# PRIVATE EQUITY RETURNS AND DISCLOSURE AROUND THE WORLD*

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**Douglas Cumming**
Associate Professor and Ontario Research Chair
York University - Schulich School of Business
4700 Keele Street
Toronto, Ontario M3J 1P3
Canada
Tel: +1-647-280-3410
Email: DCumming@schulich.yorku.ca
http://www.schulich.yorku.ca/
http://ssrn.com/author=75390


**Uwe Walz**
Goethe-Universität Frankfurt/Main
Center for Financial Studies
Grüneburgplatz 1
D-60325 Frankfurt/Main
Germany
Tel.: ++49-69-798-34821
Fax: ++49-798-22753
email: uwe.walz@wiwi.uni-frankfurt.de
http://www.wiwi.uni-frankfurt.de/profs/walz

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**Abstract**

To obtain more funds from the institutional investors, private equity fund managers may report inflated valuations of private investee companies that are not yet sold. However, such overvaluations may result in a reputational cost when those investments are realized. Using evidence from 39 countries, we show that there are significant systematic biases in managers' reporting of fund performance. We find that these biases depend on the accounting and legal environment in a country, and on proxies for the degree of information asymmetry between institutional investors and private equity fund managers.

**Keywords:**   International Financial Reporting, Private Equity and Portfolio Diversification, Venture Capital

**INTRODUCTION**

Private equity (PE) funds are specialized intermediaries. Usually, such funds are organized as limited partnerships that invest in illiquid assets, i.e., privately held firms. Valuation of these illiquid assets is difficult and subject to discretion. PE funds routinely report to their institutional investors the valuations on their investments in illiquid companies prior to an actual exit or sale transaction. Fund managers raise follow-on funds before exiting their investments, and may have incentives to overvalue their as-yet-unsold investments when making disclosures to institutional investors. Despite perverse incentives to overvalue, PE funds do not face mandatory disclosure rules in any country with a significant PE industry. Yet the overvaluation of unexited PE investments has the potential to distort capital allocations to the PE industry generally, and across PE funds in different countries around the world (FSA, 2006). Thus, it has motivated PE associations such as the European Venture Capital Association (EVCA) and Institutional Limited Partners Association, as well as investment manager associations around the world, to reconsider imposing standards, or at least more stringent guidelines, on reporting unrealized returns (Cumming & Johan, 2007; McCahery & Vermeulen, 2009).

In this paper, we examine the theory and evidence underlying the way in which PE fund managers disclose information to their institutional investors. The issue of PE funds' disclosure to institutional investors is very much an international issue, because institutional investors invariably invest in PE funds internationally (Tykvova & Schertler, 2006). Even institutional investors in relatively smaller countries invest in PE funds in the U.S., across Europe and in the Asia-Pacific region (Cumming & Johan, 2007). Institutional investors rank the quality of international disclosures from PE funds as among the most important hurdles in PE investment, and as important as risks associated with illiquidity and liquidations (Cumming & Johan, 2009). Given the industry practice of internationalization in PE investment, an effective analysis of PE disclosures requires an international perspective. This paper represents what we believe is a first attempt to do so.

We analyze PE funds' reporting of valuations in terms of their unexited internal rates of returns (IRRs). We ask if there are systematic biases in the reporting of fund performance, and under what conditions such biases are more pronounced. We examine a detailed international data set that provides cash flow information at the level of the individual investment for the 5,038 portfolio firms of 221 PE funds. Our sample covers the period 1971–2003, and 39 countries. To analyze potential biases in the reporting of current fund holdings, we use information on former fund holdings to construct a benchmark. We investigate potential drivers of fund dispositions to establish predictions for the returns on current fund holdings. By comparing the reported and predicted returns of current holdings, we are able to examine fund reporting and to consider potential determinants of biases in the

valuation of current holdings. We confirm the validity of the approach by comparing realized IRRs to previously reported unrealized IRRs for a subsample of the data.

We find systematic biases in the reporting of unrealized IRRs relative to forecasted IRRs. These reporting biases are explained by cross-country differences in accounting standards, legality, and proxies for information asymmetry between PE managers and their institutional investors. We show that higher-quality legal systems and accounting standards lead to less overvaluation. Thus, we provide empirical evidence for the idea that a trade-off between the reputational costs of misreporting and the benefit of PEs that result from misreporting govern the degree of overvaluation. We also study other various determinants of this trade-off that reflect international differences in PE markets. Overall, our data show that economic and institutional drivers of misreporting information are directly related to information asymmetries faced by the users of the information reported.

The paper is organized as follows. In the second section we present the institutional background behind PE disclosure and valuations and we derive the theoretical hypotheses that form the basis for our empirical analysis. We describe our data set in the third section. In the fourth section we analyze realized IRRs by considering sample selection issues. In the fifth section we compare unrealized IRRs to predicted IRRs. The last section concludes.

## REPORTING BIASES WITH UNREALIZED INVESTMENTS: INSTITUTIONAL BACKGROUND AND HYPOTHESES

### Institutional background

#### *Main characteristics of the PE industry.*

PE is a collective investment scheme (fund) that invests in companies with the intention of obtaining a controlling interest, usually by becoming a majority shareholder, sometimes by becoming the largest plurality shareholder. In this paper we use the term PE as a generic term that encompasses all investments in private firms. Likewise, for ease of exposition, we use the term "PE funds" to include earlier stage venture capital (VC) funds and both late-stage and mezzanine funds. Similarly, a "PE manager" refers to the manager of a PE fund that makes and implements investment decisions. The PE fund's goal is to be in a position to restructure the target company's reserve capital, management, and organizational infrastructure. The target companies are typically held private and restructured over a period of three to seven years. They are then exited through an initial public offering (IPO) or sold to other (strategic or financial) investors. Restructuring can be done through leveraged buyouts, VC, growth capital, angel investing, mezzanine debt, management share

participation programs, and other methods. PE funds are typically invested in non-listed companies with limited liability.

PE funds are financial intermediaries between entrepreneurial firms and, primarily, institutional investors (Sahlman, 1990). PE funds exist because of pronounced information asymmetries and principal-agent problems in financing start-up and late-stage firms, and because institutional investors lack the time and skill to select suitable entrepreneurial firms in which to invest. Therefore, PE funds are typically set up as limited partnerships that exist for a ten-year period with an option to continue for a further three years, so that investments can be selected and brought to fruition via exit. The PE manager, who selects, monitors, and adds value to the investment, is the general partner, and the institutional investors are the limited partners (Gompers & Lerner, 1999).

Each year, PE managers report valuations on unrealized portfolio investments to their investors. However, there is a principal-agent problem between PE managers and their institutional investors. Since the resulting cash flows must be distributed to the limited partners, the measurement of returns on investments that have been exited is straightforward. However, matters are far more difficult for reporting returns and valuations on unrealized investments, since this reporting hinges on the valuations determined by the PE managers.

In the context of PE investment, an "unexited" or "unrealized" investment return is not one for which the PE fund manager has sold the investment by way of an IPO, acquisition, or some other form of exit. Rather, it is a return that the PE fund manager still maintains in the fund portfolio (as noted above, such investments often last three to seven years), and to which the fund manager assigns a value that implies a return. The fund manager reports that unrealized valuation and implied return to the fund's institutional investors. The valuation is not a market valuation, because the investee firms are privately held. Hence, there is room for interpretation of the appropriate valuation.

Given that PE funds are intermediaries between the portfolio firms and the investors, there are two links that affect the valuation of unexited investments and their disclosure to investors. The first is the financial reporting and disclosure of the privately held portfolio firm, and the second is the valuations disclosed by private equity managers to their investors. To clarify the potential impact of the disclosure environment and the legal framework on both links, we review the institutional set-up for links for both the U.S. and the European Union (EU), thereby covering a large part of our sample. By making this connection, we also point to channels through which both the legal framework and the disclosure environment affect the valuation of unexited investments.

*Related research.*

Our paper builds on and extends the literature that investigates the financial disclosure of firms that are, or aim to become, PE-backed. Using a panel of U.S. biotech firms Hand (2005) finds that the financial statements of privately held, VC-backed firms are value-relevant. Despite the fact that disclosure is not mandatory for these firms, reporting is value-relevant to about the same degree as in public markets, but only for later (and not for earlier stages) of the firm's life cycle. Armstrong *et al.* (2005) confirm and extend this view by analyzing a broader set of venture-backed early stage companies in different industries. Beuselinck *et al.* (2008) address this question by using a sample of Belgian PE-financed companies. They show that firms do not reveal more information before receiving PE investments compared to their non-PE counterparts. However, after having received PE financing, these (unlisted) firms voluntarily disclose more information. Rather than looking into the relationship between the portfolio firm and the PE investor, we address the disclosure behavior of PE firms in relation to their investors concerning the value of the portfolio firms. Thereby, we complement these studies, and extend them in two directions. First, we investigate the second, missing link between financial reporting and disclosure in the PE industry. Second, we apply our analysis to an international setting.

Our paper is related to analyses of returns of PE investments as in Manigart *et al.* (1996, 2000, 2002a,b), Moskowitz and Vissing-Jorgensen (2002), Ljungqvist and Richardson (2003a), Das *et al.* (2003), and Cochrane (2005), who investigates the performance of PE investments in individual U.S. portfolio firms. Ljungqvist and Richardson (2003b) use a proprietary data set to analyze the investment behavior of PE funds in the U.S., Cumming and MacIntosh (2003) present data on exits and returns in Canada and the U.S., Manigart *et al.* (1996, 2000, 2002a,b), Hege *et al.* (2003), and Schwienbacher (2003) have similar data that compares Europe and the U.S. We differentiate ourselves from these studies because, to our knowledge, our paper is the first to analyze the (over-) valuations issue with an international data set. Thus, we add new insights to the regulatory discussion. Our paper is also related to other studies on international aspects in the PE industry (see for an overview Wright *et al.*, 2005). These studies have, however, quite a different focus than ours and consider issues such as e.g. the development of the PE industry particular markets (Ahlstrom *et al.*, 2007) and issues of risk management practices in the PE industry in a cross-country perspective (Kut *et al.*, 2007; Smolarski, 2007). Perhaps the paper most closely related to ours in this context is Wright *et al.* (2004) who focus on the use of valuation methods in different countries; however, unlike our paper they do not consider issues of disclosure and strategic overreporting.

***Valuation and disclosure rule for privately held companies.***

An important channel that can affect the PE funds' disclosure of information to their limited partners is the degree of information disclosed by the funds' portfolio firms. The disclosure of such financial information to the portfolio firm's investor (i.e., the private equity fund) is clearly an important starting point for the correct valuation of the PEs investments. PE funds' portfolio firms are usually privately held and have limited liability status. Although publicly traded global firms face stiff financial reporting standards worldwide with respect to their valuation and disclosure policies, matters can be significantly different for privately held portfolio firms.

In the U.S., there are no mandatory financial reporting or disclosure rules imposed on privately held firms (FASB, 2006). Therefore, non-listed firms are free to choose how, if, and to what extent they will provide financial reporting. However, firms have strong incentives to provide financial statements that generally adhere to the guiding principles of U.S. Generally Accepted Accounting Principles (GAAP) (FASB, 2006; McCahery & Vermeulen, 2009). These incentives stem mainly from two factors. The first is the often stressed effect of voluntary disclosure on the cost and availability of capital. (For empirical analyses on this effect for publicly traded firms, see, e.g., Welker, 1995, and Healey *et al*., 1999.) Firms want to attract new financiers. To do so, even privately held firms that do not directly rely on the public markets need to convince potential investors that their financial situation and firm are sound. Second, firms that are willing to go public soon are required to hold at least their last five years' financial statements that are consistent with U.S. GAAP (Hand, 2005). Since a significant number of PE deals are exited via an IPO, PE-backed firms have a strong incentive to provide sound financial statements. Furthermore, given the strong position of PE investors, we should expect PE funds to be able and willing to force their portfolio firms to provide such financial statements.

