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(Occasional Papers)

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in good and bad times

by Emilia Bonaccorsi di Patti and Valentina Nigro

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# THE FINANCIAL STRUCTURE OF ITALIAN START-UPS, IN GOOD AND BAD TIMES

by Emilia Bonaccorsi di Patti\* and Valentina Nigro\*

## Abstract

We analyse the financing sources of over 360,000 Italian start-ups registered between 2003 and 2010. The data show that, before the global financial crisis, 50 per cent of start-ups borrowed from banks when they were one year old, and that bank loans covered 16 per cent of total assets on average. In the post-crisis period we find that the frequency of borrowing by one-year-old start-ups declines by 5 percentage points, and the difference does not disappear as firms become older. We also document that the post-crisis decline in borrowing from banks is more marked than that observed for older firms, controlling for business characteristics.

**JEL Classification:** D22, G32.

**Keywords:** start-ups, corporate finance, financial constraints.

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## 1. Introduction<sup>1</sup>

The creation of firms and their expansion during the first years of activity are critical factors in the dynamic allocation of resources within an economy. Financing constraints affecting new firms can therefore act as a drag on growth.

A large body of literature links financial frictions to information asymmetries, suggesting that new firms face tighter financing constraints than well-established businesses because they are more informationally opaque. If we interpret the ‘pecking order’ theory of Myers (1977) and Myers and Majluf (1984) as a financial cycle theory, the prediction is that start-ups have to rely mainly on funds provided by an entrepreneur, family and friends (inside resources).<sup>2</sup> Firms that face difficulties in accessing bank credit can also resort to trade debt as an alternative source of funds (e.g. Petersen and Rajan, 1997). As firms get older, they gain access to outside financing, either debt or equity, because more information on their creditworthiness and business prospects becomes available. Eventually they will be able to raise debt and equity on financial markets.

The available evidence is somewhat inconsistent with this prediction. Using data for the United States, Berger and Udell (1998) and Robb and Robinson (2014) show that external debt, particularly bank debt, is very important even in the earliest stage of a firm's life. Similar evidence is available for Canada (Huynh, Petrunia and Voia, 2012) and Portugal (Farinha, 2005). This inconsistency could be explained by the special nature of bank credit, highlighted by the literature on financial intermediation. Theoretical models showing why financial intermediaries exist underline their ability to mitigate asymmetric information problems and reduce transaction costs because they can process soft information on the entrepreneur and the local economy to make lending decisions and monitor borrowers more effectively (e.g. Benston and Smith, 1976; Leland and Pyle, 1977; Diamond, 1984). Furthermore, banks have an incentive to invest in relationships with opaque borrowers because they can extract monopoly rents over time (Petersen and Rajan, 1994).

Given that banks play an important role in funding new businesses, what happens when their ability to provide credit to the real economy is weakened by negative liquidity or capital shocks? A large number of studies show that bank shocks are transmitted to borrowers, and have negative real effects on investment and employment. These effects tend to be more marked for small bank-dependent borrowers (see for example, Gertler and Gilchrist, 1987). To the extent that start-ups are more opaque than other firms, one would expect a stronger negative impact on credit availability than that for older firms.

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<sup>1</sup> We would like to thank F. Columba, P. Fainaldi Russo, G. Gobbi, S. Magri and V. Vacca for their comments. The opinions do not necessarily reflect those of the Bank of Italy, the Eurosystem or their staff.

<sup>2</sup> Equity financing from a wealthy individual other than the entrepreneur or his/her family member.

From a policy perspective the issue is highly relevant because problems in the banking system could delay the recovery of the economy after a recession by hampering the creation of new, more efficient businesses after the destruction of inefficient and unprofitable ones. A recent strand of literature links the duration of the Great Recession in the United States to the sharp decline in firm creation, possibly due to the credit crunch (Haltiwanger, Jarmin and Miranda, 2013; Siemer, 2016; Gourio, Messer and Siemer 2016).

In this paper we study the financing sources of a very large sample of Italian start-ups and find that bank financing is common, as in other countries. We then investigate differences in financing patterns between the pre-crisis and post-crisis years. Italy is well suited as a case study for analysing the change in credit access due to negative bank shocks because the financial system is bank-based, and a number of studies have already documented that the crisis caused a significant negative credit supply shift (Bonaccorsi di Patti and Sette, 2016; Cingano, Manaresi and Sette, 2016). To our knowledge, no study has investigated the impact of the global financial crisis on start-up financing.

Our analysis is based on a very large dataset of around 400,000 businesses registered between 2003 and 2010. The main results are the following: first, on average for the entire period, start-ups (when one year old) finance almost 30 per cent of their assets with equity and loans from shareholders. Loans from financial intermediaries, mostly from banks, finance about 20 per cent of assets. Focusing on headcounts, 55 per cent of firms rely on financial debt excluding loans from shareholders, and 48 per cent of them on bank loans.

Second, we find that after the outbreak of the global financial crisis, the probability that a start-up uses bank loans is 5 percentage points lower than before the crisis, controlling for firm characteristics. It is an economically significant effect, given that the pre-crisis share of start-ups borrowing from banks was 50 per cent. The amount of bank debt as a share of total assets declines by 2.6 percentage points; this difference is also economically significant when compared with the pre-crisis average of 18 per cent. Start-ups appear to increase the share of assets funded by trade debt and other forms of debt (towards employees, social security and so on).

Third, we also observe that the gap in the use of bank loans by start-ups does not vanish as the firms age, even after five years. We interpret this fact as suggesting that tighter credit supply conditions act as a selection mechanism at birth. Some of the businesses that would have used bank debt were discouraged or prevented from starting. Further analyses should be developed to understand the medium-term implications for growth.

From a policy perspective, our results suggest that changes negatively affecting the willingness or ability of banks to fund opaque borrowers might require measures that target access to funds by start-ups. A number of measures were enacted by the Italian government to support access to finance for small and medium enterprises,



especially start-ups. For example, in 2012 the government introduced fiscal incentives to investments through venture capital funds in ‘innovative start-ups’, i.e. seed and early-stage financing of start-ups active in the field of technological innovation. These firms were also granted easier access to public guarantee schemes supporting bank loans.

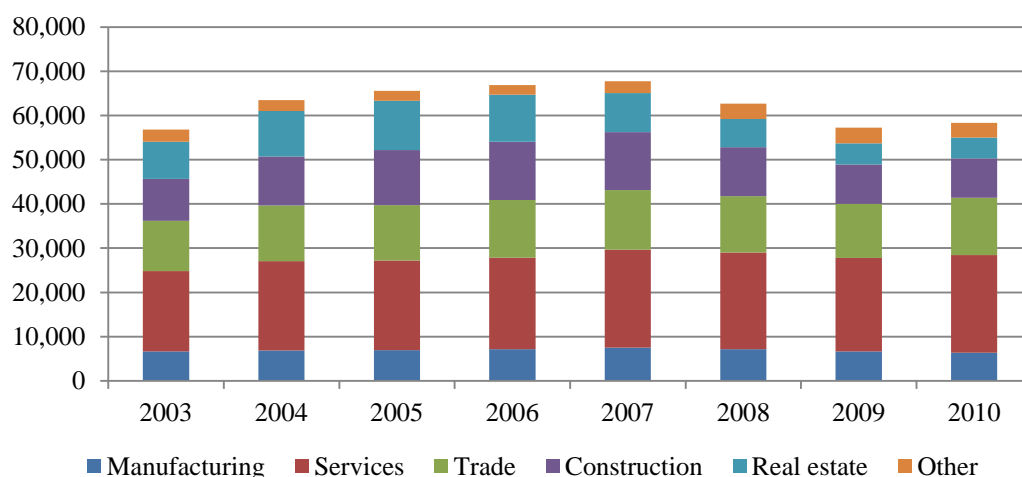
The paper is organized as follows. The next section presents the data and sample characteristics; section 3 describes the financing of start-ups; section 4 focuses on the timing of access to borrowing, while section 5 concludes.

## 2. Data

Our data are from Cerved, a database containing the financial accounts of the universe of Italian limited liability entities. Limited liability businesses are around 20 per cent of start-up firms in the Italian Business Register, but they represent over 50 per cent of the value added of the non-financial business sector. We identify newly created non-financial firms for each year between 2003 and 2010, excluding holding companies, and firms owned by government agencies or other public entities.<sup>3</sup>

Since we want to focus on small and opaque firms, we apply a size threshold and only keep firms whose reported sales and total assets on their first balance sheet were below €10 million.<sup>4</sup> We also use, when available, the information provided by the firm register about spin-offs or firms born via mergers so that we can drop these entities;<sup>5</sup> the size threshold should ensure that most of these firms are excluded when the information is unavailable. Details of the sample construction are provided in the Appendix (Table D1).

**Chart 1: Sample of start-ups by year and sector**



<sup>3</sup> We also exclude consortiums, which are associations of firms.

<sup>4</sup> The threshold of €10 million for sales and total assets is the same as that established by Eurostat for the definition of small firms.

<sup>5</sup> The Italian Business Register provides information on firms created by spin-offs or mergers only after 2005.

Chart 1 plots the sample size by year and sector. As expected, the number of start-ups increases during the economic expansion in 2004-2007 and decreases during the 2008-2010 recession. About 30 per cent of start-ups are in construction and real estate, two industries that experienced a boom in the years before the global financial crisis; 33 per cent are in services, 20 in retail and wholesale trade, and 11 in manufacturing. Most of the firms in our sample are set up as a ‘*società a responsabilità limitata*’ (Srl), an entity that is similar to a small limited liability company in other jurisdictions; 7 per cent are cooperatives and 1 per cent are joint-stock companies (see Table D2 in the Appendix). Looser accounting standards and lower minimum paid-in capital apply to an Srl in Italy with respect to a joint-stock company.<sup>6</sup>

Since most of the firms do not file a balance sheet for the fiscal year during which they are registered, we analyse their financial statements when they are one year old; 91 per cent of the sample have filed a balance sheet at this stage. In the rest of the paper we refer to these firms as being in their infancy.

