

# PERFORMANCE OF PRIVATE EQUITY INVESTMENTS: ARE MANAGEMENT COMPANIES' SHAREHOLDERS RELEVANT?

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## Abstract

This study demonstrates that the ownership of private equity (PE) funds influences investment performance. The analysis focuses on the universe of PE investments made by Italian closed-end funds from 1999 to 2005. We find that bank-owned funds generally engage in weaker monitoring of the firms in which they invest, because their representatives hold a plurality of offices on boards of directors of such firms, whether PE-backed or not. This leads to lower revenue growth for portfolio firms, and consequently to lower IRR. On the contrary, corporate-owned funds are able to enforce closer supervision of their investments, leading to better performance.

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## 1. Introduction

It is widely acknowledged that private equity investment has a positive impact on target firms. Private equity (PE) financing provides firms with “patient” capital, which sustains them during the start-up period, as well as providing backing for expansion plans, new strategies, acquisitions, privatization, internationalization, technological development, generational or governance changes, and other critical phases of the life cycle of a firm. In both the US and Europe, several studies highlight that PE providers are able to support and speed up the transformation of the internal processes of target firms, through mapping every business unit along two dimensions: strategic fit and economic value. In addition to providing capital, PE houses perform many other roles within their portfolio firms, such as serving as a sounding board for management, development of production or service techniques, assisting in finding and selecting key management team personnel, solicitation of essential suppliers and customers, selecting vendors and equipment, strategic and operational planning, assistance in obtaining additional financing, and replacement of management personnel when appropriate (Gorman and Sahlman 1989; Stein and Bygrave 1990; Bygrave and Timmons 1992; Lerner 1995; EVCA and Coopers & Lybrand 1996; Sapienza, Manigart and Vermeir 1996; Hellmann 1998; Hellmann and Puri 2002). If necessary, PE providers do not hesitate to replace management if such management proves unable to satisfactorily implement a strategy.

Representatives of PE funds, as supervisory directors or non-executives, keep their finger on the pulse of portfolio firms, aligning management and shareholder incentives, and providing better monitoring of managers.

None of the above-mentioned studies empirically examines how PE funds’ involvement correlates with firm performance. MacMillan et al. (1988) attempt to identify correlations between venture capitalist (VC) involvement and venture performance. Whether VCs actually add value remains controversial (Sapienza 1992). For example, MacMillan et al. (1988) observe both positive and negative associations between VC involvement and venture performance.

Thus far, most of the PE literature has tended to be descriptive. Only recently has attention turned to industry performance. This is mainly due to the lack of public data on cash flows attributable to PE investments, which prevents the estimation of internal rates of return. However, the empirical research on this topic has nevertheless developed, along two main directions. The first research stream concerns investment performance and includes the pioneering study by Gompers and Lerner (1997), as well as analyses by Berk et al. (1999), Peng (2001), Quigley and Woodward (2003), Woodward and Hall (2003), Hand (2004), Cochrane (2005), Gompers et al. (2006), and Hege et al. (2008). The second investigative direction focuses on fund performance and includes studies by Ljungqvist and Richardson (2003), Kaplan and Schoar (2005), Phalippou and Zollo (2005), and Phalippou and Gottschalg (2009) among the main scientific contributions.

Both research directions address the PE industry as if it were homogenous. A few studies analyze the impact of different types of PE provider on investment and divestment patterns, both cross country (Mayer et al. 2005) and within one country (Tykvová 2006).

Little research has analyzed the effect of PE funds’ ownership structure on investment performance. Fitzta et al. (2009) find that variation in the performance of portfolio firms is largely attributable to VCs’ ownership structure. These authors also show that some VCs

provide a high value-added on average (about 19% over at least 10 investments), while others appear to destroy value on average (about -18% over at least 10 investments). Using a sample of European venture capital deals, Bottazzi et al. (2008) show that independent VC firms maintain a more active investment style than captive firms and these authors demonstrate that investor activism is positively related to the success of portfolio firms.

We integrate the research stream on owner effects, showing that corporate-owned funds are able to monitor portfolio firms with a higher level of involvement than bank-owned funds, which carry out weaker supervision and consequently achieve a lower level of investment performance.

In Italy this issue is particularly relevant, since the Italian PE market is characterized by a wide variety of domestic fund types. Most PE investments in Italy are carried out by bank-owned funds, as a result of the traditionally bank-centered structure of the Italian financial system. However, as a consequence of the rapid growth of the PE market, a considerable proportion of PE investment now originates from corporate funds (around 25%), and from independent and public entity funds (over 15%).

For purposes of this study, we distinguish among independent funds and corporate-, bank-, government-, and other–entity-owned funds. This classification of funds is based on the ownership structure of the general partnership (hereafter, the fund’s management company, or MCO). Thus, we classify funds as:

- independent funds, when more than 50% of MCO shares are held by private investors;
- corporate-owned funds, when more than 50% of MCO shares are held by industrial or service firms;
- bank-owned funds, when more than 50% of MCO shares are held by banks or other financial institutions;
- government-owned funds, when more than 50% of MCO shares are held by public authorities or public entities;
- other–entity-owned funds, when more than 50% of MCO shares are held by entities not described by the above classifications.

We collect a data set of all deals realized by Italian closed-end funds from 1999 through 2005. As the measure of performance, the gross IRR on realized investments is considered.

Our analysis adopts a two-step approach.

First, we show that funds owned by different types of entities show different investment patterns. We define fund investment patterns with respect to the following features:

- amount of time allocated by fund representatives to monitoring portfolio firm activities;
- nature of the investment (early-stage, expansion, buy-out, turnaround);
- investment size;
- percentage of shares held by PE fund in a portfolio firm;
- investment exit strategy;

- portfolio firm business sector; and
- investment holding-period.

Secondly, we identify the determinants of IRR and demonstrate that these include or are affected by some of the same variables that define the investment patterns of funds owned by different types of entities.

We pursue an indirect estimation approach. Our key assumption is that the ownership of PE funds does not influence portfolio firm outcomes directly, but indirectly through PE fund investment patterns.

The remainder of this paper proceeds as follows: In Section 2, we describe the Italian institutional context with respect to the PE industry. In Section 3, we illustrate our data set and present summary statistics. In Section 4, we form an analytical framework and discuss the regression results. Section 5 presents our conclusions.