In the EU, matters are somewhat different. The EU's Fourth Council Directive (EU, 1978) sets the minimum standard of reporting for non-listed companies with limited liability in the European Union: "… the annual accounts shall comprise the balance sheet, the profit and loss account and the notes on the accounts. These documents shall constitute a composite whole." This requirement differentiates the EU reporting requirements from their counterparts in the U.S., because the directive is based on a binding legal requirement, not on voluntary disclosure or an agreement between company and investors/funds. Further, EU-based firms must also disclose their financial statements to the general public (EU, 1978, Section 10, "Publication" Article 47). (However, we note that state laws may provide exceptions to this requirement.) Nevertheless, many companies, especially small, non-listed firms, adhere to traditional European accounting standards that were set in the 1971-2003 period covered by our data set, but also beyond. These standards are unlike U.S. GAAP, which is based on the idea of fair value and going concern, relying instead on the concept of debtor protection. The transition to International Financial Reporting Standards (IFRS), which are closer to fair value

accounting, has happened in most European countries since 2007 and appear to have been slowly adopted by non-listed firms. (But we note that adoption rates for non-listed firms are difficult to quantify and present opportunities for further research.)

This brief comparison reveals three important points. First, PE managers should have access to proper financial reports of the portfolio firms to use as starting point for their own valuations. Second, the financial reports of portfolio firms should limit the discretionary powers that portfolio managers have over valuations. Third, we should expect that the stringency of reporting standards (with respect to fair value) should be reflected in the valuation of PE-backed firms.

### *Valuation and disclosure guidelines for private equity funds.*

PE funds organized as private limited partnerships do not face mandatory reporting and disclosure rules, particularly for the countries and years covered by the data in this paper (see, e.g., Cumming & Johan, 2007, 2009; Lerner *et al*., 2004; FSA, 2006; McCahery & Vermeulen, 2009, and Tuck School, 2003). There have been several attempts to establish voluntary industry guidelines and thus increase transparency in the industry. The first of these goes back to the National Venture Capital Associations (NVCA) effort in 1990 to propose guidelines for consistent valuations in the industry (Lerner *et al*., 2004; Tuck School, 2003). The British Venture Capital Association (BVCA) and EVCA followed the NVCA in the early 1990s, proposing guidelines for valuations and their disclosure from the limited to the general partners of private equity funds. The basic idea behind all these guidelines is that the general partner is the better-informed party, and therefore is in charge of valuing portfolio companies. Furthermore, the early valuation principle strongly relied on the idea of valuing the portfolio firm at the price of the most recent investment. This principle could either imply a valuation at the cost of investment, or, in cases in which further investment rounds by other informed outside investors (other PE investors) had taken place, using the price paid in the last investment round.

After many previously published guidelines, the International Private Equity and Venture Capital Valuation Guidelines (IPEV), which form the joint guidelines of many regional industry groups except for the NVCA, were published in October 2006. Throughout this entire process, the valuation guidelines of both IPEV and NVCA moved further towards valuing portfolio firms on the basis of fair values. But despite this objective, firms still use many different methods, such as the price of recent investments, earnings multiples, discounted cash flows or earnings of underlying business, discounted cash flows from the investments, and industry valuation benchmarks (IPEV, 2007). The use of different methods implies that even now there is significant leeway for PE

managers on their valuation of their unexited investments. This leeway is even wider with these guidelines that allow for substantial exception to the general rule.

**Hypotheses**

Intentional overvaluation by PE fund managers depends on information asymmetry between general and limited partners, and the expected marginal benefits and marginal costs of overvaluation. The marginal benefit is the expected probability of the overvaluation not being detected and the increase in the likelihood of raising future funds. The marginal cost is the expected probability of an overvaluation being detected and the loss of reputation, and the subsequent worsening in ability to raise capital. The likelihood of an overvaluation being detected depends on the information asymmetry between the limited partners and the general partner. The PE fund manager's decision to willingly over-report valuations is determined by the factors that affect this basic trade-off. We argue that the main factors affecting this trade-off are legal and accounting standards, conditions in local public markets, and fund and firm characteristics. The legal and accounting standards are international in themselves. The conditions in local public markets and fund and firm characteristics reflect cross-country differences only indirectly, via the country-specific composition of funds and firms.

Prior theoretical work that addresses trade-offs between overvaluations and reputational costs includes, among others, Verecchia (1983), Benabou and Laroque (1992), Healey and Palepu (2001), Stocken (2000), and Neus and Walz (2005). These studies show that insiders disclose their private information truthfully, provided that investors are sufficiently patient; that the accounting system is sufficiently useful for assessing the credibility of the insider's disclosure; and that the insider's disclosure can be evaluated over a sufficiently long period.

We note that for several reasons, the lack of formal rules for valuing unrealized PE investments as discussed does not imply that we should not expect any systematic link between valuations, the disclosure environment, and the legal frameworks. First, there is ample empirical evidence for the U.S. that the financial reporting of PE-backed firms is value-informative (Armstrong *et al*., 2005; Hand, 2005). The fact that large sophisticated investors in PE funds may demand these financial reports greatly limits the leeway for PE managers. Second, when a PE-backed company goes public, the company is required to report its financial information, which must include the time prior to the IPO (typically 5 years). Hence, although PE-backed firms are not required to follow disclosure and valuation rules while the firm is private, reporting standards do become relevant for the subset of firms that anticipate going public. Going public is the objective for a substantial portion of PE-backed companies at the time of first investment. For the U.S., ex post, during our observation period roughly one quarter of all firms were exited through an IPO; ex ante, a significantly higher

percentage expect to exit via an IPO (Ueda & Frantzeskakis, 2007). Third, there are studies that support the view that stronger regulations and accounting standards significantly and positively impact the quality of voluntary reporting across countries (e.g., Chen & Countenay, 2006). Other studies find that countries with better laws have firms that are more likely to be early voluntary adopters of the IFRS (e.g., Renders & Gaeremynck, 2007). Although there is no international index on the informativeness of voluntary reporting, to assess robustness to different measures of existing standards we can assess the quality of reporting standards relative to a number of different available accounting indexes. However, all these factors do not imply that with stringent reporting standards there is no leeway for PE fund managers when reporting the value of their portfolio firms, or for firms in engaging in earnings management (see Sloan, 1996, and Xie, 2001, for evidence for the U.S.). But these factors do lead us to expect that in cross-country comparisons, the quality of PE disclosure is related to the stringency of the reporting standards.

Finally, we note that limited partnership agreements sometimes contain fair-valuation clauses. There is some evidence consistent with the view that fair-valuation clauses, among the many other clauses in PE fund agreements, tend to be more common in countries with stronger legal environments (Cumming & Johan, 2009). As well, based on La Porta *et al*. (1997, 1998), we expect that such clauses are more likely to be enforced in countries with stronger legal environments. If so, valuation clauses would strengthen our prediction of a negative relation between the strength of legal and accounting standards and the degree of over-reporting, as postulated in Hypothesis 1.

>**Hypothesis 1:** *Unexited PE investments are less likely to be overvalued in countries that have superior accounting and legal standards.*

Apart for legal changes over time, there are several important factors that may affect a trade. These factors can lead us to expect that they structurally affect the willingness of the firm to either over-report or decline to write down poor investments. Conditions in public equity markets in the country in which the investment takes place are generally an important source of information for valuation. Behavioral biases lead PE managers to write up investments in good market conditions and to not write down investments in bad market conditions. Practitioner web pages such as http://vcexperts.com frequently note this tendency among fund managers. Write-downs give rise to a negative perception among possible future owners of the firm and therefore hurt exit potential.

Further, to attract new capital for follow-on funds, especially in times of poor local market conditions, fund managers have stronger incentives to overvalue unexited investments. In contrast, in times of good market conditions, attracting new capital is not as challenging, and there is often excess capital chasing too few opportunities (Gompers & Lerner, 2000). Hence, we expect PE funds to have

a greater tendency to overvalue investee firms in times of poor market conditions in the country in which the investment takes place. Our international data set makes it possible for us to investigate the impact of local market conditions differing across countries.

**Hypothesis 2:**  *Unexited PE investments are more likely to be overvalued at times and in countries where there are poor market conditions.*

Because PE funds hold illiquid assets in the form of portfolio firms that do not have a market value, institutional investors face pronounced information asymmetries.  The incentive to overvalue and thereby attract new future funds from institutional investors is especially pronounced for inexperienced fund managers – that is, first-time PE managers who have no track record of successful exits. Related evidence shows first-time PE managers often grandstand to institutional investors by taking portfolio firms public sooner than appropriate (Gompers & Lerner, 1999). Given they have less reputational capital to lose,  first-time PE managers are more likely to face lower expected costs of reporting overvaluations, and hence a stronger incentive to overvalue unexited investments. Further, with respect to analyzing financial statements and forecasting firm valuations (Bushee, 1998), there is likely a lower degree of skill and sophistication among first-time fund managers. We may also reasonably expect that the degree of sophistication among PE funds is correlated with the degree of sophistication of institutional investors (Lerner & Schoar, 2004), since more sophisticated institutional investors are less likely to invest in funds managed by less skilled or first-time PE fund managers. Overall, we conjecture that the more experienced PE managers who have managed multiple funds are better able to forecast valuations precisely, and have fewer incentives to overvalue unexited investments.

We note that we would expect significant international differences in the supply of experienced PE fund managers.  For instance, we expect that countries with less stringent accounting standards may have less experienced fund managers.  Our empirical analyses separate out these different possibilities in an international context.

**Hypothesis 3:**  *Inexperienced PE managers are more likely to overvalue unexited investments.*

 It is possible that a decline in the value of a PE-backed firm is due to adverse changes in market conditions between the time of reporting and the time of exit.  Changes in value can also be attributable to idiosyncratic factors associated with the portfolio firm, changes of which the PE manager was unaware at the time of reporting.  As a result, earlier-stage investments are more likely to be overvalued, since the time to exit is longer (Gompers & Lerner, 1999). Therefore, it is more

difficult to distinguish between reported overvaluations and changes in market conditions or other idiosyncratic factors that affect firm value. We also expect that where information asymmetries are more pronounced, such as for high-tech firms, unexited investments are more likely to be overvalued. Thus, we follow Gompers & Lerner (1999) by controlling for industry effects with dummy variables and industry market/book values. It is more difficult for institutional investors to disentangle reported overvaluations from the negative shocks associated with changes in market conditions and other idiosyncratic factors that affect value.

Similar to the notion that there are international differences in the experience of PE fund managers, we note that we would also expect to find significant differences in the demand for PE investment by firms at different stages of development and in different industries. For instance, we can expect that countries with less stringent accounting standards to have fewer early stage high-tech firms. Therefore, in our empirical analyses we consider and control for these different factors, which we expect to be central to understanding international differences in PE valuations.

**Hypothesis 4:** *Unexited earlier-stage PE investments are more likely to be overvalued.*

In addition to testing these hypotheses, we control for factors that may affect the degree of over-reporting valuation of the IRRs of unexited investments. These factors include proxies for the contribution of PE fund manager effort (see Cumming, 2006; Jääskeläinen *et al*., 2006; Kanniainen & Keuschnigg, 2003, 2004, Keuschnigg, 2004, and Keuschnigg & Nielsen, 2001, for evidence consistent with the idea that PE funds that add more value to their investees are less likely to overstate unexited investments), and syndication (see Brander *et al*., 2002; Lerner, 1994 and Wright & Lockett, 2003, for evidence consistent with PE funds having fewer incentives to overstate unexited in syndicate deals).

## DATA

We obtain our data set from the Center of Private Equity Research (CEPRES) in Frankfurt, Germany. Table 1 summarizes the data, which comprise 221 PE funds managed by 72 PE managers, and include 5,038 observations of portfolio firms (3,824 VC and 1,214 late-stage mezzanine and buyout firms). Our sample period spans 1971 to 2003, and covers 39 countries from North and South America, Europe, and Asia. For confidentiality reasons, we cannot disclose the names of funds, managers, and firms, etc. The observations represent 2,419 fully realized investments, i.e., the previous fund holdings; 1,665 unrealized investments, i.e., the current fund holdings in the original amounts; and 954 partially realized investments, i.e., the current fund holdings that have been partially exited or liquidated. The annual transaction volume is consistent with that reported in, for example, the U.S. (Gompers & Lerner, 1999). Table 1 indicates that the sample is characterized by a

large proportion (47.6%) of investments in the U.S., consistent with other work showing the U.S. has the dominant PE market (Armour & Cumming, 2006). Therefore, we test our hypotheses with and without the U.S. data in the sample. Table 1 further shows that the sample represents a wide range of industries and investment characteristics; however, for brevity we do not include other smaller categories in Table 1.

