidating loans (*S*, loans given against some form of account receivables; e.g., factoring).

For each loan category, the BoI collects the average rate of return and the total volume outstanding, in each province and in each quarter. Fixed-term loans are the largest category, accounting on average for 70 percent of the total volume of loans in a province. I calculate the weighted average rate of return of short-term loans, $\bar{r}$, weighted by the total volume of each loan type (L_j):

$$\bar{r} = \frac{r_R L_R + r_F L_F + r_S L_S}{L_R + L_F + L_S}, \tag{5}$$

From Eq. (2), I then obtain the rate spread for each Italian province from the first quarter of 2010 to the fourth quarter of 2012 (the passage of the SIA). For each province, I then calculate the average over the 2010–2012 period, which I refer to as the pre-policy period. Lastly, I rank provinces according to the median rate spread, defining a dummy *Uncomp*, which takes a value of 1 if the province has a rate spread above the median, and 0 otherwise.

2.3 Estimation and identification

First, I estimate the effect of the SIA on firm creation in innovative industries, defined by two-digit NACE codes. I study the evolution of the number of newly created firms in more and less innovative industries around the passage of the SIA. To this end, I collapse the data on firm creation at the industry-quarter level.

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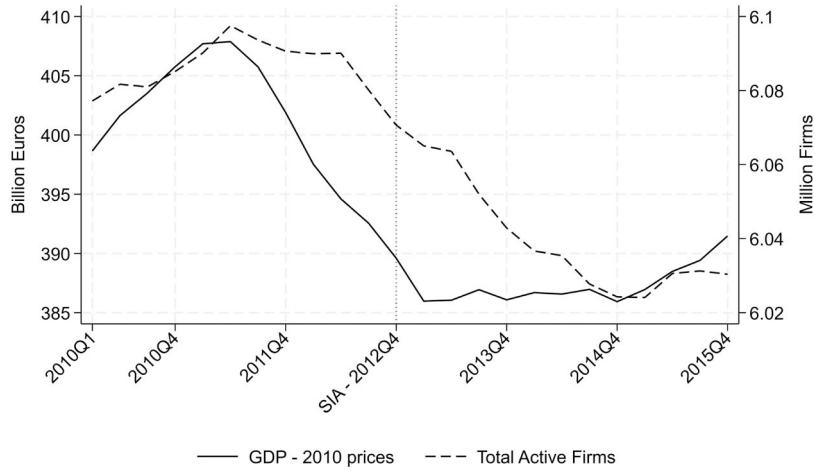


Figure 1 Trends—GDP and active firms

Seasonality-adjusted time series of GDP and number of active firms in Italy, from the first quarter of 2011 to the fourth quarter of 2015. The vertical dotted line denotes the passage of the Start-Up Italy Act (SIA).

I define an industry as innovative if it is over-represented in the sample of firms that enter the SIA registry right at the passage of the law but are incorporated beforehand, relative to the distribution of firms in the Italian economy at the end of 2012 (i.e., if in the sample the share of firms in that industry is higher than the share of firms in that industry in Italy, overall). Looking at firms that enter the registry at the passage of SIA but are incorporated beforehand ensures that the assignment of industries is not based on firms that are incorporated as a result of the policy itself.

As can be seen in figure 1, between 2010 and 2015, Italy experienced a steep decline in both GDP and the number of active firms, as a result of the European sovereign debt crisis. Moreover, Supplementary Appendix figure A1 shows that, starting from 2012 in an effort by the Government to boost economic activity, the number of publicly guaranteed loans (panel a) grew significantly, leading to a similar trend in the number of new registered firms (panel b). Nonetheless, both of these trends are stronger, in relative terms, for firms in industries defined as innovative, which hints at a positive effect of the SIA on firms in these industries.

To identify the causal effect of the SIA on firm creation from the general macroeconomic trend, I use a DID design. By comparing firm creation before and after the SIA, and in industries classified as innovative versus non-innovative, I control for time-varying trends that affect all industries similarly. The regression is as follows:

$$\bar{y}_{iq} = \alpha + \gamma Innovative_i \times Post_q + Q_q + I_i + \varepsilon_{iq} \tag{6}$$

The unit of observation is an industry × quarter combination. $Innovative_i$ is a dummy equal to 1 if the industry is over-represented in the sample of start-ups in the SIA registry in 2012Q4 but incorporated before the policy, and 0 otherwise. $Post_q$ is a dummy equal to 1 after the introduction of the SIA (2012Q4) and 0 before, and Q_q and I_i are quarter and industry fixed effects, respectively. Quarter fixed effects account for time-varying economic conditions at the national level, while industry fixed effects help alleviate the concern of time-invariant confounders. The dependent variables ($\bar{y}_{iq}$) are number of newly created firms, its inverse hyperbolic sine transformation, and the number of newly created firms as a share of the firms active in the same industry four quarters before. All dependent

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variables are averaged across provinces, as the SIA is a national policy that affects all provinces simultaneously.

Next, I study whether the effect of the SIA on firm creation differs in provinces where bank market power is higher, compared to provinces where it is lower. To causally identify the effect of bank market power on the effect of the SIA, I augment the specification in Eq. (6) to a DDD approach, resulting in the following regression:

$$y_{piq} = \alpha + \beta Uncomp_p \times Post_q \times Innovative_i + PI_{pi} + PSQ_{psq} + RIQ_{riq} + \varepsilon_{piq}, \quad (7)$$

where $Innovative_i$ and $Post_q$ are the dummies previously defined. $Uncomp_p$ equals 1 if the province has a pre-SIA rate spread above the national median and zero otherwise. The unit of observation is a province × industry × quarter combination. I saturate the regression with province × industry fixed effects (PI_{pi}) to account for time-invariant differences at the industry-province level, also absorbing the baseline fixed effects for industry and province (I_i, P_p). Furthermore, I add province × sector × quarter fixed effects (PSQ_{psq}) to control for differential trends in firm creation across sectors in different provinces, where sectors are defined as collections of industries (i.e., NACE letters). In addition, I also add region- × industry × quarter fixed effects (RIQ_{riq}) to control for time-varying industry-specific factors in firm creation across regions, like the introduction of additional policies at the regional level to support innovative firm creation.[6] These fixed effects (PSQ_{psq} and RIQ_{riq}) also absorb interactions of province and quarter fixed effects (PQ_{pq}) and industry and quarter fixed effects (IQ_{iq}), thus controlling for time varying unboservables at the province- and industry level. Such a saturated specification accounts for all the factors that additively interact with the endogenous variable, and, among other things, it addresses the concern that results may be influenced by differential recovery patterns from the sovereign debt crisis by innovative industries or more competitive provinces.

The dependent variable y_{piq} is one of the aforementioned three measures of firm creation, corresponding to the number of newly created firms, its hyperbolic sine transformation, and its ratio to the total of firms active four quarters before in each industry × province combination. Moreover, in subsequent specifications, the outcomes are quarterly counts and volumes of guaranteed loans and VC deals in each industry × province × quarter combination, as well as firm-level leverage and cost of credit. The coefficient β is the DDD estimator that captures the impact of bank market power on the effect of the SIA on firm creation in the two groups of provinces. To take into account potential correlations between observations within the same credit market, as well as serial correlation in the policy variable, standard errors are clustered at the province level in the main specification.

Lastly, the identifying assumption of the DDD is that of parallel trends in the differences in the outcomes between innovative and non-innovative industries for high and low market power provinces, absent the SIA. To provide evidence in support of the assumption, and show the evolution of the main effects over time, I estimate a dynamic DID model separately for provinces with high ($Uncomp_p = 1$) and low ($Uncomp_p = 0$) bank market power:

$$y_{piy} = \alpha + \sum_{y=2010}^{2015} \beta_y Innovative_i \times Year_y + PI_{pi} + PSY_{psy} + \varepsilon_{piy}, \quad (8)$$

where in order to be able to identify the β_y coefficients, I need to exclude fixed effect that absorb variation at the industry × year level. Therefore, region-industry-year (RIY_{riy}) fixed

[6] According to Albanese et al. (2019), Italian regions introduced 75 policies between 2012 and 2018 to support innovative start-ups, totaling €340 million.

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effects are excluded.[7] For ease of reporting, I estimate the model using yearly dummies, rather than quarterly ones. If the parallel trends assumption is likely to be satisfied, the difference between the interaction coefficients estimated in the two groups of provinces should widen following the passage of SIA (2012).

3. Data and summary statistics

I obtain the data for the analysis from a variety of sources. Data on the quantities needed to estimate *RS* are from the BoI Surveillance database at the province × quarter level.[8] The database contains information on the delinquency rates, rates of return, and volumes of short-term loans at the province × quarter level, for 104 Italian provinces.

Data on the number of active and newly created firms in all of the 88 industries (two-digit NACE codes) and 105 provinces is from *Rapporto Movimprese* (Cao et al. 2023), a collection of aggregated statistics from all the business registries in Italy kept by the Italian Chambers of Commerce.[9] The data, available since 1995, contain information at the quarterly frequency on the total number of active firms in the registry and the number of firms incorporated and liquidated in that quarter, both for LLCs and ULPs, aggregated by province and by industry. Following Bertrand, Duflo, and Mullainathan (2004), I use data from twelve quarters before (2010Q1) the passing of the policy (2012Q4) to twelve quarters after (2015Q4) in the analysis.

Next, I obtain data on publicly guaranteed loans in Italy from the Guarantee Fund (Fondo di Garanzia per le PMI) from 2010 to 2015. Data before the third quarter of 2012 are not publicly available and have been obtained from the Fund at the quarter × province × industry level. Data starting from the fourth quarter of 2012 are publicly available at the loan level, and for each loan I collect information on the date of the loan, as well as the industry and location of the borrowing firm.[10] I then aggregate the number and volume of guaranteed loans at the quarter × province × industry level.