## **2. The Italian institutional context for the PE industry**

The typical structure employed for carrying out PE activity in Italy is the closed-end fund. The legislation that introduced this vehicle is Law No. 344, enacted August 13, 1993. All the provisions included in this law and those regarding civil law issues of investment funds were replaced by Legislative Decree No. 58, enacted February 24, 1998 (The Consolidated Act on Financial Intermediation).

The structure of Italian PE operations is identical in essence to that in the US, but differs in form (see Figure 1). Funds have an MCO, which raises capital from investors<sup>1</sup> and assumes full responsibility for fund management, including all investment and divestment decisions. However, the MCO may assign specific investment authority to intermediaries authorized to supply asset management services.

[FIGURE 1 APPROXIMATELY HERE]

An MCO can be controlled by banks, industrial firms, public entities, private investors, or other entities. It can manage more than one fund and can hold shares in different industries (i.e., industrial firms or financial intermediaries) that are not involved in the activity of the PE fund. A PE fund can finance more than one firm. The MCO appoints fund representatives, who sit on the boards of directors of portfolio firms and monitor firm activities and performance. The same fund representative can sit on boards of directors of more than one firm. In addition, a fund representative can sit on the boards of firms controlled by the MCO but that are not venture-backed.

Fund investments made are kept in custody by the so-called custodian bank, which verifies the legitimacy of the operations of issuance and redemption of fund investment units and the allocation of fund income. It also verifies the correctness of the calculation of the

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<sup>1</sup>Usually, Italian PE funds are restricted to so-called qualified investors, i.e., investment firms, banks, management companies, pension funds, insurance companies, holding companies of banking groups, foreign intermediaries authorised under the law in force in their home country to perform the same activities as those performed by the above-mentioned intermediaries, banking foundations, natural and legal persons, and other entities with specific expertise and experience in transactions involving financial instruments.

value of the units, or makes the calculation, when it is charged with this task by the MCO. In addition, the custodian bank verifies that, in transactions involving fund assets, any consideration is remitted to it within the customary time limits.

### 3. Data description and summary statistics

Our empirical investigation uses a very detailed data set covering 804 PE investments realized over a seven-year period, from 1999 to 2005. The quality and originality of these data are important since officially there does not exist such a comprehensive database in Italy. In addition, the period of observation represents almost the entire history of Italian closed-end funds.<sup>2</sup>

Data were collected via a questionnaire sent to 58 Italian private equity firms, which represent the whole population of private equity management firms operating before 1999, and which managed all 87 closed-end funds available up to and during 1999. All firms contacted provided the requested data, after execution of agreements preventing us from disclosing the data to other parties. None of the firms is entirely dedicated to start-up financing; in fact, this type of financing represents only a small proportion of closed-end fund portfolios.<sup>3</sup> The number of deals coincides with the number of venture-backed firms, since there were no syndicated deals during our period of observation.

PE firms and funds launched after 1999 are excluded to avoid all risks associated with gathering incomplete data, given that the time horizon for closed-end fund investments can be as long as 5–7 years. A total of 987 operations were reviewed, from which 804 are included, as they represent investments made and closed through exit-way (including write-offs) within the 1999–2005 timeframe. The remaining 183 operations are deals in progress; these are not included because they have no final value, so final performance cannot be calculated.

Given our special interest in the involvement of fund representatives, we collected additional data via interviews with all 58 private equity firms. Interviews are an appropriate way of collecting direct evidence on issues that are not recorded in standard sources of PE data, such as fund involvement.

Our methodology allows us to collect a significant number of variables. Details on all variables are presented in Table 1.

[TABLE 1 APPROXIMATELY HERE]

In particular, CNF and CNMC measure the plurality of offices held by fund representatives. We use these variables as proxies for the time that fund representatives devote to monitoring the strategic fit and economic value of portfolio firm activities. We conjecture that the higher are CNF and CNMC, the busier are fund representatives and the lower is investment IRR. We believe that when fund representatives are very busy, they are not able to keep a finger on the pulse of portfolio firms, or to effectively monitor firm results.

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<sup>2</sup>Before 1999 there were very few funds or investments of this type; in fact, the first dates only to 1995.

<sup>3</sup>This is a traditional feature found in Italy and most other European countries, except for the UK.

On this topic, the literature is not definitive. Fich and Shivdasani (2006) show that firms in which a majority of directors hold three or more directorships are associated with weak corporate governance. These firms exhibit lower market-to-book ratios and weaker profitability. On the contrary, Ferris et al. (2003) examine the number of appointments held by corporate directors and conclude that the evidence does not support calls for limits on the number of directorships held by an individual.

In this Section, we provide summary statistics for our data set.

The funds entered in our database are managed by 58 management firms, 69% of which manage only one fund, while 17% have two funds under management and 14% manage three or more funds.

We distinguish among independent funds and corporate-, bank-, government-, and other–entity-owned funds. Over 56% of the funds are bank-owned. In 86% of these cases, the bank financed the firm during the five years preceding PE investment. In the remaining 14%, no lending relationship existed prior to PE investment. Corporate-owned funds account for 25% of PE providers, while independent and government-owned funds represent 9.8% and 7.8%, respectively. A small minority of funds (1.1%) are owned by other entities.

The number of seats that fund representatives hold on portfolio firm boards of directors, during the holding period (CNF), ranges from 1 to 9; mean CNF is 3 and the median is 2. Table 2 shows that mean CNF is higher for boards of firms that have participation from bank- and government-owned funds.

The number of seats that fund representatives hold on boards of firms owned by fund management companies (including non–PE-backed firms), during the holding period (CNMC), ranges from 1 to 15; mean CNMC is 7 and the median is 8. Table 2 shows that mean CNMC is higher for boards of firms that have participation from bank- and other–entity-owned funds.

[TABLE 2 APPROXIMATELY HERE]

Fund size ranges from 8.4 to 182.2 million euro. Average fund size is 71.8 million (median: 65.5 million, standard deviation: 37.9 million) euro; in 75% of cases, fund size amounts to less than 86.8 million euro.

