What Do Different Commercial Data Sets Tell Us About Private Equity Performance?

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ABSTRACT

This paper examines private equity (both buyout and venture funds) performance around the globe using four data sets from leading commercial sources. For North American funds, our results echo recent research findings: buyout funds have outperformed public equities over long periods of time; in contrast, venture funds saw performance fall after spectacular results for vintages in the 1990s. For funds outside North America, buyout funds show performance similar to those in North America while venture fund performance is weaker than in North America. Venture samples outside North America are, however, relatively small and strong conclusions await further research. The similarity of performance estimates across the data sets strengthens confidence in conclusions about the results of private equity investing.

Research on private equity (PE) has been challenged by the difficulty of obtaining high quality data. Private equity is called "private" for a reason. There is no requirement for those running private equity funds, the General Partners (or GPs), to make their data available. Since no data set exists on the entire universe of private equity funds, researchers and practitioners are forced to rely on samples, each of which might differ depending upon fund characteristics and collection methods employed by the data provider. This paper combines PE data from multiple providers. Doing so allows us to compare the scope of coverage across sources and conduct a more comprehensive study of the investment performance delivered by PE funds.

We study databases created and maintained by four well-established commercial firms: Burgiss, Cambridge Associates (CA), PitchBook, and Preqin (listed alphabetically) and thank all for supplying data. Each firm has its own business model, methods for gathering data, and approach to dealing with confidentiality issues. If each data provider's sample were a completely random draw from the same underlying universe, we would expect similar messages to emerge across all databases. This should very likely occur for reasonably large sample sizes that may overlap to a large extent. Therefore, comparing results across databases, each constructed in

different ways and with different possible biases, provides insights into the likely effect of any biases on conclusions about PE performance.[1]

Unlike much prior research on venture capital and buyout funds, the samples we use in this study include all funds in each database, not just those focused on investing in North America. Moreover, we examine more recent data (through June 2014 for vintage years 1984-2010) than has prior work comparing data sources. Taking advantage of this more comprehensive data, our study contributes to private equity research on a number of fronts. First, we report sample sizes available for research (both in North America and elsewhere). Our comparisons shed light on the relative coverage and performance information available from different databases. As the industry becomes more global, important research questions may require data from multiple countries. Second, we reassess existing research findings for North America. We use absolute performance data (i.e. investment multiples and internal rates of return) from all four databases. Unlike prior work, we harness two independent sources of cash flow data necessary to compare performance relative to public markets. Third, we provide initial results on performance outside North America and compare it to our findings on North American data. Fourth, we provide detail on data providers' approaches to obtain information and categorize funds. These details point the way for understanding why results may differ across samples and, hopefully, serve as a guide for both research and practice. Fifth, we investigate a new database provided by PitchBook, not previously studied, in order to help inform conclusions.

We categorize results by geography (North America vs. outside of North America) as well as by fund type (buyout vs. venture). Our findings lead to a number of summary conclusions about sample coverage and investment performance. For North America, all four providers have similar sample sizes for buyout funds for which they report absolute performance information—approximately 800 buyout funds over the vintage years 1984-2010. This represents the large majority of capital raised for such funds. Our analysis suggests the coverage is three-quarters or more for capital raised by buyout funds over the 2000-2010 vintage years. Two of the data providers (Burgiss and CA) have full performance histories of cash flows for all funds they

[1] For instance, Harris, Jenkinson and Kaplan (2014) assess investment performance in North America and find inferences are similar across three leading data sets (all three included here), however, results from a fourth are markedly different. The quality of the data set with the different results has been called into question (see Stucke 2011).and it has since been discontinued by the supplier.

cover, while the other two providers have such cash flow histories for substantially smaller samples. Unlike buyout, there are some notable differences across databases in coverage of North American venture funds. However, for both buyout and venture all four sources provide similar signals on fund performance. The consistency in performance patterns lend confidence to our overall conclusions about average performance. The typical North American buyout fund return has exceeded those from public market in almost all vintage years before 2006. Since 2006, these buyout funds' performance has been roughly equal to those of public markets. Meanwhile, venture fund performance has been more variable over time than that of buyout. North American venture funds started in the 1990s substantially outperform public equities; however, those started since 2000 have generally underperformed. Our results document a performance rebound for venture funds raised in recent years (consistent with the decline in assets invested in venture capital during the 2000s.)

Outside of North America we find that coverage varies substantially across the databases for buyout funds. Performance measures for buyout are, however, relatively consistent across the databases. For venture funds outside North America, the coverage and performance varies dramatically by database, likely owing in part to the smaller size of this market. Overall, both multiples and direct analysis of public market equivalents suggest that buyout funds outside North America have had average performance about the same as North American buyout. Initial indications are that venture fund performance outside North American differs considerably from that of buyouts. Moreover, it differs considerably for venture patterns seen in North America.

In the next section, we discuss our data and metrics of performance. Section II compares coverage of the databases for buyout and venture funds in North America and in the rest of the world. In Section III, we analyze performance in North America. Section IV investigates performance outside North America. Section V looks at differences in performance between North America and the rest of the world. Section VI concludes.

I. Data and Measures of Performance

A. Data

The investment performance of a private equity fund for the limited partner (LP) ultimately comes from the outflows and inflows of cash. Prior to the end of a fund's life, the LP also needs an assessment of the remaining value (as yet undistributed) in the fund. These

elements are analogous to the purchases, dividend flows, and ending share prices in public equities. Thus, assessment of a fund's performance ideally benefits from a time-series of fund level cash flows and remaining values. These measures are net of fees since an LP only realizes cash after all fees are paid. In addition to having cash flows for individual funds, an accurate assessments of private equity performance as an asset class requires a comprehensive, or at least representative, set of funds.

We study databases created by four different commercial data providers: Burgiss, Cambridge Associates (CA), PitchBook and Preqin. We thank all the providers for supplying data for this study. The dataset we construct combines all four of these databases with samples gathered as of the second quarter of 2014. The starting dates of each sample varies by database. All the databases have sparse data for the first few years of their samples, which is expected given the rapid institutionalization of the asset class during the 1980s. We focus on fund-level statistics, and include only those funds with available performance data. Of course, each provider has their own methods for gathering the data, and as such the databases can vary both because of which funds are included as well as what information is available.

Two data suppliers, PitchBook and Preqin, have a primary business model of supplying information to fee paying customers. Both firms collect a wide array of public data (e.g. fund raising, trends in the industry) on PE and create periodic analyses and reports. To obtain fund level data, PitchBook and Preqin gather information from public sources and make direct requests for submission. Freedom of Information Act (FOIA) requests (or their parallel outside the U.S.) requiring LPs to reveal certain information are often used, combined with requests to both LPs and GPs to voluntarily make their information public. For instance, PitchBook states "The methods of obtaining fund performance information rely heavily on FOIA requests to a variety of public pensions, with additional data being obtained from online sources, listed private equity sources, filings and those GPs who choose to report their performance data."
As discussed in more detail in the appendix, Preqin's sourcing is a blend of data from both LPs and GPs,

In contrast, the other two data providers (Burgiss and Cambridge Associates) supply various services to institutional investors as their core business. The firms then harness these client relationships to create PE data sets, each of which maintains certain confidentiality requirements. Each firm, however, is different.

Burgiss provides "investment decision support tools for the private capital market."[2] Clients are LP investors who use a range of Burgiss systems dedicated to private equity investment. According to Burgiss, the data set "is sourced exclusively from LPs and includes their complete transactional and valuation history between themselves and their primary fund investments." In essence, Burgiss uses the cash flow data from institutional clients who use its tools for record-keeping and performance monitoring to create "checkbook" data on cash flows.