Moreover, I collect data on VC deals in Italy from Preqin and CB Insight. I consider deals of all stages taking place between 2010 and 2015 and for each deal I identify the date and size of the deal, as well as the target firm. I then manually match the target firm name to the Orbis database by Bureau Van Dijk, to identify its province and industry (i.e., two-digit NACE code). Lastly, I aggregate deal counts and volume by province and industry of the target firm, as well as by the quarter of the deal. The resulting dataset is a panel of VC activity in each two-digits NACE code and Italian province, from the first quarter of 2010 to the fourth quarter of 2015.

Furthermore, I collect firm-level leverage and cost of credit data from the Orbis database from 2009 to 2018. Since balance sheet data is yearly, rather than quarterly, I extend the range of the data collection to have enough time periods before and after the shock. Moreover, a longer time-span allows me to investigate long-run effects on existing firms. I measure leverage as the ratio of short-term and long-term debt (*LOAN* and *LTDB*) to total assets, and cost of credit as the ratio of interest expenses (*INTEREST EXPENSES*) to the sum of short- and long-term debt.[11] Moreover, I also obtain information on equity owners of newly incorporated firms between 2010 and 2015, from Orbis. I use information on a founder's place of birth and share of equity to calculate the share of founders and total equity owned by founders born in the same province where the firm is located (i.e., local founders). Lastly, I also obtain data on return of asset (ROA, defined as *EBIT* over

[7] Region-year factors are absorbed by province-sector-year fixed effects (PSY_{psy}), while region-industry factors are absorbed by province-industry (PI_{ri}) fixed effects.

[8] Statistics aggregated at the province level, as used in this paper, are publicly available at: www.bancaditalia.it/statistiche/

[9] *Rapporto Movimprese* is publicly available at: www.infocamere.it/en/movimprese.

[10] Publicly available data on guaranteed loans is available here.

[11] To limit the influence of outliers, both variables are winsorized at the 99^{th} percentile.

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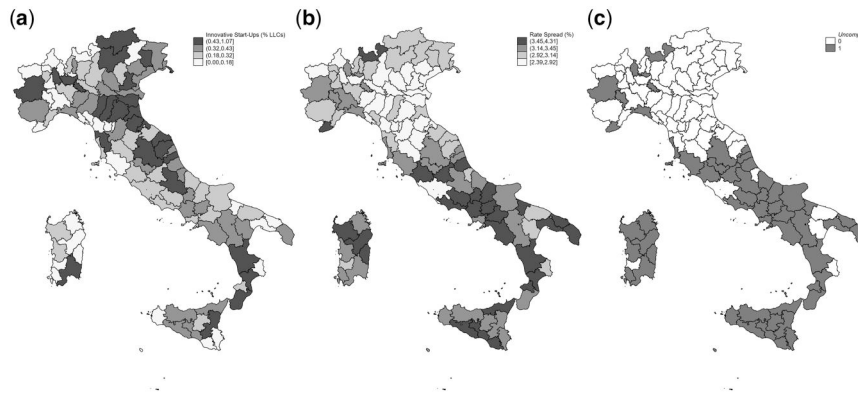


Figure 2 Geographic distribution of start-ups, the rate spread, and $Uncomp_p$

In Panel (a), provinces are ranked by quartiles of the number of innovative start-ups in the SIA registry as of the end of 2015, in percentage of limited liability companies active at the end of 2012; in Panel (b), provinces are ranked by quartiles of the average rate spread between 2010 and 2012 (in %); Panel (c) shows the assignment of the treatment $Uncomp_p$, according to which provinces in grey (white) have an average rate spread above (below) the national median and are classified as high (low) bank market power provinces.

total assets) and turnover growth of firms ineligible for the SIA. I define ineligible firms as those older than five years with a turnover lower than 10 million euros. This ensures I am only considering firms that any given time are not eligible for the SIA (i.e., incumbent firms older than 5 years) but are comparable in size (i.e., total sales lower than 10 million euros).

Supplementary Appendix Table A1 shows the full list of the industries (nine in total) that are over-represented among firms that are eligible for the SIA and are classified as innovative start-ups but are also incorporated before the policy came into effect (266 start-ups). Moreover, Supplementary Appendix Table A1 reports the distribution of these nine industries in the sample, as well as among the number of active firms in Italy at the end of 2012, while Supplementary Appendix figure A2 shows the distribution of industries in the pre-SIA start-up sample compared to their distribution across firms in Italy in 2012. The nine industries classified as innovative make for 84 percent of the pre-SIA innovative start-ups but only around 4 percent of all firms in Italy in 2012. Lastly, the distributions of industries (i.e., share of firms by industry) in the sample of all innovative start-ups in the SIA registry up to 2015 (6,850 start-ups) has a correlation of 0.94 with the distribution of industries in the pre-SIA start-up sample, showing that the latter is representative of the former in terms of distribution across industries.

Next, I explore geographical variation in the main variables of interest. Figure 2a shows the geographical distribution by province of innovative start-ups included in the SIA between its passage and 2015, as a percentage of all limited liability companies active at the end of 2012. While on average there is a higher concentration of innovative start-ups in the northern and central parts of Italy, there are also provinces in the south of the country that belong to the upper quartile.

Figure 2b shows the geographic distribution of the average rate spread between 2010 and 2012 across provinces, while figure 2c shows the treatment assignment of provinces—$Uncomp_p$. Provinces with a higher level of bank market power tend to be clustered in the south, whereas provinces where bank market power is lower are concentrated in the north, particularly in the north-east. To address the problematic North-South divide, which affects Italy along many dimensions and could be a confounding factor, I also use an alternative assignment, where the treatment $Uncomp'_p$ equals 1 if the province's bank market power is above the median of the rate spread of provinces within the same region. Supplementary Appendix figure A3 shows that ranking provinces in this way mechanically

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Table 1. Balance tests.
Balance tests of province-level characteristics of the banking sector. $Uncomp_p$ is a dummy equal to one if the province p has a below-median return spread. In Panel A, the reported coefficient represents the difference in the mean of the dependent variable across the two groups of provinces. In Panel B, region fixed effects are added to account for region-specific unobservable factors across provinces.

	(1) Branch per capita	(2) Rel. branches (%)	(3) Number of banks	(4) HHI branches	(5) Deposits per branch
Panel A					
$Uncomp_p$	−0.260***	−0.0889**	−6.497**	0.0411***	−2.759
	(0.0294)	(0.0387)	(2.664)	(0.0144)	(1.752)
Panel B					
$Uncomp_p$	−0.0474**	−0.00567	−7.523**	0.0323**	−3.419
	(0.0234)	(0.0427)	(3.754)	(0.0146)	(2.678)
N	104	104	104	104	104
	(6) Loans per branch	(7) Income per capita	(8) Log(population)	(9) Firm creation ratio	(10) VC Deals
Panel A					
$Uncomp_p$	−9.515***	−4.468***	−0.0758	−0.0654***	−0.761
	(3.581)	(0.519)	(0.140)	(0.0101)	(0.981)
Panel B					
$Uncomp_p$	−14.93***	−0.841	−0.196	−0.0138	−1.194
	(5.393)	(0.562)	(0.198)	(0.0129)	(1.553)
N	104	104	104	104	104

forces cross-sectional variation within each region, and thus it does not result in a North-South divide.

Next, I investigate the cross-sectional distribution of RS and its determinants. Supplementary Appendix Figure A4 shows scatter plots of the average rate spread in the pre-policy period for all 104 provinces, from the lowest (2.38 percent) to the highest (4.3 percent), with the average and competitive rates of short-term loans in all provinces. While a higher rate spread is associated with a higher average rate set by banks, the competitive rate, and therefore the riskiness of the credit market, does not vary systematically with RS. The intuition is further confirmed by regressing RS on the observed rate ($\bar{r}$) and the competitive rate (r^*), separately. The observed rate explains more than 50 percent of the variation in RS across provinces, while RS is not significantly correlated with the competitive rate. This means that variation in the rate spread is driven by banks pricing short-term loans differently across credit markets rather than by differences in the credit risk.

Furthermore, Table 1 report estimates from a regression of several characteristics of the credit market at the province level on $Uncomp_p$, in columns (1) to (7). These regressions are akin to a balance test and are run without (panel a) and with region fixed effects (panel b), to compare credit markets across more and less competitive provinces. According to panel a, provinces where banking competition is weaker ($Uncomp_p = 1$) tend to differ along several dimension of the banking system, compared to competitive ones. Less competitive provinces have fewer banks and branches per capita, a higher concentration of branches (i.e., HHI), and a less vibrant economic environment with fewer loans and lower income per-capita. Yet, when including fixed effects for the region (i.e., comparing more and less competitive provinces within the same region) these provinces no longer differ significantly in terms of income per-capita and share of relationship banking intermediaries. This speaks to the importance of controlling for region-specific factors via the inclusion of region × industry × quarter fixed effects (RIQ_{riq}, in the main analysis).

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Table 2. Summary statistics.
Summary statistics of the main sample used in analyses. The unit of observation is province × industry × quarter. *Uncompetitive* is a dummy equal to one if the province *p* is classified as non-competitive using the median return spread at the national level. *Innovative* is a dummy equal to 1 if the industry is considered innovative according to Supplementary Appendix Table A1. *Post* is a dummy equal to 1 for quarters after the passage of the SIA (2012Q4).