Most of the transactions included in our database are focused on minority stakes (see Table 3). Italian PE funds each make between 3 and 19 investment deals; the average number of investments is 10 (median: 10 investments, standard deviation: 3 deals). Some 75% of funds make less than 12 investments.

[TABLE 3 APPROXIMATELY HERE]

Table 3 shows that over 35% of portfolio firms are small and medium enterprises, having an annual turnover not exceeding 50 million euro. The year prior to PE investment, the average annual turnover of portfolio firms was 128 million euro (median: 82 million).

During the holding period, annual revenues of portfolio firms grew by 7.4% on average (median: 4.1%, standard deviation: 11.9%). In 75% of portfolio firms, the revenue growth rate is lower than 8% (see Table 3). Some 4% of portfolio firms show a decrease in revenues or a growth rate equal to zero. Forty percent of these investments concern turnaround financing.

Table 3 also reports data on the economic performance of portfolio firms. Annual return on assets grew by 6.7% on average during the holding period (median: 3.4%, standard deviation: 12.10%). In 75% of portfolio firms, the annual ROA growth rate is less than 7.2%.

Annual return on equity grew by 21% on average (median: 8.4%, standard deviation: 51.27%). In 75% of portfolio firms, the annual ROE growth rate is less than 7.2%.

In Italy, PE investments support a wide variety of business sectors, which we group into 10 categories (see Figure 2). About 25% of transactions are in the sectors of aerospace and defence, electronic and electrical equipment, and engineering and machinery. About 20% of the deals involve firms operating in the automotive, household goods, and textiles sectors.

[FIGURE 2 APPROXIMATELY HERE]

About 52% of Italian PE investments are dedicated to financing firms in their expansion stage (see Figure 3), with no distinction among economic sectors. Originally, Italian funds looking for profit maximization concentrated on early-stage financing. Because of low performance from such transactions, from the beginning of the 1990s Italian PE funds began investing mostly in more consolidated firms, aiming to help carry through their development plans.

[FIGURE 3 APPROXIMATELY HERE]

The goal of PE funds is to sell a restructured and improved business at a profit in three to five years, though the holding period may vary depending on a portfolio firm's ability to produce consistent cash flows in the short term.

In our data, the time between initial investment and final exit ranges from 6 months to 5.5 years. The average holding period is almost 3 years. In 75% of cases, the holding period is less than 3.5 years.

The average holding period is longer (3 years) for transactions in the sectors of cyclical services (e.g., general retailers, leisure & hotels, media & entertainment, support services, transport) and cyclical consumer goods (e.g., automobiles & parts, household goods, textiles), as well as investments in early-stage firms (3.5 years). The average holding period is longer for investments made by bank-owned and independent funds. See Table 4 for details.

[TABLE 4 APPROXIMATELY HERE]

Investment size ranges from 0.25 to 30.4 million euro. The average investment size is 6.7 million euro (median: 4.1 million) and in 75% of cases less than 9.8 million euro are invested in a single firm. On average, the invested capital is higher in the finance and utility sectors (8.8 and 8.4 million, respectively), in buyout operations (15.6 million) and in short-duration transactions (up to 12 months, 8.7 million). On average, bank-owned funds and corporate-owned funds invest larger amounts than do other fund types. See Table 5 on this matter.

[TABLE 5 APPROXIMATELY HERE]

With respect to exiting an investment (i.e., the opportunity for the PE firm to sell the investment), in almost 88% of cases portfolio firms included in the data set were sold to another PE house or entrepreneur, while only 6% were floated in the stock market. In 6% of cases, PE participation was liquidated because the investment failed and the firm went into

bankruptcy. Trade sale is the most common exit way for Italian PE providers, with no distinction with respect to either business sector or investment type (see Table 6).

[TABLE 6 APPROXIMATELY HERE]

We now turn to investment performance.

The most common measure of performance within the PE industry is IRR. The annual IRR adopted for this study is a gross return<sup>4</sup> based on cash outflows and inflows with respect to realized investments, including realization values and dividends.

The average IRR of the investments included in our data set is 11.4% (median: 11.3%; standard deviation: 24.77%). High standard deviation is typical of PE investments. In this study, IRR ranges between -100.0% and 97.9%.

The highest annual IRR is achieved on investments in the business sector labeled “general” (aerospace & defence, electronic & electrical equipment, engineering & machinery), while “resource” (mining, oil & gas) and “utility” sectors show the lowest IRR. Concerning performance among different kinds of investment, the highest IRR is achieved in buyout transactions (16.38%), while turnaround financing seems to perform quite poorly on average (-22.8%). See Table 7 for details.

[TABLE 7 APPROXIMATELY HERE]

#### 4. Analysis framework and regressions results

We distinguish among five types of PE firm, depending on the entity that owns the MCO: independent funds (IND), corporate- (CORP), bank- (B), government- (PA), or other entity-owned funds (OTH). Among bank-owned funds, we further distinguish two categories: funds in which the bank financed the firm during the five years preceding the PE investment (BL), and funds in which no lending relationship ever occurred between the bank and the firm (BNL).

Our objective is to test whether the owners of fund management companies influence the IRR of investments and, if so, to provide an explanation. We control for endogeneity by using an instrumental variable framework. The key assumption is that the ownership of PE funds does not influence portfolio firm outcomes directly, but affects them indirectly through PE fund investment patterns.

As mentioned in the Introduction, we employ a two-step analysis.

First, we show that funds owned by different entities have different investment patterns. We define fund investment patterns in accordance with the following features:

- the amount of time that fund representatives can devote to monitoring portfolio firm activities;
- the investment type (i.e., early stage, expansion, buy-out, turnaround);
- the size of the investment;

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<sup>4</sup> The return is gross of carried interest and management fees.



- the percentage of shares held by the PE fund in portfolio firms;
- the investment exit strategy;
- the portfolio firm business sector; and
- the holding period of the investments.

As proxies for the amount of time that fund representatives can devote to monitoring portfolio firms, we use the variables CNF and CNMC. As mentioned in Section 2, CNF and CNMC measure the plurality of offices held by fund representatives. We conjecture that the higher are CNF and CNMC, the busier are fund representatives and the lower is the investment IRR. We believe that when fund representatives are very busy, they are not able to keep a finger on the pulse of portfolio firms, or to monitor their results effectively.

