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# Non-bank finance for firms. The role of private equity funds in north-western Italy

Daniele Coin<sup>1</sup>, Valerio Vacca<sup>2</sup>

## Abstract

Using fund-, firm- and bank-level data we investigate the investments of private equity (PE) funds in the north-western regions of Italy. Both the private equity fund managers and the PE investments are heavily concentrated in this most developed area of the country. The average size of the portfolios is small by international standards and their concentration by firm has been growing after the 2008 crisis. The average duration of investments is rather short (about 3.4 years) and just 10 per cent of them target firms which are both young and innovative. PE investments are more significant for north-western firms than for those in the rest of the country, relative to traditional bank credit. We find that being participated by a PE fund increases the amount of credit obtained by the target firm and (weakly) reduces its cost. However, this effect is exclusively related to the entry of the fund in the firm's capital, as it fades away as soon as the fund exits from the capital, thus suggesting a weak signalling role of PE towards banks.

**JEL classification:** G23, G24, G28, G32.

**Keywords:** private equity, fund portfolio.

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# 1 Introduction and motivation<sup>3</sup>

Italian firms have been traditionally highly dependent from bank credit. A more balanced development of the financial system might entail, among other things, a larger role for non-bank financial support of firms' development than it currently has. Within non-bank finance, a prominent task is played by private equity. Private equity (PE) funds receive capital contributions from private or public investors and supply them to companies in order to support them with equity in different phases of their life.

In particular, private equity is considered an important tool in fostering the creation of new businesses and the growth of existing ones, especially in areas related to new technologies (ICT, biotechnology, etc.) where information asymmetries happen to be particularly strong. In the latter case, PE is conventionally labelled as venture capital (VC). The development of private equity in Europe and Italy still lags behind that of more market-oriented systems, like the US or the UK, but also behind other European countries. The role of these investors could be particularly beneficial in the country areas which are most developed, both from an industrial and a financial point of view, like the north-western regions. In spite of the importance of the topic, comprehensive evidence on the role played by the PE industry in Italy is still insufficient.

This study tries to fill informative gaps about the relevance and the type of investments carried out by private equity funds, particularly in the North-West of Italy. A specific focus will be devoted to the impact of private equity provision on credit granted by banks to the target firms, in terms of availability, bank-firm relationships, and the cost of credit. The interaction between bank credit and private equity has been the object of several studies (Fang et al., 2013; Smith, 2011; Drucker and Puri, 2006; Winton Yerramilli, 2008; Berger and Schaeck, 2006; Ueda, 2004; Hellman et al., 2008) and is of particular relevance in Italy, a relatively bank-centred financial system.

The main contribution of the paper is to use fund- and firm-level data which have not yet been employed to describe the PE industry in the most financially developed area of the country. Micro-data are retrieved from the mandatory reports to the Bank of Italy from financial firms managing the Italian private equity funds (including VC funds) and the credit information from the Central Credit Register. These data provide a thorough portrait of the financial operations carried out by Italian financial companies managing private equity funds. Previous studies in the field, by contrast, mainly rely on information retrieved through questionnaires submitted to the market players, or through hand-collected data sets (see, for example for Italy, Bank of Italy (2009) and Granturco and Miele (2011)).

The rest of the paper is organised as follows. Paragraph 2 briefly describes the framework of the analysis; paragraph 3 introduces the data bases; paragraph 4 summarizes the main features of the investments by Italian PE funds, while paragraph 5 focuses on the effect of PE intervention on the bank-firm relationships of the target companies. The final section draws some conclusions.

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<sup>3</sup> The opinions are those of the authors and do not involve the Bank of Italy. We wish to thank ... for useful comments, while retaining the responsibility for residual errors.

## 2 Background

Private equity includes two types of investment in firms' capital: the first (venture capital operations) addresses young companies with high growth prospects, which would hardly be able to attract investors through traditional fund-raising. For these companies it is often difficult to borrow from banks, since the early stages of growth of a firm feature a high risk – high return profile and a shortage of assets to be used as collateral for loans. The second type of PE operations entails investment into larger and more mature companies, often characterized by abundant financial resources. Within this second category, 'expansion' operations aim at consolidating the development of mature companies; 'buyouts' often involve a change of directors, e.g. at the time of the generational transfer in family-owned businesses, and are undertaken with the objective to improve operational efficiency and management. Operations directed to the 'stock market' aim at accompanying the target firm towards an initial public offering (IPO), with a view to floating its capital on the market, and enhancing in a structural way the company's access to equity. Finally, 'turnaround' operations are aimed at restructuring trailing companies.

Private equity is poorly developed in Italy. According to Popov and Rosemboom (2009), in the period 2001-2004 the aggregate private equity investment in Italy was less than two thirds of the corresponding amount for Germany and just a third of the corresponding investment in UK. In principle, firms from north-western regions of Italy should be better placed to take advantage from these non-bank sources of finance. Both innovative firms and larger firms are more widespread in these regions, which feature a comparatively more advanced industrial sector and a larger average firm size. According to the most recent data from the Istat's ASIA data base, in 2010 firms belonging to the technologically advanced sectors<sup>4</sup> accounted for 4.4 per cent of all firms established in the North-West, and for 13.9 per cent of the employees. Both percentages are higher than the country average (3.6 and 11.3 per cent, in the order). As far as the firm size is concerned, firms of 500 employees and beyond employed 20.9 per cent of total workforce in 2010, against a national average of 16.6.

In fact, the Italian private equity activity appears to be more intense in the North-West. According to Eurostat data, at the end of 2011, replacement and expansion investments accounted for 0.152 percent of the GDP of the North-West, twice the Italian average (0.078 per cent). However, as far as early stage operations are concerned, i.e. those which are more likely to be addressed to small innovative companies, the rate drops to 0.002 percent of GDP in the North-West, less than half the country-wide average (0.005).