	N	Mean	σ	5th pc.tile	Median	95th pc.tile
Innovative	207168	0.108	0.311	0.000	0.000	1.000
Post	207168	0.500	0.500	0.000	0.500	1.000
Uncompetitive	207168	0.500	0.500	0.000	0.500	1.000
Return distance	207168	0.032	0.004	0.027	0.031	0.038
New firms	207168	0.572	2.466	0.000	0.000	3.000
IHS(New firms)	207168	0.286	0.650	0.000	0.000	1.818
New firms (%)	175638	0.005	0.029	0.000	0.000	0.024
Active firms	207168	122.829	568.755	0.000	21.000	481.000
Loans	207168	1.237	4.837	0.000	0.000	6.000
his (loans)	207168	0.453	0.890	0.000	0.000	2.492
his (loan funding)	207168	3.228	5.473	0.000	0.000	13.305
VC deals	207168	0.003	0.070	0.000	0.000	0.000
his (VC deals)	207168	0.002	0.051	0.000	0.000	0.000
his (VC funding)	207168	0.002	0.061	0.000	0.000	0.000

Moreover, columns (9) and (10) of Table 1 report balance tests for the pre-reform supply of innovative entrepreneurs and innovative investments across more and less competitive provinces. In column (9), I measure the supply of innovative entrepreneurs as the ratio of newly created firms in innovative industries to new firms created in non-innovative ones in the pre-SIA period, while in column (10), I consider the number of VC deals before the SIA. The ratio of newly created firms in innovative industries to new firms created in non-innovative ones is 6.5 percentage points lower in less competitive provinces, while the number of VC deals in these provinces is lower but not statistically significant. Importantly, this difference in the supply of innovative entrepreneurs pre-SIA is driven to zero by the inclusion of region fixed effects. As a result, while differences across more and less competitive provinces in the pre-SIA period may cast doubts on the validity of the identification strategy of the main effects, the inclusion of very granular fixed effects able to control for region-specific trends significantly attenuates such concerns.

To validate *RS*, I show it correlates with alternative measures of bank market power and competition. Following Coccorese (2008), I estimate bank conduct in every province between 2010 and 2012. Bank conduct measures the distance between the marginal costs and the revenues of loans in each geographic market and is estimated structurally using non-linear simultaneous equations. Supplementary Appendix Figure A5a shows that bank conduct and *RS* are highly and positively correlated in the cross-section of provinces, with an R^2 of 52%. When I rank provinces above and below the median value of bank conduct, the resulting dummy has a correlation of 78.84 percent with $Uncomp_p$, and of 70.19 percent with $Uncomp'_p$. Conversely, *RS* has a weaker correlation with the HHI of bank branches, as shown in Supplementary Appendix figure A5b. The R^2 of a regression of *RS* on HHI is only 2 percent, but the correlation is still positive and statistically significant at 5 percent level.

Lastly, Table 2 reports summary statistics of the variables used in the main analysis at the province × industry × quarter level. On average, there are 123 firms active and 0.57 firms created in a province × industry combination in a given quarter. Given the fine level of observation, the creation of new firms is rather rare occurrence, amounting to around 0.5 percent of the firms active in a province × industry combination. On the one hand,

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Table 3. Difference-in-differences—firm creation.
Estimates of Eq. (6) measuring the effect of the SIA on firm creation in innovative industries using a DID approach. Firm creation is expressed in number of new firms, its inverse hyperbolic sine transformation, and number of new firms as percentage of total firms active four quarters before. In columns (1) to (3) the estimation technique is Ordinary Least Squares, whereas in column (4) it is Poisson Maximum Likelihood. $Innovative_i$ is a dummy equal to 1 if the industry is considered innovative according to Supplementary Appendix Table A1. $Post_q$ is a dummy equal to 1 for quarters after the passing of SIA (2012Q4). *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1) New Firms	(2) IHS (New Firms)	(3) New Firms (%)	(4) New Firms
$Post_q \times Innovative_i$	0.148***	0.0587***	0.00171***	0.120***
	(0.0551)	(0.0139)	(0.000528)	(0.0395)
Observations	2,112	2,112	2,052	2,112
R-squared	0.907	0.953	0.492	0.568
Fixed Effects				
Quarter	YES	YES	YES	YES
Industry	YES	YES	YES	YES

publicly guaranteed loans are more common, with 1.2 new loans granted per quarter in the average province × industry cluster, while on the other hand VC deals are much rarer, occurring only in a small number of province × industry × quarter clusters. Lastly, by construction exactly half of the observations are after the SIA ($Post = 1$), and half in provinces classified as noncompetitive ($Uncomp = 1$). Conversely, around 11 percent of observations are in innovative industries ($Innovative = 1$), consistent with only nine industries out of 88 being classified as innovative.

4. Results

4.1 The effect of the SIA on firm creation

I use a DID approach to examine whether the SIA stimulated the supply of new firms in innovative industries. Since the SIA is a national policy that affects all provinces, I first average firm creation across provinces and run my specification at the industry × quarter level. Table 3 shows the estimates of the effect of the SIA on the supply of new LLCs (firm creation) in innovative industries. Firm creation is expressed as the number of newly created firms, its inverse hyperbolic sine transformation, and the number of newly created firms as a percentage of total active firms in an industry × province combination four quarters before, in columns (1)–(3) respectively. Furthermore, since in column (1) the outcome is count data, in column (4), I re-estimate the regression using a Poisson maximum likelihood estimator (Cohn, Liu, and Wardlaw 2022).

All estimates are positive and significant, suggesting that firm creation in innovative industries grew more than in non-innovative ones after the passage of the SIA, which induced the creation of 0.148 additional firms per province in innovative industries, increasing the number of firms created by 25 percent of the pre-SIA mean. Importantly, results do not change when using a Poisson maximum likelihood estimator, according to which the SIA increased the number of newly created firms by 12 percent. As a result, the SIA helped create between 1,100 and 600 extra innovative firms, meaning that out of the 6,850 start-ups included in the SIA registry by the end of 2015, up to 16 percent were marginal and would not have been started without the policy. I thus conclude that the SIA has been successful in providing effective incentives for potentially innovative entrepreneurs to start their firms.

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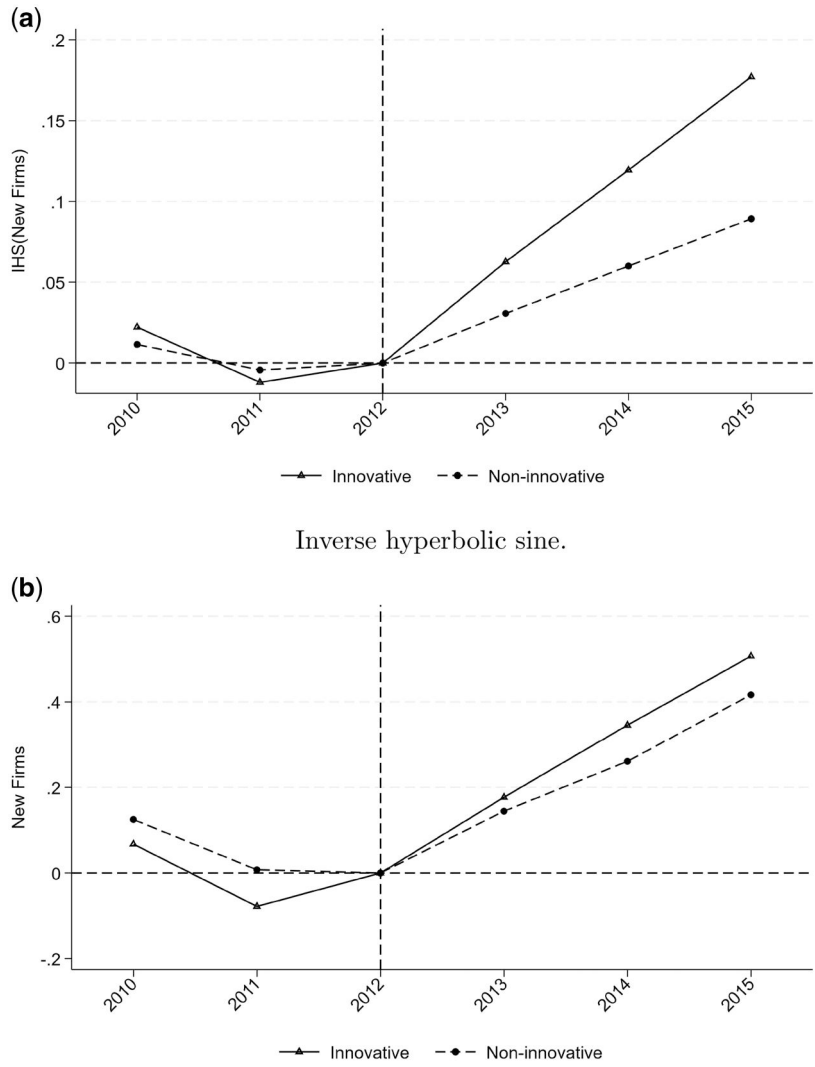


Figure 3 Trends—DID (firm creation)

Evolution over time of newly created LLCs in innovative (triangles) and non-innovative (circles) industries separately. The vertical line indicates the passage of the SIA (2012, omitted). To smooth seasonality, estimates are reported at yearly frequency. In Panel (a) the outcome is the inverse hyperbolic sine transformation of the number of new firms and the regression is estimated using OLS. In Panel (b), the outcome is the number of new firms and the model is estimated using Poisson maximum likelihood. The model, estimated separately for innovative and non-innovative industries, is: $y_{iy} = \alpha + \sum_{y=2010}^{2015} \beta_y Year_y + l_i + \varepsilon_{iy}$.

Figure 3 shows the evolution of firm creation separately for innovative and non-innovative industries. In panel a, the regression is estimated using OLS and the inverse hyperbolic sine of the number of new firms, while in panel b the outcome is the number of new firms and the regression is estimated using Poisson maximum likelihood. In both panels, the coefficient for the last year before SIA (2012) is omitted. Figure 3 shows that, relative to 2012, firm creation started growing in both groups of industries as a result of the

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recovery of the Italian economy after the financial and sovereign debt crises, but for innovative industries the growth has been stronger, and the difference in firm creation between innovative and non-innovative industries, relative to 2012, widens significantly. Moreover, the figure also suggests that the identifying assumption of the DID (i.e., parallel trends) is likely to be satisfied, as there is no difference in the trend in firm creation in the two groups of industries relative to the year prior to passing of the SIA.