The second step in our analysis consists of identifying the determinants of IRR and testing whether these are affected by the variables that define the investment pattern of funds owned by different types of entities.

#### ***4.1. Differences in investment patterns among PE firms***

We use a Wald test to verify whether PE firms owned by diverse entities exhibit different investments patterns.

The model is defined by a response variable, OWNER, with values BL, BNL, CORP, IND, PA and OTH (see Section 3 for acronym definitions), and eight effects represented by the variables defining a fund's investment pattern:

- CNF and CNMC, as proxies for the amount of time that fund representatives can devote to monitoring investments;
- I-KIND;
- I-SIZE;
- %-SHARE;
- EXIT WAY;
- BUS;
- HOLD-PER.

Wald test results in Table 8 support the conclusion that the investment holding period, CNF and CNMC, are an important basis for discrimination among PE firms. No differences seem to exist among PE firms in terms of the other investment characteristics.

[TABLE 8 APPROXIMATELY HERE]

In order to quantify the average difference in the above-mentioned discriminant variables among diverse PE firms, we run three standard least squares models, where the dependent variables are represented as follows:

- BL is a dummy variable that takes the value 1 if the fund MCO is owned by a bank that provided financing for the portfolio firm in the five years preceding the PE investment, and 0 otherwise;
- BNL is a dummy variable that takes the value 1 if the fund's MCO is owned by a bank that did not finance the firm in the previous five years, and 0 otherwise;
- CORP is a dummy variable that takes the value 1 if the fund is owned by industrial or service firms, and 0 otherwise;
- PA is a dummy variable that takes the value 1 if the fund is owned by public authorities or public entities, and 0 otherwise;
- OTH is a dummy variable that takes the value 1 if the fund is owned by other entities, and 0 otherwise.

The independent variable is the holding period in the first OLS regression, CNF in the second regression, and CNMC in the third.

Panel A of Table 9 shows the regression results on the holding period. Each coefficient measures the difference in average holding period among funds owned by diverse entities. We also report two-sided t-ratios, which show the coefficients' significance.

The results highlight that, on average, bank-owned funds (BL and BNL) stay in portfolio firms longer, while the holding period for corporate funds is shorter on average.

On the amount of time that fund representatives can devote to monitoring investments, we use two variables as proxies for fund representative involvement: CNF and CNMC. As we mentioned Section 2, the former indicates the total number of seats that fund representatives hold on boards of directors of venture-backed firms during the holding period. The latter measures the total number of seats that fund representatives hold on the boards of firms that belong to fund management companies (including non-PE-backed firms) during the holding period.

We argue that the higher are CNF and CNMC, the busier are fund representatives and the lower is IRR.

We report coefficients on PE fund types in Panel B of Table 9. Each coefficient measures the difference in average CNF among PE providers. A positive coefficient implies that the number of seats held by the fund representatives on the boards of PE-backed firms during the holding period is higher on average. The results of the two-sided t-test show that dummy variables BL and BNL have significant positive coefficients, while the CORP coefficient is significant and negative. No statistically significant difference exists in average CNF among other PE firms.

Panel C of Table 9 shows coefficients of the multivariate regression on CNMC. Once again, the results of the two-sided t-test indicate that dummy variables BL and BNL exhibit significant positive coefficients, while the CORP coefficient is statistically significant and negative. On average, bank-owned fund representatives hold a higher number of seats on the boards of firms in the portfolio of the MCO (including non PE-backed firms) during the holding period. The contrary outcome occurs for corporate-owned funds. No statistically significant difference exists in average CNF among other PE firms.

[TABLE 9 APPROXIMATELY HERE]

The results shown in Table 9 provide empirical evidence that bank-owned fund representatives are busier than other fund representatives, while the opposite occurs in corporate-owned funds. In order to check whether bank-owned funds invest in bigger, that is, more complex firms, we test for differences in average investment size for bank-owned and corporate-owned MCOs, but we find no difference. Further, the fact that bank-owned funds have higher CNF and CNMC does not depend on the number of board members designated, since in 98% of cases the funds appoint one board member in each portfolio firm.

Moreover, in both regressions the coefficient of BL is greater than the coefficient of BNL. Since the t-ratios are both very close to 2, we test for differences in BL and BNL coefficients using a Wald test. We define the model via the response variable OWNER, with values BL and BNL, and two effects, represented by CNF and CNMC. The Wald test results (prob > ChiSq is 0.0459 and 0.0578 for CNF and CNMC, respectively) show that CNF and CNMC play an role in differentiating BL from BNL funds, even if the significance of the effect is borderline. We conjecture that BL fund representatives are able to devote less time than BNL fund representatives to the monitoring of PE investments. It is probable that management companies of BL funds think that a close monitoring of portfolio firms is not necessary, because the bank-owner already knows the quality of the firm, thanks to the previous lending relationship. Besides, if the firm's economic conditions deteriorate, the bank can again provide financing.

#### ***4.2. Multivariate regressions on IRR***

In this section, we explore the determinants of IRR on PE financing using a multivariate regression approach.

The regression on IRR involves variables that pertain to the economic performance of the PE-backed firm and the characteristics of the PE investment.

In particular, the performance of a portfolio firm is represented by the annual revenue growth rate ( $\Delta$ SALES), the annual variation in return on assets ( $\Delta$ ROA), and the annual variation in return on equity ( $\Delta$ ROE).

Variables that pertain to investment features include the amount of capital invested in the firm, the percentage of shares held by the closed-end fund, the holding period of the investment, the nature of the investment, and the business sector of the portfolio firm. We exclude exit strategy as an explicative variable of IRR, in order to avoid endogeneity.

Our choice of explanatory variables for the multivariate regression takes into account the strong correlations among some of them. In fact, as shown in the correlation matrix in Table 10, a value higher than the 0.5 threshold (as an absolute value) is labeled "multicollinearity," which greatly complicates any estimate of the impact of each variable on the dependent variable (in this case, IRR).

[TABLE 10 APPROXIMATELY HERE]

In particular, we find that  $\Delta\text{SALES}$ ,  $\Delta\text{ROA}$ ,  $\Delta\text{ROE}$  and  $\text{HOLD-PER}$  are strongly correlated. Consequently, we consider four multivariate models, which treat separately these variables.