**Table 1: Distributions of sales, assets and paid-in capital**

Year of establishment		Sales	Total Assets	Paid-in Capital
2003-2010	First quartile	29	62	10
	Median	140	175	10
	Third quartile	430	479	20
	Mean	431	429	23
	Number of firms		455,393	
2003-2007	First quartile	25	63	10
	Median	136	183	10
	Third quartile	429	502	20
	Mean	432	429	23
	Number of firms		295,407	
2008-2010	First quartile	36	59	6
	Median	148	162	15
	Third quartile	433	438	38
	Mean	430	430	23
	Number of firms		159,986	

Note: Figures are for one-year-old firms; thousands of euros.

As expected, new firms are small (Table 1). Average sales are €438,000, but more than half of start-ups have sales below €140,000. Average total assets are €489,000 but the median is €175,000. A quarter of the firms are very small, with sales and assets

<sup>6</sup> The minimum capital to set up a joint-stock company was €120,000 until 2014, and €10,000 for an Srl. In 2012 the law introduced the ‘simplified Srl’, requiring a minimum paid-in capital of €1. Mean values are computed on a winsorized distribution because there are very few large firms; winsorization of the variables is at the 1<sup>st</sup> and 99<sup>th</sup> percentiles.

below €29,000 and €62,000 respectively. The amount of paid-in equity capital is equal to the legal minimum for more than half of the sample (€10,000), and below €20,000 for at least two thirds of it.

When breaking down start-ups by industry, we note that firms in manufacturing have the highest revenues, while firms in the real estate industry are larger in terms of average and median assets. The figures are shown in Table A3 in the Appendix.

We consider two indicators of profitability: operating profits (EBITDA) to total assets and Return on Assets (ROA) before taxes (Table 2). EBITDA is positive for around 68 per cent of start-ups and ROA before taxes is positive for 57 per cent of them. When dividing firms into size quartiles, we note that the share of firms with positive earnings is lower for the smallest firms but there is no clear correlation between profitability and size.

**Table 2: Profitability of start-ups by size**

Year of creation	Asset classes	EBITDA/total assets		ROA before tax	
		median	share if >0	median	share if >0
2003-2010	< 62k	2.6	50.9	0.0	40.2
	62 - 175k	9.7	71.2	3.1	62.6
	175 - 479k	6.6	73.7	2.0	64.9
	> 479k	3.5	74.7	0.7	60.5
	Total	5.5	67.6	1.2	57.0
2003-2007	< 62k	0.0	49.8	0.0	38.6
	62 - 175k	9.5	70.5	2.8	61.0
	175 - 479k	6.3	72.7	1.7	62.8
	> 479k	3.4	74.4	0.5	58.1
	Total	5.1	66.9	0.8	55.2
2008-2010	< 62k	4.2	52.5	0.0	42.5
	62 - 175k	10.1	72.4	3.9	65.1
	175 - 479k	7.1	75.5	2.6	68.9
	> 479k	3.8	75.3	1.1	65.7
	Total	6.1	68.8	1.8	60.4

Note: Figures are for one-year old firms; per cent. Median values are based on the entire distribution including firms with zero or negative profitability. Asset classes are based on quartiles computed for all firms at age 1.

The firms created during the downturn that followed the global financial crisis (2008-2010) are somewhat different from those that started in the expansionary period before the crisis. Their median assets are 11 per cent smaller but their sales are higher by 9 per cent; they also have more paid-in capital. On average, they are more profitable than those created during the pre-crisis economic expansion. These differences could

reflect the more difficult environment acting as a tougher selection mechanism, favouring businesses that are able to generate revenues early on and that need fewer external financial resources. We explore financing patterns in more detail in our empirical analysis below.

### **3. The financial structure of start-ups**

In this section we first describe the financial structure of start-ups during their infancy over the entire sample period. Then we compare the funding sources of start-ups registered before 2008 with those registered afterwards. The descriptive evidence is complemented by a multivariate regression analysis that takes into account firm-level characteristics. The data refer to around 80 per cent of the sample providing the relevant information.<sup>7</sup> Firms not reporting the details on financial debt are smaller and have a higher equity-to-asset ratio.

#### *3.1 Stylized facts from the entire sample period*

Based on the pecking order hypothesis, we expect start-ups to rely on equity and loans from partners because they are usually cheaper than loans from outsiders. Other sources will be accessed if the initial investment cannot be covered by the business owners and their close circle of friends and family.

Another source of financing that could be significant for start-ups is trade debt. The theoretical literature identifies many possible explanations of why trade debt is an important financing source for firms. The most important demand-side rationale is that opaque, typically small firms rely on trade debt because they are financially constrained and thus have limited or no access to other forms of external funding (see Biais and Gollier 1997; Petersen and Rajan 1997). According to this point of view, trade debt and bank debt are substitutes and they coexist if the firm has insufficient access to bank debt.<sup>8</sup> Structural characteristics related to the type of business and the role of working capital explain differences across industries and firms.

We cannot perfectly distinguish between inside and outside financing sources in our data because the information is broken down by instrument (equity, debt, securities issued) and only partially by source (partners, financial intermediaries, other). Given the very small size of start-ups, we can assume that equity is mostly provided by the same individuals that are involved in the management of the business and/or family members.

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<sup>7</sup> In Italy, companies that have not issued securities traded on regulated markets may choose to adopt the simplified balance sheet when they have not exceeded two of the following size thresholds in the first year or subsequently for two consecutive years: i) total assets €4.4 million; ii) sales €8.8 million; and iii) 50 is the average number of employees in any given year. Most of the firms in our sample fall into this category but they nevertheless provide information on the composition of liabilities.

<sup>8</sup> Supply-side explanations are typically based on benefits that suppliers acquire when establishing relationships; for example, firms acquire private information about their customers through trade credit (Jain, 2001), decrease warehouse costs (Emery, 1987) and increase future business opportunities.

We consider it all to be inside financing, together with loans from shareholders and partners.<sup>9</sup>

Statistics are shown in Table 3. The main categories of liabilities are equity, financial debt, trade debt and other types of debt (debt towards employees, taxes due, social security and minor items).

Equity at book value finances 14 per cent of assets on average. Loans from shareholders have an equally important weight. External financial debt is about 20 per cent of total assets, and most of it is towards banks. Market debt financing is virtually zero, as expected.

The last column of the table shows the incidence of firms with a positive value for each financing source. Equity is obviously present in all firms because of legal requirements, but in 15 per cent of our sample the firm booked a loss that is enough to wipe out the initial capital. Loans from shareholders are frequent, and are observed for 41 per cent of firms. About 55 per cent of firms have some external financial debt, mostly towards banks (48 per cent). As expected, bond financing is almost absent (0.1 per cent).<sup>10</sup>

Trade debt is widely used (90 per cent of firms) and accounts for a large share of total resources, about 31 per cent. The average trade credit balance (credit minus debt) is negative and is 9 per cent of total assets; around 35 per cent of firms in our sample have a positive trade credit balance (Table A2 in the Appendix).

If we split the sample by size classes, the pattern is consistent with the evidence in Berger and Udell (1998). Smaller companies, typically more opaque, resort more to internal funds (equity and loans from shareholders and partners) than larger ones. The share of bank financing increases with size, possibly reflecting higher demand by firms in need of resources to fund larger investments, and easier access. The shares of loans from other intermediaries and trade debt are instead similar.

Additional statistics by industry are reported in the Appendix. Start-ups in real estate have a higher ratio of bank debt to total assets (by 12 percentage points) and are more dependent on loans from shareholders and partners (by 11 percentage points) in comparison with the average start-up (Table A4), possibly because they have more collateral they can post. Firms in services use less bank credit (by 4 percentage points), especially those in professional, scientific and technical activities, and information and communication services. In these industries human capital is likely to play a more significant role than physical assets.

Summing up - and leaving aside trade debt which is mainly used to finance trade receivables - the data show that although inside resources are the main source of financing (equity plus loans from shareholders and partners), external financial debt

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<sup>9</sup> In a small number of cases there could be outsiders, for example venture capital funds and other entities, but the private equity industry is very small in Italy.

<sup>10</sup> Amounts of debt are shown in Table A1 in the Appendix.

plays a significant role. This finding is consistent with statistics on start-ups in the United States showing that outside loans (defined as funds provided by financial institutions or individuals that are not the owner or their circle of friends and family), and especially bank loans, are the prevalent source of funding (Robb and Robinson, 2014).<sup>11</sup>

**Table 3: Financing sources for start-ups, by firm size**

	All cohorts (2003-2010)					Share of firms with value>0 for the specific item
	As a share of total assets					
	Asset size classes				All firms	
< 62k	62 - 175k	175 - 479k	> 479k			
Equity	22.2	15.4	11.0	10.3	14.5	85.5
Loans from shareholders	14.8	13.8	14.4	13.9	14.2	41.0
Total external financial debt	10.3	15.3	21.0	30.7	19.7	54.8
Loans from banks	7.2	11.9	17.4	26.4	16.1	47.7
Loans from other financial intermediaries	2.8	2.9	2.8	2.5	2.8	12.0
Bonds	0.0	0.0	0.0	0.0	0.0	0.1
Other financial debt (*)	0.4	0.5	0.8	1.8	0.9	3.7
Trade debt	27.1	33.2	34.8	29.3	31.2	90.7
Other non-financial debt (**)	12.7	12.6	11.5	11.0	11.9	72.4
Number of firms	364,149					

Note: The figures are for one-year old firms; average values. Asset size classes are based on quartiles computed for all firms during infancy. \*Includes intra-group financial transfers, commercial paper held by non-banks. \*\*Includes items such as trade debt with a maturity beyond the next fiscal year, debt towards employees, and other short-term debt.

### 3.2 Pre- and post-crisis comparison

In this section we compare the financial structure of firms registered in 2003-2007 (pre-crisis cohorts) with those registered in 2008-2010 (post-crisis cohorts).<sup>12</sup> Credit rationing by financial intermediaries increased substantially during the crisis, particularly for smaller firms. No study has specifically analysed start-ups but the

<sup>11</sup> The Italian data are not exactly comparable because the Kaufman Survey data on United States start-ups include not only limited liability entities but also sole proprietorships, and also consider personal credit obtained by the business owner as outside debt. As shown by Cole and Sokolyk (2017), more than half of start-ups use personal debt and 44 per cent use debt in the name of the business.