[Table 1 About Here]

The data contain actual IRRs for realized investments, those that account for all cash flows between the fund and the portfolio firm. Thus, our study differs from others, such as Cochrane (2005), that appear to base their proxies for returns on initial and final cash flows. In addition, our data contain details on the IRRs of unrealized investments that were reported to institutional investors by PE managers between June 2000 and September 2003. For unrealized investments reported to institutional investors, we use only one report per entrepreneurial firm. In our empirical analyses we test our theoretical hypotheses with two types of analyses. First, using econometric models with 2498 realized IRRs, we compare the reported unexited valuations with the econometric model's predicted valuations. Second, with a smaller subsample of 80 investments (Table 1), we perform exact back-testing of the realized valuation relative to the prior reported unrealized valuation.

Despite the fact that IRRs are subject to manipulation (Damodaran, 2001), we focus on IRRs in our analyses for several reasons. For example, one criticism of the use of IRR as a performance measurement is that managers can manipulate the duration of an investment. To some extent this criticism is correct, but for most entrepreneurial firms, the duration from first investment until actual exit is determined by exogenous factors, such as market conditions and factors internal to the investee company itself that affect the timing of the exit. Thus, realized IRRs are much harder to manipulate than unrealized IRRs.

Perhaps more importantly, the venture capital and private equity funds in our sample report IRRs for realized and unrealized investments. Further, they sometimes manipulate unrealized IRRs in their reports to institutional investors. In fact, IRR is the only performance metric provided to the institutional investors in our sample. Hence, it is appropriate for us to look at IRRs, because this variable is the information that has been reported to the institutional investors in our data set. Our data are derived from institutional investors, and the IRRs were provided by the institutional investors. We note that we do not calculate any IRRs ourselves, although we verify the IRRs from the cash flows provided. Our hypotheses and data are based on IRR manipulation for each investee firm, and it is necessary to study IRRs to see what is actually manipulated.

Table 2 defines the other variables in our data set and models.  To test Hypothesis 1, we use the following accounting and legal measures:

(1) The Disclosure Index developed by La Porta *et al.* (2006, Table 3): This index, which applies to IPO firms, is applicable to PE investee companies that are expected to go public in an IPO, because PE funds are be more likely to disclose more accurate valuations of unexited investee companies that have better prospects of subsequently achieving an IPO.  Hypothesis 1 requires a negative relation between the Disclosure Index and the disclosure of unexited PE returns to institutional investors.

(2) The Earnings Aggressiveness Index developed by Bhattacharya *et al.* (2003, Table 2):  This measure reflects median accruals scaled by total assets for each country. We define earnings aggressiveness as the tendency to delay the recognition of losses and the speed of the recognition of gains.  Accounting conservatism is the opposite of earnings aggressiveness;  it represents the more timely incorporation of economic losses rather than economic gains (Ball *et al.*, 2000).[1] The lower of cost or market rules and accounting procedures with a conservative bias result in negative accruals.  Hence, support for Hypothesis 1 requires a positive relation between the Earnings Aggressiveness Index and the disclosure of unexited PE returns to institutional investors.

(3) The Private Firm Accounting Indexes developed by Burgstahler *et al.* (2006, Table 2), with the following notation and variables: (1) EM1 (Avoidance of Small Losses) measures the degree to which firms use accounting discretion to avoid reporting losses. Using this index is consistent with the view that PE funds are often reluctant to write down the book value of their investments for several reasons, but especially to avoid the appearance of carrying "living dead" investments that will be difficult to sell.  (2) EM2 (Magnitude of Total Accruals in Relation to Cash Flow from Operations) measures the extent to which firms use reporting discretion to, for example, boost earnings in years of poor performance. This measure is particularly relevant for our sample period 2000–2004.  (3) EM3 (Smoothing of Operating Earnings vis-à-vis Cash Flow) refers to the extent to which firms use accruals to reduce the variability of reported earnings. This variable is a relevant measure for PE fund reporting, because exit transactions such as IPOs might be facilitated by reducing the appearance of earnings variability of the portfolio firm prior to the actual exit.  (4) EM4 (Correlation between Accounting Accruals and Cash Flow from Operations) is an alternative measure of earnings smoothing, because larger magnitudes of this negative measure indicate smoothing of reported earnings unrelated to the firm's economic performance.  5) EM Aggregate (Aggregate Measures of Earnings Management) is the percentage sum of EM1 to EM4.  We note that we define these accounting indexes developed by Burgstahler *et al.* (2006) for a subset of countries in our sample: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal, Spain, Sweden, and the U.K.  Thus, the use of these

accounting indexes facilitates a dual robustness check for a subsample of countries and for different measures of accounting standards throughout various countries. The Burgstahler *et al*. (2006) accounting standards are pertinent measures for private firms.

(4) The Legality Index, based on Berkowitz *et al.* (2003), following La Porta *et al*. (1997, 1998): The Legality Index refers to Berkowitz *et al*.'s weighted average of a country`s efficiency of the judicial system, rule of law, corruption, risk of expropriation, risk of contract repudiation, and shareholder rights. Where legal protection and enforcement is superior, misreporting PE fund managers are more likely to be exposed as such to institutional investors.

We note that we considered a wide variety of other legal and accounting measures (e.g., Disclosure Level Index in Table 2 of Bhattacharya *et al*. (2003)- originally used by the Center for International Financial Analysis and Research, 1995) to test Hypothesis 1, and found consistent results, since many of these alternative indexes are highly correlated with each other. Alternative specifications are available on request.

[Table 2 About Here]

Table 3, Panel A, presents summary IRR statistics for all funds. We also differentiate among funds according to market and legal factors (Panel B), PE fund characteristics (Panel C), portfolio firm characteristics (Panel D), transaction-specific characteristics (Panel E), and by country and legal origin (Panel F). We provide comparison tests for average and median returns across fully realized compared to unrealized or only partially realized investments. The median unrealized IRR is zero for all transactions (Table 3, Panel A, row 1), but the average unrealized IRR is 63.23%. In contrast, realized IRRs have a median of 16.99% and an average of 68.67%. Median realized IRRs are significantly greater than are median unrealized IRRs, but the average realized IRRs are not statistically different from the average unrealized IRRs. We attribute the nonsignificance of the differences in average values to the very large standard deviations of the returns, which is consistent with U.S. data (Cochrane, 2005).

[Table 3 About Here]

When we observe the legal and accounting indexes (Table 3, Panel B, rows 2-7), we see that the average unrealized IRRs are significantly higher among countries with weaker legal environments and less stringent accounting requirements. This observation is consistent with Hypothesis 1. Due to the high variance in IRRs, these differences-of-means tests are not statistically significant, but are nevertheless indicative of trends in the data.

We note that when public equity markets experience high returns (Table 3, Panel B, row 8), the realized returns are positive and greater than are the unrealized median returns. However, when public equity markets experience low returns (row 9), then the unrealized median returns are greater than the realized median returns, which are negative. These facts indicate that in cold markets, PEs are less inclined to write off the values of their portfolio as they should, given market developments. This finding is consistent with Hypothesis 2. Also, we note that unrealized investment returns are sticky downwards at zero. The data indicate that PE managers do not tend to write off the value of an investment below its book value until such losses are actually realized: 42.4% of the realized investments had IRRs of less than zero, while 16% of the unrealized investments had reported IRRs of less than zero.

Panel C of Table 3 reports the data according to various PE fund characteristics. Although the average and median realized returns are higher among funds that have PE managers of different levels of experience compared to the respective unrealized returns in rows 12 and 13, we note that funds managed by PE managers with less experience have higher median unrealized IRRs compared to those of their more experienced counterparts. This finding is consistent with Hypothesis 3. Furthermore, row 13 shows that younger funds are less inclined to report losses on unrealized investments. Again, this finding is consistent with Hypothesis 3. We also note that funds with large portfolios have statistically significant higher average unreported IRRs relative to reported IRRs. This result suggests that those funds that add less value to their portfolio firms are more likely to exaggerate their IRR performance on unrealized investments. Kanniainen and Keuschnigg (2003, 2004) show that in terms of the number of portfolio firms, value added is inversely related to portfolio size per investment professional.

Panel D of Table 3 reports the data according to portfolio firm characteristics. The data indicate that for the start-up and early stages of investment (rows 17 and 18), for which informational opaqueness is very pronounced, the unrealized median and average IRRs are greater than are the realized IRRs. Unrealized IRRs are less than the realized IRRs at the latter development stages. Indirectly in support of Hypothesis 4, we note that the average unrealized IRRs of firms in industries with high market/book values are quite high, over 100%, but due to the high variance, not significantly different from realized IRRs.

The definition of a seed, start-up, early-stage, or even expansion-stage firm is complicated, due to differences in conventions across countries. For many of the firms in our sample, we are unable to obtain a reliable definition, and therefore use an "unknown" category (row 20).

Panel E of Table 3 reports the data according to transaction characteristics. Lead investors in syndicated deals (row 24) report very high average IRRs on unrealized investments.

Panel F of Table 3 reports the data by country and legal origin. The data indicate that English legal origin countries experience the highest median realized IRRs (17.49%), and German legal origin countries experience the lowest median realized IRRs (10.95%). However, tests for differences in medians (rows 96-101) are statistically significant for differences in medians between English and French legal origin countries. There are no statistically significant differences in means across legal origins. This finding is explained by the high variability in returns, which is consistent with Cochrane's (2005) evidence for the U.S. There are no statistically significant differences in medians across legal origins for unrealized returns. The mean unrealized returns are highest (89.97%) in German legal origin countries, but the differences in mean unrealized returns are not significant for German legal origin countries relative to other legal origin countries. Again, this nonsignificance is due to the high variance. Mean English legal origin countries' unrealized returns are 54.25%, and significantly higher than are mean French legal origin countries' unrealized returns (19.1%) and mean Scandinavian legal origin countries' unrealized returns (14.1%). Further, we note that for all legal origins, the median unrealized returns are lower than are median realized returns. Panel F of Table 3 indicates that legal origins and country-specific factors do not appear to play as great a role in driving differences in means and medians as do market and legal factors (Panel B of Table 3), fund characteristics (Panel C), portfolio firm characteristics (Panel D), and investment characteristics (Panel E). In particular, we note that the differences in legal and accounting standards (Panel B, rows 2-7) appear to be stronger drivers of differences in realized and unrealized returns than do the legal origins variables in Panel F.

Since some entrepreneurial firms do business in more than one country and others are in unknown locations,   in our empirical analyses from the data entrepreneurs with an unknown domicile. Using alternative methods, such as two-step regressions or inferring values based on other information known about the firms, to deal with these unknown observations does not yield materially different inferences drawn from the data. For entrepreneurs based in more than one country, we use the average values of the legal and accounting conditions variables across the different countries.

## DERIVING A BENCHMARK: THE ANALYSIS OF REALIZED RETURNS

In this section we analyze realized returns. The first subsection describes empirical methods. Results are briefly discussed in the second subsection. These results are thereafter used as a benchmark in the analysis of unrealized returns in the subsequent section.

**Empirical methods**

The methods we use to analyze realized returns are based on previous work (Cochrane, 2005; Nikoskelainen & Wright, 2007) and utilize a multistep Heckman-like (1976, 1979) sample selection correction on realized/unrealized exits and full/partial exits. For the subsample of realized exits that we report below, we find that  this approach  outperforms both other single-step sample selection corrections and standard OLS methods.

Our sample selection corrections involve multiple steps. In the first step we determine the probability of either full or partial exit.  Our second step involves establishing the probability of a full or partial exit, taking into account the first-step consideration of an actual exit.  The third step is a linear regression, which we use to explain returns with the sample selection correction based on steps one and two (Heckman, 1976, 1979).  We note that our results are robust in relation to alternative specifications of the sample selection corrections.