With respect to the sign of the coefficients, we expect a positive sign for  $\Delta\text{SALES}$ ,  $\Delta\text{ROA}$  and  $\Delta\text{ROE}$ , since it is reasonable to assume that the higher the economic performance of the portfolio firm, the higher the IRR of PE investments.

We also expect a negative sign for the coefficient of  $\text{HOLD-PER}$ . We believe that a long holding period indicates that the economic conditions of the portfolio firm are not good enough to achieve a high IRR.

Table 11 shows coefficients of the multivariate regressions on IRR. The only coefficients that are statistically significant are those pertaining to the economic performance of firms, holding period, and investment type. With reference to business sector, the “resource” coefficient is statistically significant only in regression 4, while t-ratios in regressions 1 and 3 show borderline significance.

[TABLE 11 APPROXIMATELY HERE]

As expected, the results of the two-sided t-test show that the economic performance of firms has statistically significant coefficients. Also, the holding period is negatively linked to IRR.

The best regression model is the first one ( $R^2 = 0.54$ ), which involves the annual variation of portfolio firm revenue. We conclude that  $\Delta\text{SALES}$  is the best explanatory variable for IRR.

In the following section, we test whether IRR determinants are affected by the investment patterns of the various PE providers.

### ***4.3. Univariate regressions on the determinants of IRR***

In Section 4.1 we highlight that funds owned by diverse entities differ in terms of the holding period of their investments and the number of seats that their representatives hold on boards of directors, both in PE-backed firms and in other firms held by the fund MCO.

In Section 4.2, we find that IRR is influenced by the economic performance of the portfolio firm and by the holding period of the investment. In addition, we find that IRR differs among diverse investment types.

Now we test whether IRR determinants are affected by the variables that define the investment patterns of the funds owned by diverse entities.

From paragraph 4.1, we already know that the holding period, which is one IRR determinant, differs among funds owned by diverse entities. We also find that PE providers do not differ in terms of investment type.

Here we consider  $\Delta\text{SALES}$ , which is the best explanatory variable for IRR. We argue that  $\Delta\text{SALES}$  is affected by the amount of time fund representatives can devote to monitoring tasks.

In paragraph 4.1, we find that representatives of bank-owned funds have a higher number of seats on the boards of directors both of PE-backed firms and of other firms belonging to the fund MCO than do corporate-owned fund representatives. As a consequence of this plurality of offices, bank-owned fund representatives have less time to devote to the monitoring of the investments than do corporate funds; less time should lead to lower performance.

We test whether  $\Delta\text{SALES}$  is affected by CNMC and CNF, which we use as proxies for involvement of fund representatives. Based on our previous considerations, we expect a negative sign for the coefficient of both CNMC and CNF. Moreover, we expect that CNMC is more detrimental to the revenue growth rate than is CNF. On one hand, sitting on many boards of directors could be very time consuming and thereby prevent fund representatives from becoming deeply involved in the activities of each portfolio firm. On the other hand, fund representatives who participate on the boards of directors of several PE-backed firms could benefit from experience effects, which could partially compensate for the above-mentioned negative effect. A different situation should occur when fund representatives sit on the boards of directors of several firms, including non PE-backed firms. In such a case, we believe that the time available to adequately monitor investment performance is much less than in the previous case.

Table 12 shows coefficients for the univariate regressions on  $\Delta\text{SALES}$ .

[TABLE 12 APPROXIMATELY HERE]

A negative coefficient indicates that the plurality of offices held by fund representatives negatively affects firm revenue growth rate. As expected, the results of a two-sided t-test show that CNMC and CNF have negative and statistically significant coefficients. As expected, CNMC has a more detrimental effect on firm performance than does CNF.

## 5. Conclusions

Based on a data set including the universe of PE investments made by Italian closed-end funds from 1999 to 2005, we verify that the ownership of PE funds influences investment performance, and we formulate an explanation.

We pursue an indirect estimation approach. Our key assumption is that the ownership of PE funds does not influence portfolio firm outcomes directly, but indirectly through PE fund investment patterns.

Our analysis adopts a two-step approach.

First, we show that funds owned by diverse entities have different investment patterns. In particular, during the holding period, bank-owned fund representatives hold a higher number of seats on boards of directors of PE-backed firms and on boards of other firms (non-PE-backed) owned by the fund's MCO than do corporate-owned fund representatives. This means that bank-owned and corporate-owned funds differ in terms of the amount of time that their representatives can devote to monitoring investments. Bank-owned fund representatives are busier than corporate fund representatives. We conclude that bank-owned funds implement weaker monitoring of the firms in which they invest, because of less effective participation as members of firm boards of directors. Among bank-owned funds, those in

which the bank financed the firm prior to PE investment (BL funds) seem to have busier fund representatives than do funds in which the bank did not finance the firm (BNL funds). Nevertheless, the statistical significance of the difference between BL and BNL funds is borderline. We conjecture that management companies of BL funds perceive that close monitoring of the portfolio firm is not necessary, since the bank-owner already knows the quality of the firm. Besides, if the firm's economic conditions deteriorate, the bank can refinance it.

Secondly, we identify the determinants of IRR and show that revenue growth rate is the best explanatory variable. We demonstrate that less effective participation by fund representatives on firm boards of directors leads to lower revenue growth of portfolio firms. Since the revenue growth rate is strongly correlated to IRR and is influenced by fund representatives' involvement in portfolio firms, we conclude that the ownership of PE funds affects investment IRR, because of differing effectiveness with respect to participation of fund representatives on portfolio firms' boards of directors.