<sup>12</sup> We consider 2007 as the beginning of the global financial crisis in Europe since banks started to experience liquidity problems and a drying-up of the interbank market during the summer. The Italian economy entered a recession in the last quarter of 2008, following the default of Lehman Brothers.

evidence suggests that they could have faced even tighter financing conditions than the average firm since rationing appears to increase more for smaller firms (Albareto and Finaldi Russo, 2012).

By analysing quantities, scaled by total assets, we find a decline in the ratio of external financial debt to total assets from 21.7 to 16.3 per cent (Table 4), driven by a large drop in the share of bank loans and to a lesser extent by a decline in loans from other intermediaries. If we compare firms within the same size class, we see an increase in the shares of equity mostly for larger firms and of loans from shareholders for smaller ones. Splitting loans from shareholders by maturity (not shown), we note that short-term loans increase at the expense of long-term loans in all firm size classes. Finally, the increase in trade debt and other non-financial debt is consistent with prior evidence for older firms in Italy (Albareto and Finaldi Russo, 2012) and in Spain (Carbó-Valverde, Rodriguez-Fernandez, and Udell, 2016) during the same period.<sup>13</sup>

By analysing frequencies (Table 4, the last columns of each panel), we note that the pattern is consistent with the change in quantities. The post-crisis share of firms using loans from shareholders increases while those using external financial debt drops (by 8 percentage points). In particular, firms with bank loans drop by more than 7 percentage points with respect to the pre-crisis level of 50 per cent; firms with loans from other financial intermediaries decline by 3 percentage points with respect to the pre-crisis level of 13 per cent.

The observed difference is a lower bound on the potential true effect if the lack of credit prevented entrepreneurs from starting up their businesses. A back-of-the-envelope calculation illustrates why. If we compare the number of firms created in 2010 (58,000) with those registered in 2006 (67,000), we get 9,000 ‘missing firms’. If we assume that all of the missing firms were unable to start because they could not get any credit, in a scenario in which the missing start-ups would have found other sources of financing, for example equity, the number of firms with credit would still be 25,000 but the number of start-ups would be larger, possibly equal to that observed in 2006. Under this scenario, the share of firms with credit would be 37 per cent (25,000 divided by 67,000), 13 percentage points lower than the pre-crisis average. This pro-forma calculation yields an upper bound estimate of the true impact of the credit crunch on start-ups. Assuming instead that only half of the missing firms were not registered because of credit rationing but would have found other sources of financing, we would have found 62,500 firms created in 2010, and still had 25,000 with bank credit. The hypothetical share of firms with bank credit would have therefore been 40 per cent, 10 points less than in the pre-crisis period. This scenario is more reasonable since, during a recession, lower expected profits reduce the incentives to start a new business, other things being equal.

### *3.3 Multivariate regression analysis*

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<sup>13</sup> The increase could also reflect the fact that post-crisis start-ups have a higher volume of sales than pre-crisis ones, but their level of assets is on average lower.

Given that some of the differences between pre-crisis and post-crisis cohorts could be the result of differences in the sample composition by size or industry, we estimate the difference in conditional means with a multivariate regression. We use probit models to estimate the changes between cohorts in the probability of having any external financial debt and the probability of having any bank debt during infancy, controlling for firm characteristics. We repeat the estimation using a fractional probit regression to estimate the difference in the shares of external financial debt to total assets and bank debt to total assets. The fractional response estimator fits continuous variables bounded in the interval (0,1) where the boundaries are included, such as rates and proportions. The model estimates the parameters by using quasi-likelihood methods, assuming a reasonable functional form for the conditional mean. In our case we use a standard normal distribution function.

The difference in means between cohorts is given by the average partial effect of cohort dummy variables, conditional on firm characteristics. In a second specification we add interaction terms for the cohort dummies with the size quartiles, to assess the differential effects of the crisis on firms by size.

We are guided by theory in our choice of explanatory variables. We include: dummies for four size classes (based on the quartiles of total assets), five mutually exclusive classes based on the level of the ratio of tangible fixed assets to total assets (zero, less than 0.25, 0.25-0.50, 0.50-0.75, above 0.75), and the ratio of intangible fixed assets to total assets. We choose to include categorical variables for the share of tangibles because the effect could be non-linear and we do not have an a priori on the shape of the relationship; the share of intangible fixed assets has a limited range, with 75 per cent of the observations below the value of 6 per cent, so we prefer not to use categorical variables.<sup>14</sup> Size should have a positive effect on the frequency and volume of debt financing, both because larger firms have greater funding needs that cannot be met by internal sources, but also because they are less likely to be credit constrained, given demand. Similarly, firms with relatively more tangibles are in principle more transparent and have more real collateral to mitigate asymmetric information problems. The effect of the share of intangible assets, such as patents or non-observable technology, is ambiguous since firms with more intangibles are harder to evaluate but, when holding constant tangibles, they could also have a greater financing need because they tend to invest in projects whose returns take time to materialize.

We also include a dummy equal to 1 if the start-up has no sales during infancy, 0 otherwise. The expected sign of the coefficient is ambiguous because it should be negative if financial intermediaries focus on the current volume of activity rather than a firm's prospects, or positive if firms with no revenues are more likely to demand loans to support their investments until they start being profitable. Other controls are dummies for the industry, the firm's legal form, and the region (North-West, North-East, Centre, South and Islands).

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<sup>14</sup> Our main results are robust to alternative specifications for the functional forms of these controls.



The results shown in Table R1 provide estimates of the difference between the baseline year (2003) and each of the subsequent cohorts. Focusing on the post-crisis cohorts, the average partial effects of the dummies are negative and statistically significant in both the regression of bank credit and of external financial debt, and in both models (probit and fractional), indicating that start-ups resorted less to these financing sources after 2007. The decline increased in magnitude from 2008 to 2010.

As shown in column 1 in Table R1, the decline in the probability of having bank debt for firms born in 2010 is 4.8 percentage points, which is economically significant against the baseline probability of 48.6 per cent in 2003.

Similarly, there is a decline of 2.1 percentage points in the share of bank loans to total assets, to be compared with an observed share of 16.1 per cent in 2003. The fall in external financial debt is even stronger (by 7.0 percentage points in the probability and by 4.1 percentage points in the ratio of debt to total assets).

The average difference between the post-crisis and the pre-crisis cohorts can be computed as the mean of the yearly effects. We obtain a decline of 5 percentage points in the probability of bank debt, and 6 percentage points in the probability of external financial debt. The magnitude of these gaps, conditional on observed differences between pre- and post-crisis start-ups, is about two thirds of the one between the unconditional means shown in Table 4 (7 percentage points for bank debt and 9 percentage points for external financial debt), implying that there is an economically significant and unexplained difference in the behaviour of the two samples that could reflect increased financing constraints.

The decline in the share of assets financed with bank debt is approximately 3 percentage points, and that in external financial debt is 4 percentage points.

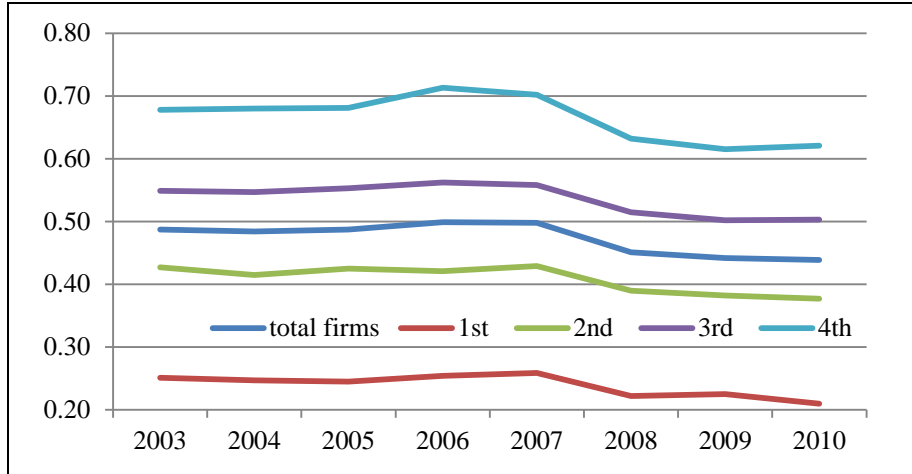
**Table 4: Financing sources for start-ups, by firm size and cohort**

	<i>Pre-crisis cohorts (2003-2007)</i>						<i>Post-crisis cohorts (2008-2010)</i>					
	As a share of total assets					Share of firms with value>0	As a share of total assets					Share of firms with value>0
	Quartiles of Total Assets				All firms		Quartiles of Total Assets				All firms	
	< 62k	62 - 175k	175 - 479k	> 479k		< 62k	62 - 175k	175 - 479k	> 479k			
Equity	22.5	15.1	10.7	9.7	14.1	85.4	21.7	15.8	11.5	11.6	15.1	85.7
Loans from shareholders	14.4	13.9	14.9	13.9	14.3	40.0	15.5	13.5	13.5	13.8	14.1	42.7
Total external financial debt	11.3	16.7	22.9	33.4	21.7	57.8	8.8	13.2	17.8	25.4	16.3	49.9
Loans from banks	7.8	12.8	18.8	29.0	17.7	50.4	6.3	10.5	14.9	21.6	13.3	43.1
Loans from other financial entities	3.3	3.4	3.3	2.8	3.2	13.1	2.1	2.2	2.0	1.9	2.1	10.1
Bonds	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Other financial debt (*)	0.4	0.5	0.8	1.6	0.9	3.6	0.5	0.5	0.8	2.0	0.9	3.8
Trade debt	26.9	33.1	34.1	28.0	30.6	90.7	27.5	33.5	36.1	31.8	32.3	90.7
Other non-financial debt (**)	12.2	11.8	10.6	10.5	11.2	70.6	13.5	13.8	13.0	11.9	13.1	75.4
Number of firms	229,169						134,980					

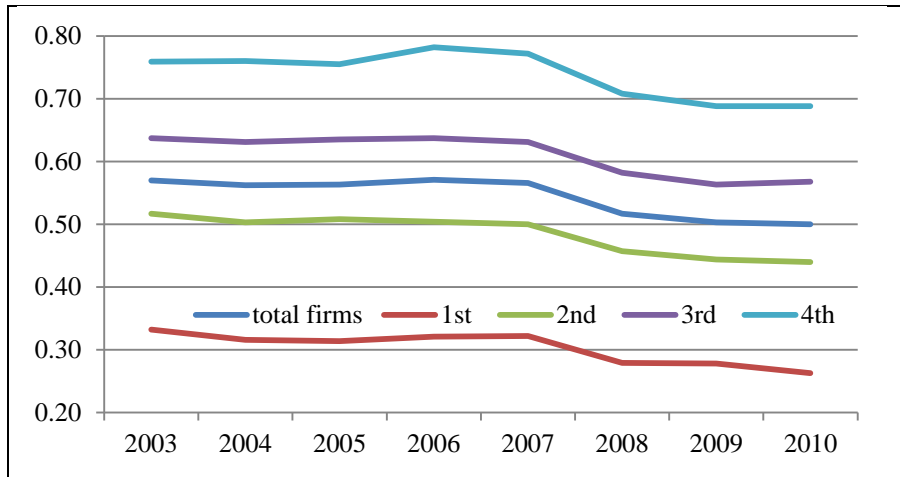
Note: The figures are for one-year old firms; average values. All the variables are computed for firms with information on financial debt, including those that have zero for the specific item. Financing sources exclude fiscal debts, severance pay (TFR), and provisions for risks and charges. \*Includes intra-group financial transfers and non-bank commercial papers. \*\*Includes items such as trade debt with a maturity beyond the next fiscal year, debt towards employees, and other short-term debt.