From the supply side, the Italian finance industry is hugely concentrated in these regions (Rossi and Scalise, 2013). All in all, both demand and supply-side factors suggest that the role of private equity should be more significant in financially supporting the development of firms in this area than elsewhere. In paragraph 4, therefore, we will try to understand whether the portfolios of Italian PE funds are actually addressed to north-western regions more than to other country areas and which features they display.

In this paper, however, we are also interested in detecting the effect of the private equity intervention onto the credit relationships of the target firm (Vacca, 2013). The Italian financial industry is strongly concentrated on the banking system, and therefore the link between non bank-financing of firms and traditional bank credit (amount and cost of credit, number and strength of bank relationships) is a key

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<sup>4</sup> The sorting of industries according to their technological content is inspired by the taxonomy proposed by the OECD (see OECD, 2003, and the methodological appendix).

factor to the development of the firm, even in presence of a supply of capital by non-bank investors. In paragraph 5, therefore, we will tackle the issue of the effect of a PE fund commitment on the amount and cost of credit obtained by the target firm.

### 3 The data

The data employed in this study are primarily retrieved from reports that firms managing Italian closed-end funds must submit to the supervisory authority (the Bank of Italy) on a half-yearly basis.<sup>5</sup> The advantage of using this data base stems from the fact that it records all the stakes in a firm held by the Italian PE funds (including the VC funds). The drawback of the data base is that it disregards non-fund investors and investors not established in Italy, and that the data are primarily collected for administrative, not research-related, purposes.

Supervisory reports from fund managers can be jointly analysed with other firm-level information on target firms, namely that from the Italian central balance sheet register (Cerved/Cebi), and data on quantity and cost of credit extended to firms by banks and other financial institutions (from the central credit register, CCR, and the Bank of Italy's survey data on interest rates). The latter sources allow assessing the effects of a PE injection on the subsequent credit history of the target firm.

During the reference period (December 2003 to December 2012),<sup>6</sup> supervisory data report operations by 127 funds, out of which about 20 can be labelled as venture capital funds.<sup>7</sup>

In addition, we use data from the Italian Central Credit Register (CCR) and the Bank of Italy's survey on loan interest rates. The CCR is an information system on the debt of the customers of the banks and financial companies supervised by the Bank of Italy. Banks and financial companies are required to report all their loans in excess of a given threshold (75,000 euro until December 2008, 30,000 euro afterwards; the threshold does not apply to non performing loans). The Bank of Italy's survey on loan interest rates reports data on interest rates and fees applied to loans by a large sample of over 200 banks, largely representative of the whole credit market. Only loans above the 75,000 euro threshold are reported.

### 4 The investments of private equity funds

#### *4.1. The supply side. The industry of the private equity funds in the North-West*

Like a large part of the Italian financial system, the PE funds industry is highly concentrated in the North-West regions. Within the 127 funds reporting to the Bank of Italy in the period December 2003 – December 2012, more than two thirds were managed by firms established in the North-West (88

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<sup>5</sup> For references see the methodological appendix.

<sup>6</sup> Reports after June 2012 are not fully homogeneous with previous data, due to changes in the reporting guidelines.

<sup>7</sup> The classification of 'VC-devoted' funds has been done through information provided by the AIFI, the Italian private equity and venture capital association.

funds).<sup>8</sup> Among these, however, only 6 funds could be classified as specifically devoted to venture capital operations, less than one third of such funds across the country.

In terms of total portfolio, fund managers established in the North-West accounted for 81 per cent of the total PE funds' portfolio as at end 2012, a share which has been slightly declining in recent years after peaking at 88 per cent at end 2006. The average PE fund reported a total portfolio of 48.5 million at end 2012 (fig. 1a), with an average single investment of 12.5 million. Even though both amounts are larger by about 20 per cent with respect to other such funds in other regions, the size of north-western funds appears to be rather small compared to the industry average values in other countries: with reference to the US market, for instance, Humphery-Jenner (2011) documents an average fund size as large as 1,056 mln USD in 2007 vintage funds (that is, more than 20 times the corresponding figure for north-western funds at that time). According to EVCA, the European sector organisation, in 2013 funds were considered 'mid-size' in the 250 to 1,000 eur million size. The minimum efficient size of PE funds – and of VC-devoted funds in particular – is still an open question; however, the minimum viable scale of operations has been recently identified at a much higher threshold than the Italian and north-western average figures (European Commission, 2012). This might be an issue in particular for public sponsored funds, which display a lower-than-average size.

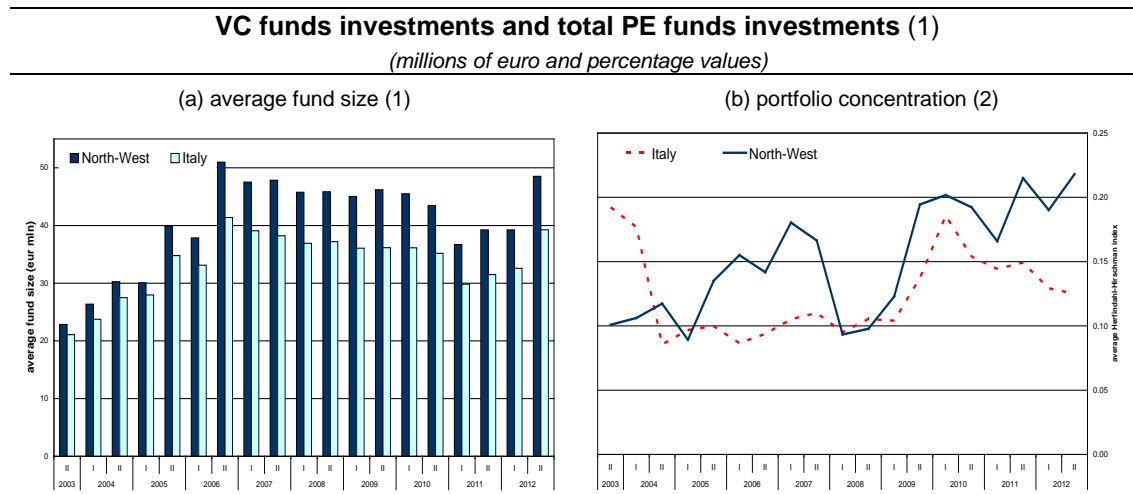
In spite of the diversification advantages stemming from a large portfolio, the relatively small scale of funds could not be necessarily a drawback. Humphery-Jenner (2011) show that a poor performance of large funds is driven by investments in small firms: investments in small start-ups are more easily initiated by small funds, and therefore the role in venture capital of PE funds would be fostered by a relatively small portfolio. The activity of these specialised investors often involves industry-specific skills, especially when funds focus on small, young and high technological firms. Therefore, notwithstanding the usual risk diversification benefits, investments excessively dispersed might lead to *limited attention* issues, which explains the better performances often achieved by managers focussed on a few firms or sectors.