CA provides an array of investment management services to its clients. These include advisory services, outsourcing and discretionary management, and investment office tools and services. CA "utilizes the quarterly unaudited and annual audited fund financial statements produced by the fund managers (GPs) for their Limited Partners (LPs). These documents are provided to Cambridge Associates by the fund managers themselves. … We use a number of paths to encourage fund managers to submit their performance data to our database" including CA clients, regular meetings with GPs, and relationships with industry groups. Thus CA adds additional funds (not currently in CA client portfolios) from GPs who voluntarily supply information.

We have access to Preqin and PitchBook data through the websites they provide to customers. In addition, PitchBook provided files that allowed us to construct a fund-level data set based on information from LPs that share data with PitchBook. Cambridge Associates kindly supplied summary level data across funds. They also provided documents specifying their procedures for gathering data and fund classifications. Burgiss provided summary data on fund level information and access to their website. In addition, we have the ability to access Burgiss fund-specific information on an anonymized basis. The Appendix provides more detail on each data provider and sample construction.

Each approach to gathering data has pros and cons. For instance, the "public approach" used by PitchBook and Preqin has the advantage of being able to identify the name of the individual PE fund, as would be the case with public equity, thus opening paths for researchers to add additional fund-specific data and detect patterns. A downside of the public approach is that reliance on FOIA disclosures and voluntary submissions may lead to a sample that is not representative of the universe of funds. FOIA taps only certain types of investors (e.g., public

[2] Burgiss website, www.burgiss.com sourced January 23, 2015

pension funds); moreover, voluntary submission (especially by GPs) may introduce selection and survivorship biases. Moreover, this process may make it more difficult to check the data for accuracy or create comprehensive performance histories.

Burgiss and CA retain certain confidentiality requirements that limit identification of fund names to the researcher in most circumstances. On the other hand, direct sourcing from LPs who report their entire investment history may eliminate certain aspects of selection and survivorship bias that could accompany voluntary reporting by GPs. Such LP sourcing has the additional advantage of obtaining more timely information as it avoids reporting lags such as those associated with FOIA requests. Moreover, use of LP cash flows can result in higher quality data since that information is carefully checked and monitored. Confidential data sets typically reveal aggregates of individual fund data which contain enough funds to prevent identification of any fund's individual data. A "confidential" data set also may allow analysis based on access to individual fund data but on an anonymized basis. The research results then reveal fund-level patterns but not information for individual funds. These confidentiality issues are reminiscent of those faced by some government agencies who allow research on data gathered with assurances of confidentiality (e.g. U.S. Census data).

B. Performance Measures

We study both absolute performance (i.e. internal rates of return (IRRs) and investment multiples) and performance relative to public equity as measured by public market equivalents (PMEs). PMEs compare two ways investors can have residual equity claims on companies; limited partner (LP) stakes in a private equity fund or ownership of publicly traded stocks.[3] Despite the real differences between the two forms of ownership (including liquidity and control over cash flow timing), portfolio managers increasingly see them both as forms of equity rather than as separate asset classes. The result has been increasing use of PMEs in both research and practice.

Historically, the most widely used metrics among funds and investors are the fund IRR and the investment multiple (also referred to as the multiple of invested capital). The former measures the LP's annualized IRR based on fund contributions and distributions, net of fees and

[3] Kaplan and Sensoy (2015) survey research on private equity performance. Cornelius (2011) provides an overview of issues related to illiquid assets such as limited partner interests in private equity funds.

profit shares (also known as carried interest) paid to the GP. Until all the investments in the fund are realized, and the cash is returned to the investors, the IRR calculation includes the estimated value of any unrealized investments (the residual net asset value, or NAV) as of the last reporting date as a final "cash flow." The investment multiple compares the sum of all fund contributions by investors to the sum of all fund distributions and the value of unrealized investments, again net of fees and carried interest. All four data sources routinely provide these absolute performance metrics. In our presentation we present these metrics across all four sources.

Neither IRR nor the investment multiple provides a direct way to assess how PE performance compares with returns to public equity investments. There are, however, a variety of metrics that do compare private and public returns and these have become increasingly used in both research and practice. See Griffiths et al. (2014) for a discussion and comparison of methods which are often referred to collectively as variants of public market equivalent calculations (PMEs).[4] Such methods require a full performance history for a fund—i.e. cash contributions, distributions and an ending remaining value. While Burgiss and CA have full performance histories for funds in their samples, the other two sources have these for only limited subsets. Consequently, we only use Burgiss and CA data to compare private to public market returns.

II. Buyout and Venture Capital Funds: Sample Sizes and Coverage

A. Sample Construction

Since we focus on performance data, we require performance information on a fund for inclusion in the samples we present. Burgiss and CA p require a full performance history of cash flows and quarterly net asset values for fund inclusion. As a result, our tables contain samples as Burgiss and CA report them. Funds in these samples have both absolute performance information (i.e. IRRs and Multiples) as well as the cash flow data needed to compute public market equivalents. On the other hand, Preqin and PitchBook do not have a requirement for a full performance history of cash flows and net asset values. We include a fund from PitchBook and Preqin as long as there is reported absolute performance (i.e. IRR) as of the most recent

[4] Commercial data providers often report PMEs for their clients. CalPERS investment office's workshop materials for a recent session include explanations of PME and research findings based on PMEs. https://www.calpers.ca.gov/page/about/board/board-meetings/invest-201511

quarter (in this case 2014:Q2). Our procedures for PitchBook and Preqin (compared to Burgiss and CA) mean that figures for these two providers significantly overstate the number of funds for which they have full cash flow histories. The appendix provides additional detail on screens and sample construction for PitchBook and Preqin.

Each data source has a different scheme for fund classification. We focus on two broad groupings: buyout and venture.[5] The data providers also have different schemes to organize funds by geographic location or a country's stage of development (e.g. developed versus emerging economy). We segment funds into two geographic groups: North America and the "rest of the world" (ROW). North America has historically been the home of substantial private equity investment and the subject of much research. Our "rest of the world" category is a catchall that allows initial insights into the scale of activity outside North America and the size of samples available. The appendix contains additional information on classifications and sample construction.

B. Overall Sample Size

Table 1 summarizes samples from the four data providers across the globe for over a quarter century of vintage years (1984-2010).[6] Panel A reports the number of buyout funds and the associated capital commitments. Panel B shows analogous figures for venture.

The first row of Panel A in Table 1 reveals very similar sample sizes for North American buyout funds across Burgiss, CA, PitchBook and Preqin: 781, 782, 817 and 836, respectively. Sample sizes differ appreciably, however, for funds outside North America, referred to here as

[5] Categorizing many funds is straightforward, but some present special challenges. For instance, in recent years some funds have branded themselves as "growth equity" reflecting a strategy of providing capital for business expansion but not necessarily obtaining control. Such funds have attributes of both traditional buyout and venture capital. CA, PitchBook and Preqin have categories corresponding to growth equity while Burgiss does not. In the PitchBook and Preqin data passing our screen for sample inclusion, the "growth" categories represent well less than 10 % of the total number of funds classified as buyout. Our presentation includes growth equity as part of buyout for CA, PitchBook and Preqin. The appendix provides more information on sample construction.

[6] Sample sizes for CA and Burgiss are as reported by the data provider and, as discussed in the appendix, likely to reflect up to date information from LPs. Given sourcing strategies of the other two providers, the PitchBook and Preqin samples are likely to contain more stale information. For instance, if we require that the "as of 2014:Q4" sample to have a reported IRR from no earlier than 2013:Q2, the North American sample sizes for PitchBook and Preqin would drop by 16% and 6% respectively. The same screen would reduce the rest of world sample by 24% for PitchBook and 8% for Preqin. Part of the differences in sample attrition between the two suppliers may be due to differences in how they treat dates for IRRs of older funds who may have completely liquidated, e.g., those with vintage years in the 1980s.