Our econometric specifications are a function of the following variables that we define in Table 2:
- (1)  Probability of exit $= f$ {age of investment}
- (2)  Probability of a full exit $= f$ {age of investment, legal environment, stage of investment, country dummy variables, industry dummy variables, exit year dummy variables, syndication | Actual Exit in regression (1)}
- (3)  Realized returns $= f$ {market and legal conditions, PE fund characteristics, portfolio firm characteristics, investment characteristics | Actual Exit [regression (1)] and Full Exit [regression (2)]}

Step (1) models the probability of an exit as a function of age.  The age of the investment is a natural explanatory variable for the probability of exit (Cochrane, 2005; Cumming *et al*., 2006). The longer a particular firm is in the portfolio of the PE fund, the more likely it is to be divested, regardless of whether the firm is successful and unsuccessful.

Step (2) models the extent of exit as a function of variables that we use as our proxies for the information asymmetry that the new owner(s) of the firm confronts upon exit.  This step is consistent with Gompers and Lerner (1999) and Cumming and MacIntosh (2003).  Partial exits are more likely when the new owner faces more pronounced information asymmetry.  The PE partially exits to certify the quality of the firm to the new owner.  Full exits are less likely for younger investments, poorer legal conditions, earlier-stage firms, high-tech industries, and non-syndicated investments. In step (2) we also control for market conditions with exit year dummy variables.

Step (3) examines the factors that affect realized investment performance: market and legal conditions, characteristics of PE funds, characteristics of portfolio firms, and transaction structures. Earlier studies are consistent with the view that PE fund returns are greater in stronger markets (Cochrane, 2005; Phalippou & Zullo, 2005), with improved governance (Hochberg *et al.*, 2007; Ljungqvist & Richardson, 2003a, b), and in common-law countries with stronger legal environments (Lerner & Schoar, 2005). PE funds that are reputed to add greater value tend to have higher returns (Hsu, 2004), and PE-backed firms in high-tech industries also tend to earn higher returns (Gompers & Lerner, 1999). PEs that structure their transactions with convertible securities and stronger control rights add more value, thereby improving returns (Kaplan & Schoar, 2005; Ljungqvist & Richardson, 2003a,b). Step (3) reflects this prior work (see also Ahlstrom *et al.*, 2007; Beuselinck *et al.*, 2008, Beuselinck & Manigart, 2007; Bowen & De Clercq, 2008; Coeurduroy & Murray, 2008; Cumming, 2008; Kut *et al.*, 2007; Meuleman & Wright, 2006; Nielsen, 2008; Smolarski, 2007; Wright *et al.*, 2004, 2005, 2007; Zacharakis *et al.*, 2007).

In view of the large number of regressions and to streamline the findings, we do not present extensive robustness checks here. When we examine alternative specifications with different right-hand-side variables, we find that the results are extremely robust. We attribute this robustness to the large number of observations in the data. For instance, the results are robust to inclusion of industry, country, and exit-year dummy variables. We considered other variables, such as other measures of market returns, etc., but eliminated them as less relevant. We correct for standard errors by cluster design (Petersen, 2009), by country, and heteroskedasticity in all regressions.

It is possible that some of the right-hand-side variables are endogenous. For example, syndication might be endogenous if project quality affects the probability of syndication. We consider this issue, but we are limited by the absence of ideal instruments (as in Brander *et al.*, 2002). Some potential instruments are fund characteristics, such as fund location, if different from the portfolio firm, and fund size, which could be more closely connected to syndication than to returns themselves. Since we do not find material differences in the results, we report only the straight estimates without the use of instrumental variable methods. Other studies, such as Cochrane (2005) and Ljungqvist and Richardson (2003a,b), ignore the effect of any investment characteristics on returns, but Hand (2005), considers more detailed firm-specific information. We do not feel comfortable with dropping these variables, because they have been used in other studies to explain the performance of PE-backed IPOs and the ensuing returns to PEs (Barry *et al.*, 1990; Megginson & Weiss, 1991; Gompers & Lerner, 1999; Hand, 2005). We believe that failure to consider these variables could result in a more serious problem concerning omitted variables in relation to

endogeneity. Regardless, our main results are robust to alternative specifications with or without these variables.

Ideally, our specifications in each step would involve different explanatory variables (Puhani, 2000). To some extent we use different variables, as the right-hand-side variables do not completely overlap. For instance, the age of the investment is in steps (1) and (2), but not in step (3). Our reported results are robust to alternative specifications. A limitation in our data set is that in many cases, we do not know the precise exit vehicle, so we cannot explore that dimension with the data. Nevertheless, if there is no causal relation between exit vehicle choice and returns, then this lack of detail in the data is not a significant limitation for our research question. The exit choice would be endogenous to a good project with high returns. At a general level of comparison, steps (1) and (3) are consistent with Cochrane (2005), steps (1) and (2) are consistent with Cumming *et al.* (2006), and Step (3) is consistent with Ljungqvist and Richardson (2003b) and Brander *et al.* (2002).

**Empirical results**

In Table 4 we present the results for the full sample. The main results are robust to consideration of the subset of only the VC investments. Model 1 is the standard OLS approach with the subsample of fully realized exits. Model 2 is the three-step bivariate Heckman-corrected (1976, 1979) approach based on actual exits compared to no exit, and full exits compared to partial exits. We note that the data indicate a superior fit in regard to the Heckman-corrected model (Model 2) relative to the simple OLS model (Model 1) concerning the subsample of realized returns. Adjusted $R^2$s and other model selection criteria all point to the appropriateness of Model 2.

[Table 4 About Here]

The Step 1 selection regressions in Model 2 indicate that the longer the duration of the investment, the more likely the exit. This point is obvious, and Cochrane (2005) uses this variable in his sample of U.S. data

We use the Step 2 selection regressions in Model 2 to examine the determinants of full compared to partial exits. A partial exit facilitates ownership transfer when it is relatively difficult for the new owner to value and monitor the firm. Consistent with previous work such as Gompers and Lerner (1999), PE funds choose a partial exit when the informational problems faced by the new owners are more pronounced. The funds then complete the exit and fully divest once the new owners feel sufficiently confident to take over total ownership of the firm. Our specifications control for industry factors, year effects, stage of development at first investment, investment duration, and

investment syndication. This method is consistent with Gompers and Lerner (1999), Lockett and Wright, (1999, 2001), Wright and Lockett (2003), Cumming and MacIntosh (2003), Manigart *et al.* (2006), and De Clercq *et al.* (2008).

The data indicate that controls for other factors are not warranted.  Furthermore, we do not want to over specify the full/partial exits regressions, because it is undesirable for the different Heckman (1976, 1979) regressions to have right-hand-side variables that are overly correlated between equations (Puhani, 2000).

Alternative specifications for the first-step selection regressions, including alternative right-hand-side variables, single-step mechanisms rather than multiple step, etc., do not materially impact the results, including those discussed below pertaining to IRRs. (Different specifications are available on request.)

Given these preliminary selection regressions, we can briefly analyze the returns based on the Heckman (1976, 1979) corrections, and compare these results with standard OLS tests that are based on the subsample of fully realized IRRs. We use four groups of determinants in our regression: market and legal factors, fund characteristics, firm characteristics, and investment characteristics.

When we look at market and legal factors that affect realized returns, we find a statistically significant and positive coefficient of the market return variable in our Heckman-corrected (1976, 1979) estimates (Model 2). This result accords with the Capital Asset Pricing Model.  The coefficient on the legal environment index is positive and significant in all of the specifications.  This finding indicates that legal protection facilitates PE returns, and is consistent with the role of legal protections in public markets (La Porta *et al.*, 1997, 1998). In most of our regressions, to control for country- and industry-specific effects we use both country and industry dummies.

For fund characteristics, we find highly negative, significant, economically large effects of portfolio size per investment professional. These results are consistent with Kanniainen and Keuschnigg (2003, 2004), Keuschnigg (2004), and Cumming (2006).

For portfolio firm characteristics, depending on the specification, we find some differences in the estimates for stage of investment variables. Nevertheless, our main regression results are robust to the inclusion or exclusion of different controls for country dummy variables, industry dummy variables, and year of exit dummy variables.

We find that investment structures appear to have a significant effect on returns along several different dimensions. First, syndication significantly enhances returns. This finding is consistent with the view that syndication facilitates value-added investments (Brander *et al*., 2002; Gompers & Lerner, 1999). Second, co-investment and the allocation of board seats are associated with lower returns, possibly because such structures are more likely for poorly performing investments (see also Gompers & Lerner, 1999). Third, the use of convertible securities with periodic cash flows (Table 3) enhances returns. This finding is consistent with the view that the use of convertible securities gives rise to incentives for the PE manager to provide value-added advice and to efficiently monitor the firm. It also provides incentives for the portfolio firm to perform (Casamatta, 2003; Schmidt, 2003).

We note that both selection effects have a statistically and economically important impact on the measurement of returns. The lambda A and B coefficients are both negative and statistically significant in the Heckman (1976, 1979) regression in Model 2 in Table 4. The negative sign of these coefficients indicates that realized returns are systematically lower than unrealized returns. In particular, unrealized returns are roughly 7% higher than realized returns, and unrealized returns from partial exits are roughly 1% higher than realized returns. This result implies that the degree to which unrealized returns are overstated is greater for completely unrealized exits compared to partially realized exits.

Overall, the models in Table 4 correspond closely to the data. The adjusted $R^2$ values range from 28% to 32%. The high $R^2$ values in our specifications are useful for reliably predicting returns of unrealized investments.

## ANALYSIS OF REPORTING BIASES IN UNREALIZED INVESTMENTS

In the first subsection we present an analysis of unexited investments based on predicted returns with the regression models in Table 4 discussed above. In the second subsection we present an analysis of reported returns versus subsequently realized returns for a subsample of the data.

**Predicted returns compared to reported returns**

***Empirical methods.***

In our data we observe one investment valuation for each unexited portfolio firm for the period June 2000–September 2003. We use three steps to compare the predicted returns for unrealized investments with the reported returns on unrealized investments. First, we estimate the realized IRRs based on a set of explanatory variables that are our proxies for market and legal conditions, PE fund

and portfolio firm characteristics, and transaction characteristics for each of the observations for the realized returns. These variables are collectively represented by $X_{Realized}$ in Eq. (1):

(1) $IRR_{Re\,alized} = \alpha_1 + \beta_1 X_{Re\,alized} + residuals$

Second, we generate a vector of predicted returns for the full sample of all investments based on the estimated coefficients in Eq. (1), as follows:

(2) $IRR_{\Pr\,edicted} = \hat{\alpha}_1 + \hat{\beta}_1 X_{Unrealized}$

Third, we compare the difference between the reported unrealized returns by PE managers to predicted returns, and regress this difference on a set of explanatory variables:

(3) $IRR_{Unrealized} - IRR_{\Pr\,edicted} = \alpha_3 + \beta_3 X_{Unrealized} + residuals$

One possible concern with the data and empirical strategy is that the IRRs of many unrealized investments are reported at cost to institutional investors. This fact creates two concerns in our regression analyses. The first is that the difference between reported IRRs and predicted IRRs on the unrealized investment are the negative of the predicted IRR, indicating a complete absence of information content in reported valuations. The second is that the relation between accounting standards and (over-) valuations stems from the fact that badly performing firms are held at their cost valuations, i.e., with an IRR of zero, while well-performing firms experience a further investment stage leading to higher (market) valuations. The signs and statistical significance of our results are robust to excluding all transactions from the data and regressions for which the reported unrealized IRR is zero. (This NOUN applies to approximately 25% of our sample.) However, the magnitude of the estimated coefficients varies, depending on whether we exclude this subsample (details with different subsample are available on request from the authors). Also, we note our regressions results are robust to sensitivity checks for collinearity.