In a second specification we estimate the model by adding interaction terms between firm size classes and cohort dummies (not shown). We plot the predicted probability of having debt in Chart 2 and the predicted share of debt in Chart 3 for each size class.

**Chart 2A: Estimated probability of having bank debt by cohort and size class**

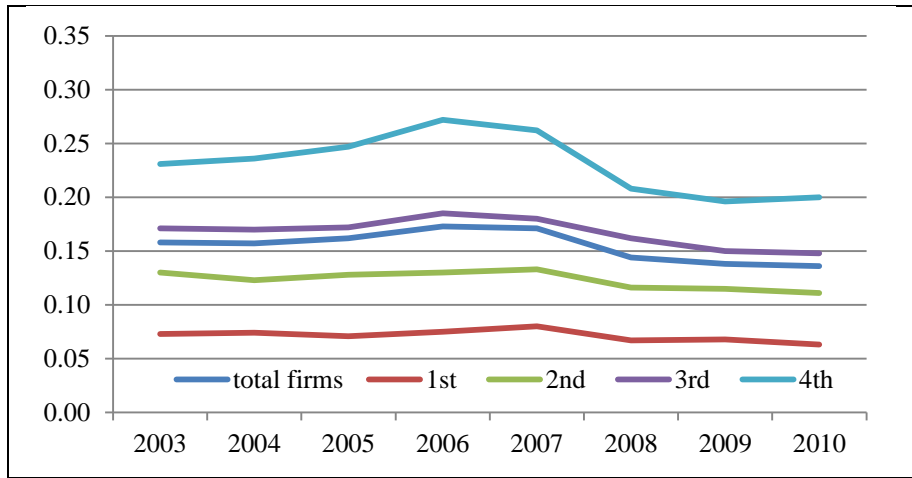


**Chart 2B: Estimated probability of having external financial debt by cohort and size class**

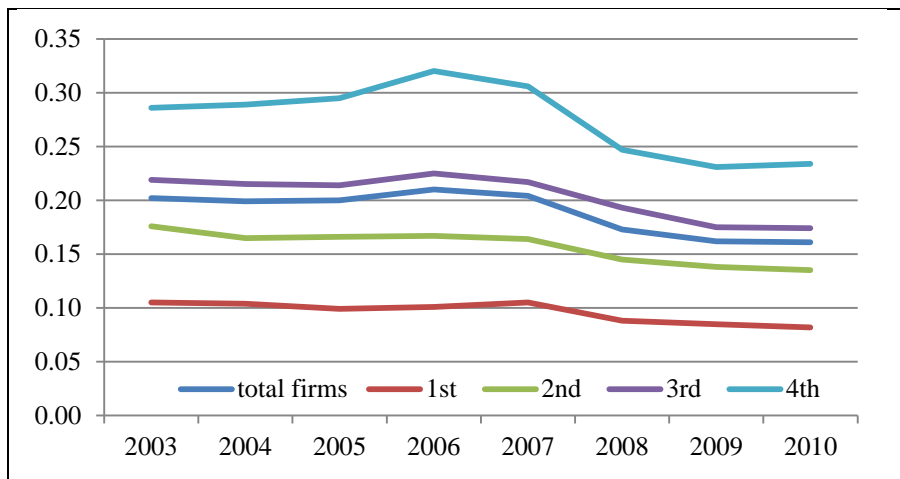


Note: The effects are estimated with a probit model in which the dummy to have any of bank debt (A) and external financial debt (B) is regressed on cohort dummies and quartiles of assets dummies and their interactions, plus other regressors (shares of tangibles and intangibles, dummy if sales=0, legal form, industry and geographic area dummies).

**Chart 3A. Estimated ratio of bank debt to total assets by cohort and size class**



**Chart 3B. Estimated ratio of external financial debt to total assets by cohort and size class**



Note: The effects are estimated with a fractional probit model in which the ratio of bank debt to total assets (A) and external financial debt (B) to total assets is regressed on cohort dummies and quartiles of asset dummies and their interactions, plus others (shares of tangibles and intangibles, dummy if sales=0, legal form, industry and geographic area dummies).

For example, Charts 2A and 2B plot the estimated probabilities of borrowing for each cohort by debt source (banks are any external source). Focusing on the dynamics, the charts show that borrowing peaks in 2006-2007 and declines thereafter. The post-crisis drop is more significant for larger start-ups, which also appear to have been the most procyclical firms during the credit boom. Charts 3A and 3B yields the same conclusion.

Were start-ups more affected by the credit supply shock than old firms? Using a regression analysis, we compare the drop in the probability of access to external

financial debt and to bank debt for start-ups with that experienced by a large sample of older firms in the Cerved database. The analysis is repeated for the share of assets financed by external or bank debt.

We include year dummy variables that refer to the balance sheet year and we add an interaction term between the year dummies and the dummy identifying a start-up firm. Older firms are thus compared with firms during infancy in that same calendar year. The estimates quantify the difference in the means of the two samples, conditional on region, industry, legal form, and firm size (logarithm of total assets).<sup>15</sup> Start-ups are only included when they are one year old, and excluded in subsequent years.

Table R2 shows the results for bank debt as dependent variable, and Table R3 shows those for external financial debt. For the sake of brevity we only comment on the results for bank debt in Table R2. The estimated effects show that in the entire sample period, new firms have a lower probability of using bank debt than older firms. The point estimate of the difference depends on the set of control variables. In column 2 we control for demographics and size, and the effect is around 2.1 percentage points. When we control for other characteristics (column 3), the effect rises to 3.6 percentage points.

Start-ups instead appear to be more indebted than old firms (columns 5 and 6). The inconsistency between the lower probability of having debt and the higher debt level reflects a difference in the shape of the distribution of the two variables. There is a tail of start-ups that has much higher debt levels, which increases the mean.

The comparison between the effect of the crisis for start-ups as opposed to older firms can be drawn from the coefficients of the interaction terms between the year dummies and the dummy identifying start-ups. In the case of the probability of having bank debt, these coefficients are all negative and increase in absolute value. This means that start-ups experience a decline in the use of bank debt that is more marked than that experienced by older firms. The difference is economically significant: between 3 and 5 percentage points of additional impact depending on which post-crisis year is considered (column 2), against a decline of 4 percentage points for older firms. In contrast, the estimated effects for the share of credit show that the decline in borrowing for start-ups is slightly smaller in magnitude than for older firms.

We further investigate whether the higher indebtedness of start-ups with respect to older firms is explained by the behaviour of more cyclical industries, especially construction and real estate services. The regression analysis was repeated excluding firms in these industries. While our main descriptive statistics do not exhibit major differences across sectors, we observe that start-ups no longer have more debt than old firms in the manufacturing and services sample (column 5 in Table R4). Furthermore, the gap in the probability of borrowing between start-ups and older firms becomes larger (column 2 in Table R4).

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<sup>15</sup> We also run the probit and the fractional models, adding some other regressors such as the ratio of tangibles and intangibles to total assets and the ratio of operative margins-to-total assets (columns 3 and 6 of Table R2 in the Appendix).

#### 4. When do start-ups access credit?

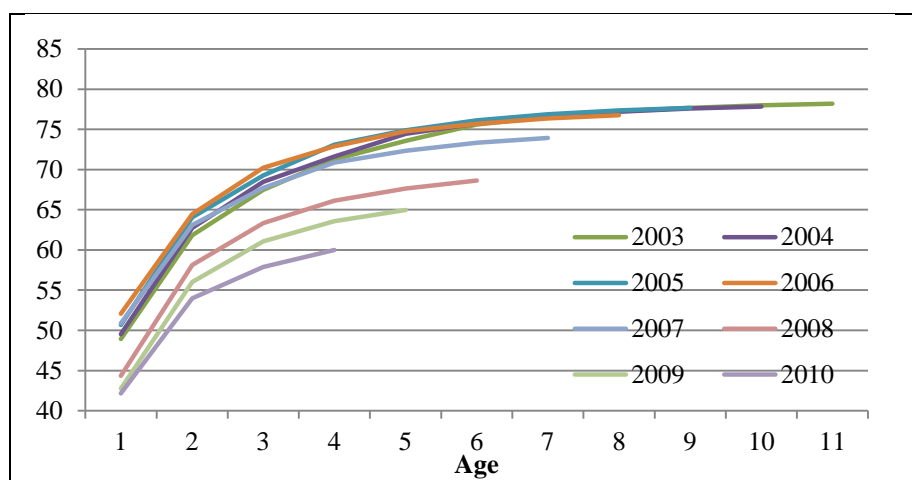
As shown in Section 3 (Table 3), 55 per cent of start-ups use external financial debt during infancy, mostly bank debt. This fact supports the view that banks can mitigate asymmetric information problems and are willing to invest in information acquisition at the beginning of the relationship to extract future rents. A related question is whether firms not accessing credit during infancy are able to do so over time as they build a reputation and a performance record.