"Rest of World."[7] The second row of Panel A shows that CA's coverage (725 buyout funds outside North America) is substantially larger than that of Preqin (581) and Burgiss (495), which in turn have much larger coverage than PitchBook (253). Moreover, CA has almost as many buyout funds outside North America as it does within. Overall, global samples sizes for buyout show that CA has the most funds and that this is driven by their larger international coverage. In contrast, PitchBook has relatively smaller international coverage resulting in its having the smallest number of buyout funds in its global sample.

The last three rows of Panel A illustrate buyout samples through the lens of capital committed, rather than fund count. Again, the four providers have similar levels of capital committed in North America. The capital committed figures for the rest of the world show less pronounced differences across the data suppliers than do the fund counts. The net result is that all four providers appear to have global buyout samples representing about $1.3 trillion in capital committed.

The capital committed figures in Table 1 are those reported by the data provider and have not been adjusted for inflation. Furthermore, any apparent differences in patterns of sample coverage between the fund count and capital committed figures could stem from a number of factors. For instance, differences might reflect patterns in vintage year coverages across samples. The capital committed to one buyout fund launched in 2010 could easily match the capital of many funds from decades earlier. So, for example, the results suggest that CA has better coverage of small funds, but not for larger ones that get the majority of the capital. To shed more light on these and other issues, we later analyze samples by vintage year.

Panel B of Table 1 summarizes the venture samples. Unlike buyout, there are substantial differences in venture coverage for North America. CA has the largest North American venture sample (1330), followed by Burgiss (1085), Preqin (983) and PitchBook (685). The second row shows that samples outside North America are similar in number for CA, Burgiss and Preqin but much smaller for PitchBook. The net result is that CA has the largest global sample of venture funds driven largely by its better coverage in North America. In contrast, PitchBook's coverage of venture is limited relative to the other samples. The capital committed figures in the last three

[7] We use this aggregation since many regions of the world have very small sample sizes. We were able to look at figures from Burgiss, PitchBook and Preqin which show that about 60 percent of the "rest of world" buyout funds are located in Europe, though the portion of capital commitments is appreciably higher. The same process shows that about half of the rest of the world venture funds are classified in Europe.

rows of Panel B tell a somewhat different story about coverage. By this metric, CA's global venture coverage is not as large as that in Burgiss. Moreover, the gap between PitchBook and the other providers is not as substantial as indicated by fund count. As with buyout, differences in patterns between fund count and capital committed can reflect a number of factors including fund size and patterns of vintage year coverage. In the case of North American venture, for instance, our vintage year analysis, to which we turn in subsequent sections, shows that a substantial portion of the CA fund count advantage stems from better coverage prior to 2001.

Unlike the Burgiss and CA samples, neither the PitchBook nor Preqin samples reported above require a full quarterly performance history of cash flows. Such a requirement would reduce the samples considerably. Analysis in the appendix suggests the order of magnitude. It appears that PitchBook's global sample would be reduced by half or more if one added the requirement that an LP have an uninterrupted quarterly performance history. For Preqin, it appears that a requirement of full cash flow information makes their global buyout sample about half the size of that from Burgiss[8]. The corresponding figure for venture is about two-fifths. We suspect the percentages would be even smaller if Preqin were compared to CA given that CA had the largest global sample of funds over the 1984-2010 vintages.

C. North America samples by Vintage Year

Table 2 displays counts for North American buyout and venture capital funds for vintage years 1984-2010. Table 3 recasts the samples in terms of capital commitments by vintage year.

Buyout Funds. We first focus on buyout funds, noting that the CA series does not have data until 1986. This date reflects the data we received from CA and matches their policies on what vintage years they report. Figure 1 plots buyout sample sizes (from Panel A of Table 2) by vintage year and displays quite similar trends across the data providers. The number of North American buyout funds increased through the 1990s, peaking at the end of the decade and then plummeting in the first few years of the 2000s. After a rebound, the numbers fell again after the financial crisis.

Turning to capital commitments, Panel A of Table 3 shows that all four data providers capture total capital commitments to North American buyout funds in the $800 to $950 billion

[8] Preqin offers cash flow information on funds for which it has this information. The appendix reports on the size of this sample.

range. Compared to total fund commitments as estimated by Private Equity Analyst, these figures correspond to 60 to 70 % of total capital raised. Not surprisingly the coverage is not as large in the early vintage years-averaging well less than 50% for the 1980s.
Different classification schemes across sources complicate precise estimates of coverage. The PEA figures in Panel A of Table 1 include a broader range of funds than our samples. When we estimate the effect of removing fund raising for co-investment and distressed securities from the PEA data, the coverages for all four commercial samples go up to three quarters or more of the buyout fund raising over the vintage years 2000-2010.

Venture Funds. Focusing on North American venture funds, Panel B of Table 2 reports sample sizes by vintage year. CA has the largest overall sample (1330), followed by Burgiss (1085), Preqin (983) and PitchBook (685). Figure 2 shows that CAs larger venture sample is particularly prevalent prior to 2001. In later vintage years, the Burgiss and CA samples are similar in size. PitchBook's venture sample size is typically smaller across the spectrum of vintage years. Figure 2 also demonstrates the dramatic rise of VC funds in the late 1990s with a sharp drop thereafter. In the mid-2000s venture sample sizes again increase only to drop dramatically after the financial crisis. Again, the VC sample sizes reflect the highly variable nature of fund raising in venture capital. Overall, the ups and downs in fund raising amounts mimic patterns in sample sizes for both buyout and venture funds.

While there are more venture than buyout funds, they support much less capital. For instance, comparing Panels A and B in Table 3 shows that Private Equity Analyst estimates of venture capital commitments are only about 30% of those in buyout over the full period. For our data samples, Panel B of Table 3 shows capital committed to North American venture funds ranges from around $152.8 billion (PitchBook) to over $250 million (Burgiss and CA). Looking at the last block of columns in Panel B we see that Burgiss and CA's coverage of VC averages over 60% of the Private Equity Analysts figures. In contrast, the other two data providers' coverage is around 50% and is particularly low in the early years.

Across Tables 1 through 3, North American buyout coverage is comparable across all four sources with sample sizes of around 800 for vintage years 1984-2010. Vintages in the 1980s and early 1990s often have single digit sample sizes but by the mid-1990s vintages, all four sources consistently have sample sizes of at least 20, with much larger samples in peak fundraising years. For venture, CA has the largest number of funds followed by Burgiss. Even for the 1980s

vintages, both CA and Burgiss typically have venture sample sizes above 20. CA's coverage is especially strong in the early venture vintages. Burgiss and CA have better venture coverage than Preqin and PitchBook. This is perhaps not surprising given that the latter two sources rely heavily on FOIA requests for sourcing data. PitchBook, in particular, has small venture samples in vintages prior to the mid-1990s.

D. Rest of World samples by Vintage Year

Table 4 displays fund counts for the rest of the world (i.e. outside North America) for vintage years 1984-2010. Panel A focuses on buyout funds while Panel B focuses on venture capital funds.

Buyout Funds. The general pattern of the number of buyout funds in the rest of the world matches that of North America. In each region there are two distinct cycles: the first peaking in the late 1990's and the second peaking in the late 2000's during the onset of the financial crisis. The rest of the world has a slightly less pronounced peak in late 1990's cycle, and a slightly more pronounced peak in the late 2000's cycle.

Not surprisingly, there is sparse coverage prior to 1990 in all of the data sets. By the mid-1990 the buyout sample sizes increase markedly for Burgiss, CA, and Preqin. The PitchBook sample remains markedly smaller than the other data suppliers for the duration of the period. This is particularly evident during the mid-2000's increase, wherein PitchBook exhibits a similar, but much more muted, cycle.

Turning to capital commitments, Panel A of Table 5 shows again a similar pattern of growth and disposition among data suppliers for the rest of the world as we see in North America. Total commitments as estimated by our data suppliers range between $390 billion to $531 billion, which is approximately 50%-65% of that reported in North American funds. The size of these commitments grows rapidly from the mid 1980's to the 1990's, and then again in the 2000's. Note the rate of growth between the 1990's and 2000's is substantially faster in the rest of the world than in North America. The smaller coverage by PitchBook outside North America means that its data are less indicative of overall market trends outside North America.