We present the estimates of Eq. (3) in Tables 5 and 6. We express these differentiated amounts as log(1+Reported IRR) – log(1+Predicted IRR). Alternatively, we can interpret this difference as log((1+Reported IRR)/(1+Predicted IRR)), so that the economic significance of the coefficients directly indicates the relative degree of overstatement of unrealized returns. Our explanatory variables consist of our four categories that are our proxies for information asymmetry between PE managers and their institutional investors. Category (1) covers market and legal conditions, along with different accounting indexes used in recent accounting research on international differences in reporting standards (Bhattacharya *et al*., 2003; Burgstahler *et al*., 2006, and La Porta *et al*., 2006). Category (2) is PE fund characteristics. Category (3) is portfolio firm characteristics, and Category (4) is transaction-specific characteristics. Model 4 in Table 5 shows that on average, from June 2000 to September 2003, PE managers report unrealized IRRs that are143% of

the magnitude predicted by our econometric model. The value of 143% indicates significant reported overvaluations, since the value should be 100% if actual and expected returns are equal.

[Tables 5 and 6 About Here]

### *Multivariate econometric results.*

We derive the dependent variables for each model in Tables 5 and 6 from the models in Table 4. We report two different specifications based on predictions from each of the two Table 4 models. The results are robust to concerns about collinearity. Overall, the multivariate econometric analyses indicate that the data are consistent with the theory that valuations of unrealized investments are higher when the information asymmetries that confront institutional investors are more pronounced, as happens in countries with weaker accounting standards, and for investors, portfolio firms, and transactions that are more opaque.

The results in Tables 5 and 6 indicate that valuations are overstated by PE funds in countries with weaker disclosure, and in countries with less conservative accounting.[2] The results for countries with weaker disclosure standards (La Porta *et al.* , 2006) and greater earnings aggressiveness (Bhattacharta *et al.*, 2003) are strong in Models 3 and 4 in Table 5. Furthermore, our results are robust to the use of the various private-firm accounting standards indexes (Burgstahler *et al.*, 2006) in Models 5-10 in Table 6. We note that the reporting of overvaluations was far greater before the introduction of the Sarbanes-Oxley legislation in July 2002. Table 6 presents supportive evidence, using yearly fixed-effect regressions.

Overall, we find very strong evidence that stricter accounting environments curb the overvaluation of unrealized PE fund returns reported by PE managers to their institutional investors. This finding supports Hypothesis 1. We also find evidence that a stronger legality index leads to less overvaluation (Table 6, Model 10). This finding supports the idea that stronger legal settings that protect investors impose higher costs of overvaluing PE firms. Thus, for a wide variety of proxies for international differences in accounting and legal settings, there is strong support for Hypothesis 1.

Consistent with Hypothesis 2, we find that overvaluation is more pronounced when there are weak stock market conditions, as in Models 3 and 4 in Table 5. We note as well that PE funds appear to be reluctant to devalue the book value of their portfolio firms when there are weak markets, because doing so would signal negative information to potential new investors in the investee company and for investors in the PE fund itself. As indicated in the description of the data, the reported unrealized returns are rarely less than zero.

Aside from market, legal, and accounting variables, several other categories of variables are related to information opaqueness and reputation. First, for fund manager characteristics, the valuations reported by less-experienced PE managers are significantly higher. More-experienced PE managers have more reputational capital at stake, but younger PE managers have an incentive to signal with higher valuations to increase the probability of closing the next fund (Hypothesis 3). Also, the overvaluation of unrealized IRRs is greater among PE funds with larger portfolios per investment professional. This finding is consistent among all our specifications (Models 3, 4, and 10 in Tables 5 and 6). Fund managers who invest in a larger number of companies provide less value-added to their investees and have lower expected returns. Such fund managers have an incentive to overvalue their unexited portfolio holdings to attract funds from institutional investors.

Furthermore, we find some evidence of stronger overvaluation among early-stage firms and less-pronounced overvaluation for expansion-stage and late-stage portfolio firms (Model 4 in Table 5). This evidence suggests that the longer the time to exit, the less potentially damaging is the overvaluation, since there is a longer time period before these overvaluations become transparent and a higher chance that positive factors may arise, thus allowing the PE manager to justify the overvaluation (Hypothesis 4). Also, information asymmetries are more pronounced with earlier-stage high-tech firms, thus providing greater scope for exaggerating unrealized returns. However, we acknowledge that not all of the estimated coefficients for the stage variables are consistent. In particular, seed-stage investments tend to not be overvalued in Model 4. One explanation for this result is that by convention, seed investments are valued at cost.[3] Further, our evidence for buyout investments is not robust to the specification of the benchmark model (Model 3 compared to Model 4). We note that this is the only major difference between Models 3 and 4. In some cases, such as riskier LBOs with high degrees of leverage, it is possible that the overvaluation is attributable to misperceived risks.

Model 3 in Table 5 indicates that overvaluation is more pronounced among firms in high market/book industries, in certain industries such as the web-based firms, and among smaller investments. However, these effects are not robust in Models 4 and 10. This finding provides support for Hypothesis 4, and indicates once again that investments that exhibit a higher degree of information asymmetries are more inclined to be overvalued. The value of growth firms relies heavily on the anticipated growth rate, which is exposed to shocks that have positive or negative effects on firm valuation. Hence, it is more difficult for investors to distinguish between the impact of market shocks and overvaluation.

Also, Models 3, 4, and 10 indicate less overvaluation among syndicated investments. PE managers are less inclined to report overly high valuations when their actions might be monitored by, and therefore might be revealed to, other syndicated investors. This evidence implies that syndication acts as a barrier for overvaluation. PE managers of different PE firms monitor each other in this respect. But this is not the case for PE managers of the same PE firm: the co-investment variable has a positive, but not statistically significant, effect on the degree of overvaluation.

Models 3, 4, and 10 indicate that the use of convertible securities mitigates overvaluation. Periodic cash flows lead to a higher degree of certainty in valuation. This certainty makes overvaluation less likely and less attractive to a PE manager, since the valuation of these investments can more easily be determined or verified by outside parties, such as auditors or institutional investors.

Our data support the idea that overvaluation of unrealized IRRs takes place when the information asymmetries that confront the institutional investor are greater. In the context of our international sample, it is perhaps most important that the data indicate that the reporting of overvaluations is more pronounced in countries with lower-quality accounting standards.

**Robustness check: reported returns compared to subsequently realized returns**

We compare actual realized IRRs to unrealized reported IRRs for a subsample of 80 observations (portfolio firms) from 11 countries (Canada, Finland, France, Germany, Israel, Norway, Spain, Sweden, the Netherlands, the UK, and the U.S.). We use only those firms for which both the realized and unrealized reported IRRs are known. The reported IRRs are between 2000 and 2003, and the realized IRRs are between 2001 and 2005. The average (median) duration between the reported IRR and the realized IRR is 2.6 years. The average (median) unrealized reported IRR is 219.71% (2.56%). The average (median) subsequently realized IRR is 98.46% (8.70%). Our predicted average (median) IRR (based on Model 1 of Table 4) for this subsample is 15.22% (7.75%). The correlation between out-of-sample average realized IRRs and our predicted IRRs is 0.45, which is significant at the 1% level. We note that the average reported unrealized IRR is more than 100% higher than the average realized IRR. We also note that although the average level predicted by our model is less than the out-of-sample realized IRR, there is a high positive correlation between our predicted IRR and the out-of-sample realized IRR.

In Table 7 we present regressions that we use to analyze the differences between reported unrealized IRRs and predicted IRRs, and between reported unrealized IRRs and subsequently realized IRRs. We use the subsample of the 80 investments for which this information is available. Model 11

presents our OLS estimates of the determinants of the difference between unrealized reported IRRs and predicted IRRs. These estimates are analogous to regression Model 3 in Table 5, although there are fewer included right-hand-side variables in Model 1 due to the comparative dearth of observations. In Models 12, 13, and 14 in Table 7, the dependent variable is the difference between unrealized reported IRRs and subsequently realized IRRs for the same investments. There are 80 observations, which represent the 80 portfolio firms that are subsequently exited.

[Table 7 About Here]

Table 7 indicates findings similar to those reported above in Tables 5 and 6. We present Model 11 to provide a basis of comparison to the Table 5 results for the subsample of 80 observations. The unrealized reported IRRs are significantly higher than expected for countries with weaker accounting standards, in terms of both the Disclosure Index and Earnings Aggressiveness Index, consistent with Hypothesis 1. Also, we note that unexited reported IRRs are significantly higher than expected for high-tech industries with high industry market/book values, and for non-syndicated investments and investments for which convertible securities are not used. Further, we note that in Models 12, 13, and 14, unrealized reported IRRs are higher than the subsequently realized IRRs for investments with weaker accounting standards (a lower disclosure index and higher earnings aggressiveness index, consistent with Hypothesis 1), and higher for investments in which convertible securities are not used.

The econometric results in Table 7 do not perfectly overlap for the prediction model or the actual realizations for the subsample of 80 firms for which we can make this comparison. Nevertheless, the main qualitative results are analogous and robust to alternative specifications. Table 7 shows overvaluation is greater among countries with weak accounting standards, consistent with Hypothesis 1. Overvaluation is also greater in the presence of certain characteristics of the investment such as the use of convertible securities, which mitigates the tendency for PE managers to report overvalued unrealized investments to their institutional investors.

**CONCLUSION**

PE funds may overstate the value of their investments in order to attract new investors into follow-up funds. We provide theoretical arguments and supporting empirical evidence from 39 countries that shows that significant systematic biases exist in the reporting of fund performance to institutional investors. Our data enable us to account for different portfolio firm characteristics, and for differences in transaction structures. The global nature of the data set makes it possible for us to

investigate potentially important aspects of economic and financial rules and institutions, and their impact on PE returns and reporting behavior.

The data show a robust and significant impact of accounting standards and the legal framework on the reporting behavior of PE managers. This finding is consistent with our central theoretical prediction. Less-stringent accounting rules and weak legal systems appear to facilitate overvaluation, thereby decreasing the information content of reported valuations. Further, PE funds are less inclined to overvalue unexited investments since the introduction of the Sarbanes-Oxley legislation in 2002.

These results have strong policy implications. Stronger legal accounting standards might induce the provision of more risk capital if the communication between institutional investors and PE funds is more accurate. Stronger standards might also reduce any distortions in the allocation of capital throughout PE funds and throughout countries, due to the effects of overvaluation on subsequent fundraising.

Consistent with our other predictions, the data show that less-experienced PE managers and those involved in early-stage high-tech investments are more inclined to overvalue unexited investments. PE funds with a greater number of investee firms per manager tend to report overvaluations. In contrast, PE funds that syndicate and use convertible securities with periodic cash flows tend to be less inclined to overstate the value of their unrealized investments. Thus, in addition to international differences in accounting standards, international differences in market conditions and investment characteristics also account for some of the differences we observe in the reporting behavior by PE fund managers to their institutional investors.