To further investigate the issue, we have therefore computed a Herfindahl-Hirschman index for the portfolios of each PE fund. The index accounts for the whole distribution of investments within the portfolio, and ranges from 0 (maximum dispersion of the investments) to 1 (maximum concentration). Under this respect, it is remarkable that, in spite of a larger size, the degree of concentration of north-western funds, as measured by the Herfindahl-Hirschman (HH) index of their investments, in recent years has become larger than the Italian average (with a normalised HH index of 0.22 at end 2012; fig. 1b). This suggests that larger portfolios do not necessarily imply excessive diversification of the investments by north-western closed-end funds and this could therefore represent a strategic advantage for the latter, due to stronger focus and lower limited attention issues.

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<sup>8</sup> In this paper only the investments whose target firm could be identified based on the available data bases are considered. This entails different figures from those reported in similar analysis, without substantial changes in the findings. See the methodological appendix for details.

Figure 1



Source: Bank of Italy supervisory reports.

(1) Average portfolio of private equity funds at the end of the reference period in millions of euro. – (2) Average Herfindahl-Hirschman index of concentration of the investments within private equity fund portfolios. The range of variation of the index is 0 (minimum concentration) to 1 (maximum concentration).

#### 4.1 Features and relevance of the PE operations on behalf of north-western firms

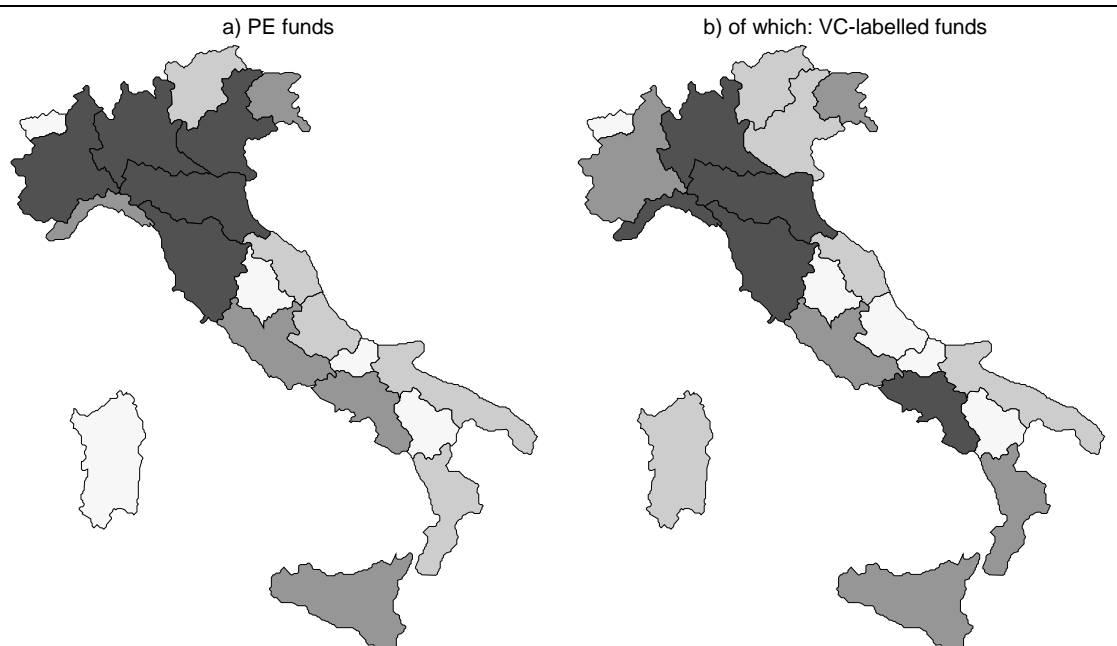
In this section, we look at the PE investments having north-western firms as a target, with a view to outlining the characteristics of the PE operations in these regions of the country, regardless of the establishment of the originating fund manager.

At the end of 2012 stakes in north-western firms accounted for three quarters of the value of the whole portfolio held by Italian PE closed funds (fig. 2a). Firms established in Liguria accounted for a larger share of investments by VC-devoted managers than on overall PE investments, whereas Piemonte attracted a smaller share of investment from VC funds than it did from other PE funds (fig. 2b).

The share of PE flowing to north-western firms, which declined after the onset of the crisis in 2008, has increased again in 2012. Over the whole period 2003-2012, the share of investments flowing to the north-western firms has been about 20 percentage points lower than the share of funds held by north-western managers. In other words, the north-western fund managers have also supported to some extent firms headquartered in other areas of the country. This geographical diversification, however, has displayed a decreasing trend over the decade, and a significant reduction in 2012. Moreover, the net supply of investments from north-western fund managers to the rest of the country is lower than within the traditional banking business, suggesting that for the private equity business the supply and the demand are rather 'self-contained' within the north-western boundaries.