Venture Funds. Panel B of Table 4 reports sample sizes by vintage year for the rest of the world. As with buyout funds, there are several similarities between the rest of the world and the

North American funds. Again, there are two distinct cycle surrounding the late 1990's and the financial crisis. Moreover, PitchBook provides the smallest venture samples.

There are, however, several important differences. The first concerns the relative size of the venture capital samples around the world. The North American venture capital sample, which ranges from 685 to 1130 in total, is much larger than the rest of the world sample, which ranges from 62 to 275. In fact, in any given vintage year, the North American sample is roughly four times the size of the rest of the world sample.

Second, within the rest of the world, the venture capital sample is smaller than the buyout sample, which ranges from 253 to 725. This is opposite our observation for the North American samples, in which the number of venture capital funds was larger than the number of buyouts.

Third, the dispersion among the data providers is more pronounced for venture capital funds than it is for buyout funds. Since PitchBook has relatively sparse coverage of venture funds outside North America its data do not show some of the patterns revealed by other sources

Fourth, the mid 2000's cycle is more pronounced for venture funds than it is for buyout funds. For buyout funds, the cycle peak is roughly twice that of the cycle trough. Meanwhile, for venture capital funds, the cycle peak is roughly six times that of the cycle trough.

Turning to capital commitments, Panel B of Table 5 suggests that venture capital funds in the rest of the world support roughly 15% of the funds supported within North America. The smaller PitchBook sample has only $14.6 billion in total commitments, as opposed to the $30 billion from Preqin, $40 billion from CA, and $46 billion from Burgiss.

We also find that the venture funding in the rest of the world is roughly 10% of that of buyout funds in the rest of the world (which is consistent with the greater number of buyout funds). This is distinct from the pattern we find in North America where all providers except PitchBook show venture funds outnumbering buyout funds.

E. Summary of Coverage by Commercial Data Sets

In terms of coverage, we find that all four providers have similar sample sizes for North American buyout funds for which they report absolute performance information—approximately 800 buyout funds over the vintage years 1984-2010, representing a large majority of capital raised for such funds. Our estimates suggest the coverage is three fourths or more for capital raised by buyout funds over the 2000-2010 vintages. For North American venture, however,

coverage varies substantially across the data providers, undoubtedly reflecting differences in the ways providers gather information. Cambridge Associates (CA) has the largest North American venture sample (1330), followed by Burgiss (1085), Preqin (983) and PitchBook (685). Much of CA's larger coverage stems from the earlier vintage years. In terms of capital commitments, the Burgiss sample is slightly larger than that of CA and both sources reflect over 60 percent of capital raised.

Coverage outside North America differs dramatically across providers, especially for venture funds. For buyout, CA's coverage (725 buyout funds outside North America) is substantially larger than that of Preqin (581) and Burgiss (495), which in turn have much larger coverage than PitchBook (253). About sixty percent of these funds are in Europe. The gaps in sample size are less pronounced in terms of capital commitments. None of the provider samples have double digit vintage year samples until 1994. Venture sample sizes outside North America are similar for Burgiss (235), CA (275) and Preqin (254) but much smaller for PitchBook (62). These sample sizes are dramatically smaller than for North American venture. Moreover, none of these venture sample sizes reach double digits prior to the late 1990s. About half of the venture funds are from Europe.

Overall for buyout, all four providers have North American samples of similar size. Globally, CA has the most buyout funds, driven by larger international coverage. In contrast, PitchBook has relatively smaller international coverage resulting in its having the fewest buyout funds in its global sample. Venture samples outside North America are similar in fund count for CA, Burgiss and Preqin but much smaller for PitchBook. The net result is that CA has the largest global sample of venture funds driven largely by its better coverage in North America, especially in early vintage years. PitchBook coverage of venture is limited relative to the other data sources.

III. Performance of Buyout and Venture Capital Funds in North America

A. Absolute Performance for North American Funds

Both IRRs and investment multiples are typically used in measuring absolute performance. As is well known, however, an IRR for an individual fund is subject to a number of technical issues. In addition, the average IRR for a set of funds is not a reliable estimate of the IRR for a portfolio formed by combining those funds.[9] Moreover, prior research (Harris, Jenkinson and

[9] See Kocis, et al (2009) for a discussion.

Kaplan (2014)) finds that investment multiples show considerably more statistical power in explaining public market equivalents than do IRRs. As a result, we rely primarily on investment multiples for our analysis of absolute performance. Table 6 reports investment multiples for North American funds. Panel A covers buyout and Panel B reports on venture.

Buyout Fund Multiples: Using data from Table 6, Figure 3 plots weighted mean investment multiples for buyout funds against vintage year for all samples, where the weights are capital commitments. In the early vintages, when sample sizes are relatively small, there are occasionally substantial differences across samples. For instance, the weighted mean multiple for Preqin exceeds 8 in the 1986 vintage, over double that of other sources.[10] Beginning in the 1990s, however, the figures are similar across samples and are quite close in the 2000s. For instance, for 2000-2010 the means of the vintage year averages of weighted multiples are around 1.7 from all sources, ranging from 1.66 for PitchBook to 1.73 for CA.

Each of the data sources portrays the pattern of considerable variation in average absolute performance across vintage years, with cycles that appear to lead economic booms and busts. This is due to the convention of classifying funds by vintage year, which is the year of the fund's first investment in a company. Most funds have a 5 or 6 year investment period, and so deploy most of their capital in the few years after their designated vintage year.

Similarities in vintage year multiples across the four series is confirmed by statistical tests. A non-parametric (Kruskal-Wallis) test does not reject the hypothesis that the sources provide the same ranking of vintage year average investment multiples (on either a capital-weighted or unweighted basis) at conventional levels. In all pairwise comparisons of the sources, paired *t*-tests of the weighted average vintage year investment multiples (e.g. a vintage year average from CA paired with same vintage's average for PitchBook) do not reject the hypothesis that the mean difference is zero at conventional levels. Moreover, the time patterns in average investment multiples are highly correlated across sources. Across vintages beginning in 1991 (when all samples have data), the simple correlation coefficients for the weighted average investment multiples are as follows: Burgiss with CA (0.90), with PitchBook (0.77), with Preqin (0.90); CA with PitchBook (0.67), with Preqin (0.86) and PitchBook with Preqin (0.91). The lower

[10] We utilize all data as reported by the source. We searched the Preqin data for the reported investment multiples for each of the nine funds in Preqin's 1986 buyout sample. The high average was primarily due to a very large multiple for a single fund.

correlations for PitchBook likely reflect, in part, smaller sample sizes in early vintage years. Pairwise correlations for the 2000-2010 period all exceed .90.

Overall, the data on investment multiples suggest that each of the four samples provides similar average buyout performance.

Venture Fund Multiples: Figure 4 plots weighted mean investment multiples, which come from the first columns of Table 6 for venture funds, for all samples. All the averages are quite close for vintages after the late 1990s. For earlier years; however, there are notable differences between some providers. Differences, both positive and negative, are largest for PitchBook and likely reflect that their vintage year venture samples are have less than 10 funds until the early 1990s. This serves as a reminder of research issues affected by use of earlier samples with smaller sizes.

Looking at Table 6, the average of vintage-year-weighted multiples is about 2.5 for venture funds across all four data providers, with values ranging from 2.44 (Preqin) to 2.59 (PitchBook). Vintage year means of unweighted averages are around 2.3 and medians are between 1.7 and 1.8. The substantially lower figures for median fund performance reflects the strong positive skewness of returns from venture funds. Long-term averages mask the dramatic differences in absolute venture performance across time that is signaled by all four sources. In the 2000's, average multiples are much lower (1.5 or less) and are much higher in the late 1990s, well over 3.0 from all sources.