We follow start-ups year by year until 2014, the last year in our sample, to verify whether they switch from a non-borrower to a borrower status, considering all types of external financial debt or bank debt only.

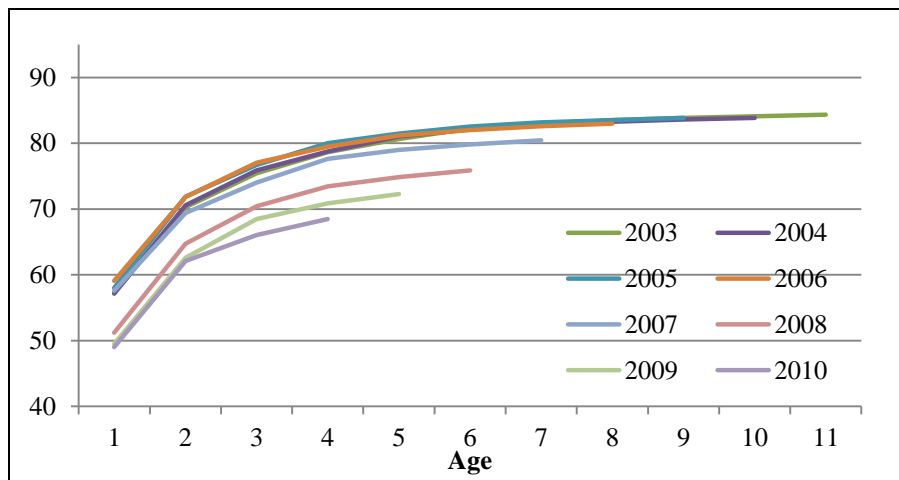
Access to credit is defined not only with reference to outstanding debt as reported in the balance sheets, but also checking whether firms have been granted credit lines. We search for firms in the Credit Register (CR), a reporting system managed by the Bank of Italy containing information on all bank loans granted by banks above a minimum threshold. More details are provided in Table D3 in the Appendix. A firm is deemed to have access to bank financing if we observe either some outstanding loans (in the balance sheet and/or in the CR) or loans granted as reported in the CR, even if undisbursed. We follow the same procedure if a firm has an undisbursed loan from a non-bank financing company, although this is a very infrequent case.

The frequencies of first access to bank loans and to external financial debt are shown in Charts 4A and 4B. Each curve in the charts depicts the cumulative share of firms that have gained access to credit for the first time by a given age, and refers to a cohort. The shape of the curves suggests that the probability of occurrence is highest early in life and declines thereafter.

**Chart 4A: Age of first access to bank debt by cohort**



**Chart 4B: Age of first access to external financial debt by cohort**



Note: The date of first access to credit is based on the combination of information from Cerved and CR. The vertical axis reports the total percentage of new firms that access credit for the first time by the age indicated on the horizontal axis.

The plots show that over time a small additional share of firms gains access to bank loans and external financial debt in each additional year of life. Considering the first three cohorts, observed for nine years or more, 78 per cent of firms eventually use loans from banks and 84 per cent borrow from external sources.<sup>16</sup>

We note that there is a non-negligible share of firms that never borrow within the sample period. This finding is consistent with evidence from the United States showing that about one in five small firms do not use any credit, and from other analyses on Italian micro-firms (De Mitri et al., 2013).<sup>17</sup>

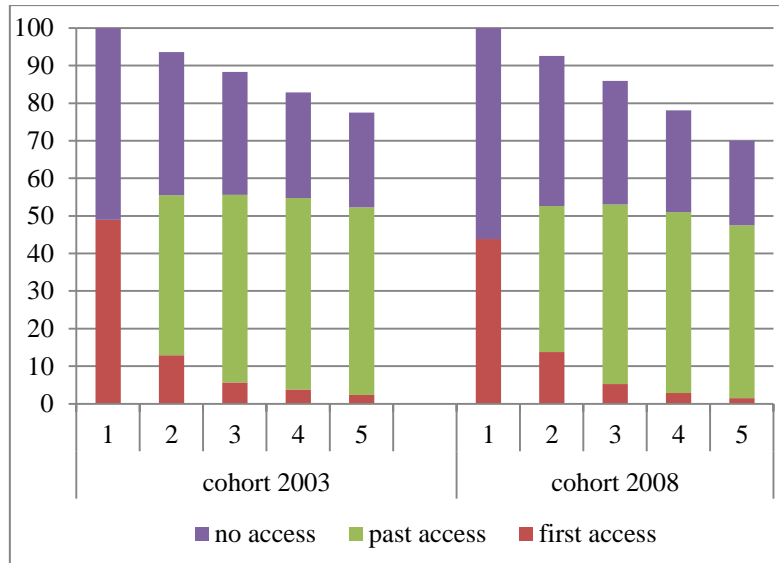
The result could be partly driven by exits of firms since access over time can only be observed for surviving firms. We verify that this is not the case by analysing year by year the share of observed firms by their financing status. At each age, a firm can fall into one of the following categories: i) firms having accessed bank financing at least once before that age; ii) firms that access bank financing for the first time at that age; and iii) firms that have not accessed bank financing yet. Chart 5 shows the percentages of firms observed at each age, in each status, for two cohorts.

The chart shows that there is a share of firms that never borrow from banks, even after many years of activity.

<sup>16</sup> The figure for banks is slightly higher than the one in Table 4 because some firms have access to credit even before age one, but report zero bank debt in their first balance sheet at age one.

<sup>17</sup> Cole and Sokolyk (2017) find that around 20 per cent of US start-ups are 100 per cent equity financed; tracking these firms over the first five years of their life shows that the portion of those reporting zero debt remains relatively constant. In our sample the share of firms with no external debt is lower but we only consider incorporated entities while Cole and Sokolyk (2017) also include sole proprietorships and partnerships, typically smaller firms.

**Chart 5: Access to bank loans for surviving firms**



Note: percentage points; one-year-old start-ups = 100. At each age the share of firms in the three categories is calculated as a proportion of the total number of firms observed at 1 year of age; in the years after year 1, the proportion is lower than 100 owing to the exit of firms from the sample.

Considering Charts 4A and 4B, we note that in the post-crisis years the curves shift downwards, showing that the percentage of firms that have access to external financial debt for the first time, by a given age, is lower than in the pre-crisis years, not only when firms are one year old, as shown in Section 3, but also later on. For example, at age five the gap between the 2003 and 2008 cohorts is about 7 percentage points for access to bank loans, and 6 percentage points for external financial debt.

A quantitative assessment of the average gap between the pre-crisis and post-crisis cohorts – purged of differences in firm characteristics – can be obtained by regression analysis. We estimate two pooled cross-section probit models, one for bank credit and one for external financial debt, flagging the firm-year observations that switch from non-borrowing to borrowing for the first time as ones, and as zeros if they do not.<sup>18</sup>

The regression includes dummies identifying the post-crisis cohorts (pre-crisis is the excluded category) and firm age. The coefficients of the interaction terms between the post-crisis dummy and the age dummies quantify the difference between pre- and post-crisis first access to bank debt/external financial debt at each age.

<sup>18</sup> We follow Shumway (2001) and estimate the model by pooling yearly observations for each firm, and clustering standard errors at firm level; the firm remains in the dataset until the dependent variable switches to 1 for the first time, after which it exits the sample. This approach is equivalent to estimating a discrete-time hazard model of the conditional probability of getting credit at a particular age given that the firm has not accessed credit before.



The other explanatory variables are the same as those of the probit and fractional models discussed in the previous section. Details on the estimated equation and results are shown in Table R6.

The results show that there is a negative and statistically significant gap between pre- and post-crisis start-ups in the probability of accessing both bank credit and external financial credit at each age. The estimated difference between the pre- and post-crisis cohorts in the probability of accessing bank credit at age one is 5 percentage points, consistent with the estimates of our main model (Table R1).

We also compute the predicted share of firms that have access to bank credit/external financial debt by age five for the pre- and post-crisis cohorts (reported at the bottom of Table R6). The difference is 6 percentage points for access to bank debt, slightly higher than that estimated during infancy, meaning that there is no catching-up as start-ups age.

## 5. Conclusions

Our analysis on the financing of start-ups in Italy documents that external financing sources are important, as found by studies on other countries. During infancy, 55 per cent of firms receive some financial resources from intermediaries, most of which are banks (48 per cent). The number of start-ups using external loans from banks and other intermediaries increases as they age, but around 16 per cent of them have never used either of these sources even by their tenth birthday.

We show that during the post-crisis period (2008-2010), the probability that a start-up uses any bank credit, controlling for its characteristics, is 5 percentage points lower than before the crisis, an economically significant effect when assessed against the pre-crisis average of 50 per cent. The results are qualitatively similar when we analyse the share of assets funded by bank debt, which declines by 2.6 percentage points with respect to the pre-crisis average of 18 per cent. We also follow start-ups over time and find that the gap in the probability of using both bank and non-bank debt is persistent as firms become older.

The decline in the frequency and quantity of external financing of start-ups, particularly bank loans, could reflect different factors. One of these could be a drop in the demand for borrowing by start-ups, given their weaker growth prospects during hard times. A second one is a negative credit supply shift, implying higher cost and/or lower availability of credit for start-ups, typically small and opaque businesses. A third factor could be that the tighter credit supply conditions documented by other studies might have worked as a selection mechanism, such that on average the start-ups that we actually observe are those that need less credit.

In the latter two cases, policy interventions aimed at supporting access to external finance for viable new businesses, for example the provision of public guarantees, and measures incentivizing non-bank lenders, could be beneficial.