Nonetheless, the fact that the economic recovery from the financial crisis coincided with the SIA may cast doubts on the validity of the effects identified in Table 3. For example, if innovative industries were more cyclical, the economic recovery would have affected more these industries, generating the patterns observed in figure 3. To address this concern, I re-estimate the DID model on outcomes of firms that are not eligible for the SIA. As mentioned in Section 2.1, in order to benefit from SIA's incentives, the firm needs to be incorporated since no longer than 5 years and as an LLC. Therefore, I compare the performance of comparable incumbent firms ineligible for the SIA (i.e., those older than 5 years in any given year) in innovative and non-innovative industries, before and after the SIA.[12] Columns (1) and (2) of Supplementary Appendix Table A2 show that neither the ROA or the growth rate of turnover changed after the SIA for incumbent firms in innovative industries compared to those in non-innovative industries. This is also confirmed in Supplementary Appendix figure A6, where I show that the outcomes of incumbents firms evolved similarly in innovative and non-innovative industries.

Lastly, it could be that, compared to the performance of incumbent firms, firm creation is affected differently across industries by the business cycle. To address this point, I use as an outcome firm creation of ULPs, that are excluded from the SIA. Columns (4)–(6) of Supplementary Appendix Table A2 show that the coefficient of the interaction of $Post_t$ and $Innovative_i$ is not significant, and even negative when expressing firm creation as the inverse hyperbolic sine of new firms created. These tests suggest that the difference in firm creation of LLCs between innovative and non-innovative industries is driven by the SIA, rather than by the improving economic conditions, which in turn would also affect the performance of incumbent firms or the creation of ULPs.

4.2 Bank market power and firm creation

Next, I study whether a lower degree of banking competition affects the transmission of the SIA incentives and thus its effect on firm creation. For example, a lower degree of banking competition may impair a firm's ability to obtain a publicly guaranteed loans (one of the main SIA's incentive), and therefore, the SIA should have a smaller (bigger) effect, in terms of both firms created and guaranteed funding obtained, in provinces where banking competition is weaker (stronger).

Table 4 reports the estimates of the DDD model, in particular the coefficient on the interaction term in Eq. (7), for different measures of firm creation. In column (1), the coefficient is negative and significant, meaning that lower banking competition causes the difference between the number of new firms created in innovative and non-innovative industries to grow less. The coefficient's magnitude is -0.295, and it accounts for around twice the SIA's effect in Table 3. Since provinces are sorted on the median of bank market power and divided into groups of equal sizes, the coefficient implies that the effect of the SIA in Table 3 is entirely driven by provinces where banking competition is stronger. On the other hand, the SIA had no effect on firm creation in innovative industries in provinces with weaker banking competition.

In column (2), the result is robust when measuring firm creation as the inverse hyperbolic sine transformation of the number of new firms, and, in column (3), as the number of new firms as a percentage of active firms in the same province and industry four quarters before.

[12] To ensure comparability of incumbent to newly created firms, I only consider those that report turnover lower than 10 million euros.

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Table 4. Difference-in-difference-in-differences—firm creation.

Estimates of Eq. (7) (DDD) to identify effect of bank market power on the effect of the SIA, measured in terms of firm creation of LLCs in innovative industries. Firm creation is measured in numbers of new firms (columns (1), (4), (5), and (8)), the inverse hyperbolic sine transformation of the number of new firms (columns (2) and (6)), and new firms as percentage of total firms active four quarters before (columns (3) and (7)). In columns (4) and (8) estimation technique is Poisson Maximum Likelihood. Provinces are sorted in competitive and non-competitive using the dummy $Uncomp_p$ (using the median return spread at the national level) in columns (1)–(4), and using the dummy $Uncomp'_p$ (using the median at the regional level) in columns (5)–(8). $Innovative_i$ is a dummy equal to 1 if the industry is considered innovative according to Supplementary Appendix Table A1. $Post_q$ is a dummy equal to 1 for quarters after the passage of the SIA (2012Q4). Standard errors are clustered at the province level (104 clusters) in parenthesis. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Limited liability companies	(1) New Firms	(2) IHS (New Firms)	(3) New Firms (%)	(4) New Firms	(5) New Firms	(6) IHS (New Firms)	(7) New Firms (%)	(8) New Firms
$Uncomp_p \times Post_q \times Innovative_i$	−0.295**	−0.0517***	−0.00416**	−0.153*				
	(0.128)	(0.0185)	(0.00163)	(0.0850)				
$Uncomp'_p \times Post_q \times Innovative_i$					−0.166***	−0.0401***	−0.00216**	−0.0701***
					(0.0567)	(0.0129)	(0.000978)	(0.00347)
Observations	207,168	207,168	175,638	70,995	207,168	207,168	175,638	70,995
R-squared	0.910	0.815	0.441	0.761	0.910	0.815	0.441	0.761
Fixed Effects								
$Province \times Industry$	YES	YES	YES	YES	YES	YES	YES	YES
$Quarter \times Province \times Sector$	YES	YES	YES	YES	YES	YES	YES	YES
$Quarter \times Region \times Industry$	YES	YES	YES	YES	YES	YES	YES	YES

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Column (4) instead shows that results are unaffected when using a Poisson Maximum likelihood estimator to estimate the regression on count data.[13] Next, I estimate Eq. (7) by substituting $Uncomp_p$ with a dummy $Uncomp'_p$ that is equal to one if the province has a rate spread above the median in its region, to address concerns about the North-South clustering of $Uncomp_p$. The results in columns (5)–(8) are comparable to those of the main specification, albeit generally smaller in magnitude. Such smaller magnitude is partly mechanical, since the difference in banking competition between below- versus above-median provinces within a region is smaller than between below- versus above-unconditional median. Therefore, the impact of $Uncomp_p$ on firm creation is expected to be larger than that of $Uncomp'_p$.

In figure 4, I plot the coefficients obtained by estimating Eq. (8) on the inverse hyperbolic sine transformation of the number of new firms for provinces with competitive and non-competitive banking sectors separately. In panel a, provinces are sorted into the two groups using the dummy $Uncomp_p$, whereas in panel b the provinces are sorted using $Uncomp'_p$. The figure shows a change in trend, with respect to the omitted year (2012), in the difference in firm creation between innovative and non-innovative industries around the passage of the SIA (end of 2012) for both groups of provinces, signalling that the SIA increased firm creation in innovative industries also in less competitive banking markets. However, in provinces where banks have less market power, the increase in firm creation in innovative industries is stronger. Importantly, the difference across industries in firm creation does not show a significant trend before the SIA, in both competitive and non-competitive provinces, suggesting that the identifying assumption of parallel trends in the differences is likely to be satisfied. Moreover, results are similar when estimating the regressions using Poisson maximum likelihood and the number of new firms as outcome, as shown in Supplementary Appendix figure A7.

4.3 Bank market power and guaranteed lending

Next, I investigate the channel through which a lower degree of banking competition hinders the effect of SIA on firm creation. In particular, since the SIA significantly expands innovative firms' access to public guarantees, I study whether the number and volume of guaranteed loans granted to firms in innovative industries increase less compared to firms in non-innovative industries, depending on the degree of competitiveness in the local banking market. If that is the case, then it is a lower degree of transmission of the policy incentives which hinders the effect of the SIA, and thus banking competition would emerge as an important modulator of the policy.

Table 5 shows that guaranteed credit, measured as the number of loans, increases less following the SIA for innovative industries, versus non-innovative industries, where banks have more market power. The number of guaranteed loans in less competitive provinces is almost 0.9 lower (70 percent of the mean) after the passage of the SIA. The effect is even stronger when estimating the regression using Poisson maximum likelihood in column (4) of Table 5: in less competitive provinces the number of new guaranteed loans to firms in innovative industries, compared to those in non-innovative industries, is up to 87 percent lower, compared to more competitive provinces, after the SIA. Results are similar when using the inverse hyperbolic sine transformation of the number or volume of guaranteed loans in columns (2) and (3). Furthermore, results are comparable, but smaller in magnitude as it was the case for firm creation, when sorting provinces within regions in columns (5)–(8).

[13] These regressions are estimated using the STATA command *PPMLHDFE* (Correia, Guimarães, and Zylkin 2020). The number of observations in columns (4) and (8) differs from the other columns because *PPMLHDFE* drops not only collinear observations, but also separated observations (i.e., observations that do not convey additional information to estimate the likelihood function).

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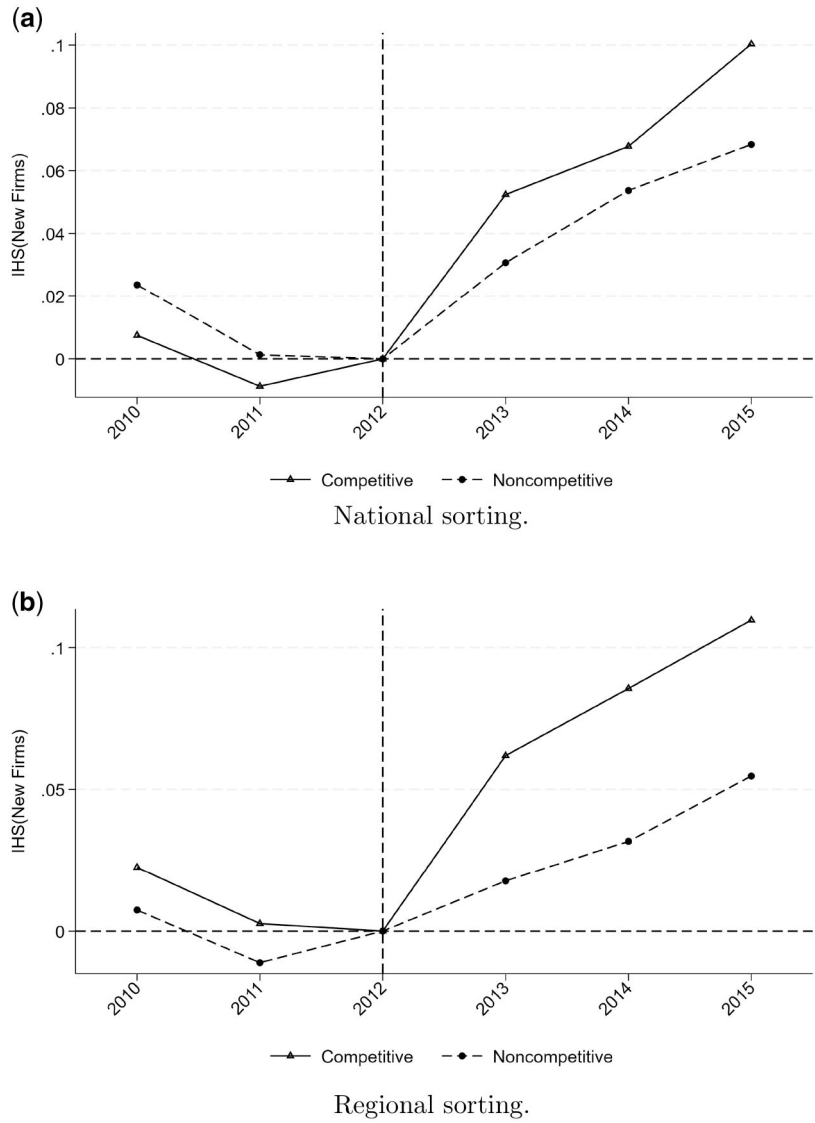