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**ABOUT THE AUTHORS**

**Douglas Cumming** is an Associate Professor and the Ontario Research Chair at the Schulich School of Business, York University, in Toronto, Canada.  He received his J.D. and Ph.D. degrees from the University of Toronto.  He is a Canadian citizen and currently resides in Canada.  His current research interests include venture capital, private equity and hedge funds, with a focus on international differences around the world.  He can be reached at dcumming@schulich.yorku.ca

**Uwe Walz** is the Chair of Industrial Organization at the Faculty of Business Administration and Economics at the Goethe-Universität Frankfurt/Main.  He received his Ph.D. from the University of Tübingen.  He is a German citizen and currently resides in Germany.  His current research interests are focused on international differences in venture capital and private equity markets around the world.  He can be reached at uwe.walz@wiwi.uni-frankfurt.de

**Table 1. Sample Characteristics**

| | |
|---|---|
| Number of observations (investee firms) | 5117 |
| Number of fully exited investments | 2498 |
| Number of partially exited and unexited investments | 2619 |
| Number of investments and fully realized exits 1971-1979 | 35 investments, 34 exits |
| Number of investments and fully realized exits 1980-1989 | 486 investments, 377 exits |
| Number of investments and fully realized exits 1990-1999 | 3282 investments, 1952 exits |
| Number of investments and fully realized exits 2000-2003 | 1314 investments, 135 exits |
| Period for which not fully exited investments are reported | June 2000 - September 2003 |
| Fund Manager Characteristics | |
| Number of different fund managers | 221 |
| Number of different funds | 72 |
| Average number of funds managed by PE fund manager | 3.5 |
| Average age (in days) of fund manager at time of first investment | 3192.3 |
| IRR Characteristics in Sample | |
| Average IRR (fully exited investments only) | 68.18% |
| Average IRR (unrealized and partially realized investments only) | 63.23% |
| Number of investments for which we can match subsequent realized IRR with prior reported IRR (exact back-testing) for the years 2001 – 2005 | 80 |
| -- Average number of years from reported unexited IRR to fully realized IRR (only for the exact back-testing subsample of 80 firms) | 2.6 |
| -- Average difference between realized IRR and prior reported IRR for exact back-testing sample of 80 firms | 219.71% |
| Investee Characteristics in Full Sample | |
| Proportion of seed stage investments in sample | 0.044 |
| Proportion of start-up stage investments in sample | 0.018 |
| Proportion of early-stage investments in sample | 0.216 |
| Proportion of expansion-stage investments in sample | 0.092 |
| Proportion of late-stage investments in sample | 0.056 |
| Proportion of MBO/MBI-stage investments in sample | 0.115 |
| Proportion of LBO investments in sample | 0.009 |
| Proportion of publicly listed investments in sample | 0.005 |
| Proportion of U.S.- based investments in sample | 0.476 |
| Proportion of UK-based investments in sample | 0.119 |
| Proportion of German-based investments in sample | 0.047 |
| Proportion of French-based investments in sample | 0.095 |
| Proportion of Internet investments in sample | 0.026 |
| Proportion of Telecom investments in sample | 0.075 |
| Proportion of semiconductor investments in sample | 0.015 |
| Proportion of media investments in sample | 0.064 |
| Proportion of information technology-based investments in sample | 0.108 |
| Investment Structure Characteristics in Full Sample | |
| Proportion of syndicated investments | 0.233 |
| Proportion of investments with convertible securities and periodic cash flows | 0.238 |
| Average amount invested (real 2003 $US) | 5,963,340 |

This table presents descriptive statistics for the sample. There are a total of 5,117 observations in the sample. One observation corresponds to one investee firm. We calculate averages with each investee firm as a separate observation. The sample comprises both exited and unexited investments (unexited as at 2003) from 39 countries around the world. For a subsample of 80 investee firms for which we observe the actual IRR and the prior reported unexited IRR, there are exits data up to 2005.

**Table 2. Variable Definitions**

| Variable | Description |
|---|---|
| Internal Rate of Return (IRR) | The exact IRR based on all current discounted cash flows. For unrealized investments, we use the reported valuation as the last cash flow. |
| Market and Legal Factors | |
| Legality Index | Weighted average of the following factors (based on Berkowitz *et al*., 2003): efficiency of judicial system, rule of law, corruption, risk of expropriation, risk of contract repudiation, and shareholder rights (as per La Porta *et al*, 1998). Higher values indicate "better" legal systems. |
| Disclosure Level Index | La Porta *et al*.'s (2006, Table 3) accounting disclosure requirements index. Higher values indicate better disclosure. |
| Earnings Aggressiveness Index | Bhattacharya *et al*.'s (2003, Table 2) measure of countries' firms' and accountants' tendency to incorporate economic gains in a more timely fashion than economic losses (i.e., the opposite of accounting conservatism). Higher values indicate more aggressive earnings reporting (i.e., less conservative accounting practices). |
| Private Firm Accounting Indexes | Burgstahler *et al*.'s (2006, Table 2) accounting standards for earnings management in private and public firms in the European Union. The higher the number, the worse the accounting disclosure. EM1=Avoidance of Small Losses. EM2=Magnitude of Total Accruals relative to Cash Flow from Operations. EM3=Smoothing of Operating Earnings vis-à-vis Cash Flow; EM4=Correlation between Accounting Accruals and Cash Flows from Operations; EM Aggregate = Average of the Percentage Ranks from EM1 – EM4. |
| Sarbanes Oxley | A dummy variable equal to one for PE fund disclosures of unrealized IRRs to institutional investors after July 30, 2002 (and in year 2003 in the data), and zero otherwise. (We note that the disclosures first started in the 2000 data.) |
| MSCI Return | The country-specific Morgan Stanley Capital International index return over the contemporaneous investment period. |
| Risk Free Return | The U.S. risk-free return over the contemporaneous investment period. We note that the use of the euro and other risk-free returns does not materially change the results. |
| Committed Capital Overall Market at Date of Investment | The industry total of committed venture capital in the overall U.S. market (as reported by *Venture Economics*) in the year of investment. This variable is a proxy for deal-flow competition. To avoid correlation with the Legality index, we take the measure from the U.S. and not specific countries in the data. |
| Fund Characteristics | |
| Fund Number in the PE Firm | The number of PE funds the PE firm had operated prior to managing this current fund. |
| Age of Specific PE Fund | The age (in days) of the PE fund. |
| Portfolio Size (# Portfolio firms) / # General Partners | The number of portfolio firms in the PE fund / the number of investment professionals of the general partners in the fund. |
| Portfolio Firm Characteristics | |
| Seed Stage | A dummy variable equal to one for financing provided to research, assess and develop an initial concept. |
| Start-up Stage | A dummy variable equal to one for financing provided to firms for initial product development and marketing. Firms may be in the process of being set up or may have been in business for a short time, but have not sold their product commercially. |
| Early Stage | A dummy variable equal to one for financing provided to firms with testing and/or pilot production. The firm may or may not be generating revenue, and has usually been in business less than 30 months. |
| Expansion Stage | A dummy variable equal to one for financing provided to firms in need of development capital. The financing is provided for the growth and expansion of a firm, which may or may not break even or trade profitably. Capital may be used to finance increased production capacity, for market or product development, to provide additional working capital. |
| Late Stage | A dummy variable equal to one if the firm has reached profitable operating levels. |
| MBO/MBI | A dummy variable equal to one for buyout financing either of MBO or MBI form. We define an MBO as a buyout in which external managers take over the firm. Financing is provided to enable a manager or group of managers from outside the target firm to buy into the firm with the support of private equity investors. We define an MBI as a buyout in which the target's management team acquires an existing product line or business from the vendor with the support of private equity investors. |
| LBO | A dummy variable equal to one for a buyout in which the new firm's capital structure incorporates a particularly high level of debt, much of which is normally secured against the firm's assets. |
| Publicly Listed Firm | A dummy variable equal to one for firms with a listing on a stock exchange. |
| Industry Market / Book | The industry market/book ratio for the firm's primary industry. |
| Industry Dummy Variables | Dummy variables equal to one for the firm's primary industry. |
| Country Dummy Variables | Dummy variables equal to one for the firm's country of primary residence. |
| Year of Exit Dummy Variables | Dummy variables equal to one for the year of exit. |
| Investment Characteristics | |
| Syndicated Investment | A dummy variable equal to one if the investment is syndicated, zero if not syndicated, and 0.5 if unknown. |
| Co-Investment | A dummy variable equal to one if the investment is co-invested (two or more PE funds in the same PE firm investing in the same portfolio firm), zero if not a co-investment, and 0.5 if unknown. |
| Convertible Security with Actual Periodic Cash Flows | A dummy variable equal to one if the investor holds a convertible security which functionally provides for periodic cash flows back to the investor prior to exit. |
| Lead Investment | A dummy variable equal to one if the investor is the lead investor, zero if not the lead investor, and 0.5 if unknown. |
| PE Board Seat(s) | A dummy variable equal to one if the investor has board seat(s), zero if no board seats, and 0.5 if unknown. |
| Standard Deviation of Cash Flows to Entrepreneur / Initial $ Invested | The standard deviation of the cash flows provided to the entrepreneur from the investor, scaled by (divided by) the initial investment amount. We calculate the standard deviation based on all flows of funds between the PE fund and portfolio firm. For example, a small amount of capital in one round combined with a massive amount in the next round increases the risk measure. Smaller initial investments are also deemed riskier with the scaling. However, our results are robust to different scaling measures. |
| Initial Amount Invested | The initial investment value (in real 2003 U.S. dollars). |

**Table 3. Summary Statistics**

| | | Unrealized / Partially realized Portfolio Firm Investments | | | Fully Realized Portfolio Firm Investments | | | Difference Tests | |
|---|---|---|---|---|---|---|---|---|---|
| | | # Firms | Average IRR | Median IRR | # Firms | Average IRR | Median IRR | Means | Medians |
| Panel A | All Funds | | | | | | | | |
| 1 | All Funds in the Data | 2619 | 63.23 | 0 | 2419 | 68.67 | 16.99 | 0.22 | p <= 0.00*** |
| Panel B | Market and Legal Factors | | | | | | | | |
| 2 | Legality Index > 20 | 1874 | 60.01 | 2.16 | 1631 | 47.23 | 19.26 | -0.87 | p <= 0.00*** |
| 3 | Legality Index < 20 | 745 | 71.3 | 0 | 788 | 113.04 | 14.21 | 0.54 | p <= 0.00*** |
| 4 | Disclosure Level Index > 0.75 | 1654 | 55.38 | 1.66 | 1438 | 43.68 | 19.24 | -0.81 | p <= 0.00 *** |
| 5 | Disclosure Level Index < 0.75 | 967 | 76.65 | 0 | 981 | 105.31 | 14.57 | 0.47 | p <= 0.00 *** |
| 6 | Earnings Aggressiveness Index > -0.383 | 765 | 27.43 | 3.17 | 646 | 85.5 | 18.39 | 1.03 | p <= 0.00*** |
| 7 | Earnings Aggressiveness Index < -0.383 | 1854 | 77.92 | 0 | 1773 | 62.54 | 16.22 | -0.54 | p <= 0.00*** |
| 8 | MSCI Return > 3.5% | 611 | 76.88 | 9.32 | 1908 | 58.07 | 20.21 | -1.14 | p <= 0.00*** |
| 9 | MSCI Return < 3.5% | 2008 | 59.07 | 0 | 511 | 108.24 | -10.99 | 0.64 | p <= 0.00*** |
| Panel C | Fund Characteristics | | | | | | | | |
| 10 | Fund Number in the PE Firm > 3 | 1603 | 69.37 | 0 | 781 | 88.72 | 1.51 | 0.34 | p <= 0.00*** |
| 11 | Fund Number in the PE Firm < 3 | 1018 | 53.55 | 10.3 | 1638 | 59.11 | 20.27 | 0.29 | p <= 0.00*** |
| 12 | Age of Specific PE Fund > 1795 days | 1230 | 54.15 | 9.23 | 2233 | 57.48 | 18.73 | 0.19 | p <= 0.00*** |
| 13 | Age of Specific PE Fund < 1795 days | 1391 | 71.25 | 0 | 186 | 202.96 | -91.74 | 0.67 | p <= 0.00*** |
| 14 | Portfolio Size (# Portfolio firms) / # General Partners > 20 | 1035 | 59.58 | 0 | 988 | 21.29 | 12.34 | -2.52** | p <= 0.00*** |
| 15 | Portfolio Size (# Portfolio firms) / # General Partners < 20 | 1586 | 65.61 | 1.7 | 1431 | 101.38 | 22.07 | 0.87 | p <= 0.00*** |
| Panel D | Portfolio Firm Characteristics | | | | | | | | |
| 16 | Seed Stage | 146 | 8.88 | 0 | 71 | 520.37 | -2.92 | 1.01 | p <= 0.097* |
| 17 | Start-up Stage | 56 | 126.72 | 18.97 | 34 | 48.58 | -11.45 | -1.65* | p <= 0.127 |
| 18 | Early Stage | 670 | 39.55 | 0 | 424 | -1.52 | -29.14 | -2.93*** | p <= 0.00*** |
| 19 | Expansion Stage | 240 | 36.4 | 0 | 226 | 28.91 | 14.54 | -0.56 | p <= 0.00*** |
| 20 | Unknown Seed, Early or Expansion Stage | 838 | 91.8 | 5.09 | 1119 | 71.69 | 20 | -0.36 | p <= 0.00*** |
| 21 | Late Stage | 168 | 55.77 | 0 | 116 | 121.2 | 25.34 | 1.5 | p <= 0.00*** |
| 22 | Industry Market / Book > 5 | 1448 | 101.95 | 0 | 816 | 80.27 | 6.08 | -0.55 | p <= 0.00*** |
| 23 | Industry Market / Book < 5 | 1173 | 15.42 | 7.92 | 1603 | 62.76 | 20.28 | 2.01** | p <= 0.00*** |
| Panel E | Investment Characteristics | | | | | | | | |
| 24 | Syndicated Investment | 729 | 68.11 | 0 | 449 | 151.27 | 15.88 | 1.01 | p <= 0.00*** |
| 25 | Initial Amount Invested > US $2,500,000 | 1310 | 34.62 | 5.04 | 1040 | 75.58 | 25.22 | 1.09 | p <= 0.00*** |
| 26 | Initial Amount Invested < US $2,500,000 | 1311 | 91.8 | 0 | 1379 | 63.46 | 8.6 | -0.75 | p <= 0.00*** |
| Panel F | | | | | | | | | |
| 27 | UK | 305 | 22.04 | 6.25 | 304 | 40.81 | 24.1 | 1.36 | p <= 0.00*** |
| 28 | U.S. | 1273 | 60.89 | 0.19 | 1162 | 43.62 | 13.84 | -0.95 | p <= 0.00*** |
| 29 | All English Legal Origin | 1699 | 54.25 | 1.16 | 1493 | 42.76 | 17.49 | -0.8 | p <= 0.00*** |
| 30 | France | 226 | 17.94 | 3.82 | 259 | 149.53 | 12.35 | 0.88 | p <= 0.00*** |
| 31 | All French Legal Origin | 318 | 19.1 | 3.82 | 312 | 127.3 | 12.76 | 0.95 | p <= 0.00*** |
| 32 | Germany | 126 | 142.74 | 0 | 109 | 105.31 | 15.39 | -0.35 | p <= 0.04** |
| 33 | Switzerland | 19 | 11.48 | 3.84 | 12 | 60.51 | 35.51 | 1.48 | p <= 0.21 |
| 34 | All German Legal Origin | 206 | 89.97 | 0 | 134 | 83.64 | 10.95 | -0.08 | p <= 0.00*** |
| 35 | Sweden | 27 | 7.73 | 0 | 27 | 44.99 | 21.44 | 1.41 | p <= 0.11 |
| 36 | All Scandinavian Legal Origin | 54 | 14.1 | 3.27 | 49 | 50.84 | 19.29 | 1.33 | p <= 0.02** |