## References

- Albareto, G. and P. Finaldi Russo, 2012. Fragilità finanziaria e prospettive di crescita: il razionamento del credito alle imprese durante la crisi. Bank of Italy Occasional papers, n. 127.
- Benston, G. and C.W. Smith, 1976. A transaction cost approach to the theory of financial intermediation. *Journal of Finance* 31(2): pp.215-231.
- Berger, A. N. and G. F. Udell, 1998. The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle. *Journal of Banking and Finance* 22: pp. 613-673.
- Biais, B., and C. Gollier, 1997. Trade Credit and Credit Rationing. *Review of Financial Studies* 10(4): pp. 903–937.
- Bonaccorsi di Patti, E., and E. Sette, 2016. Did the securitization market freeze affect bank lending during the financial crisis? Evidence from a credit register. *Journal of Financial Intermediation* 25: pp. 54-76.
- Carbó-Valverde S., F. Rodriguez-Fernandez, and G.F. Udell, 2016. Trade Credit, the Financial Crisis, and SME Access to Finance. *Journal of Money, Credit and Banking* 48(1): pp. 113-143.
- Cingano, F., F. Manaresi, and E. Sette, 2016. Does Credit Crunch Investment Down? New Evidence on the Real Effects of the Bank-Lending Channel. *Review of Financial Studies* 29(10): pp. 2737-2773.
- Cole, R. A., and T. Sokolyk, 2017. Debt Financing, Survival, and Growth of Start-Up Firms. *Journal of Corporate Finance*, forthcoming.
- De Mitri, S., A. De Socio, P. Finaldi Russo, and V. Nigro, 2013. Le microimprese in Italia: una prima analisi delle condizioni economiche e finanziarie (Micro-Enterprises in Italy: A First Analysis of Economic and Financial Conditions), Bank of Italy, Occasional Paper 162.
- Diamond, D.W., 1984. Financial intermediation and delegated monitoring. *Review of Economic Studies* 51(3): pp.728-762.
- Emery, G.W., 1987. An Optimal Financial Response to Variable Demand. *Journal of Financial and Quantitative Analysis* 22(2): pp. 209–225.
- Farinha, L., 2005. The survival of new firms: impact of idiosyncratic and environmental factors. *Financial Stability Report*, Banco do Portugal.

- Gertler, M., and S. Gilchrist, 1994. Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms. *Quarterly Journal of Economics*, 109(2): pp. 309–340.
- Gourio F., T. Messer, and M. Siemer, 2016. Firm Entry and Macroeconomic Dynamics: A State-level Analysis. Federal Reserve Bank of Chicago, WP 2016-01.
- Haltiwanger, J., R.S. Jarmin, J. Miranda, 2013. Who creates jobs? Small versus large versus young. *Review of Economics and Statistics* (95): pp. 347-361.
- Huynh, K.P., R. J. Petrunia, and M. Voia, 2012. Duration of new firms: The role of startup financial conditions, industry and aggregate factors. *Structural Change and Economic Dynamics* 23: pp. 354-362.
- Jain, N., 2001. Monitoring Costs and Trade Credit. *Quarterly Review of Economics and Finance* 41(1): pp. 89–110.
- Leland, H.E. and D.H. Pyle, 1977. Informational asymmetries, financial structure and financial intermediation. *Journal of Finance* 32(2): pp.371-387.
- Myers, S.C. 1977, Determinants of capital borrowing. *Journal of Finance Economics* 5: pp. 5147-5175.
- Myers S.C. and N. Majluf, 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13: pp. 187-221.
- Petersen, M., and R. Rajan, 1994. The Benefits of Lending Relationships: Evidence from Small Business Lending. *Journal of Finance* 49: pp. 3-37.
- Petersen M., and R. Rajan, 1997. Trade Credit: Theories and Evidence. *The Review of Financial Studies* 10(3): pp. 661–691.
- Robb, A., and D. T. Robinson, 2014. The Capital Structure Decisions of New Firms. *Review of Financial Studies* 27(1): pp. 153-179.
- Siemer, M., 2016. Firm Entry and Employment Dynamics During the Great Recession. Federal Reserve Board, mimeo.
- Shumway, T., 2001. Forecasting bankruptcy more accurately: A simple hazard model. *The Journal of Business* 74: pp. 101-124.

## Regression Results

**Table R1: Determinants of external financing at age one**

The table reports the average partial effects from: i) pooled cross-section probit models of the probability of having bank or external financial debt; and ii) fractional probit models of the ratio of bank financing or external financial debt to total assets; the two models are estimated separately. Total assets, tangible and intangible fixed assets, and the dummy for no revenues refer to the balance sheet when firms are one year old. Standard errors clustered at firm level. \* p-value<0.01, \*\* p-value<0.05, \*\*\* p-value<0.01.

Dep. Variable:	Bank debt		External financial debt	
	Probit Y=1 if debt>0	Fractional Debt/Assets	Probit Y=1 if debt>0	Fractional Debt/Assets
Cohort_2004	-0.003	-0.000	-0.008***	-0.003*
Cohort_2005	0.000	0.004***	-0.007**	-0.002
Cohort_2006	0.012***	0.016***	0.001	0.008***
Cohort_2007	0.011***	0.013***	-0.005	0.002
Cohort_2008	-0.036***	-0.013***	-0.054***	-0.029***
Cohort_2009	-0.045***	-0.020***	-0.067***	-0.040***
Cohort_2010	-0.048***	-0.021***	-0.070***	-0.041***
Spa	-0.096***	-0.055***	-0.063***	-0.051***
Srl-single owner	-0.071***	-0.031***	-0.038***	-0.017***
Cooperative	-0.059***	-0.032***	-0.046***	-0.024***
Dummy 2nd quartile of assets	0.169***	0.052***	0.181***	0.061***
Dummy 3th quartile of assets	0.297***	0.096***	0.308***	0.108***
Dummy 4th quartile of assets	0.426***	0.161***	0.436***	0.181***
Tangible Fixed Assets/Assets 0-25%	0.093***	-0.015***	0.093***	-0.020***
Tangible Fixed Assets/Assets 25-50%	0.163***	0.026***	0.173***	0.036***
Tangible Fixed Assets/Assets 50-75%	0.151***	0.056***	0.160***	0.073***
Tangible Fixed Assets/Assets >75%	0.125***	0.082***	0.127***	0.095***
Intangible Fixed Assets/Assets	0.050***	0.034***	0.095***	0.081***
Dummy Sales=0	-0.056***	0.010***	-0.043***	0.022***
Interaction quartile of assets# cohort dummies	YES	YES	YES	YES
Industry and region dummies	YES	YES	YES	YES
Predicted baseline: cohort_2003	0.487	0.158	0.570	0.202
Observed baseline: cohort_2003	0.486	0.161	0.566	0.204
Number of observations	361,016			

**Table R2: Comparison between use of bank debt  
by start-ups and old firms**

The table reports the average partial effects from a pooled cross-section probit model, and from a fractional probit model of the ratio of bank financing to total assets. The year dummies refer to the balance sheet year; for new firms this is the balance sheet when they are one year old. The baseline year is 2004. Standard errors clustered at firm level. \* p-value<0.01, \*\* p-value<0.05, \*\*\* p-value<0.01.

Model	Probit: Y=1 if Bank Debt>0			Fractional Regression: Bank Debt/Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy new firm	-0.125***	-0.021***	-0.036***	-0.014***	0.023***	0.020***
Average effect for old firms at year:						
D2005	-0.002***	-0.011***	-0.010***	-0.001***	-0.005***	-0.004***
D2006	0.000	-0.018***	-0.016***	-0.000	-0.007***	-0.006***
D2007	0.006***	-0.023***	-0.019***	0.005***	-0.006***	-0.004***
D2008	0.011***	-0.027***	-0.022***	0.002***	-0.012***	-0.010***
D2009	0.003***	-0.043***	-0.039***	-0.001**	-0.017***	-0.018***
D2010	0.006***	-0.040***	-0.036***	-0.001*	-0.017***	-0.019***
D2011	0.012***	-0.037***	-0.033***	-0.001***	-0.019***	-0.020***
newfirm*D2004	-0.112***	-0.029***	-0.039***	-0.010***	0.019***	0.017***
newfirm*D2005	-0.103***	-0.020***	-0.030***	-0.006***	0.025***	0.023***
newfirm*D2006	-0.096***	-0.011***	-0.021***	-0.001	0.031***	0.029***
newfirm*D2007	-0.088***	0.003	-0.010***	0.007***	0.042***	0.040***
newfirm*D2008	-0.102***	0.002	-0.015***	0.001	0.041***	0.037***
newfirm*D2009	-0.153***	-0.027***	-0.048***	-0.028***	0.014***	0.010***
newfirm*D2010	-0.167***	-0.039***	-0.061***	-0.037***	0.005***	0.002
newfirm*D2011	-0.183***	-0.047***	-0.072***	-0.040***	0.004***	0.000
Sector, geographic area, legal form dummies	YES	YES	YES	YES	YES	YES
Size classes	NO	YES	YES	NO	YES	YES
Other firms controls (Table R1)	NO	NO	YES	NO	NO	YES
Number of observations				3,770,450		
Observed baseline: cohort of 2003 start-ups – 2004 balance sheet		0.49			0.16	
Observed baseline: old firms – 2004 balance sheet		0.62			0.18	

**Table R3: Comparison between use of external financial debt by start-ups and old firms**

The table reports the average partial effects from a pooled cross-section probit model, and from a fractional probit model of the ratio of external financial debt to total assets. The year dummies refer to the balance sheet year; for new firms this is the balance sheet when they are one year old. The baseline year is 2004. Standard errors clustered at firm level. \* p-value<0.01, \*\* p-value<0.05, \*\*\* p-value<0.01.

	Probit: Y=1 if External Financial Debt>0			Fractional Regression: External Financial Debt/Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy new firm	-0.120***	-0.019***	-0.035***	-0.015***	0.024***	0.021***
Average effect for old firms at year:						
D2005	-0.005***	-0.013***	-0.013***	-0.006***	-0.009***	-0.009***
D2006	-0.006***	-0.022***	-0.020***	-0.007***	-0.014***	-0.014***
D2007	-0.003***	-0.029***	-0.025***	-0.004***	-0.015***	-0.013***
D2008	-0.000	-0.036***	-0.031***	-0.010***	-0.025***	-0.023***
D2009	-0.013***	-0.057***	-0.053***	-0.017***	-0.034***	-0.035***
D2010	-0.014***	-0.058***	-0.055***	-0.019***	-0.037***	-0.039***
D2011	-0.008***	-0.055***	-0.051***	-0.020***	-0.039***	-0.041***
newfirm*D2004	-0.105***	-0.026***	-0.036***	-0.011***	0.021***	0.017***
newfirm*D2005	-0.099***	-0.018***	-0.029***	-0.005***	0.027***	0.025***
newfirm*D2006	-0.092***	-0.010***	-0.021***	-0.002	0.031***	0.030***
newfirm*D2007	-0.085***	0.002	-0.011***	0.007***	0.043***	0.041***
newfirm*D2008	-0.099***	0.001	-0.016***	0.001	0.042***	0.038***
newfirm*D2009	-0.147***	-0.025***	-0.044***	-0.029***	0.015***	0.011***
newfirm*D2010	-0.162***	-0.037***	-0.058***	-0.040***	0.003***	0.001
newfirm*D2011	-0.178***	-0.044***	-0.067***	-0.042***	0.004***	0.002
Sector, geographic area, legal form dummies	YES	YES	YES	YES	YES	YES
Size classes	NO	YES	YES	NO	YES	YES
Profitability and collateral controls	NO	NO	YES	NO	NO	YES
Number of observations				3,770,450		
Observed baseline: cohort of 2003 start-ups – 2004 balance sheet		0.57			0.20	
Observed baseline: old firms – 2004 balance sheet		0.69			0.22	

**Table R4: Comparison between use of bank debt  
by start-ups and old firms  
(manufacturing and services sectors only)**

The table reports the average partial effects from a pooled cross-section probit and from a fractional probit model of the ratio of bank financing and of external financial debt to total assets. Standard errors clustered at firm level. \* p-value<0.01, \*\* p-value<0.05, \*\*\* p-value<0.01.