Figure 4 Trends—DDD (firm creation)

The graph shows the evolution over time of the difference in the inverse hyperbolic sine transformation of the number of new firms between the two groups of industries in provinces with competitive (triangles) and non-competitive (circles) banking markets. In Panel (a), provinces have been sorted using the national median rate spread, while in Panel (b), provinces have been sorted using the median rate spread in the corresponding region. The vertical line indicates the passage of the SIA (2012, omitted). To smooth seasonality, estimates are reported at the yearly frequency. The model, estimated separately for provinces with competitive and noncompetitive banking markets, is: $y_{piy} = \alpha + \sum_{y=2010}^{2015} \beta_y Innovative_i \times Year_y + PI_{pi} + PSY_{psy} + \varepsilon_{piy}$.

Notably, figure 5 shows that, in more competitive provinces, the difference in the number of loans between innovative and non-innovative industries turned, relatively to 2012, from strongly negative to slightly positive, indicating that firms in innovative industries were penalized in accessing guaranteed funding but they became as likely to attract

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Table 5. Difference-in-difference-in-differences—guaranteed loans.
Estimates of Eq. (7) (DDD) to identify the causal effect of bank market power on the effect of SIA for bank funding backed by public guarantees. At the province × industry × quarter level, publicly guaranteed lending is measured as number of loans (columns (1), (4), (5), and (8)), the inverse hyperbolic sine transformation of the number of loans (columns (2) and (6)), and the inverse hyperbolic sine transformation of the total volume of loans in Euros (columns (3) and (7)). In columns (4) and (8) estimation technique is Poisson Maximum Likelihood. Provinces are sorted in competitive and non-competitive using the dummy $Uncomp_p$ (using the median return spread at the national level) in columns (1)-(4), and using the dummy $Uncomp'_p$ (using the median at the regional level) in columns (4)-(7). $Innovative_i$ is a dummy equal to 1 if the industry is considered innovative according to Supplementary Appendix Table A1. $Post_q$ is a dummy equal to 1 for quarters after the passage of the SIA (2012Q4). Standard errors are clustered at the province level (104 clusters) in parenthesis. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1) Loans	(2) IHS (Loans)	(3) IHS (Funding)	(4) Loans	(5) Loans	(6) IHS (Loans)	(7) IHS (Funding)	(8) Loans
$Uncomp_p \times Post_q \times Innovative_i$	–0.893**	–0.243***	–0.740***	–0.870***				
	(0.400)	(0.0495)	(0.282)	(0.110)				
$Uncomp'_p \times Post_q \times Innovative_i$					–0.443**	–0.128***	–0.450**	–0.449***
					(0.216)	(0.0327)	(0.194)	(0.0848)
Observations	207,168	207,168	207,168	81,457	207,168	207,168	207,168	81,457
R-squared	0.828	0.808	0.697	0.812	0.828	0.808	0.697	0.812
Fixed Effects								
Province × Industry	YES	YES	YES	YES	YES	YES	YES	YES
Quarter × Province × Sector	YES	YES	YES	YES	YES	YES	YES	YES
Quarter × Region × Industry	YES	YES	YES	YES	YES	YES	YES	YES

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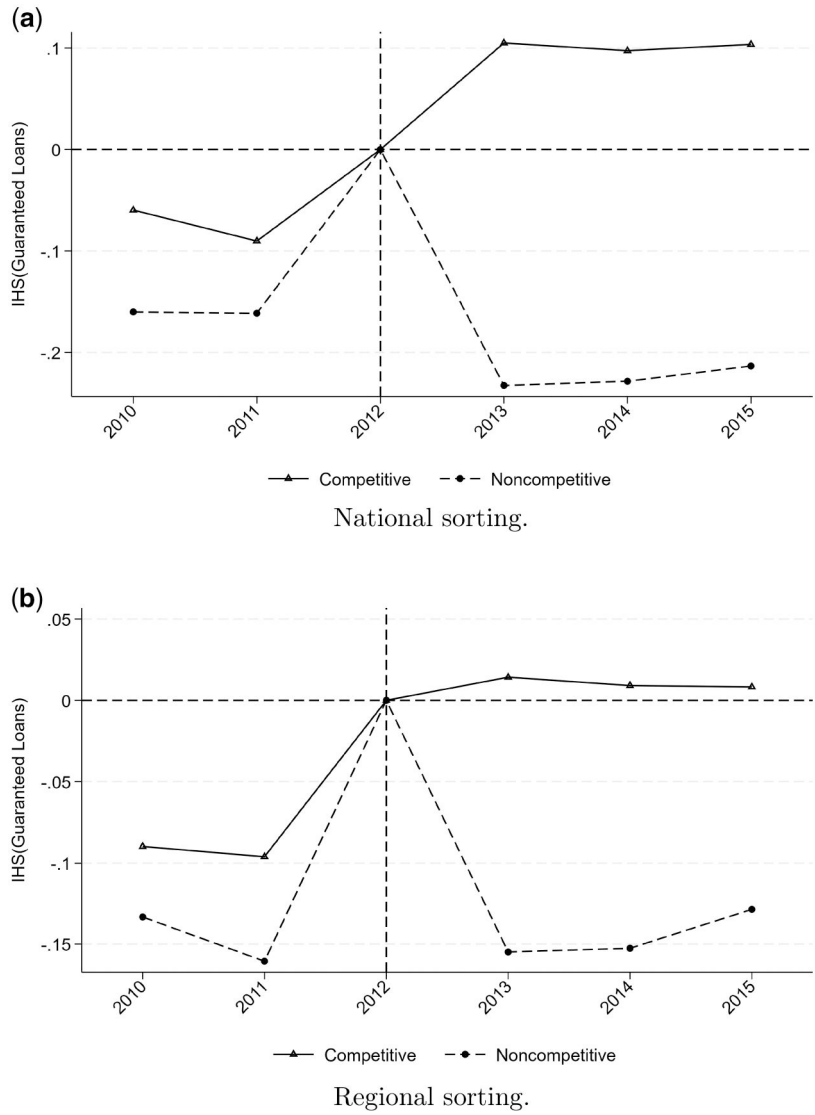


Figure 5 Trends—DDD (bank funding)

The graph shows the evolution over time of the difference in the inverse hyperbolic sine transformation of the number of guaranteed loans between the two groups of industries in provinces with competitive (triangles) and non-competitive (circles) banking markets, expressed as the of number of loans. In Panel (a), provinces have been sorted using the national median rate spread, while in Panel (b), provinces have been sorted using the median rate spread in the corresponding region. The vertical line indicates the passage of the SIA (2012, omitted). To smooth seasonality, estimates are reported at the yearly frequency. The model, estimated separately for provinces with competitive and non-competitive banking markets, is: $y_{piy} = \alpha + \sum_{y=2010}^{2015} \beta_y Innovative_i \times Year_y + PI_{pi} + PSY_{psy} + \varepsilon_{piy}$.

guaranteed funding as firms in non-innovative ones after the SIA, at least in more competitive provinces. On the other hand, the SIA has not similarly altered the difference in guaranteed funding across industries in less competitive provinces.[14] The evidence is consistent

[14] Fig. in the Internet Appendix shows that these results are robust to estimating the regression on the number of guaranteed loans using a Poisson maximum likelihood estimator.

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Table 6. Difference-in-difference-in-differences—VC deals.
Estimates of Eq. (7) (DDD) to identify the causal effect of bank market power on the effect of SIA for venture capital activity. At the province × industry × quarter level, VC activity is measured as number of VC deals (columns 1 and 4), the inverse hyperbolic sine transformation of the number of deals (columns (2) and (5)), and the inverse hyperbolic sine transformation of total VC funding in million €(columns (3) and (6)). Provinces are sorted in competitive and non-competitive using the dummy $Uncomp_p$ (using the median return spread at the national level) in columns (1)–(3), and using the dummy $Uncomp'_p$ (using the median at the regional level) in columns (4)–(6). $Innovative_i$ is a dummy equal to 1 if the industry is considered innovative according to Supplementary Appendix Table A1. $Post_q$ is a dummy equal to 1 for quarters after the passage of the SIA (2012Q4). Standard errors are clustered at the province level (104 clusters) in parenthesis. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1) VC Deals	(2) IHS (VC Deals)	(3) IHS (Funding)	(4) VC Deals	(5) IHS (VC Deals)	(6) IHS (Funding)
$Uncomp_p \times Post_q \times Innovative_i$	–0.0375**	–0.0251**	–0.00988*			
	(0.0188)	(0.0118)	(0.00500)			
$Uncomp'_p \times Post_q \times Innovative_i$				–0.0160**	–0.0111**	–0.00260
				(0.00788)	(0.00493)	(0.00310)
Observations	207,168	207,168	207,168	207,168	207,168	207,168
R-squared	0.523	0.488	0.415	0.522	0.488	0.415
Fixed Effects						
Province × *Industry*	YES	YES	YES	YES	YES	YES
Quarter × *Province* × *Sector*	YES	YES	YES	YES	YES	YES
Quarter × *Region* × *Industry*	YES	YES	YES	YES	YES	YES

with a mechanism in which potential entrepreneurs forgo starting firms in innovative industries in anticipation of future financial constraints in the vein of Bazzi et al. (2023).