Figure 2

### VC funds and total PE investments. Distribution by region of target firm (1)



Source: Bank of Italy supervisory reports.

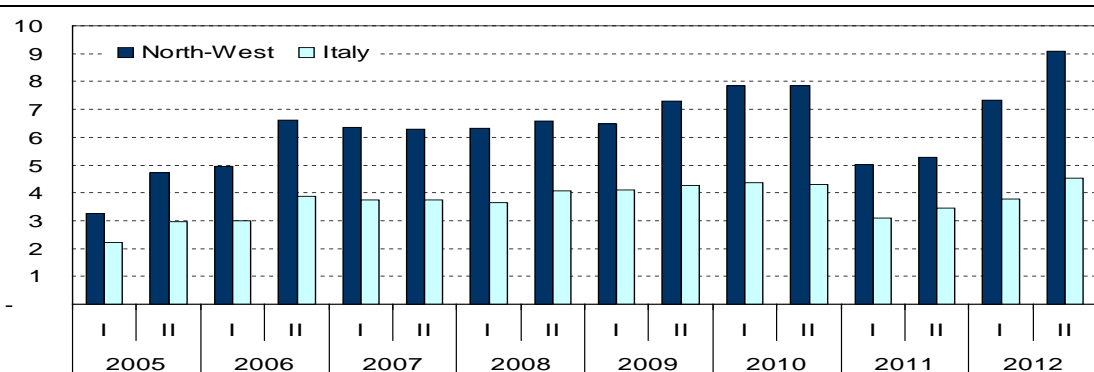
(1) Share of investments over total portfolio of Italian PE funds (and VC-labelled funds among them) by region of the target firm, as at December 2012. Darker colours correspond to higher quartiles among the Italian regions with respect to the overall portfolio directed to firms of the relevant region.

Comparing PE amounts to credit granted by banks to corporations (i.e. firms which are potentially the target of PE operations), funds flowing from PE funds to north-western firms represented 0.91 per cent of the credit granted the same type of firms at end 2012, a much higher percentage than for other regions (0.45 per cent): the main finding of this benchmarking exercise is that PE was more important for north-western firms than in the rest of the country as a source of non-bank finance. The share of PE to bank credit has started to increase again in most recent years, after a drop subsequent to the financial turmoil (fig. 3).

Figure 3

### Private equity investments and bank credit (1)

(Ratio of the value of PE funds portfolios directed to resident firms to bank credit used by corporations ; / 1000)



Source: Bank of Italy supervisory reports.

(1) Data by region of the target/borrower firm.

Over the whole period end-2003 to end-2012, 541 operations had involved north-western firms. The average amount of these operations was rather large (9.7 million, compared to the country average of 7.5), whereas their duration was about 3.4 years (the same as the average in other areas). Durations appeared to be higher in leveraged buy-outs (4 years), whereas they are particularly short in most risky op-

erations, namely early stage and turnaround interventions. This is apparently at odds with the expectation that younger ventures need to be assisted for longer periods, but at the same time it confirms some previous findings on other markets: Cumming and Johan (2010), with reference to venture capital operations, record similar investment duration (about 3 years in the US, 2.4 in Canada) and argue that, for an early stage firm, investment has a longer expected duration if the firms succeed, whereas in the case of failure (write-off), not unlikely in this high-risk segment, the duration could be shorter than for other investments.<sup>9</sup>

According to self-reported categories, only 1.2 per cent of the total amount of PE investments were directed to north-western early stage firms (but see also the next paragraph on the issue), whereas 19.7 per cent targeted expansion operations, and 39.0 leveraged buyouts; the shares devoted to stock-market oriented operations or to turnaround operations were residual. Although this partition stems from the taxonomy of the operations provided by the fund manager itself, it appears that only a minor part of the interventions is aimed at financially supporting young firms which could suffer significant hurdles in securing traditional bank credit. Both buyouts and expansion operations have shrunk their weight over the whole portfolio during the 2003-2012 period, but this was on behalf of 'other' (not specified) types of operations, rather than on behalf of operations of early stage or turnaround or stock-market directed.

With reference to the ownership of the fund, the joint partnerships of private and bank-related managing firms carry out the most sizeable investments (20 million on average over the decade 2003-2012, twice the country average for the same type of fund managers; table a1). Privately owned fund managers rank second with an average 11 million per operation, whereas banking affiliated funds, which in principle should be endowed with larger financial resources display a below-the-average investment (6.4 million). Public funds display the smallest amounts (below 2 million per investment), which might depend from the fact that these public-sponsored fund managers mainly address venture capital operations in rather small companies.

#### *4.2 Investing on high-tech industries and on young firms*

Among the features of the PE investment, a relevant issue is the type of firms targeted by the PE fund manager. PE operations can be very heterogeneous, and therefore in table a2 we report the composition of the funds portfolios by age of the firm at the time of first PE investment, and by sector of economic activity. Since there is a specific interest to detect the role of private equity in supporting the competitiveness of the entrepreneurial system, in particular in the North-West regions where innovative firms are more relevant than in the rest of the country, the partition of investments by firm sectors has been inspired by the technological level grouping of the industry proposed by the OECD (2003).

North-western firms targeted by PE funds are often in the youngest class: two thirds of the targeted firms have 5 years or less at the time of the first fund investment, and the share is even larger in terms of invested amount. The range of 0 to 5 years is usually considered the *early stage* of a firm development, encompassing the seed and start-up phases. On the other hand, firms with more than 10 years account for one fifth of the pool of targets, and 14 per cent of the invested amounts.