	Probit: Y=1 if Bank Debt>0			Fractional Regression: Bank Debt/Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy new firm	-0.148***	-0.040***	-0.068***	-0.031***	-0.000	-0.009***
Average effect for old firms at year:						
D2005	-0.001	-0.009***	-0.007***	-0.001***	-0.003***	-0.003***
D2006	0.001	-0.016***	-0.012***	-0.000	-0.005***	-0.004***
D2007	0.007***	-0.020***	-0.012***	0.005***	-0.004***	-0.000
D2008	0.013***	-0.024***	-0.014***	0.004***	-0.007***	-0.003***
D2009	0.007***	-0.035***	-0.029***	0.002***	-0.010***	-0.010***
D2010	0.011***	-0.029***	-0.025***	0.003***	-0.009***	-0.011***
D2011	0.018***	-0.026***	-0.019***	0.004***	-0.010***	-0.011***
newfirm*D2004	-0.134***	-0.042***	-0.068***	-0.030***	-0.004**	-0.013***
newfirm*D2005	-0.134***	-0.041***	-0.066***	-0.027***	-0.001	-0.010***
newfirm*D2006	-0.131***	-0.035***	-0.061***	-0.026***	0.002	-0.007***
newfirm*D2007	-0.124***	-0.024***	-0.051***	-0.021***	0.009***	-0.000
newfirm*D2008	-0.131***	-0.021***	-0.053***	-0.023***	0.010***	-0.002
newfirm*D2009	-0.166***	-0.043***	-0.074***	-0.040***	-0.005***	-0.014***
newfirm*D2010	-0.177***	-0.053***	-0.082***	-0.043***	-0.008***	-0.014***
newfirm*D2011	-0.192***	-0.062***	-0.095***	-0.044***	-0.008***	-0.016***
Sector, geographic area, legal form dummies	YES	YES	YES	YES	YES	YES
Size classes	NO	YES	YES	NO	YES	YES
Profitability and collateral controls	NO	NO	YES	NO	NO	YES
Number of observations			2,590,600			
Observed baseline: cohort of 2003 start-ups – 2004 balance sheet		0.46			0.13	
Observed baseline: old firms – 2004 balance sheet		0.63			0.16	

**Table R5: Comparison between use of external financial debt  
by start-ups and old firms  
(manufacturing and services sectors only)**

The table reports the average partial effects from a pooled cross-section probit and from a fractional probit model of the ratio of bank financing and of external financial debt to total assets. Standard errors clustered at firm level. \* p-value<0.01, \*\* p-value<0.05, \*\*\* p-value<0.01.

	Probit: Y=1 if External Financial Debt>0			Fractional Regression: External Financial Debt/Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy new firm	-0.140***	-0.034***	-0.059***	-0.031***	0.003***	-0.006***
Average effect for old firms at year:						
D2005	-0.004***	-0.012***	-0.010***	-0.004***	-0.007***	-0.006***
D2006	-0.004***	-0.020***	-0.016***	-0.006***	-0.012***	-0.010***
D2007	0.000	-0.026***	-0.019***	-0.002***	-0.012***	-0.008***
D2008	0.003***	-0.033***	-0.024***	-0.006***	-0.018***	-0.014***
D2009	-0.008***	-0.048***	-0.042***	-0.011***	-0.025***	-0.025***
D2010	-0.007***	-0.047***	-0.043***	-0.013***	-0.026***	-0.029***
D2011	-0.001	-0.044***	-0.038***	-0.012***	-0.027***	-0.028***
newfirm*D2004	-0.122***	-0.032***	-0.055***	-0.028***	0.002	-0.009***
newfirm*D2005	-0.125***	-0.033***	-0.056***	-0.025***	0.005***	-0.005***
newfirm*D2006	-0.121***	-0.028***	-0.051***	-0.025***	0.006***	-0.003*
newfirm*D2007	-0.116***	-0.018***	-0.043***	-0.019***	0.014***	0.003**
newfirm*D2008	-0.124***	-0.017***	-0.046***	-0.021***	0.015***	0.002
newfirm*D2009	-0.160***	-0.037***	-0.066***	-0.040***	-0.003*	-0.011***
newfirm*D2010	-0.172***	-0.048***	-0.075***	-0.045***	-0.008***	-0.013***
newfirm*D2011	-0.187***	-0.057***	-0.086***	-0.044***	-0.006***	-0.014***
Sector, geographic area, legal form dummies	YES	YES	YES	YES	YES	YES
Size classes	NO	YES	YES	NO	YES	YES
Profitability and collateral controls	NO	NO	YES	NO	NO	YES
Number of observations			2,590,600			
Observed baseline: cohort of 2003 start-ups – 2004 balance sheet		0.55			0.17	
Observed baseline: old firms – 2004 balance sheet		0.70			0.20	



**Table R6: Probability of first access to external financing**

The table reports the average partial effects from a pooled cross-section probit model of the probability of first access to external financial debt and to bank financing, defined as 1 if the firm either has bank debt on its balance sheet or is reported in the CR as having been granted credit. Each firm stays in the database with a 0 value until bank debt/external financial debt is observed for the first time; it exits the sample once the dependent variable takes the value 1. Variables based on balance sheet data are one-period lagged. Standard errors clustered at firm level. \*p-value<0.01, \*\*p-value<0.05, \*\*\*p-value<0.01.

Dep. Variable:	First access to bank debt	First access to external financial debt
Cohort>2007	-0.039***	-0.049***
Age_2	-0.147***	-0.164***
Age_3	-0.258***	-0.284***
Age_4	-0.296***	-0.327***
Age_5	-0.326***	-0.367***
Age_1*Cohort>2007	-0.052***	-0.064***
Age_2*Cohort>2007	-0.018***	-0.036***
Age_3*Cohort>2007	-0.033***	-0.024***
Age_4*Cohort>2007	-0.035***	-0.040***
Age_5*Cohort>2007	-0.035***	-0.037***
Spa	-0.031***	-0.013*
Srl-single owner	-0.053***	-0.027***
Cooperative	-0.046***	-0.044***
2nd quartile of assets	0.102***	0.117***
3th quartile of assets	0.190***	0.211***
4th quartile of assets	0.279***	0.313***
Tangible Fixed Assets/Assets 0-25%	0.071***	0.072***
Tangible Fixed Assets/Assets 25-50%	0.113***	0.122***
Tangible Fixed Assets/Assets 50-75%	0.095***	0.103***
Tangible Fixed Assets/Assets >75%	0.053***	0.045***
Intangible Fixed Assets/Assets	0.025***	0.066***
Dummy Sales=0	-0.018***	-0.016***
Industry and Geographic Area dummies	YES	YES
Observed probability for cohort<=2007 and age 1	0.502	0.576
<b>Predicted share of firms with access=1 at age one</b>		
Pre-crisis cohorts (<=2007)	0.464	0.540
Post-crisis cohorts (>2007)	0.411	0.476
<b>Difference</b>	<b>0.053</b>	<b>0.064</b>
<b>Predicted share of firms with access=1 by age five</b>		
Pre-crisis cohorts (<=2007)	0.782	0.872
Post-crisis cohorts (>2007)	0.718	0.817
<b>Difference</b>	<b>0.063</b>	<b>0.056</b>
Number of observations	799,223	710,315

## Statistical Appendix

**Table A1: Volume of financing during infancy (thousands of euros)**

	All firms				For firms with single item>0			
	mean	p25	p50	p75	mean	p25	p50	p75
Equity	61	6	15	38	80	10	18	47
Loans from shareholders	70	0	0	26	170	12	43	146
Total external financial debt	161	0	4	86	293	18	69	250
Loans from banks	136	0	0	60	286	18	68	250
Loans from other financial entities	13	0	0	0	107	8	22	74
Bonds	0	0	0	0	388	6	41	500
Other financial debt (*)	12	0	0	0	314	10	52	241
Trade debt	145	5	34	127	160	10	43	145
Other non-financial debt (**)	57	0	6	31	78	5	15	51
Number of firms	364,149							

Note: unweighted means.

**Table A2: Financial structure ratios during infancy (percentages)**

Ratios	Quartiles of Total Assets				Total firms	Share of firms with positive item
	< 60k	60 - 171k	171 - 468k	> 468k		
	Leverage	49.7	57.5	66.9		
Short-term financial debt/financial debt	28.6	37.4	41.4	42.7	37.8	58.9
Bank debt/financial debt	16.5	31.0	41.3	51.8	35.8	47.7
Shareholder debt/financial debt	21.1	22.1	22.6	20.4	21.6	41.0
Financial interests/EBITDA	34.0	51.1	61.5	76.8	56.7	59.6
Trade credit balance/total assets	-7.4	-7.4	-9.9	-10.3	-8.8	35.4
Number of observations	364,149					

Note: The figures are for one-year old firms; unweighted means. Leverage is defined as the ratio of financial debt to the sum of financial debt and equity. Leverage and financial interest/EBITDA indicators are winsorized at the 99<sup>th</sup> percentile. The trade credit balance-to-total assets ratio is winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles.