4.4 Bank market power and VC

The SIA also incentivizes equity financing of innovative start-ups (i.e., tax breaks for equity investors). If equity financing is a substitute for debt financing, since banking competition hinders the transmission of public guarantees, then the lack of debt funding could be compensated by an increase in equity funding. As a result, the number of VC deals should be higher, post-SIA, in innovative industries in less competitive provinces. Conversely, if debt and equity funding are complements (e.g., public guarantees help creating firms likely to subsequently obtain VC) the number of VC deals should be lower, post-SIA, in innovative industries in less competitive provinces.

To explore this question, I estimate Eq. (7) using three measures of VC activity as dependent variables: number of deals, its inverse hyperbolic sine transformation, and the inverse hyperbolic sine transformation of total VC funding, all measured at the province × industry × quarter level. The results are presented in Table 6, while figure 6 shows graphical evidence of parallel trends and the evolution of the effect of interest. The coefficient on the triple interaction is always negative for all dependent variables, and is more significant for the number of VC deals, albeit a weaker negative effect is also detectable for the volume of VC deals. This result suggests that weaker banking competition results in the loss of almost 0.04 VC deals per quarter in less competitive banking markets. This means that if the SIA had stimulated firm creation and VC activity in less competitive provinces as much as it did in more competitive ones, Italy would have recorded 300 more VC deals in the post-SIA period. Compared to the 432 recorded deals in the same period, this means the SIA would have increased VC activity by almost 70 percent in the country, absent barriers imposed by non-competitive credit markets.

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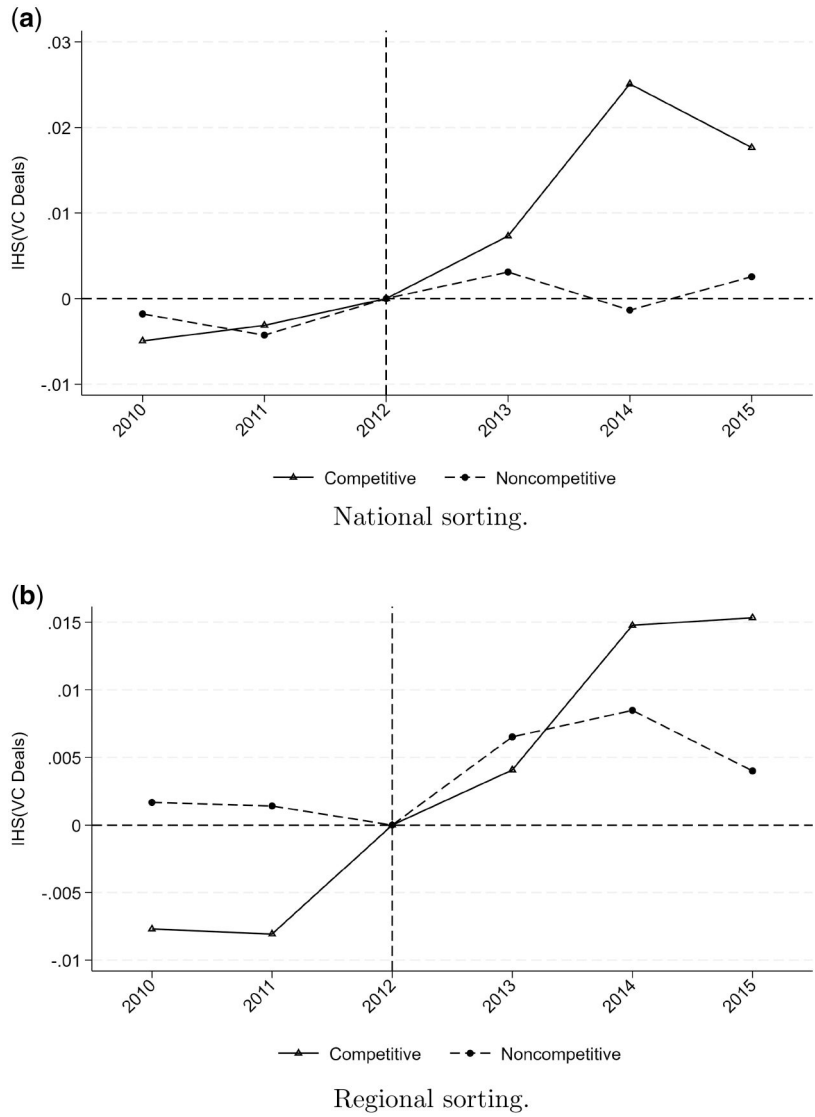


Figure 6 Trends—DDD (VC activity)

The graph shows the evolution over time of the inverse hyperbolic sine transformation of number of VC deals between the two groups of industries in provinces with competitive (triangles) and non-competitive (circles) banking markets. In Panel (a), provinces have been sorted using the national median rate spread, while in Panel (b), provinces have been sorted using the median rate spread in the corresponding region. The vertical line indicates the passage of the SIA (2012, omitted). To smooth seasonality, estimates are reported at the yearly frequency. The model, estimated separately for provinces with competitive and non-competitive banking markets, is: $y_{piy} = \alpha + \sum_{y=2010}^{2015} \beta_y Innovative_i \times Year_y + PI_{pi} + PSY_{psy} + \varepsilon_{piy}$.

These results shows that VCs and banks are interconnected and influence each other, and banking competition in particular affects VC activity through firm creation and entrepreneurial choices. These results shed light on the delineation of the market for entrepreneurial finance, demonstrating that banks and venture capitalists are not independent actors, but rather interconnected players, and are more likely to act as complements rather than substitutes.

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Furthermore, these results also provide insights on how the excess of firms created in response to the policy changes the quality of the average firm. In fact, if the marginal firm entering as a result of the SIA should not have been funded, the quality of the average firm should decrease, making it less likely to attract further funding or survive. Yet, this is not consistent with observing an increase in the number and volume of VC deals in innovative industries in competitive province. Similarly, I also find that the marginal firms created are not less likely to survive. Results are in Supplementary Appendix Table A3, where I study whether firm exits change differentially after the SIA between innovative and non-innovative industries across competitive and non-competitive provinces: following the SIA, the number of firms in innovative industries, relative to non-innovative ones, that are cancelled from the business registry does not meaningfully change across more- and less-competitive banking markets.

4.5 Bank market power and leverage

While banks with higher market power negatively affect the disbursement of guaranteed credit to finance innovative firms, they could still compensate by granting regular, potentially more expensive, credit to these firms. To investigate the dynamics of leverage I use Orbis firm-level data from 2009 to 2018, eliminating all firms older than five years in 2012 and those always having a turnover greater than €5 million, as these firms would not be eligible for SIA after 2012. I consider three outcomes: a dummy equal to 1 if the firm has any leverage, the leverage of the firm (in %), and the cost of credit (in %) of the firm in a given year.[15]

The estimates in Table 7 show that firms in innovative industries, compared to firms in non-innovative industries, are less likely to have any leverage, by 2 p.p. accounting for 4.5 percent of the pre-SIA mean (39 p.p.), when located in provinces with less competitive banking markets following the SIA, than in provinces where banks are more competitive. Moreover, firms in innovative industries and less competitive provinces also have lower levels of leverage following the SIA, by 0.5 p.p. or 4.6 percent of the pre-SIA mean (11 p.p.), while the cost of credit is unaffected by the SIA, even if the coefficient is positive, suggesting that, if anything, cost of credit for innovative firms in more competitive banking markets decreased. All of these results are estimated controlling for firm-level time-invariant heterogeneity via the inclusion of firm fixed effects, as well as including fixed effects for the firm's age. Lastly, figure 7 shows that the difference in the likelihood of having leverage between firms in innovative and non-innovative industries grows strongly after 2012 but only for firms in provinces where banks are more competitive. Conversely, starting from 2012, the difference in the amount of leverage grows for firms in both groups of provinces, but the growth is stronger for firms in more competitive ones.

4.6 Bank market power and migration

Since bank market power hinders the ability of innovative firms to attract funding by banks, and eventually VC, prospective entrepreneurs may decide to move to more competitive banking markets. If this is the case, entrepreneurial migration would play a role in explaining why firm creation is weaker, following the policy, in less competitive provinces. To investigate this mechanism, I use founder-level data from Orbis, obtaining information on the share of equity and place of birth of every founder of firms founded between 2009 and 2018. I define a founder as "local" if born in the same province where the firm is located, and for each new firm I calculate the share of founders and amount of equity owned by "non-local" founders at founding (i.e., each firm is observed only once).[16]

[15] Leverage (in percentage points) is calculated as $\frac{LOAN+LTDB}{ASSETS}$, while cost of credit is measured as $\frac{INTEREST\ EXPENSES}{LOAN+LTDB}$. Both variables are winsorized at the 99^{th} percentile.

[16] Information on the place of birth of the founder is extracted from their fiscal code, as in Stazi et al. (2002) and Core (2024).