However, investing in young firms does not necessarily entail promoting advanced productions and innovations (e.g. medium-to-high tech manufacturing and knowledge intensive-high tech services). Alt-

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<sup>9</sup> The data set used in this study records all the investments, including those with a rapid adverse outcome.

though 28.5 per cent of the target firms belonged to these innovative or partly innovative industries, just 17 per cent of the PE portfolio goes to these innovative firms. Moreover, north-western firms which are *both* young and innovative represent just 15.7 per cent of the targets, and the total investment in their capital accounted for just 10.2 per cent of the overall portfolio in the period 2003 to 2012.

It is remarkable that the composition of the investments is quite different between north-western firms and the rest of Italy. In spite of a less frequent investment into early stage firms, PE funds in the rest of the country favour more technological industries (33.3 per cent of the total investments, i.e. twice the corresponding share for north-western firms). The investment in both young and innovative firms accounted for a 13.9 per cent over the whole period, again a larger share than in the North-West.

Summing up, the commitment of PE investors towards north-western companies is not particularly focused on innovative ventures, even with respect to other, less advanced regions of the country. In addition, this poor commitment to technological innovation does not seem to stem from a longer established tradition of private equity financing in the most financially developed area of the country: in fact, the average age of the north-western PE targets is lower than for the rest of the country.

## **5 The effect of the PE fund intervention on the credit relationships of the target firm**

Although a wider role for PE funds could be likely to be desirable, it is clear that in a bank-centred financial system like the Italian one, private equity will have, also in the foreseeable future, to coexist and work jointly with the banking system in order to effectively support the development of the target firms. In this context, this section presents an econometric analysis based upon the joint use of the data on PE investment (firm-level data) and on the bank credit obtained by these target firms. The aim of the analysis is to detect if the entry of the private equity managers into the capital of the firm has a significant impact on the subsequent development of the presence of the firms into the credit market, therefore establishing an explicit link between the non-bank and the bank financial support of the same pool of firms.

### *5.1 The methodology and the data*

In this paragraph we try to investigate whether a firm financed by a private equity fund has an easier access to the market credit compared to a non financed one, and if this effect is particularly strong in the north-western regions of Italy, compared to the rest of the country. We perform three, interconnected, analysis. In the first case, we consider the amount of credit granted to the target firm before and after the fund's entry; in the second specification we deal with the number and relative strength of the bank relationships of the target firms, and finally we address the cost of credit in a third specification.

In order to run this analysis we adopt a panel fixed effect model based on the pool of firms which obtained some PE funding in the reference period, instead of a cross-section regression. This choice has the advantage of overcoming the problem of selecting a benchmark (control) sample, which is essential to figure out the effect of the private equity involvement in a cross-section analysis.

As a matter of fact in a non-natural experiment context, it is very challenging to build an effective control sample since a firm participated by a private equity fund is not selected randomly. In this case, even matching for many qualitative (observed) variables is not sufficient, due to the plausible presence of

unobservable factors that could affect the funding choice of a firm (e.g. the quality of the management, business plan, etc.). Target firms, in other words, are likely to be self-sorting with respect to the private equity industry, and this selection bias is difficult to be accounted for, especially when observations are not very numerous.

Furthermore the one-way fixed effects estimator is equivalent to an adjusted matching estimator, where each observation is matched with the average of the other observations of the same unit, which may include those with the identical treatment status (see Imai and Kim, 2011). Finally, this estimation strategy allows us to pool the observations regarding operations of different nature, which is common in this kind of investments (early stage, expansion, turnaround or buy out). Hence we take fully advantage of the longitudinal data available for each firm in the central credit register (CCR, see above).

For all the firms participated by a private equity fund in the period 2009-12 we collect from the Central Credit Register the granted credit, the cost of the same credit and other related information. We limit our sample to the period January 2009 – December 2012 in order to overtake the problem of the threshold change.

### 5.2 *The amount of credit*

The first analysis concerns the total amount of credit. We measure the benefits accruing from private equity funding with the (variation of the) log of the total outstanding amount of credit granted to the target firms by banks and financial intermediaries.

We run a regression focusing on the entire set of firms changing their PE status at least once in the sample period 2009-2012 (i.e. switching from non-PE supported to PE-supported, or the other way round):

$$\log(Y_{it}) = \alpha_i + \gamma_t + \beta_1 PE_{it} + \varepsilon_{it} \quad (1a)$$

where  $Y_{it}$  is the total amount of loan facilities (drawn and undrawn) obtained by firm  $i$  at time  $t$  from the banking system,  $\alpha_i$  and  $\gamma_t$  are respectively firm and time fixed effects,  $PE_{it}$  is a dummy variable equal to 1 when the  $i$  firm is funded by a PE fund (results are reported in table 1, column 1).

We have 2,786 observations related to 418 firms changing their PE status in the period. We found that being funded by a PE would imply an estimated additional 25 per cent of credit.

An extension of this exercise consists in estimating a territorial effect. Hence we estimate the following model where  $NO_i$  is a dummy variable equal to 1 when the legal headquarters of firm  $i$  is in the North-West of Italy (results are reported in table 1, column 2):

$$\log(Y_{it}) = \alpha_i + \gamma_t + \beta_1 PE_{it} + \beta_2 PE_{it} * NO_i + \varepsilon_{it} \quad (1b)$$

In this case we cannot find any significant territorial effect, i.e. the benefit from private equity involvement in terms of granted credit does not show significant differences for north-western firms and for other Italian firms.

### 5.3 *The number and strength of bank-firm relationships*

The second analysis is devoted to the number of bank relationships. We suppose that private equity funding could increase the number of lenders.