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Table 1

*Variables description*

Variables	Description
OWNER	The entity that owns the fund MCO
CNF	The total number of seats that fund representatives hold on portfolio firm boards of directors, during the holding period
CNMC	The total number of seats that fund representatives hold on boards of firms owned by fund MCO (including non-PE-backed firms) during the holding period
I-KIND	The investment type, which mainly refers to the stage of the portfolio firm's life cycle (EARLY-early stage; EXP-expansion; BUYOUT-buyout investments; TURN-turnaround investments)
I-SIZE	The amount of capital invested in the portfolio firm (millions of euro)
%SHARE	The percentage of shares of the portfolio firm held by the PE fund
HOLD-PER	The holding period of the investments (years)
EXIT WAY	The exit strategy of the PE fund (TRADE; IPO; WRITE OFF)
Y_INVIRR	The annual gross IRR on realized investments
BUS	The portfolio firm's business sector
$\Delta$ SALES	The annual sales growth rate of the portfolio firm
$\Delta$ ROA	The return on assets annual growth rate of the portfolio firm
$\Delta$ ROE	The return on equity annual growth rate of the portfolio firm

Table 2

Average CNF and CNMC by MCO owner

MCO OWNER	N	% of Total	Mean CNF	Mean CNMC
BL	389	48%	4.22	8.19
BNL	63	8%	3.63	7.54
CORP	201	25%	2.18	6.27
OTH	9	1%	2.29	8.22
PA	63	8%	2.92	5.78
PI	79	10%	2.28	6.11
<i>Overall</i>	<i>804</i>	<i>100%</i>	<i>2.94</i>	<i>6.92</i>

Table 3

Quantiles, mean and standard deviation of the shareholding held in portfolio firms, size and economic performances of portfolio firms

	PE fund shareholdings in portfolio firms (%)	Size of portfolio firms (annual sales the year prior to PE investment, millions euro)	Revenue annual growth rate of portfolio firms (%)	ROA annual growth rate of portfolio firms (%)	ROE annual growth rate of portfolio firms (%)
<i>Quantiles</i>					
100.0%	50.00	499.10	92.22	121.5	635.7
99.5%	40.00	494.32	75.81	89.1	382.0
97.5%	35.00	476.72	46.85	43.6	135.4
90.0%	30.00	355.88	15.47	13.9	40.2
75.0%	25.00	170.08	7.95	7.2	18.0
50.0%	25.00	81.66	4.09	3.4	8.4
25.0%	20.00	30.24	2.13	1.6	3.7
10.0%	15.00	15.58	0.85	0.7	1.4
2.5%	10.00	9.39	-1.05	-0.9	-1.7
0.5%	5.00	8.22	-8.25	-7.4	-28.9
0.0%	2.00	6.31	-35.37	-30.4	-70.8
<i>Moments</i>					
Mean	22.63	128.01	7.44	6.75	20.74
Std Dev	6.77	131.28	11.88	12.10	51.27

Table 4

*Average holding period of investments (years), by business sector, investment kind and MCO owner*

The business sectors in which Italian PE firms invested are as follows:

RESOURCE: Mining - Oil & Gas

BASIC: Chemicals - Construction & building materials - Forestry & paper - Steel & other metals

GENERAL: Aerospace & defence - Electronic & electrical equipment - Engineering & machinery

CG-CYCL: Automobiles & parts - Household goods & textiles

CG-NONCYC: Beverages - Food producers & processors - Health - Personal care & household products - Pharmaceuticals & biotechnology - Tobacco

CYCLSERV: General retailers - Leisure & hotels - Media & entertainment - Support services - Transport

NONCYSER: Food & drug retailers - Telecommunications services

UTILITY: Electricity - Other utilities

FINANCE: Banks - Insurance - Life insurance - Investment companies - Real estate

IT: Information technology hardware - Software & computer services

Panel A: holding period by business sector	
RESOURCE	2.87
BASIC	2.82
GENERAL	2.70
CG-CYCL	3.01
CG-NONCYCL	2.82
CYCLSERV	2.97
NONCYSER	2.87
UTILITY	2.83
FINANCE	2.86
IT	2.72
Panel B: holding period by investment type	
EARLY	3.49
EXP	2.82
BUY OUT	2.53
TURN	2.73
Panel C: holding period by MCO owner	
BL	2.99
BNL	2.92
CORP	2.62
OTH	2.46
PA	2.69
PI	2.78
<i>Overall Mean</i>	2.85

Table 5

Average investment size (millions euro), by business sector, investment kind, holding period and MCO owner

Panel A: Investment size by business sector	
RESOURCE	4.48
BASIC	6.20
GENERAL	6.21
CG-CYCL	6.91
CG-NONCYCL	7.65
CYCLSERV	6.35
NONCYSER	7.35
UTILITY	8.43
FINANCE	8.81
IT	5.91
Panel B: Investment size by investment type	
EARLY	1.03
EXP	3.89
BUY OUT	15.60
TURN	8.10
Panel C: Investment size by holding period	
0-12 months	8.68
12- 24 months	8.24
24- 36 months	7.50
36- 48 months	7.07
48- 60 months	6.07
Panel D: Investment size by MCO's owner	
BL	6.86
BNL	6.49
CORP	6.96
OTH	4.34
PA	6.34
PI	6.14
<i>Overall Mean</i>	<i>6.71</i>

Table 6

Exit strategy by business sector and investment type

Panel A: Exit strategy by business sector			
	TRADE	IPO	WOFF
RESOURCE	82.35%	0.00%	17.65%
BASIC	86.57%	2.99%	10.45%
GENERAL	89.39%	5.05%	5.56%
CG-CYCL	89.38%	6.25%	4.38%
CG-NONCYCL	91.30%	3.48%	5.22%
CYCLSERV	85.59%	7.21%	7.21%
NONCYSER	84.31%	9.80%	5.88%
UTILITY	76.92%	7.69%	15.38%
FINANCE	93.75%	0.00%	6.25%
IT	81.40%	13.95%	4.65%
Panel B: Exit strategy by investment type			
	TRADE	IPO	WOFF
EARLY	85.61%	3.79%	10.61%
EXP	90.19%	5.50%	4.31%
BUY OUT	86.19%	8.10%	5.71%
TURN	77.27%	4.55%	18.18%

Table 7

*IRRs by business sector and investment type*

Panel A. Average annual IRR by business sector	
GENERAL	14.91%
IT	13.32%
FINANCE	12.68%
NONCYSER	11.58%
CG-CYCL	11.24%
CG-NONCYC	11.02%
BASIC	9.36%
CYCLSERV	9.34%
UTILITY	3.56%
RESOURCE	1.58%
Panel B. Average annual IRR by investment type	
BUYOUT	16.38%
EARLY	11.84%
EXP	12.44%
TURN	-22.82%
Overall Mean	11.4%

Table 8

*Effect of Wald Tests on PE firms*

The table reports the results of a Wald Test, which tests for the importance of investment type, business sector of portfolio firms, investment size, percentage of shares held by the PE fund in portfolio firms, holding period, exit strategy from the investment, and plurality of offices held by fund representatives, in differentiating PE firm investment patterns.