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Table 7. Difference-in-difference-in-differences—leverage & cost of credit.
Estimates of Eq. (7) (DDD) to identify the causal effect of bank market power on the effect of SIA on the leverage and cost of credit of SIA-eligible LLCs in innovative industries. Has leverage is a dummy equal to 1 if the firm has leverage, leverage (in percentage points) is calculated as $\frac{LOAN+LTDB}{ASSETS}$, while cost of credit is measured as $\frac{INTEREST\ EXPENSES}{LOAN+LTDB}$. Provinces are sorted in competitive and non-competitive using the dummy $Uncomp_p$ (using the median return spread at the national level). $Innovative_i$ is a dummy equal to 1 if the industry is considered innovative according to Supplementary Appendix Table A1. $Post_q$ is a dummy equal to 1 for years after the passage of the SIA (2012). Standard errors are clustered at the firm level in parenthesis. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1) Has leverage	(2) Leverage (%)	(3) Cost of credit (%)
$Uncomp_p \times Post_q \times Innovative_i$	–0.0178***	–0.497**	0.561
	(0.00568)	(0.196)	(0.518)
Observations	3,180,037	3,180,037	927,121
R-squared	0.563	0.616	0.597
Fixed effects			
Year × *Province*	YES	YES	YES
Year × *Industry*	YES	YES	YES
Firm	YES	YES	YES
Firm Age	YES	YES	YES

In Table 8, I show that innovative firms started after the policy have a 5 p.p. (13 percent of the pre-SIA sample average) lower share of non-local founders when located in less competitive provinces. This translates into more than 7 p.p. (20 percent of the pre-SIA sample average) less equity owned by non-local founders in innovative firms started after the policy in less competitive banking markets. Since founder-level data are available in Orbis for both limited liability companies and unlimited liability partnerships (while financials are only available for the former), I can study the evolution of equity owned by non-local founders in new unlimited liability partnerships, which are excluded from the SIA, as a placebo test. I find that, opposite to SIA-eligible limited liability companies, unlimited liability partnerships tend to have marginally higher shares of equity owned by non-locals following the policy. Lastly, figure 8 shows that the difference in the percentage and equity of non-local founders between firms in innovative and non-innovative industries grows after 2012 only in provinces where banking competition is stronger, whereas it decreases in less competitive provinces, consistent with a story in which more competitive provinces drain potentially innovative entrepreneurs from less competitive ones. As a result, part of the missing effect of the SIA in least competitive provinces is also likely driven by lower demand for the policy incentives resulting from entrepreneurial outmigration. These results complement those of Kampanelis, Chronopoulos, and Wilson (2024), who show that stronger banking competition is a catalyst of intergenerational mobility by allowing disadvantaged individuals to become entrepreneurs. My results show that non-competitive banking markets may act as a push factor for entrepreneurs, especially in the presence of policies to incentivize entrepreneurship, thus contributing to regional divides.

4.7 Robustness

The main concern with the analysis is whether the effects can be ascribed to the SIA or are confounded by the contemporaneous change in the business cycle, especially if the latter affects innovative industries differently from non-innovative ones, and more so in areas where banking competition is stronger. To address this concern, I run a falsification test akin to that in Supplementary Appendix Table A2, using outcomes of SIA-ineligible incumbent firms and firm creation of SIA-ineligible ULPs. Supplementary Appendix Figures A9

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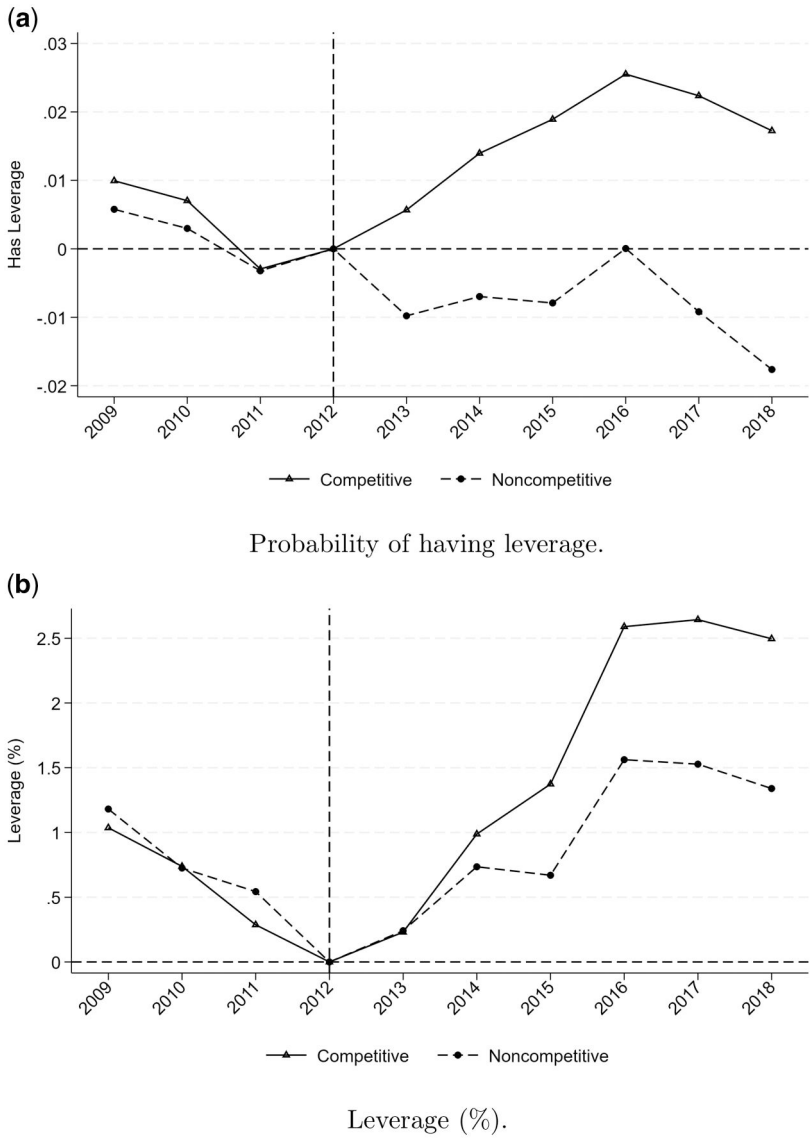


Figure 7 Trends—DDD (leverage)

The graph shows the evolution over time of the difference in the probability of having leverage and leverage (in %) of active firms between the two groups of industries in provinces with competitive (triangles) and non-competitive (circles) banking markets. In Panel (a), the outcome is a dummy equal to one if the firms have any leverage, while in Panel (b) the outcome is the actual leverage (in %) of the firm, calculated as the sum of long- and short-term debt divided by total assets. Provinces are sorted using the national median rate spread. The vertical line indicates the passage of the SIA (2012, omitted). The model, estimated separately for firms in provinces with competitive and non-competitive banking markets, is: $y_{fpiy} = \alpha + \sum_{y=2010}^{2015} \beta_y Innovative_i \times Year_y + F_f + PY_{py} + \varepsilon_{fpiy}$.

and A10 show that performance of incumbent firms does not evolve differently, in terms of ROA and turnover growth, for firms in innovative and non-innovative industries in provinces where banking competition is stronger or weaker. Supplementary Appendix Table A4 shows that all coefficients on the triple interaction are not significant, both when using the

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Table 8. Difference-in-difference-in-differences—migration.
Estimates of Eq. (7) (DDD) to identify the causal effect of bank market power on the effect of SIA on locality of founders of newly incorporated firms. Share non-locals is the share of founders born in a province different from the one of the firm (columns 1 and 3), while Equity non-locals is the share of equity held by founders born in a province different from the one of the firm (columns 2 and 4). Provinces are sorted in competitive and non-competitive using the dummy $Uncomp_p$ (using the median return spread at the national level). $Innovative_i$ is a dummy equal to 1 if the industry is considered innovative according to Supplementary Appendix Table A1. $Post_q$ is a dummy equal to 1 for quarters after the passage of the SIA (2012Q4). Standard errors are clustered at the province level (104 clusters) in parenthesis. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	Limited liability companies		Unlimited liability partnerships	
	(1) Share non-locals	(2) Equity non-locals	(3) Share non-locals	(4) Equity non-locals
$Uncomp_p \times Post_q \times Innovative_i$	–0.0492**	–7.321***	0.0751*	7.739*
	(0.0190)	(1.773)	(0.0442)	(4.232)
Observations	355,391	355,391	666,203	666,203
R-squared	0.241	0.225	0.223	0.221
Fixed Effects				
$Province \times Industry$	YES	YES	YES	YES
$Quarter \times Province \times Sector$	YES	YES	YES	YES
$Quarter \times Region \times Industry$	YES	YES	YES	YES

assignment dummy $Uncomp_p$ and $Uncomp'_p$, both for incumbent firms' performance and firm creation of ULPs. These tests thus support the conclusion that the results of the main analysis are unlikely to be explained by a contemporaneous trend in economic activity due to the European sovereign debt crisis and change in the business cycle.

Another concern in the main analysis is the strong North-South clustering of the dummy $Uncomp_p$, as provinces where banks have higher market power tend to be disproportionately located in the less developed southern part of the country. To show that my results are not driven by provinces being located in the southern part of Italy—and therefore simply economically weaker—rather than having less competitive banking markets, I construct a dummy $South_p$, which equals one if the province is located in the south of Italy (i.e., NUTS1 areas *South* and *Isles*), and zero otherwise. I then use $South_p$ in place of $Uncomp_p$ in the DDD estimation. Alternatively, I use the placebo triple interaction $South_p \times Post_q \times Innovative_i$ as a control in an alternative specification. Supplementary Appendix Table A4 shows that the coefficient on the placebo interaction, when used as the main regressor, is either negative but not significant or positive, suggesting that the SIA may have strengthened innovative firm creation more for provinces in the south. When I add the placebo interaction to the main specification as a control, the coefficient on the true interaction becomes similar in magnitude and significance to the one obtained using $Uncomp'_p$ (i.e., using regional medians for the assignment of provinces).