We estimate the following model:

$$\log(E(N_{it})) = \alpha_i + \gamma_t + \beta_1 PE_{it}. \quad (2a)$$

Where  $N_{it}$  is the number of bank relationship of firm  $i$  at time  $t$ ,  $E(.)$  is the expected value operator and the other symbols have the same meaning as above. We point out that  $N_{it}$  is distributed as a Poisson distribution and the parameters are consequently estimated.

We have 2,786 observations related to 418 firms changing their PE status in the period. We do not find any significant influence of being funded by a PE and the number of bank relationships (table 1, column 3).

In this case as well we try to estimate the territorial effect of being a North-West established firm, but without detecting any significant result (table 1, column 4).

$$\log(E(N_{it})) = \alpha_i + \gamma_t + \beta_1 PE_{it} + \beta_2 PE_{it} * NO_i. \quad (2b)$$

In addition to the number of bank-firm relationships, and partly connected with these, the share of credit granted by the main bank (i.e. the primary lender to the firm) also comes into consideration. In a further specification, therefore, we analyse in the same way as above the appropriate model for the share on the total amount of credit granted by the principal bank to firm  $i$ , we get no significant relationships and for brevity we do not report the estimation results.

#### 5.4 The cost of credit

The third analysis deals with the cost of credit. We measure the benefits accruing from private equity funding with the difference between market lending rates on revocable loans and the ones paid by the firms included in our analysis for the same type of lending *before* the fund entry or *after* its exit from the firm capital.

First we run a regression focusing on the entire set of firms changing their PE status at least once in the sample period 2009-2012 (results are reported in table 1, column 5):

$$S_{it} = \alpha_i + \gamma_t + \beta_1 PE_{it} + \varepsilon_{it}, \quad (3a)$$

where  $S_{it} = R_{it} - RM_t$ ,  $R_{it}$  being the interest rate paid by firm  $i$  at time  $t$  for the total amount of revocable loans,  $RM_t$  is the market lending rate at time  $t$  and the other symbols have the same meaning as above.

We have 1,916 observations related to 337 firms changing their PE status in the period.<sup>10</sup> We find that being funded by a PE would imply a decrease in the cost of credit of 33.9 basis points (significant at the 5 per cent confidence level; table 1, column 5).

An extension of this exercise consists again in estimating a possible territorial specific effect, namely the interaction of  $PE_{it}$  with  $NO_i$  (eq. 3b). In this case again we find there is no significant territorial effect referred to the north-western firms (results are reported in table 1, column 6).

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<sup>10</sup> The lower number of observations in this specifications depends on the nature of the interest rates dataset, which stems from a survey carried out by the Bank of Italy at around 200 Italian banks. See the methodological appendix.

$$S_{it} = \alpha_i + \gamma_t + \beta_1 PE_{it} + \beta_2 PE_{it} * NO_i + \varepsilon_{it}. \quad (3b)$$

**Table 1**

<b>The PE effect on bank credit (1)</b> (estimated parameters of the regression models. Panel-robust p-values in parentheses)						
	<b>(a) amount of granted credit</b>		<b>(b) # of bank relationships (2)</b>		<b>(c) cost of credit</b>	
	[1] (eq. 1a)	[2] (eq. 1b)	[3] (eq. 2a)	[4] (eq. 2b)	[5] (eq. 3a)	[6] (eq. 3b)
$PE_{it}$	0.223 (<0.0001)	0.209 (<0.0001)	0.004 (0.891)	0.008 (0.828)	-0.339 (0.041)	-0.336 (0.136)
$PE_{it} * NO_i$		0.027 (0.616)		-0.010 (0.864)		-0.007 (0.984)
Obs	2,786	2,786	2,786	2,786	1,916	1,916
F. stat.	66.487 (<0.0001)	33.359 (<0.0001)	NA	NA	4.173 (0.041)	2.085 (<0.125)

(1) Period 2009-2012, half-yearly data. Panel estimation with firm fixed effects. Panel robust probabilities that the coefficient is equal to 0 in brackets. – (2) Poisson model; for this model no F statistic is available.

### 5.5 The effect of the PE fund entrance and exit on the bank credit to the target firm

In the previous sections we found a favourable significant effect in accessing the credit market and in the cost of credit for the firm funded by Private Equity funds. Here we would like to disentangle the two aspects of entrance and exit of PE. The purpose is to verify whether the positive effect lasts after the exit of the PE or it is closely related to its presence in the firms' capital.

We define two dummy variables:  $I_{it}$  (investment) equal to 1 when  $t \geq$  the time when the firm  $i$  started being funded by private equity and  $D_{it}$  (divestment) equal to 1 when  $t \geq$  the time when the firm  $i$  stopped being funded by private equity.

Hence we estimate the parameters of the two following models:

$$\log(Y_{it}) = \alpha_i + \gamma_t + \beta_1 I_{it} + \beta_2 D_{it} + \varepsilon_{it} \quad (4a)$$

$$S_{it} = \alpha_i + \gamma_t + \beta_1 I_{it} + \beta_2 D_{it} + \varepsilon_{it} \quad (5a)$$

The resulting estimations are reported in table 2, columns 1 and 3. In both cases it seems clear that the positive effect of obtaining a larger amount of credit and paying for it a lower cost is closely related with the relationship between firms and the private equity fund, and it lasts as long as the PE fund participate in the firm's capital. In fact the positive effect is immediately reverted when the firm stops being funded. As far as the cost of credit is concerned, the benefit from the PE fund's entry is negligible, whereas the cost increase following its exit is significant.