Similarities in vintage year multiples across the four series is confirmed by statistical tests. We do not reject the hypothesis that the sources provide the same ranking of vintage year average investment multiples, on either a capital-weighted or unweighted basis. In all pairwise comparisons of the sources, paired *t*-tests of the weighted-average vintage year investment multiples (e.g. a vintage year average from CA paired with same vintage's average for PitchBook) do not reject the hypothesis that the mean difference is zero. Moreover, the time patterns in average investment multiples are positively correlated across all sources. The simple correlation coefficients for the vintage-year weighted-average investment multiples are as follows: Burgiss with CA (0.98), with PitchBook (0.51), with Preqin (0.89); CA with PitchBook (0.56), with Preqin (0.89) and PitchBook with Preqin (0.58). Again, the smaller samples sizes for PitchBook in the early vintages contribute to the lower correlations between it and other sources.

Overall, the data on investment multiples suggest each of the four samples provides similar venture performance, at least on average. Moreover, the samples signal similar changes over time in absolute performance of venture funds.

IRR analysis of Buyout and Venture Funds: We repeated the same analysis on IRRs as discussed earlier on investment multiples. As would be expected, especially in vintages with small sample sizes, IRRs show more variation across samples than do investment multiples. Our IRR analysis does not, however, alter our basic conclusions that the samples provide similar overall signals of fund performance.

Table 7 reports IRRs for North American funds, paralleling Table 6 values for multiples of both buyout (Panel A) and venture (Panel B) funds. The most notable differences in the table appear to be between PitchBook and the other samples. Overall, the PitchBook average IRRs are below those from other sources for both buyout and venture. Some of these differences are particularly notable in vintages with small sample sizes. For instance, the PitchBook samples for buyout vintages in the 1980s are single digits and 1990 has only two funds. Paired *t*-tests cannot reject the hypothesis that average vintage year IRRs, both weighted and unweighted, are the same at the 90 percent confidence level for all pairings of Burgiss, CA and Preqin, for both venture and buyout. In contrast, there are some significant differences between PitchBook and other providers.

Thus the IRR evidence confirms our findings about Burgiss, CA and Preqin using investment multiples. We suspect the differences for PitchBook reflect a combination of factors including small sample sizes in some years. Overall, however, the IRR findings do not change our conclusions based on investment multiples. The IRR findings also signal some of the difficulties in using this particular metric of performance.

B. Performance Relative to Public Markets for North American Funds

Our Burgiss and CA samples have cash flow performance histories that allow calculation of public market equivalents (PMEs) to compare private and public market returns. As discussed in the Appendix, PitchBook and Preqin have cash flow histories for smaller samples, making Burgiss and CA by far the largest sources for fund-level data with full performance histories.

There are a variety of PME methods, each making different assumptions about how to construct a public benchmark to compare to private investment. No consensus has emerged

among commercial sources on which PME method to report. The detail of Burgiss and CA fund-level data would allow for estimation of any of the PME variants.[11]

One PME method is the Kaplan and Schoar (2005) measure (KS-PME) which creates a form of market-adjusted multiple of invested capital (net of fees) by directly comparing an investment in a PE fund to an equivalently timed investment in the relevant public market. The KS-PME calculation discounts (or invests) all cash distributions and residual value to the fund at the public market total return and divides the resulting value by the value of all cash contributions discounted (or invested) at the public market total return. A KS-PME of 1.20, for example, implies that at the end of the fund's life, investors ended up with 20% more than they would have if they had invested in the public markets. Burgiss supplied us with summary information on KS-PMEs. This is one of the standard PME metrics they report to clients and has been widely used in research. Preqin recently introduced a KS-PME calculation. Our PME calculations are based on the S&P 500 because it is a widely used proxy for U.S. public market returns and allows for direct comparison to past research.[12]

Cambridge Associates reports another public market equivalent measure, the modified PME (mPME). As explained by CA, "private investment contributions are invested 'on paper' in a chosen public market index and distributions are taken out in the same proportion as in the private investment.[13] With each distribution, mPME "sells" the same proportion of the dollar value of shares owned by the public equivalent as the private investment sells in private shares." Thus, mPME creates a public market time-series of contributions, distributions and remaining value. That time-series can be used to calculate an IRR or investment multiple to compare with the IRR or investment multiple of a private investment. For sharper comparison between data sets, we convert the mMPE into a "market adjusted" multiple by dividing the average multiple for funds by the mMPE based on the contributions of those funds to a public investment. This derived market adjusted multiple can then be compared to the KS-PME from Burgiss. For instance, if the investment multiple from the mPME calculation is 2.0 and that of the private investment is 2.5 then private investment has provided 1.25 (=2.5/2) times the public market

[11] See Griffiths et al 2014 for an overview and discussion of various methods. Preqin's use of PMEs and its cash flow data service is described in its special report "Public Market Equivalent Benchmarking", July 2015.
[12] Harris, Kaplan and Jenkinson (2014 and 2015) discuss both theoretical and empirical justifications for using KS-PMEs to measure performance, as well as the sensitivity of KS-PME measures to the choice of market index or assumptions about beta.
[13] Language comes from CA's "About Our Private Equity Benchmarks" document on frequently asked questions.

multiple. The 1.25 is a form of market adjusted multiple, though, unlike the KS-PME, it does not take all cash flows to the same point in time. CA reports mPME (in terms of both IRRs and multiples) as a "proprietary method" and does not report other PME methods. CA provided summary information on mPME using the S&P 500 to us on a pooled basis. Burgiss does not report mPME calculations.

Table 8 reports PMEs by vintage year from Burgiss and CA. Panel A focuses on buyout and Panel B focuses on venture. We report figures using both capital weighted averages of fund data and results of pooled estimates, which aggregate all cash flows and NAVs across funds into a single time series. The two sources provide very similar signals about private equity performance relative to public markets. Moreover, the results from pooled and capital weighted estimates are essentially identical.[14]

Buyout Funds. Buyout funds have consistently outperformed the S&P 500 as shown in Panel A. In the Burgiss data, the average of the vintage KS-PMEs is 1.25 which is significantly different from 1.0. Though not shown in the table, the average of the simple average (not capital weighted) vintage averages is 1.20; and the average of the medians is 1.14, both of which significantly exceed 1.0. The weighted-average, average, and median PMEs also exceed 1.0 in all three decades. The weighted average and pooled buyout KS-PME from Burgiss exceeds 1.0 for 25 of the 27 vintages from 1984 to 2010; the average for 23 and even the median PME exceeds 1.0 for 19 of 27 vintages. And, ignoring vintage years, the average fund in the entire sample has an average KS-PME of 1.18 and a median KS-PME of 1.09.

The CA data also support the outperformance of buyout funds and show patterns very close to those revealed in the Burgiss figures. The average of the vintage year average adjusted multiple is 1.32 which is significantly different from 1.0. For the 2000s, the average is 1.27, almost identical to the 1.25 KS-PME average from Burgiss. In the 1990s, the CA average of 1.43 is higher than the comparable figure from Burgiss. The correlation over time between the average vintage year "market adjusted" multiple estimate derived from CA and the KS-PME from Burgiss is 0.76. Since 1990, the CA average falls below one in only two vintage years (2007 and 2010) which are the only two vintage years in which the Burgiss figures are below

[14] We focus on "multiples versions of PME" to avoid the well-known issues with IRR. For instance, we expect the capital weighted averages and pooled estimates for these multiples to be essentially the same. The data reveal this is in fact the case. For IRRs, however, averages for fund-level data do not always reliably estimate the IRR of a portfolio of funds (i.e. the pooled figures).

one. Overall, the CA data support buyout outperformance and, if anything, by a higher margin than the Burgiss data.