| | | Mean Test | Median Test | Mean Test | Median Test |
|---|---|---|---|---|---|
| | | | | | **p <= 0.02**\*\* |
| 37 | English versus French | **2.84\*\*\*** | p <= 0.63 | -0.73 | |
| 38 | English versus German | -0.73 | p <= 0.14 | -0.68 | p <= 0.48 |
| 39 | English versus Scandinavian | **3.22\*\*\*** | p <= 0.99 | -0.27 | p <= 0.93 |
| 40 | French versus German | -1.48 | p <= 0.43 | 0.34 | p <= 0.92 |
| 41 | French versus Scandinavian | 0.7 | p <= 0.88 | 0.64 | p <= 0.50 |

This table presents summary statistics according to various characteristics of the PE funds: Panel (A) all portfolio firms in the data set, Panel (B) market and legal factors, Panel (C) PE fund characteristics, Panel (D) portfolio firm characteristics, Panel (E) transaction-specific characteristics, and Panel (F) country and legal origin. The table shows the data summary for the average and median internal rates of return for the number of realized and unrealized transactions. The unit of observation is the portfolio firm. Difference tests: \*, \*\*, \*\*\* Significant at the 10%, 5% and 1% levels, respectively. Dollar values expressed in real U.S. 2003 dollars. Variables are as defined in Table 2.

**Table 4. Regression Analysis on the Determinants of Realized Returns**

| | Predicted Sign for Realized Returns | Model 1 — OLS on Subsample of Fully Realized IRRs — Dependent Variable = Log(1+IRR) | | Model 2 — 1st Step Heckman (1976, 1979) Regression: Bivariate Probit Model — Step 1a: Determinants of Exit — Dependent Variable=1 if Exit | | Step 1b: Determinants of Full Exit, conditioned on step 1a regarding an actual exit — Dependent Variable=1 if Full Exit | | 2nd Step Heckman Regression (Realized IRRs) — Dependent Variable = Log(1+IRR) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| Constant | | -5.48 | -1.5 | -0.26 | -2.08** | -4.17 | -2.3** | -15.88 | -3.4*** |
| Duration of PE Investment (in Days) | | | | 0.0007 | 14.4*** | 0.0002 | 2.4** | | |
| **Market and Legal Factors** | | | | | | | | | |
| Log (Legality Index) | + | 3.91 | 3.6*** | | | 1.27 | 2.0** | 3.30 | 2.4** |
| Log (Committed Capital Overall Market at Inv Date) | - | -0.82 | -6.8*** | | | | | 0.89 | 4.5*** |
| Log (MSCI Return) | + | 1.09 | 1.4 | | | | | 1.45 | 3.0*** |
| Log (Risk Free Rate) | ? | -10.23 | -2.5** | | | | | -20.66 | -4.1*** |
| **Fund Characteristics** | | | | | | | | | |
| Log (Fund Number in the PE Firm) | + | 0.06 | 0.6 | | | | | -0.04 | -0.4 |
| Log (Portfolio Size (# Portfolio firms) / General Partner) | - | -0.30 | -2.1** | | | | | -0.33 | -2.4** |
| **Portfolio Firm Characteristics** | | | | | | | | | |
| Seed Stage | ? | -0.55 | -1.1 | | | 0.12 | 0.5 | -0.55 | -1.4 |
| Start-up Stage | ? | 0.07 | 0.1 | | | 0.37 | 2.3** | -0.16 | -0.3 |
| Early Stage | ? | -1.34 | -4.6*** | | | 0.23 | 0.9 | -1.25 | -5.2*** |
| Expansion Stage | ? | 0.06 | 0.2 | | | -0.08 | -0.4 | 0.02 | 0.1 |
| Late Stage | ? | 1.00 | 2.0** | | | 0.11 | 0.4 | 0.85** | 2.2** |
| MBO/MBI | ? | -0.36 | -2.0** | | | -0.45 | -3.6*** | -0.21 | -0.7 |
| LBO | ? | -0.32 | -0.6 | | | -0.51 | -1.5 | 0.22 | 0.3 |
| Publicly Listed Firm | ? | 2.32 | 3.0*** | | | | | 2.47 | 2.6*** |
| Turnaround | ? | -0.03 | -0.1 | | | -0.52 | -2.0** | 0.51 | 0.5 |
| Secondary Trade | ? | -1.83 | -0.9 | | | 0.46 | 0.8 | -1.96 | -1.5 |
| Log (Industry Market / Book) | + | 0.12 | 0.6 | | | -0.11 | -1.1 | -0.01 | -0.1 |
| Industry Dummy Variables? | | Yes | | No | | Yes | | Yes | |
| Country Dummy Variables? | | Yes | | No | | Yes | | Yes | |
| Year of Exit Dummy Variables? | | Yes | | No | | Yes | | Yes | |
| **Investment Characteristics** | | | | | | | | | |
| Syndicated Investment | + | 0.42 | 2.06** | | | -0.40 | -2.7*** | 0.55 | 2.3** |
| Co-Investment | - | -0.11 | -0.52 | | | | | -0.20 | -0.9 |
| Convertible Security with Actual Periodic Cash Flows | + | 2.56 | 15.64*** | | | | | 2.22 | 13.3*** |
| Lead Investment | ? | 0.34 | 1.37 | | | | | 0.36 | 1.6 |
| PE Board Seat(s) | + | -0.54 | -1.67* | | | | | -0.78 | -2.9*** |
| Standard Deviation of Cash Flows to Entrepreneur | ? | 0.00 | 1.67* | | | | | 0.00 | 0.9 |
| Log (Amount Invested) | ? | 0.02 | 0.43 | | | | | 0.04 | 0.8 |
| Heckman (DATE)Lambda A | - | | | | | | | -1.99 | -3.0*** |
| Heckman (DATE)Lambda B | - | | | | | | | -6.40 | -10.4*** |
| **Model Diagnostics** | | | | | | | | | |
| Number of Observations | | 1819 | | 4306 | | | | 1819 | |
| Adjusted $R^2$ | | 0.28 | | | | | | 0.32 | |
| F Statistic | | 17.27*** | | | | | | 19.99*** | |

This table presents OLS and Heckman (1976, 1979) corrected estimates of the determinants of realized PE IRRs. We use an OLS model on the restricted sample of fully realized exits for the full sample PE investments. Model 2 presents Heckman corrected estimates on the sample of all PE investments. The Heckman corrections involve a first step bivariate probit model to select fully realized exits, as opposed to no exit, or a partial exit. By using these corrections we can assess the incidental truncation of observed IRRs. The sample in the second step is based on the selection in the first step. The full sample of all realized and unrealized (or partially realized) investments comprises 5,038 observations from 39 countries. We skip observations for which there is incomplete data for the transaction. One observation is per portfolio firm, not per staged investment round. Standard errors are corrected by cluster design by country and heteroskedasticity. *, **, *** Significant at the 10%, 5% and 1% levels, respectively. Variables are as defined in Table 2.

**Table 5. Determinants of the Difference Between Unrealized IRRs Disclosed to Institutional Investors and Predicted IRRs**

| | | Model 3 | | Model 4 | |
| --- | --- | --- | --- | --- | --- |
| | | Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 1 of Table 4 | | Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 2 of Table 4 | |
| | | Coefficient | t-statistic | Coefficient | t-statistic |
| Constant | | 6.42 | 12.7*** | 4.61 | 3.9*** |
| *Market and Legal Factors* | | | | | |
| Disclosure Index | H1 (-) | -0.45 | -4.8*** | -0.39 | -2.2** |
| Earnings Aggressiveness Index | H1 (+) | 42.61 | 14.4*** | 44.98 | 7.8*** |
| Sarbanes Oxley | | -0.31 | -5.9*** | -1.65 | -16.3*** |
| Log (MSCI Return) | H2 (-) | -1.46 | -8.3*** | -4.00 | -10.5*** |
| Log (Risk Free Rate) | | 30.12 | 14.5*** | -31.18 | -7.6*** |
| *Fund Characteristics* | | | | | |
| Log (Age of PE Fund within the PE Firm) | H3 (-) | -0.36 | -6.4*** | -1.72 | -11.3*** |
| Log (Portfolio Size (# Portfolio firms) / General Partner) | | 0.34 | 9.6*** | 0.73 | 11.0*** |
| *Portfolio Firm Characteristics* | | | | | |
| Seed Stage | H4 (+) | 0.10 | 0.75 | -0.62 | -3.2*** |
| Start-up Stage | H4 (+) | 0.17 | 1.40 | 0.54 | 2.1** |
| Early Stage | H4 (+) | 1.24 | 20.5*** | 1.05 | 9.6*** |
| Expansion Stage | H4 (-) | -0.12 | -1.56 | -0.45 | -2.9*** |
| Late Stage | H4 (-) | -0.97 | -8.9*** | -0.95 | -5.5*** |
| MBO/MBI | H4 (-) | 0.26 | 2.4** | -0.42 | -1.8* |
| LBO | H4 (-) | 0.42 | 1.54 | -0.38 | -0.7 |
| Publicly Listed Firm | H4 (-) | -1.79 | -10.5*** | -1.63 | -9.3*** |
| Log (Industry Market / Book) | | -0.11 | -2.0** | -0.03 | -0.3 |
| Disclosure Year Dummy Variables | | Yes | | Yes | |
| Industry Dummy Variables? | | Yes | | Yes | |
| Country Dummy Variables? | | Yes | | Yes | |
| *Investment Characteristics* | | | | | |
| Syndicated Investment | | -0.34 | -5.8*** | -0.63 | -6.3*** |
| Co-Investment | | 0.08 | 1.46 | 0.05 | 0.6 |
| Convertible Security with Actual Periodic Cash Flows | | -2.62 | -21.5*** | -3.06 | -9.6*** |
| Lead Investment | | -0.18 | -2.8*** | 0.04 | 0.3 |
| PE Board Seat(s) | | 0.59 | 7.2*** | 0.71 | 5.2*** |
| Standard Deviation of Cash Flows to Entrepreneur | | -.276867D-04 | -0.1 | 0.00 | 1.5 |
| Log (Amount Invested) | | -0.04 | -2.4** | 0.02 | 0.6 |
| *Model Diagnostics* | | | | | |
| Number of Observations | | 1294 | | 1294 | |
| Adjusted $R^2$ | | 0.74 | | 0.65 | |
| F Statistic | | 99.80*** | | 74.91*** | |

This table presents OLS estimates of the determinants of the difference between the unrealized reported IRRs and the predicted IRRs based on the models for realized IRRs in Table 4. Each individual observation is per portfolio firm, not per staged investment round. We exclude observations where a variable that is used in the particular specification is not observed, due to private confidential information. The number of observations corresponds to the number of unrealized investments. Standard errors are corrected by cluster design by country and heteroskedasticity. *, **, *** Significant at the 10%, 5% and 1% levels, respectively. The variables are as defined in Table 2.