Similarly with the previous sections, we perform an analysis estimating the interaction of  $I_{it}$  and  $D_{it}$  with  $NO_i$  in the models (4b) and (5b), in symbol. In this case we get no significant territorial relationship in both models (results are reported in table 2, columns 2 and 4).

$$\log(Y_{it}) = \alpha_i + \gamma_t + \beta_1 I_{it} + \beta_2 D_{it} + \beta_3 I_{it} * NO_i + \beta_4 D_{it} * NO_i + \varepsilon_{it} \quad (4b)$$

$$S_{it} = \alpha_i + \gamma_t + \beta_1 I_{it} + \beta_2 D_{it} + \beta_3 I_{it} * NO_i + \beta_4 D_{it} * NO_i + \varepsilon_{it} \quad (5b)$$

Table 2

The PE effect on bank credit: fund's entry and exit (1)				
(estimated parameters of the regression models. Panel-robust p-values in parentheses)				
	(a) amount of granted credit		(b) cost of credit	
	[1] (eq. 4a)	[2] (eq. 4b)	[3] (eq. 5a)	[4] (eq. 5b)
$I_{it}$	0.280 (<0.0001)	0.295 (<0.0001)	-0.084 (0.713)	-0.132 (0.688)
$D_{it}$	-0.185 (<0.0001)	-0.160 (0.001)	0.557 (0.009)	0.476 (0.087)
$I_{it} * NO_i$		-0.028 (0.728)		0.088 (0.847)
$D_{it} * NO_i$		-0.054(0.418)		0.197 (0.650)
Obs	2,786	2,786	1,916	1,916
F. stat.	35.232 (<0.0001)	17.825 (<0.0001)	3.410 (0.033)	1.771 (0.132)

(1) Period 2009-2012, half-yearly data. Panel estimation with firm fixed effects. Panel robust probabilities that the coefficient is equal to 0 in brackets.

All in all, the results from these econometric analyses suggest that the effect of PE in increasing the amount of credit and the (weak) effect in reducing its cost are closely tied to the presence of the fund in the target firm's capital, and do not spillover to the subsequent life of the firm. In other words, PE funds do not seem to perform a long-lasting signalling role on behalf of the banking system, thus ensuring a steady financial development of the target firm across the different stages of its life.

## 6 Conclusions

Using fund-, firm- and bank-level data about Italian private equity funds, this paper tried to shed some light on the weight and the characteristics of the investments by the private equity funds' industry, in particular in the north-western regions of Italy. We find that the private equity fund managers are heavily concentrated in this more developed area of the country, as it is the case for the whole financial industry. Also the PE investments are to a large extent directed towards firms from this area, as it could be expected due to the relative diffusion hereto of large companies with sophisticate financial needs and innovative and technological firms. However, we find that PE investments in the North-West display some limits, shared with the industry in the whole country: the average size of the portfolios is rather small (20 times less than comparable figures for the U.S.) and often below the usual figures of a minimum efficient size, especially in the venture capital segment, which has in principle the highest potential to foster economic growth. On the other hand, the concentration by firm of the investments carried out by north-western funds has been growing after the 2008 crisis, thus tackling the *limited attention* problem of excessively diversified portfolios. The average duration of investments is rather short (about 3.4 years), and just 10 per cent of the portfolios target firms which are both young and innovative: this is an even lower share than the country average, in spite of a relatively richer pool of innovative targets in the North-West.

With respect to the traditional bank credit, PE investments are more important to north-western firms than in the rest of the country. In a bank-centred financial system the link between PE investment and bank credit is a key success factor. We therefore performed an econometric analysis to detect the effect, if any, of the PE intervention on the amount of credit, the number of bank relationships, and the cost

of credit for the target firms. We find that being participated by a PE fund has a positive effect on the amount of credit obtained by the target firm, no effect on bank-firm relationships and a weak effect in reducing the cost of the credit. However, this effect is exclusively related to the entry of the fund in the firm's capital, as it fades away or is even reverted as soon as the fund exits from the capital. This suggests, therefore, that PE funds do not perform a long-lasting signalling role on behalf of the banking system, thus ensuring a steady financial development of the target firm across the different stages of its life. These country-level results also apply to the (sizeable) north-western subsample, as we fail to detect any specific territorial effect.

## 7 References

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## 8 Methodological appendix

### Supervisory reports by closed-end funds

Supervisory reports to Bank of Italy by closed-end funds are regulated by regulation n. 189 on supervisory returns (*Manuale delle Segnalazioni Statistiche e di Vigilanza per gli Organismi di Investimento Collettivo del Risparmio*; [http://www.bancaditalia.it/vigilanza/normativa/norm\\_bi/circ-reg/stat\\_oicr](http://www.bancaditalia.it/vigilanza/normativa/norm_bi/circ-reg/stat_oicr)).

According to the regulation, a closed-end fund is defined as a mutual fund whose right to the reimbursement of the shares is allowed to participants only at pre-defined maturities. Managing firms must comply with reporting requirements for each managed fund as from the inception of the fund's operations.

Within the item "holdings" the fund must report the value of the stakes held in listed and unlisted companies. Listed companies holdings will be reported at market value. Other holdings, lacking a reference market price, are to be valued – taking into account the economic and financial situation of the participated firm – according to the general criteria as per the current regulation by the Bank of Italy.

In the supervisory half-yearly reports about the fund portfolio, the financial instruments are identified through the international codification standard (ISIN code). Through the Italian securities register, the ISIN code allows to single out the majority of the Italian target firms (accounting for about 90 per cent of the total value of the funds' portfolio towards Italian target firms), and therefore to find out their structural features. For unidentified firms, it is not possible to match data on these investments with those of other data bases (central balance sheet register, central credit register, etc.). In this paper only the investments where the target firm could be identified have been considered. Furthermore, a fund has been considered a single unit even though it has changed ownership during the relevant period (that is, the managing firm has changed). This leads to slightly different figures from those displayed in other similar analysis (e.g. Vacca, 2013).

### Grouping investments by technological level of the target firm

Target firms are grouped according to the technological level of their activity, consistently with the taxonomy employed by OECD and Eurostat (OECD, 2003, Eurostat, 2005, 2012).