Taken together, the results from Burgiss and CA strongly suggest that North American buyout funds have significantly outperformed public markets – by 20% over the life of the fund, for a long period of time.[15] Not only have top quartile funds outperformed the S&P 500, but so have average and median funds. As shown in Harris, Jenkinson and Kaplan (2014 and 2015) this outperformance works out to about 3 to 4 percent per year.

At the same time, the performance of more recent buyout vintages (post-2005) have roughly equaled, not exceeded, the performance of public markets. It is worth noting that those more recent vintage funds are not fully realized. Their eventual performance will depend on the future realization of investments over the funds' remaining lives. That performance will improve if the historical J-curve pattern of private equity funds, in which fund multiples increase over a fund's life, continues to hold.[16] Alternatively, that performance will not improve if competition among buyout funds has reduced the premium for illiquidity.

Venture Funds. Both Burgiss and CA data show that the performance of North American VC has varied dramatically over time. Panel B of Table 8 shows that the public market equivalents for very early VC vintages were below 1.0, but then increased sharply after 1986. In the Burgiss data, KS-PMEs exceed 1.0 for the 1987 to 1998 vintage years, with the 1996 vintage having a weighted-average KS-PME above 4.0. Analogously, the CA data show adjusted multiples above 1.0 from the late 1980s through 1998, with the peak year again being 1996 with a vintage year average of about 4.0.

From 1999 through 2006, the pattern in VC performance reverses. Except for 2003 and 2004, none of those vintages have a KS-PME greater than 1.0. The 2003 vintage is the only one in this time frame to have an adjusted multiple greater than 1.0 in the CA data. The 1999 to 2002 vintages show particularly subpar results, with all Burgiss and CA figures at or below 0.91. Interestingly, VC performance has rebounded somewhat since the 2006 vintage. While not at the

[15] For the Preqin and PitchBook samples, we used the methods of Harris, Jenkinson and Kaplan (2014) to estimate vintage year Kaplan-Schoar PMEs from those samples using their vintage year averages for IRRs and multiples. This procedure uses statistics derived from underlying Burgiss fund-level data thus the estimated figures are informative but not completely independent of the Burgiss data. The estimated PMEs (not reported here) from PitchBook and Preqin confirm the same patterns for both buyout and venture)\ that we report for Burgiss and CA and convey the same message about PE performance.

[16] See Kocis et al. (2009) for a description of the J-curve.

high levels of the 1990s, KS-PMEs from Burgiss and adjusted multiples from CA data are above one for each of the vintage years 2007 through 2010. That performance exceeds the performance of buyout funds over the same period. Although, not reported here, that outperformance has increased through June 2015.

Both Burgiss and CA data thus show that venture fund performance has varied considerably and is different from that of buyout funds. The time-series correlation coefficient between KS-PMEs from Burgiss and market adjusted multiples from CA is 0.98. For the 1990s, the two sources show essentially identical vintage year averages signaling strong VC performance: 2.26 in Burgiss and 2.27 in CA. For the 2000's the vintage year averages are again essentially the same: 1.00 for Burgiss and 0.99 for CA.

Overall, our findings using both Burgiss and CA data suggest that North American venture funds delivered returns higher than those from public markets for most of the 1990s, and by a fairly wide margin. Beginning in 1999, venture performance dropped dramatically and returns underperformed public markets for years. In the most recent vintages, venture performance shows signs of a rebound, though not to the level of the 1990s.

Our presentation focuses on PME measures against the S&P 500 index. Using Burgiss data, earlier research (Harris, Kaplan and Jenkinson (2014, 2015)) finds that performance conclusions about private equity performance in North America are robust to a range of choices about indices or assumptions about beta. Since our Burgiss KS-PMEs are over the same time period as in earlier research (Harris, Jenkinson and Kaplan, 2015) and the results from CA are very similar, our findings also are similarly robust to those choices.

IV. Performance of Buyout and Venture Capital Funds outside North America

A. Absolute Performance for Funds Outside North America

Analysis across different geographies and currencies faces a number of analytic challenges. For instance, funds report performance in different currencies and exchange rates move over time. Moreover, the performance of public equities may vary substantially across markets making choice of an appropriate public equity benchmark more complex. We requested data from Burgiss and CA in terms of US dollars and rely on PitchBook and Preqin's reported figures without knowing the composition of the currencies used. For public market equivalent

calculations, Burgiss and CA provided public market equivalent calculations based on U.S. dollar cash flows benchmarked against the S&P 500.

As an initial step in understanding performance outside North America, we first focus on absolute performance. For reasons mentioned earlier, we rely primarily on our analysis of investment multiples to measure absolute performance. Table 9 reports investment multiples for funds outside North America. Panel A covers buyout and Panel B reports on venture. We start with 1994 given the small sample sizes for earlier vintages.

Buyout Fund Multiples: Multiples from the four samples send very similar messages about average buyout fund performance outside North America. The first columns of Panel A show weighted mean investment multiples for buyout funds against vintage year for all samples (where the weights are capital commitments). Over the entire period, the average of the vintage year averages is approximately 1.7 across all sources. Performance across sources is also very similar for vintages in the 2000s (averages of 1.62 to 1.69) and in the 1990s (averages of 1.81 to 1.87). The pairwise correlation coefficients for all series is 0.84 or above, with the exception of Burgiss and PitchBook which is 0.66. The similarities across sources are echoed in the average (unweighted) and median figures in the remaining columns of Panel A.

Venture Fund Multiples: Panel B reports multiples for venture funds. Unlike buyout, the patterns differ across the sources and often by wide margins. These disparities undoubtedly reflect, at least in part, the limited sample sizes for venture outside North America as discussed earlier in the paper. Over the 1994-2010 span of vintages the sample sizes are as follows: Burgiss (199), CA (257), PitchBook (61) and Preqin (212). For each source there are many vintage years with single digit samples. Panel B thus suggests that sample sizes for venture outside North America often do not support reliable vintage year analysis of performance for any prolonged period. This serves as reminder of research issues created by smaller sample sizes.

IRR analysis of Buyout and Venture Funds: We repeated the same analysis on IRRs as discussed earlier on investment multiples. As would be expected, especially in vintages with small sample sizes, IRRs show more variation across samples than do investment multiples. Our IRR analysis does not, however, alter our basic conclusions formed from studying multiples.

B. *Performance Relative to Public Markets for Funds outside North America*

Buyout funds. Public market equivalents from both Burgiss and CA samples strongly suggest that buyout funds outside North America have significantly outperformed public markets in the U.S. We use our Burgiss and CA samples to estimate public market equivalents for buyout funds outside North America for the 1994-2010 period. Vintage year analysis for buyout fund (reported in Table 10) reveals very similar results across the two samples. For the entire period, the average of the vintage year averages is 1.30 from Burgiss and 1.32 from CA. For the 2000s, the Burgiss figure is 1.25 and the CA figure 1.26. For the 1990s the figures are 1.40 and 1.42, respectively. Across the 1994-2010 span of vintage years, the patterns of vintage year averages track each other closely; the correlation coefficient is 0.96.

Taken together, the results from Burgiss and CA strongly suggest that buyout funds outside North America have significantly outperformed public markets in the U.S. As was true for North America, the performance of more recent buyout vintages (post-2005) have fallen short of the performance of U. S. public markets. It is worth noting that those more recent vintage funds are not fully realized. Moreover, their cash flows have been converted to U. S. dollars and are thus subject to exchange rate effects. More detailed future research using cash flow data at the fund level has the promise of better understanding the effects of currencies and local market conditions.