Next, I examine the importance of fixed effects for the main results. While the DDD allows me to include a rich set of fixed effects, the high number of regressors may cause the main result to be estimated on a small number of observations. In Supplementary Appendix Table A6, I show that the main results, on firm creation and guaranteed lending, as well as on VC deals, are robust, albeit smaller in magnitude for firm creation and larger for guaranteed lending, if I do not include any fixed effects. Moreover, the results are comparable when I define the dummy $Uncomp'_p$ using the regional sorting. The different magnitudes of the effects when fixed effects are excluded are due to the fact that most of the

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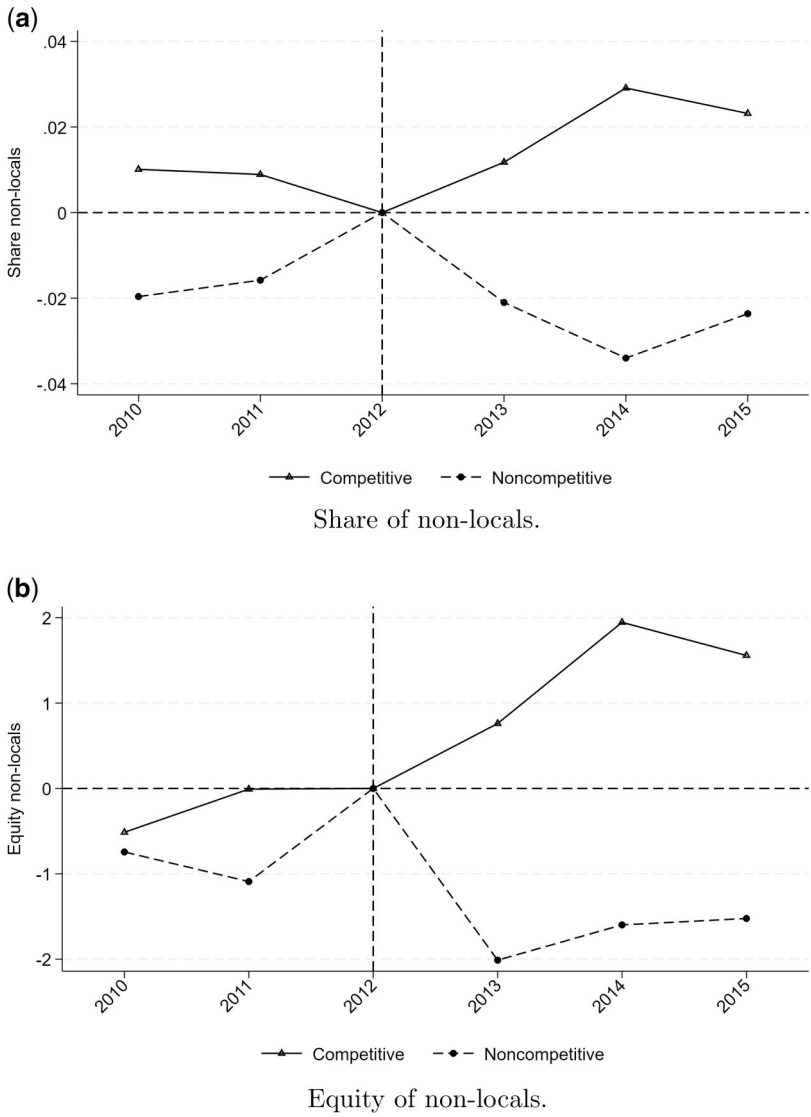


Figure 8 Trends—DDD (entrepreneurial migration)

The graph shows the evolution over time of the difference in the share and equity of non-local founders in firms between the two groups of industries in provinces with competitive (triangles) and non-competitive (circles) banking markets. In Panel (a), the outcome is the share of non-local founders, while in Panel (b), the outcome is the equity held by non-local founders. The vertical line indicates the passage of the SIA (2012, omitted). To smooth seasonality, estimates are reported at the yearly frequency. The model, estimated separately for provinces with competitive and non-competitive banking markets, is: $y_{piy} = \alpha + \sum_{y=2010}^{2015} \beta_y Innovative_i \times Year_y + PI_{pi} + PSY_{psy} + \varepsilon_{piy}$.

explanatory power absorbed by the fixed effects (e.g., the North-South divide in competitive and non-competitive provinces, and structural differences in incorporation rates across innovative and non-innovative industries) biases the effect negatively for firm creation and positively for guaranteed lending.

Next, I assess the robustness of the analysis to the measure of bank market power. I use two alternative measures of competition: bank conduct (λ), as estimated in

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Coccorese (2008), and the HHI of bank branches.[17] Supplementary Appendix Tables A7, A8, and A9 provide the results of the DDD on firm creation, guaranteed lending, and VC deals using both measures to construct alternative DDD triple interactions. Furthermore, the tables report estimates obtained when I rank provinces using both national and regional medians, of both the HHI and λ. Independently of the measure used, the results are comparable both qualitatively and quantitatively to those of the main analysis, suggesting that *RS* is a good proxy for market power in local banking markets.

Moreover, I investigate the relationship between the intensity of banking competition and the effect of interest. In Supplementary Appendix Table A10, I interact $Innovative_i$ and $Post_q$ with dummies for quartiles of the distribution of *RS* and use these interactions in DDD-regressions on firm creation, guaranteed lending, and VC deals. I find that, for all outcomes, the effect of the SIA is monotonically decreasing in the level of bank market power: the coefficient on the triple interaction becomes negative and more significant when using dummies for the third and fourth quartiles of *RS*. These results suggest that the SIA has been least effective in provinces where bank market power is highest.

I also investigate the robustness of the analysis to the sorting of industries into innovative and non-innovative ($Industry_i$). In the main analysis, I define an industry as innovative if it is over-represented, compared to the overall distribution of active firms in Italy, in the sample of firms that entered the SIA registry in 2012Q4 but were incorporated beforehand. However, if this sample (pre-sample) were significantly different from that of firms that are incorporated after the passage of the SIA (post-sample), I would be wrongly assigning treatment. To provide evidence that this is not the case, I calculate the share of firms in each industry in the pre- and post- samples separately and I regress one on the other. If there were no differences between the two samples, the resulting regression equation would have a slope of one and an intercept of zero. Indeed, I find that the estimates are 1.04 for the slope (standard error 0.03) and -0.0005 for the constant (standard error 0.001), and the R^2 of the regression is 92.3 percent. As a result, I conclude that my definition of innovative industries is likely to coincide with those most affected by the SIA.

Moreover, I also replicate the main analysis using a treatment assignment that is independent of SIA. I define an alternative dummy, $Industry'_i$, equal to 1 if the two-digit NACE code is identified by the OECD as either a high-technology manufacturing industry or a knowledge-intensive services industry, and 0 otherwise. This OECD classification is based on R&D expenditures and patenting activities of firms in all member countries, and therefore it is likely to be exogenous to characteristics specific to Italian firms. Supplementary Appendix Table A11 provides the estimates of the DDD model in which the triple interaction is constructed using the alternative $Industry'_i$ dummy. The coefficients are consistent with those of the main analysis, both when ranking provinces using national and regional medians of *RS*. Overall, the results of the main analysis are robust to the choices made in the treatment assignment at both the industry and province level.

4.8 Instrumental variable approach

To further strengthen the causal interpretation of the main analysis, I test the robustness of the results using an alternative identification strategy. I use the instrument used by Cao et al. (2023) and developed by Guiso, Sapienza, and Zingales (2004), exploiting the reform of the banking sector carried out by the Fascist regime in 1936, as an instrument for the endogenous degree of bank market power. The idea behind the instrument is that the 1936 banking reform allowed savings banks to operate and set up branches in all the provinces of the region in which they operated in 1935, whereas it restricted the area of operation of all the other types of banks (i.e., national and cooperative banks) to one province, leading

[17] Bank conduct (λ) measures the deviation of a loan's price (i.e., interest rate) from its marginal cost, and it is identified through a system of simultaneous equations estimated using aggregate data at the province level.

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to provinces with a larger number of savings bank branches per capita being historically more competitive.[18]

More specifically, I combine the IV approach with the DDD from the main analysis. I create a triple interaction as in Eq. (7), using the dummies $Post_q$ and $Innovative_i$ as in the main analysis and the continuous variable *RS* (i.e., the average rate spread in the pre-SIA period in the cross-section of provinces, standardized to have mean 0 and standard deviation 1). I then instrument it with the triple interaction of $Post_q$, $Industry_i$, and the number of savings bank branches per capita in 1936 (also standardized to have mean 0 and standard deviation 1). Since all double interactions in Eq. (7) are absorbed by fixed effects I only have to instrument the triple interaction $Uncomp_p \times Post_q \times Innovative_i$.

Results of the 2SLS estimation, as well as OLS for comparison, are reported in Supplementary Appendix Table A12 for three main outcomes: number of firms created, number of guaranteed loans, and number of VC deals. Overall, the results of the IV approach are consistent with those of the DDD in Table 4, even if larger in magnitude when compared to the OLS results.[19]

5. Conclusion

In this paper, I study how bank market power affects the pass-through of incentives for the creation of innovative firms in Italy. Exploiting the SIA of the Italian government in late 2012, I demonstrate that the effect of the SIA in stimulating firm creation in innovative industries is muted where banks have more market power, as higher bank market power impairs the disbursement of public guarantees, a key incentive of the policy. Moreover, the weaker effect of the policy in provinces with higher bank market power is not compensated by other actors, and it rather results in fewer and smaller VC deals, and in innovative firms in less competitive banking markets being likely to attract regular bank funding, leading to lower leverage. This lack of funding results in prospective founders migrating to more competitive banking markets in response to SIA's incentives. These results show that bank market power is an important moderator of policies aimed at fostering innovative firm creation and it can have important spillover effects, redefining the delineation of the market for financing innovative entrepreneurs.

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[18] According to Guiso, Sapienza, and Zingales (2004), the Fascist regime favored savings banks because their directors were mostly donors to the Fascist Party.

[19] Results from the OLS estimation differ from those in the main analysis as the continuous variable *RS* is used, rather than the dummy $Uncomp_p$. Since both *RS* and the instrument are standardized to have mean 0 and standard deviation 1, the coefficients in Table can be interpreted in terms of one standard deviation increase in *RS*.

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Data availability

Statistics for the banking sector aggregated at the province level, as used in this paper to calculate the Return Spread, are publicly available at: www.bancaditalia.it/statistiche. Data from *Rapporto Movimprese* are publicly available at: www.infocamere.it/en/movimprese. Data on guaranteed loans before the third quarter of 2012 are not publicly available and has been obtained confidentially from the Fund. Data after the second quarter of 2012 is publicly available at: www.fondidigaranzia.it/amministrazione-trasparente. Data on individual VC deals are from Preqin and CB Insight, accessed under license at the Erasmus School of Economics. Data will be shared on request to the corresponding author with permission from the providers. Data on individual firms and founders is from ORBIS, provided by Moody's under licence at the Erasmus School of Economics. Data will be shared on request to the corresponding author with permission of Moody's.

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