Source	Wald ChiSquare	Prob>ChiSq
KIND	9.35074185	0.8585
BUS	25.4779099	0.9916
I-SIZE	5.26414327	0.3845
%SHARE	8.44446025	0.8334
HOLD-PER	18.1325021	0.0028
EXIT WAY	4.870317	0.8997
CNF	6.15652584	0.0013
CNMC	17.3450735	0.0039

Table 9

*Average difference in holding period (years), CNF and CNMC, among PE firms*

Panel A reports the results of two-sided Student's t test, which tests for difference among PE providers in the average holding period of the investments.

Panel B reports the results of two-sided Student's t test, which tests for difference among PE houses in the average number of seats that fund representatives hold on portfolio firm boards of directors, during the holding period.

Panel C reports the results of two-sided Student's t test, which tests for difference among PE houses in the average number of seats that fund representatives hold on boards of firms that belong to the fund MCO (including non PE-backed firms) during the holding period.

Panel A. Dependent variable: HOLDING PERIOD			Panel B. Dependent variable: CNF		Panel C. Dependent variable: CNMC	
	Estimate	t Ratio	Estimate	t Ratio	Estimate	t Ratio
Intercept	2.7623	36.55***	2.26	20.14***	6.04	38.08***
BL	0.2302	2.69***	1.02	2.08**	1.27	2.02**
BNL	0.1570	1.98**	0.63	1.81*	0.53	2.14**
CORP	-0.1421	-1.74*	-0.81	-1.94*	-0.77	-1.88*
OTH	-0.2994	-0.95	-0.67	-1.17	-1.17	-1.15
PA	0.1332	0.96	-0.03	-0.15	-0.48	-1.02

\* Significance at the 10% level; \*\* Significance at the 5% level; \*\*\* Significance at the 1% level

Table 10

*Matrix of correlations among explanatory variables of IRR*

The table reports correlation coefficients among the quantitative dependent variables used in multivariate regression on IRR.

	$\Delta$ SALES	$\Delta$ ROA	$\Delta$ ROE	HOLD-PER	I-SIZE	%SHARE
$\Delta$ SALES	1.000	0.931	0.804	-0.571	0.132	-0.059
$\Delta$ ROA	0.931	1.000	0.887	-0.550	0.104	-0.072
$\Delta$ ROE	0.804	0.887	1.000	-0.504	0.074	-0.073
HOLD-PER	-0.571	-0.550	-0.504	1.000	-0.198	0.030
I-SIZE	0.132	0.104	0.074	-0.198	1.000	0.035
%SHARE	-0.059	-0.072	-0.073	0.030	0.035	1.000

Table 11

*Multivariate regressions on IRR (coefficients and t ratios)*

The table shows the coefficients of multivariate regression on IRR and the value of two-sided Student's t test.

	1	2	3	4
Intercept	-0.0298 (-1.99**)	-0.0221 (-2.15**)	-0.0182 (-2.62***)	0.2556 (6.71***)
$\Delta$ SALES	0.0118 (20.39***)			
$\Delta$ ROA		0.0121 (17.41***)		
$\Delta$ ROE			0.0119 (12.97***)	
HOLDPER				-0.0724 (-10.13***)
I-SIZE	0.0012 (1.10)	-0.0003 (1.08)	0.0031 (1.03)	0.0018 (1.13)
%SHARE	-0.0004 (-0.41)	0.0082 (0.12)	-0.0004 (-0.26)	-0.0011 (-0.98)
KIND[BUYOUT]	0.1676 (4.63***)	0.1648 (4.30***)	0.1550 (4.29***)	0.0679 (4.56***)
KIND[EARLY]	0.0623	0.0585	0.0641	0.0048



	1	2	3	4
	(3.08***)	(3.05***)	(2.87***)	(2.95***)
KIND[EXP]	0.0588 (3.14***)	0.0582 (3.00***)	0.0648 (3.09***)	0.0113 (3.12***)
BUSINESS SECTOR[BASIC]	-0.0018 (-0.08)	-0.0082 (-0.35)	-0.0146 (-0.58)	-0.0044 (-0.17)
BUSINESS SECTOR[CG-CYCL]	0.0144 (0.89)	0.0117 (0.69)	0.0036 (0.20)	0.0139 (0.73)
BUSINESS SECTOR[CG-NONCYC]	0.0033 (0.18)	0.0028 (0.14)	0.0020 (0.10)	0.0004 (0.02)
BUSINESS SECTOR[CYCLSERV]	0.0028 (0.15)	-0.0021 (-0.11)	0.0001 (0.01)	0.0065 (0.30)
BUSINESS SECTOR[FINANCE]	0.0510 (1.18)	0.0514 (1.13)	0.0460 (0.95)	0.0397 (0.79)
BUSINESS SECTOR[GENERAL]	0.0010 (0.07)	0.0057 (0.36)	0.0164 (0.96)	0.0267 (1.51)
BUSINESS SECTOR[IT]	0.0135 (0.49)	0.0180 (0.63)	0.0326 (1.06)	0.0287 (0.90)
BUSINESS SECTOR[NONCYSER]	-0.0090 (-0.35)	-0.0011 (-0.04)	0.0055 (0.20)	0.0109 (0.37)
BUSINESS SECTOR[RESOURCE]	0.0162 (1.64*)	0.0153 (1.27)	0.0118 (1.65*)	0.0136 (2.02**)
# obs.	804	804	804	804
R <sup>2</sup>	0.5407	0.4827	0.3954	0.3434

\* Significance at the 10% level; \*\* Significance at the 5% level; \*\*\* Significance at the 1% level

Table 12

*Univariate regressions on  $\Delta SALES$  (coefficients and t ratios)*

The table shows the coefficients of multivariate regressions on  $\Delta SALES$  and the value of two-sided Student's t test.