Venture funds. As noted earlier, vintage year analysis of the history of venture investing outside North America is limited by sample sizes. We therefore focus on average results over longer spans of vintages. Over the span 1994-2010, the average of vintage year averages for KS-PME from Burgiss is 1.01 and the comparable adjusted market multiple form CA is 0.96. For the 1990s the values are 1.17 for Burgiss and 0.90 for CA. These findings suggest that VC performance outside North America has been roughly on par with the S&P 500 for the entire period. The values also show that for funds started in the 1990s venture performance outside North America did not achieve the spectacular results witnessed by North American VC funds. Thus, initial indications are that VC performance outside North American differs considerably from that of buyouts. Moreover, it differs considerably for venture patterns seen in North America.

V. Performance Differences: North America versus the rest of the world

Buyout Funds. Our analysis suggests that buyout performance has been similar around the globe, at least on average. In Table 11 we compare public market equivalents for North American buyout funds versus those from the rest of the world. As before, all calculations are in U.S. dollars and benchmarked against the S&P 500.

The first two columns show North American performance, the next two reflect performance for the rest of world samples and the final two columns of the table report the differences in public market equivalents (North America minus rest of world) by data provider. For instance, the 0.11 figure for Burgiss in vintage year 1994 (next to last column) shows that North American buyout funds have an average (capital weighted) KS-PME that was 0.11 higher than the corresponding Burgiss figure outside North America (0.11 = 1.46 - 1.35). As discussed earlier, Burgiss and CA public market equivalents give very similar signals about performance in North America (the first two columns) and performance in the rest of the world (columns three and four). Not surprisingly then, this leads to very similar results concerning differences in performance between North America and the rest of the world. Averaged over all vintage years, the yearly differences in averages are quite small from both sources, and not significantly different from zero: the Burgiss average is -0.06 and the CA average is -0.01. The two series of annual differences also move closely together with a correlation coefficient of 0.87. Funds in the rest of the world show signs of better performance relative to North America in the late 1990s and early 2000s. However, both before and after that period, North American funds have higher PMEs. Overall, the figures in Table 11 suggest that buyout performance has been similar around the globe, at least on average. However, it is worth noting that the U.S. has outperformed the rest of the world since 2004.

Patterns in buyout investment multiples also support these conclusions on buyout performance. While multiples do not measure performance against public markets over time, Harris, Jenkinson and Kaplan (2014) show that multiples have a strong statistical link with PMEs in a given vintage year. We would thus expect that for a given vintage year differences in average multiples between North America and the rest of the world would parallel differences in average PMEs. This is indeed the case. For each data source for each vintage year since 1994, we calculated the difference between the vintage year average multiple (weighted by capital) for North America and for the rest of the world. For the two data sources for which we have public

market equivalents (Burgiss and CA), the patterns revealed by multiples are very similar to those found in PMEs. For instance, Burgiss data show a 0.96 time-series correlation between the annual differences in multiples (North America minus rest of world) and the annual differences in PMEs. For CA, the comparable correlation is 0.89. Moreover, the vintage year averages of the "difference in multiples" and "difference in PME" series are not significantly different from one another or from zero.

Figure 5 plots the vintage year differences in multiples (weighted by capital) for all four sources. The Burgiss and CA series show very similar results after the first year and the patterns echo our earlier discussion of PMEs. Preqin data confirm that same pattern. Once PitchBook buyout sample sizes for the rest of the world reach double digits (in the late 1990s), PitchBook data also displays patterns similar to the other three sources. Overall, both multiples and direct analysis of public market equivalents suggest that buyout funds have had similar average performance when one compares North America to the Rest of the World.

Venture Funds. We repeat the same analysis of differences in multiples for VC funds. Figure 6 plots the difference in multiples, weighted by capital, across all four data providers. As discussed previously, sample size limitations, especially in early years, suggest interpreting the results with caution. Nonetheless, the differences in multiples portray a pattern of difference between VC performance in North America and the rest of the world. The spectacular North American VC performance in the 1990s was not achieved elsewhere, as shown by the large positive multiple differences in Figure 6. By the 2000s, however, VC performance is similar between North America and the rest of the world.

V. Conclusions

Our findings highlight the nature of data to measure performance about investments in buyout and venture funds, both in and outside North America. Generally, for a given type of fund in a geography (e.g. North American buyout) the absolute performance measures from the different data sets show similar patterns. The notable exception is venture outside North America for which sample sizes are small. Moreover, public market equivalents from the two providers that have full performance histories depict essentially identical patterns. Overall our analysis of multiple private equity data sets strengthens confidence in conclusions drawn about average performance relative to public equity. Given that any single data set has potential biases that are

a function of their different strategies for sourcing information, we view the similar results across four data set as encouraging for research. We believe that this similarity suggests that the databases provide unbiased estimates of the overall performance of private equity.

For study of North American buyout funds, all four providers have large and similarly sized samples for which they report absolute performance information—approximately 800 buyout funds over the vintage years 1984-2010, and representing the vast majority of capital raised for such funds-around three fourths or more of the capital raised for the vintages 2000-2010. Two of the data providers (Burgiss and CA) have full performance histories for all funds they cover, while the other two providers have such histories for substantially smaller samples. Our analysis of the data confirms a set of general conclusions about North American buyout performance. Buyout fund returns have exceeded those from public markets in almost all vintage years before 2006. Since 2006, however, buyout fund performance has been roughly equal to those of public markets.

Unlike North American buyout, venture coverage varies substantially across the data sources, undoubtedly reflecting differences in the ways providers gather information. The largest two samples, provided by CA and Burgiss have over 1000 funds, reflecting over 60 percent of capital raised. Our analysis of the data confirms a set of general conclusions about North American venture performance. Venture capital performance has been more variable over time than that of buyout. North American VC funds started in the 1990s substantially outperformed public equities. However, those started since 2000 have generally underperformed. Our results document a performance rebound for VC funds raised in the most recent years of our sample.

Coverage of buyout funds outside North America differs dramatically across providers. None of the data sources have double digit vintage year samples until 1994. As a consequence, existing data sets support research on a shorter span of history that is true for North America. Our analysis support the general conclusion that buyout funds outside North America have significantly outperformed public markets in the U.S. and have been on a par with those for North American buyout.

Venture sample sizes outside North America are dramatically smaller (typically less than a fourth) than those for North American venture. Moreover, none of these venture sample sizes reach double digits prior to vintages in the late 1990s. Given these small sample sizes it is perhaps unsurprising that vintage year patterns in absolute performance differ across the data

providers and often by wide margins. While firm conclusions await larger sample sizes, initial analysis of public market equivalents suggests that VC performance outside North America has been roughly on par with the S&P 500 for the 2000s. Moreover, venture performance outside North America in the 1990s did not achieve the spectacular results witnessed by North American VC funds. Thus initial indications are that VC performance outside North America differs considerably from that of venture in North America.

Overall, our analysis of the performance of North American funds reveals large samples suitable for research. Moreover, the consistent patterns in results across the samples lends confidence to overall conclusions about average performance. The larger and longer history of reliable samples sizes in North America, compared to elsewhere, reflect the history of the private equity industry much of which originated in the United States. Research on fund performance outside North America faces challenges since vintage year sample sizes do not reach double-digits until the mid-to-late 1990s. The challenges are magnified in venture capital given the dramatically smaller sample sizes. Tests of differences with finer geographic limitations (e.g. Europe versus Asia) introduce even more challenges due to sample size. Movements in exchange rates and differences in public equity performance around the globe further complicate analysis.

Much is left to be done to understand private equity performance, including better understanding of risks and illiquidity. Here, we offer thoughts on a handful of issues related to data and its use.

One barrier for both research and practice is the lack of any uniform classification scheme (e.g. such as SIC codes and CUSIPs) across data suppliers. This adds noise to comparison of results across samples and makes benchmarking performance even more difficult. A common scheme would have many benefits. Such a scheme could include various independent dimensions (e.g. control, company stage) to allow a finer grid for research and benchmarking. This step could be particularly helpful in looking at private equity funds outside of venture and buyout, such as real estate and natural resources.