Based upon ATECO 2007 classification "high-tech manufacturing" encompasses sectors C21, C26; "medium – high tech manufacturing" includes sectors C20 and C27 to C30; "medium – low tech manufacturing" includes sectors C19 and C22 to C25; "low tech manufacturing" includes sectors C10 to C18, C31 and C32. "Knowledge intensive services" encompass sectors H50, H51, H53, J58 to J63, K64 to K66, M69 to M75, N77 to N80, N82, O84, P85, Q86 to Q88 and R90 to R93. Among the latter, "knowledge intensive high – tech services" are sectors H50, H53, J58, J61, J62, J63, M72. All services between J45 and T98 (included) and not mentioned among "knowledge intensive services" are defined "*less knowledge intensive services*".

Based upon the ATECO 2002, 2 digits, "high-tech manufacturing" encompasses sectors DL30, DL32, DL33; the "medium – high tech manufacturing" encompasses sectors DG24, DK29, DL31, DM34, DM35; the "medium – low tech manufacturing" encompasses sectors DF23, DH25, DI26, DJ27, DJ28; the "low tech manufacturing" encompasses sectors DA15, DA16, DB17, DB18, DC19, DD20, DE21, DE22, DN36, DN37. The "knowledge intensive services" include sectors ATECO2002: I61, I62, I64, J65 to J67, K70 to K74, M80, N85, 092: among these sectors, I64, K72 and K73 are defined "knowledge intensive high – tech services".

In the grouping used in this paper, moreover, investments in banks of fund managing firms are separately grouped ("Finance and banking").

### The Central Credit Register and the Bank of Italy survey data on bank interest rates

The Central Credit Register (CCR) records all the credit lines granted by banks or other financial intermediaries to borrowers whose granted or used credit at the reporting institution exceeds a given threshold (€30,000 as from 1<sup>st</sup> January 2009, €75,000 beforehand). See [http://www.bancaditalia.it/statistiche/racc\\_datser/intermediari/centrarisk](http://www.bancaditalia.it/statistiche/racc_datser/intermediari/centrarisk) for reference. The Bank of Italy survey data on bank interest rates gathers data on interest rates applied by about 200 banks, reporting data on interest rates applied to credit lines referred to borrowers whose total credit towards the reporting bank exceeds a given threshold (€75,000). See the Glossary to the Bank of Italy annual report.

## 9 Statistical appendix

Table a1

Features of investments by PE funds (1)								
Fund type	North-West				Total			
	N funds (2)	N operatio ns (3)	Average duration (years) (3)	Average amount (mln) (3)	N funds	N operatio ns (3)	Average duration (years) (3)	Average amount (mln) (3)
Banking/finance	29	178	2.9	6.3	55	403	3.3	5.2
Private	42	263	3.8	10.7	48	414	3.7	9.2
Mixed	11	55	1.1	20.0	15	131	1.6	10.4
Public	3	21	3.3	1.8	4	26	3.1	1.6
Other	3	24	3.4	6.4	5	31	3.5	6.1
<b>Total</b>	<b>88</b>	<b>541</b>	<b>3.4</b>	<b>9.7</b>	<b>127</b>	<b>1,005</b>	<b>3.4</b>	<b>7.5</b>

Source: Bank of Italy supervisory reports.

(1) Data refer to Italian target firms and to total or average values over the period December 2003 – December 2012 (half-yearly data). – (2) North-western funds refer to the region where the fund's managing firm is established. – (3) Data refer only to operations targeting Italian firms, according to the region where the firm is established.

Table a2

Investment of private equity funds by technology level of the industry and age class (1) (percentage shares; average December 2003 – December 2012)						
Technological level of the industry	(a) Number of firms			(b) Invested amounts		
	Age class			Age class		
	0-5 years	6-10 years	+10 years	0-5 years	6-10 years	+10 years
North-West						
Manufacturing high tech	1.0	0.3	2.2	1.1	0.1	0.7
Manufacturing medium-high tech	8.7	2.9	3.5	7.6	2.1	2.7
Manufacturing medium-low tech	2.9	0.6	1.6	0.7	0.3	1.3
Manufacturing low tech	3.5	1.0	1.6	4.5	1.6	0.5
Services knowledge intensive-hi tech	6.1	1.6	2.2	1.5	0.6	0.5
Services knowledge intensive	29.5	4.5	1.6	41.4	1.3	5.3
Services less knowledge intensive	5.8	0.6	5.5	4.1	2.1	2.3
Others	9.3	1.9	1.6	15.3	1.4	1.0
<b>Total</b>	<b>66.7</b>	<b>13.5</b>	<b>19.9</b>	<b>76.1</b>	<b>9.6</b>	<b>14.3</b>
Italy, other areas						
Manufacturing high tech	2.8	1.2	2.4	1.9	5.1	0.8
Manufacturing medium-high tech	6.4	3.2	5.6	7.3	0.7	3.4
Manufacturing medium-low tech	4.0	1.2	5.6	3.4	1.6	3.6
Manufacturing low tech	6.8	1.6	6.0	4.7	0.5	4.1
Services knowledge intensive-hi tech	11.6	0.4	3.6	4.7	7.7	1.7
Services knowledge intensive	9.2	3.6	3.6	12.5	4.0	5.3
Services less knowledge intensive	4.4	0.8	2.8	6.2	13.9	1.8
Others	9.2	1.2	3.2	1.6	0.2	3.3
<b>Total</b>	<b>54.2</b>	<b>13.2</b>	<b>32.7</b>	<b>42.3</b>	<b>33.7</b>	<b>24.0</b>

Source: supervisory reports to the Bank of Italy by PE fund managers, Cerved group.

(1) Age classes refer to the age of the firm at the time of the first investment recorded by a PE fund into the firm. Industries have been divided into groups by technological level, based on the OECD taxonomy (OECD, 2003)