**Table A3: Sales, Assets, Paid-in capital**

Year of establishment		Total Sales	Total Assets	Paid-in capital
<i>Manufacturing</i>				
2003-2007	First quartile	106	104	10
	Median	322	262	10
	Third quartile	805	632	30
	Mean	735	608	49
	Number of firms		32,166	
2008-2010	First quartile	104	103	10
	Median	309	254	10
	Third quartile	767	607	27
	Mean	702	608	59
	Number of firms		18,044	
<i>Services</i>				
2003-2007	First quartile	44	50	10
	Median	150	130	10
	Third quartile	430	319	15
	Mean	464	336	31
	Number of firms		150,450	
2008-2010	First quartile	50	50	10
	Median	160	128	10
	Third quartile	446	316	15
	Mean	464	327	31
	Number of firms		91,884	
<i>Construction</i>				
2003-2007	First quartile	26	95	10
	Median	192	266	10
	Third quartile	512	681	20
	Mean	440	615	31
	Number of firms		55,144	
2008-2010	First quartile	50	76	10
	Median	191	197	10
	Third quartile	472	527	15
	Mean	427	519	29
	Number of firms		26,325	
<i>Real estate</i>				
2003-2007	First quartile	0	114	10
	Median	27	389	10
	Third quartile	136	961	30
	Mean	190	842	57
	Number of firms		46,524	
2008-2010	First quartile	0	94	10
	Median	28	362	10
	Third quartile	105	945	30
	Mean	141	846	66
	Number of firms		14,391	

**Table A4: Financing sources as a fraction of total liabilities, by firm size**

	All cohorts 2003-2010				Total firms	Share of firms with value>0 for the specific item
	Ratio to total liabilities (averages)					
	Quartiles of Total Assets					
	< 62k	62 - 175k	175 - 479k	> 479k		
<i>Manufacturing</i>						
Equity	21.7	13.4	10.2	10.3	12.6	87.2
Loans from shareholders	13.4	9.4	7.4	5.8	8.2	34.7
Total external financial debt	10.8	15.9	20.3	24.2	19.3	64.1
Loans from banks	7.9	13.1	17.5	20.9	16.3	58.0
Loans from other financial entities	2.7	2.3	2.1	1.7	2.1	13.6
Bonds	0.0	0.0	0.0	0.0	0.0	0.1
Other financial debt (*)	0.5	0.4	0.6	1.5	0.9	4.6
Trade debt	29.0	37.0	40.7	41.6	38.6	95.8
Other non-financial debt (**)	12.9	13.3	12.0	10.2	11.8	84.6
Number of firms	40,438					
<i>Services</i>						
Equity	19.6	14.1	9.9	9.7	13.8	83.3
Loans from shareholders	14.6	12.9	11.2	8.5	12.2	37.2
Total external financial debt	10.7	15.6	18.6	21.0	15.9	51.2
Loans from banks	7.7	12.1	15.0	16.6	12.4	43.7
Loans from other financial entities	2.8	2.9	2.7	2.1	2.7	12.1
Bonds	0.0	0.0	0.0	0.0	0.0	0.1
Other financial debt (*)	0.4	0.6	1.0	2.3	0.9	3.7
Trade debt	27.9	34.8	40.5	43.7	35.9	92.8
Other non-financial debt (**)	12.6	12.1	11.2	10.0	11.7	74.3
Number of firms	194,343					
<i>Construction</i>						
Equity	27.8	17.3	11.2	7.5	14.1	89.5
Loans from shareholders	12.1	11.6	14.9	15.3	13.8	42.4
Total external financial debt	8.3	12.1	20.0	35.7	21.5	57.7
Loans from banks	5.4	9.2	16.9	32.4	18.4	51.0
Loans from other financial entities	2.7	2.6	2.7	2.5	2.6	12.4
Bonds	0.0	0.0	0.0	0.0	0.0	0.1
Other financial debt (*)	0.4	0.3	0.4	0.8	0.5	2.6
Trade debt	27.6	34.9	33.9	23.4	29.7	90.2
Other non-financial debt (**)	15.2	15.2	14.0	15.1	14.8	76.7
Number of firms	64,519					

				<i>Real estate</i>		
Equity	33.7	23.0	15.4	13.4	18.4	88.2
Loans from shareholders	18.3	28.8	31.6	23.7	25.6	57.8
Total external financial debt	11.4	20.5	33.2	44.1	33.1	61.7
Loans from banks	8.0	15.9	28.3	39.2	28.4	55.5
Loans from other financial entities	3.1	4.2	4.3	3.4	3.7	10.4
Bonds	0.0	0.0	0.0	0.1	0.0	0.1
Other financial debt (*)	0.5	0.5	0.7	1.4	1.0	3.2
Trade debt	21.0	13.6	9.0	7.5	10.8	81.0
Other non-financial debt (**)	9.1	9.3	8.6	9.7	9.3	54.8
Number of firms				49,285		

## Data Appendix

This appendix describes the steps followed to construct the sample using the Cerved archives. The first step was to select non-financial firms that are not part of a holding company, are not owned by general or local government agencies, and are not consortiums of other firms. We obtained more than 560,000 firms established between 2003 and 2010. We required that at least one balance sheet was filed between 2003 and 2014. We then applied the following criteria to exclude firms that are likely to be created by mergers or spin-offs, and firms that were registered but never ran any business. We only kept firms that: i) were less than four years old when they filed their first balance sheet in Cerved; ii) had revenues and total assets below €10 million when they registered; and iii) have had positive revenues and positive assets at least once over the entire sample period. The impact of each criterion on the initial dataset is shown in Table D1.

Another 9 per cent of the sample is lost in our statistics due to the lack of a balance sheet on file at age one. There are 498,675 firms for which this information is available. Their distribution by region, industry and legal type is shown in Table D2.

**Table D1: Sample size**

Year of establishment	Newly registered firms in the Cerved database	Firms with first balance sheet at age<4	Firms with revenues and total assets<€10 million	Firms revenues>0 and assets>0 at least once
	(1)	(2)	(3)	(4)
2003	64,366	62,867	62,027	56,788
2004	71,573	70,144	69,249	63,494
2005	73,805	72,566	71,524	65,553
2006	75,832	74,762	73,678	66,855
2007	76,938	76,066	74,983	67,724
2008	71,936	71,334	70,432	62,691
2009	65,761	65,257	64,400	57,266
2010	67,481	67,021	66,183	58,304
Yearly average	70,962	70,002	69,060	62,334
Total	567,692	560,017	552,476	498,675
Share of initial sample (%)	100.0	98.6	97.3	87.8

**Table D2: One-year-old firms – demographics**

	Number of firms	freq. (%)
Total	455,393	100
<b>By Region</b>		
North West	115,875	25.5
North East	83,491	18.3
Centre	123,741	27.2
South and Islands	126,954	27.9
N.A.	5,332	1.2
<b>By Industry</b>		
Agriculture	6,263	1.4
Accommodation and Food Services	28,840	6.3
Other services	5,906	1.3
Arts, entertainment, recreation	9,206	2.0
Trade	91,746	20.2
Construction	81,469	17.9
Electricity, gas, steam	6,067	1.3
Mining and quarrying	387	0.1
Real estate	60,915	13.4
Information and communication	21,089	4.6
Education	3,792	0.8
Manufacturing	50,210	11.0
Professional, scientific and technical services	34,040	7.5
Human health and social work	8,198	1.8
Transport and storage	16,638	3.7
Administrative and support services	21,211	4.7
N.A.	9,416	2.1
<b>By Legal form</b>		
Joint stock companies	2,628	0.6
Limited liability companies (SRL)	396,070	87.0
Limited liability companies with a single owner	25,268	5.6
Cooperatives	31,427	6.9

Note: Joint-stock companies include both 'società per azioni' and 'società in accomandita per azioni'.

In order to have a more comprehensive measurement of access to credit, we merge the balance sheet data with information contained in the CR to have a detailed picture of the nature of the credit relationships established by new firms. The CR data provides information on outstanding credit, disbursed or undisbursed, granted by Italian banks and non-bank financial companies (intermediaries specialized in leasing and factoring) to resident borrowers. The CR data are therefore a useful complement to the balance sheet figures. A disadvantage of the CR is that it has a reporting threshold of €30,000 for total loans granted and/or disbursed, and guarantees; before 2009 the

threshold was €75,000. Given the small size of firms in our sample and the small amount of bank debt reported in the balance sheets, substantial censoring occurs.

**Table D3: Number of one-year-old firms in Cerved and CR**

Year of balance sheet	Firms only in Cerved		Firms in Cerved and in CR						Total
	Financia debt=0	Financial debt>0	Financial debt=0			Financial debt>0			
			<i>of which</i>	<i>of which</i>		<i>of which</i>	<i>of which</i>		
			<i>d&gt;0</i>	<i>&gt;0</i>		<i>d&gt;0</i>	<i>&gt;0</i>		
2004	9,233	17,290	778	430	705	11,995	11,338	11,711	39,296
2005	10,257	19,034	992	534	898	14,780	13,998	14,497	45,063
2006	10,161	19,290	1,155	635	1,060	16,067	15,185	15,723	46,673
2007	10,212	18,909	1,065	591	975	17,212	16,400	16,892	47,398
2008	11,353	21,569	1,057	608	985	16,760	16,020	16,492	50,739
2009	11,789	21,027	1,141	379	1,072	13,974	11,485	13,750	47,931
2010	11,148	19,771	985	301	924	11,907	9,766	11,697	43,811
2011	11,791	19,844	858	260	820	10,745	8,898	10,618	43,238
Total	85,944	156,734	8,031	3,738	7,439	113,440	103,090	111,380	364,149
Share of total (%)	24%	43%	2%	1%	2%	31%	28%	31%	100%

Note: Firms providing information on financial debt.

Around 33 per cent of start-ups are reported in the CR. We note that 2 per cent of firms (around 10,000 entities) do not report any bank debt in the balance sheet but have a credit relationship reported in the CR. In half of these cases credit has only been granted but there is no disbursed amount so the balance sheet information is correct. In the other half some credit has been disbursed. As shown in Table D3, this share does not increase substantially in 2009 as a result of the lower minimum threshold. A possible explanation is that credit contracted in 2009 and subsequent years, moving more firms below the threshold, other things being equal.