**Table 6. Private Firm Disclosure Indexes and Unrealized IRRs Disclosed to Institutional Investors in Europe**

| | Hypothesis # (Predicted Sigh) | Model 5 Dependent Variable: Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 2 (Table 4) | | Model 6 Dependent Variable: Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 2 (Table 4) | | Model 7 Dependent Variable: Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 2 (Table 4) | | Model 8 Dependent Variable: Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 2(Table 4) | | Model 9 Dependent Variable: Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 2 (Table 4) | | Model 10 Dependent Variable: Unrealized Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 2 (Table 4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| **Market and Legal Factors** | | | | | | | | | | | | | |
| EM1 | H1 (+) | 0.41 | 3.6*** | | | | | | | | | | |
| EM2 | H1 (+) | | | 4.5 | 2.3** | | | | | | | | |
| EM3 | H1 (+) | | | | | 3.41 | 1.4 | | | | | | |
| EM4 | H1 (+) | | | | | | | 10.38 | 2.9*** | | | | |
| EM Aggregate | H1 (+) | | | | | | | | | 0.023 | 2.3** | 0.01 | 2.2** |
| Log (Legality Index) | H1 (-) | | | | | | | | | | | -2.47 | -1.8* |
| Year 2000 Disclosure (Fixed Effect) | | -8.77 | -20.4*** | -10.8 | -7.8*** | -5.75 | -4.0*** | -16.69 | -5.3*** | -8.965 | -14.1*** | 10.59 | 2.5** |
| Year 2001 Disclosure (Fixed Effect) | | -9.28 | -19.3*** | -11.1 | -7.8*** | -5.98 | -4.4*** | -17.04 | -5.3*** | -9.489 | -14.2*** | 9.05 | 2.1** |
| Year 2002 Disclosure (Fixed Effect) | | -10.64 | -24.3*** | -12.4 | -9.4*** | -7.22 | -4.7*** | -18.42 | -5.9*** | -10.603 | -18.1*** | 7.98 | 1.9* |
| Year 2003 Disclosure (Fixed Effect) | | -10.23 | -17.5*** | -12.2 | -8.4*** | -7.20 | -4.8*** | -18.08 | -5.7*** | -10.389 | -13.7*** | 8.38 | 2.0** |
| Log (MSCI Return) | H2 (-) | | | | | | | | | | | -7.23 | -9.8*** |
| Log (Risk Free Rate) | | | | | | | | | | | | -42.34 | -7.0*** |
| | | | | | | | | | | | | | |
| **Fund Characteristics** | | | | | | | | | | | | | |
| Log (Age of PE Fund within the PE Firm) | H3 (-) | | | | | | | | | | | -1.52 | -9.7*** |
| Log (Portfolio Size (# Portfolio firms) / General Partner) | | | | | | | | | | | | 0.28 | 2.0** |
| | | | | | | | | | | | | | |
| **Portfolio Firm Characteristics** | | | | | | | | | | | | | |
| Seed Stage | H4(+) | | | | | | | | | | | 0.65 | 2.5** |
| Start-up Stage | H4(+) | | | | | | | | | | | 0.72 | 2.1** |
| Early Stage | H4 (+) | | | | | | | | | | | 1.92 | 7.3*** |
| Expansion Stage | H4 (-) | | | | | | | | | | | 0.19 | 0.7 |
| Late Stage | H4 (-) | | | | | | | | | | | -0.28 | -0.8 |
| MBO/MBI | H4 (-) | | | | | | | | | | | 1.11 | 3.9*** |
| LBO | H4 (-) | | | | | | | | | | | 0.24 | 0.5 |
| Log (Industry Market / Book) | | | | | | | | | | | | -0.18 | -1.5 |

**Table 6. (Continued)**

| | Hypothesis # (Predicted Sign) | Model 5 | | Model 6 | | Model 7 | | Model 8 | | Model 9 | | Model 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| Industry Dummy Variables? | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Country Dummy Variables? | | No | | No | | No | | No | | No | | No | |
| | | | | | | | | | | | | | |
| Investment Characteristics | | | | | | | | | | | | | |
| Syndicated Investment | | | | | | | | | | | | -0.46 | -3.1*** |
| Co-Investment | | | | | | | | | | | | -0.12 | -0.7 |
| Convertible Security with Actual Periodic Cash Flows | | | | | | | | | | | | -4.29 | -6.4*** |
| Lead Investment | | | | | | | | | | | | -0.15 | -1.0 |
| PE Board Seat(s) | | | | | | | | | | | | 0.85 | 4.6*** |
| Standard Deviation of Cash Flows to Entrepreneur | | | | | | | | | | | | 0.0004 | 0.5 |
| Log (Amount Invested) | | | | | | | | | | | | 0.02 | 0.5 |
| | | | | | | | | | | | | | |
| Model Diagnostics | | | | | | | | | | | | | |
| Number of Observations | | 366 | | 366 | | 366 | | 366 | | 366 | | 366 | |
| Adjusted $R^2$ | | 0.24 | | 0.22 | | 0.22 | | 0.23 | | 0.21 | | 0.78 | |
| F Statistic | | 12.25*** | | 11.48*** | | 11.06*** | | 11.72*** | | 11.02*** | | 44.29*** | |

This table presents OLS estimates of the determinants of the difference between the unrealized reported IRRs and the predicted IRRs based on Model 2 for realized IRRs in Table 4. Each individual observation is per portfolio firm, not per staged investment round. Observations are only for the subset of portfolio firms in Europe for which Burgstahler et al.'s (2006, Table 2) accounting standards for earnings management in private and public firms in the European Union (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, Spain, Sweden, United Kingdom) are available. We exclude observations for which we do not observe a variable that is used in the particular specification, due to private confidential information. The number of observations corresponds to the number of unrealized investments. Standard errors are corrected by cluster design by country and heteroskedasticity.. *, **, *** Significant at the 10%, 5% and 1% levels, respectively. The variables are as defined in Table 2.

**Table 7.  Determinants of the Difference between Reported Unrealized IRRs Disclosed to Institutional Investors and Subsequently Realized IRRs**

| | Hypothesis # (Predicted Sign) | Model 11 | | Model 12 | | Model 13 | | Model 14 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dependent Variable: | | Dependent Variable: | | Dependent Variable: | | Dependent Variable: | |
| | | Unrealized Reported Log(1+IRR) - Fitted Values from Predicted Log (1+IRR) in Model 1 of Table 4 | | Unrealized Reported Log(1+IRR) - Subsequently Realized Log (1+IRR) | | Unrealized Reported Log(1+IRR) - Subsequently Realized Log (1+IRR) | | Unrealized Reported Log(1+IRR) - Subsequently Realized Log (1+IRR) | |
| | | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic | Coefficient | t-statistic |
| Constant | | 10.89 | 4.8*** | 19.26 | 2.4** | 7.73 | 0.9 | 17.30 | 2.784*** |
| **Market and Legal Factors** | | | | | | | | | |
| Disclosure Index | H1 (-) | -8.06 | -7.1*** | -16.50 | -2.9*** | | | | |
| Earnings Aggressiveness Index | H1 (+) | 20.59 | 1.1 | 489.70 | 3.9*** | 387.38 | 2.5** | 375.45 | 2.5** |
| Log (MSCI Return Reporting Time) | H2 (-) | -1.74 | -1.8* | | | | | | |
| Log (MSCI Return Reporting Time) - Log (MSCI Return Exit Time) | | | | -2.26 | -0.5 | -1.93 | -0.4 | -0.17 | -0.05 |
| Duration from Reporting to Realization | | | | | | 0.36 | 1.0 | | |
| **Fund Characteristics** | | | | | | | | | |
| Log (Age of PE Fund within the PE Firm) | H3 (-) | -0.38 | -1.5 | 0.09 | 0.9 | 0.05 | 0.04 | | |
| Log (Portfolio Size (# Portfolio firms) / General Partner) | | 0.40 | 1.8* | 1.93 | 1.0 | 1.06 | 0.6 | | |
| **Portfolio Firm Characteristics** | | | | | | | | | |
| Log (Industry Market / Book) | | 0.76 | 3.5*** | 0.01 | 0.01 | -0.19 | -0.2 | 0.05 | 0.04 |
| Industry Dummy Variables? | | Yes | | Yes | | Yes | | Yes | |
| Country Dummy Variables? | | Yes | | Yes | | Yes | | Yes | |
| **Investment Characteristics** | | | | | | | | | |
| Syndicated Investment | | -0.67 | -2.58** | 0.81 | 0.6 | 0.66 | 0.5 | | |
| Convertible Security with Actual Periodic Cash Flows | | -2.88 | -12.2*** | -3.42 | -3.4*** | -3.22 | -3.3*** | -3.13 | -3.4*** |
| Standard Deviation of Cash Flows to Entrepreneur | | 0.10 | 1.8* | -0.04 | -0.3 | | | | |
| Log (Amount Invested) | | 0.02 | 0.2 | 0.35 | 0.8 | 0.37 | 1.1 | | |
| **Model Diagnostics** | | | | | | | | | |
| Number of Observations | | 80 | | 80 | | 80 | | 80 | |
| Adjusted $R^2$ | | 0.80 | | 0.13 | | 0.131 | | 0.159 | |
| F Statistic | | 19.28*** | | 1.71* | | 1.74* | | 2.35** | |

This table presents first, in Model (11), OLS estimates of the determinants of the difference between the unrealized reported IRRs and the predicted IRRs based on the Models for realized IRRs in Table 4.  In Models (12), (13), and (14), the dependent variable is the difference between unrealized reported IRRs and the subsequently realized IRRs. We exclude observations for which we do not observe a variable that is used in the particular specification, due to private confidential information.  The number of observations corresponds to the number of unrealized investments. Standard errors are corrected by cluster design by country and heteroskedasticity. *, **, *** Significant at the 10%, 5% and 1% levels, respectively.  The variables are as defined in Table 2.

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**ENDNOTES**

[1] Accounting conservatism can be further categorized into unconditional and conditional conservatism (Beaver and Ryan, 2005). Unconditional conservatism refers to predetermined aspects of the accounting process leading to an understatement of the book value of net assets. Conditional conservatism refers to writing down the book value of assets under adverse circumstances, but not up when there are favorable circumstances. This latter asymmetry is picked up in some of the private firm accounting indexes developed by Burgstahler *et al.* (2006, Table 2). We use different indexes to check for robustness. We also note that all of our multivariate tests account for market conditions.

[2] We note that we express the legal and accounting indexes in logs, with the exception of the Earnings Aggressiveness Index. The reason is that the values in this index are small fractions that are typically negative (see Bhattacharya *et al.*, 2003, Table 2). We considered converting the earnings aggressiveness index into logs as well, using arbitrary rescaling to make a log transformation possible. The estimates in logs (available on request) yield similar results without qualitative differences in interpretation of any of the results.

[3] The 2007 reporting guidelines for the EVCA (see, e.g., http://www.evca.com; and http://www.apcri.pt/New/imagens/evca_reporting_guidelines.pdf), for example, recommend reporting at cost for seed stage investments.