Dependent variable: $\Delta SALES$		
	1	2
Intercept	10.3453 (9.20***)	7.7797 (10.52***)
CNMC	-0.4194 (-2.78***)	
CNF		-0.1223 (-2.95***)

\* Significance at the 10% level; \*\* Significance at the 5% level; \*\*\* Significance at the 1% level

Figure 1

The typical structure of a closed-end fund

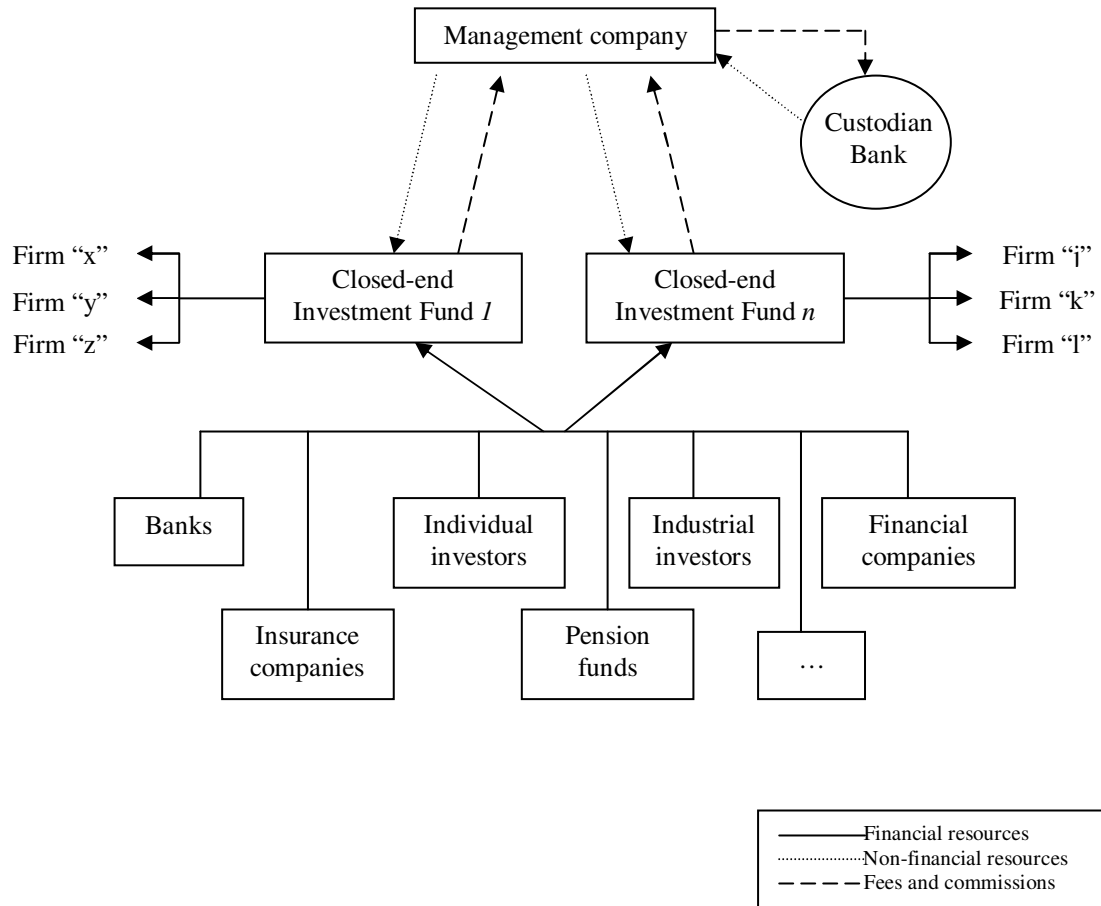


Figure 2

*Business sectors of portfolio firms*

The business sectors in which Italian PE firms invested are as follows:

RESOURCE: Mining - Oil & Gas

BASIC: Chemicals - Construction & building materials - Forestry & paper - Steel & other metals

GENERAL: Aerospace & defence - Electronic & electrical equipment - Engineering & machinery

CG-CYCL: Automobiles & parts - Household goods & textiles

CG-NONCYC: Beverages - Food producers & processors - Health - Personal care & household products - Pharmaceuticals & biotechnology - Tobacco

CYCLSERV: General retailers - Leisure & hotels - Media & entertainment - Support services - Transport

NONCYSERV: Food & drug retailers - Telecommunication services

UTILITY: Electricity - Other utilities

FINANCE: Banks - Insurance - Life insurance - Investment firms - Real estate

IT: Information technology hardware - Software & computer services

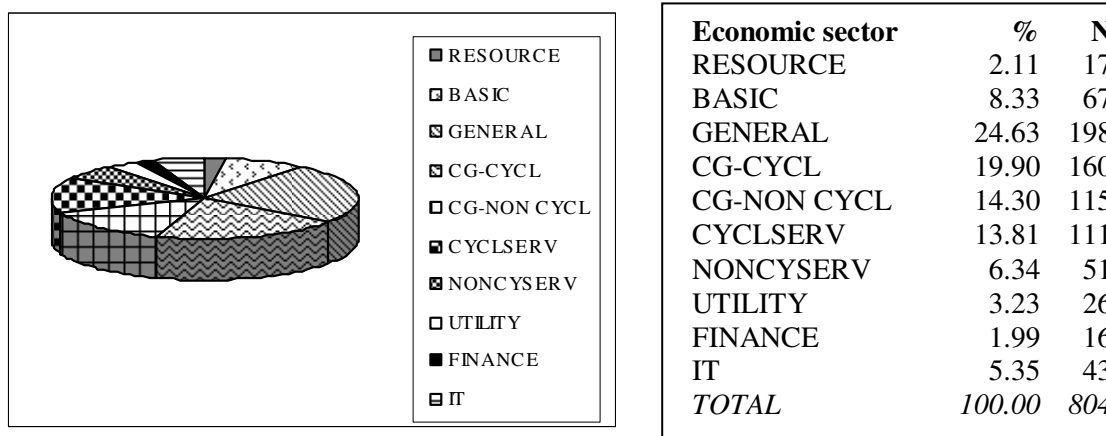


Figure 3

*Make-up of the data set by investment type*