Our analysis, as well as past work, reveals problems of using IRRs as performance measures. While public market equivalents are gaining traction in practice and research, there are a number of variants. At present no consensus exists among data providers on which of these variants to report. Reporting on some minimum common set of performance measures would offer benefits. Of course, providers could continue to differentiate by adding others.

Careful estimation of how private equity has performed relative to public markets requires fund-level cash flows and full performance histories. Only two of the data sets analyzed in this paper have large samples for such analysis and both have confidentiality requirements given the confidentiality issues surrounding the sharing and reporting of private equity data. We think that both practitioners and researchers could benefit from increasing transparency in private equity data.

Since private equity samples grow over time as new vintages are raised, there will be an ever larger set of data on funds. This will be especially beneficial for research outside North America. Time dated cash flow data (including currencies) will be especially important for this research which faces comparisons across different currencies and public market conditions around the world.

Our analysis offers encouragement for research given the reinforcing signals about performance using summary measures from different data sets. More detailed research on important performance characteristics (e.g. performance persistence) requires access to fund-level data to measure characteristics of individual funds. Moreover, that research will benefit substantially from information on the transactions funds make including cash flows into and out of portfolio companies and the characteristics of those companies (i.e. deal level information). That deal level information is, of course, useful in its own right over and above tying it back to fund performance.

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Table1: Sample Sizes for Commercial Data Providers, Vintage Years 1984-2010

This table summarizes samples of funds from Burgiss, Cambridge Associates, PitchBook and Preqin in North America and in the rest of the world from 1984 to 2010. Entres are the number of funds in a sample and capital committments to those funds ($billions). Panel A reports on buyout funds, and Panel B on venture capital funds. Samples include a fund only if the data provider reports absolute performance information on the fund.

Panel A : Buyout Funds

	Burgiss	Cambridge Associates	Pitchbook	Preqin
Number of Funds				
North America	781	782	817	836
Rest of World	495	725	253	581
Total	1,276	1,507	1,070	1,417
Capital Committed ($bn)				
North America	824.0	815.4	946.2	840.1
Rest of World	516.4	531.0	397.3	503.8
Total	1,340.4	1,346.4	1,343.5	1,343.9

Panel B : Venture Capital Funds

	Burgiss	Cambridge Associates	Pitchbook	Preqin
Number of Funds				
North America	1,085	1,330	685	983
Rest of World	235	275	62	254
Total	1,320	1,605	747	1,237
Capital Committed ($bn)				
North America	279.8	259.6	200.5	215.4
Rest of World	46.1	40.3	14.6	30.3
Total	325.9	299.9	215.1	245.8

Table 2: Number of North American Funds in Commercial Datasets

This table shows the number of buyout and venture capital funds in North America recorded by each data provider by vintage year. Panel A reports on buyout funds, and Panel B on venture capital funds. Samples include a fund only if the data provider reports absolute performance information on the fund.

Panel A : Buyout Funds

Vintage	Burgiss	CA	Pitchbook	Preqin
1984	4	-	2	6
1985	3	-	3	3
1986	7	8	2	9
1987	10	7	6	7
1988	10	14	4	12
1989	9	13	7	11
1990	4	6	2	12
1991	5	9	12	6
1992	11	11	8	19
1993	10	10	12	17
1994	20	26	12	30
1995	23	20	16	19
1996	18	29	29	24
1997	31	34	33	38
1998	46	45	45	49
1999	34	46	50	41
2000	60	71	56	70
2001	31	29	34	33
2002	23	23	38	27
2003	23	29	25	26
2004	50	43	46	34
2005	66	67	67	68
2006	80	69	79	77
2007	86	62	80	68
2008	64	58	68	67
2009	19	29	48	25
2010	34	24	33	38
Total 1984-89	43	42	24	48
Total 1990-99	202	236	219	255
Total 2000-10	536	504	574	533
Total	781	782	817	836

Panel B : Venture Capital Funds

Vintage	Burgiss	CA	Pitchbook	Preqin
1984	24	33	3	16
1985	24	25	6	17
1986	18	30	6	20
1987	30	32	9	20
1988	26	27	8	22
1989	28	39	8	36
1990	17	16	7	19
1991	8	14	3	12
1992	19	23	9	21
1993	21	35	12	28
1994	23	38	13	23
1995	28	40	16	28
1996	23	36	21	29
1997	42	72	36	45
1998	58	78	41	46
1999	88	108	55	62
2000	109	148	84	99
2001	58	69	52	57
2002	21	30	31	30
2003	30	38	25	32
2004	49	57	36	48
2005	59	62	32	43
2006	70	84	43	63
2007	84	75	45	65
2008	58	61	40	53
2009	33	23	20	22
2010	37	37	24	27
Total 1984-89	150	186	40	131
Total 1990-99	327	460	213	313
Total 2000-10	608	684	432	539
Total	1085	1330	685	983

Table 3: Value of Committed Capital in North America, Vintage Years 1984-2010

This table shows the committed capital ($ billions) of funds in North America by data provider and vintage year. Total fund commitments are from Private Equity Analyst for all North American funds. Panel A reports on buyout funds; Panel B on venture capital. Samples include a fund only if the data provider reports absolute performance information on the fund.

Panel A : Buyout Funds

Vintage	Total Fund	Commitments ($bn) by data provider				Fraction of North American Buyout Total			
Year	Commitments	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	1.8	1.2	-	0.1	1.2	0.69	-	0.06	0.70
1985	2.4	0.4	-	0.3	1.2	0.19	-	0.12	0.50
1986	6.8	3.1	2.1	1.8	1.4	0.46	0.30	0.27	0.21
1987	14.7	4.6	7.3	6.5	7.0	0.32	0.50	0.45	0.48
1988	10.7	4.3	6.0	1.1	6.7	0.41	0.56	0.10	0.63
1989	11.9	4.7	3.1	2.4	4.0	0.39	0.26	0.20	0.34
1990	4.8	0.8	1.3	-	3.5	0.16	0.26	-	0.74
1991	5.6	1.9	1.5	1.8	1.7	0.34	0.27	0.33	0.30
1992	8.1	4.1	2.9	2.1	5.7	0.50	0.35	0.27	0.71
1993	9.9	3.1	4.5	6.8	5.7	0.32	0.46	0.68	0.57
1994	15.2	11.2	10.2	6.0	13.1	0.74	0.68	0.39	0.86
1995	22.5	15.8	12.0	8.1	10.0	0.70	0.53	0.36	0.45
1996	19.7	7.0	12.1	15.8	7.9	0.36	0.61	0.80	0.40
1997	41.5	21.7	23.4	28.1	29.6	0.52	0.56	0.68	0.71
1998	61.9	40.8	43.1	36.0	39.8	0.66	0.70	0.58	0.64
1999	43.4	34.2	30.9	43.9	32.4	0.79	0.71	1.01	0.75
2000	79.6	67.9	68.7	68.7	76.6	0.85	0.86	0.86	0.96
2001	51.5	30.1	26.5	24.1	23.5	0.58	0.51	0.47	0.46
2002	43.1	14.7	18.6	29.0	14.9	0.34	0.43	0.67	0.34
2003	28.4	22.2	28.9	29.0	30.5	0.78	1.02	1.02	1.07
2004	57.4	35.7	34.4	43.6	27.1	0.62	0.60	0.76	0.47
2005	110.8	70.6	64.7	74.9	68.9	0.64	0.58	0.68	0.62
2006	148.8	127.9	146.1	141.8	159.7	0.86	0.98	0.95	1.07
2007	244.6	141.6	122.0	175.9	125.2	0.58	0.50	0.72	0.51
2008	181.0	97.6	107.6	117.0	85.4	0.54	0.59	0.65	0.47
2009	58.4	16.4	18.5	61.8	30.5	0.28	0.32	1.06	0.52
2010	61.2	40.2	18.9	19.5	26.8	0.66	0.31	0.32	0.44
Total 1984-89	48.2	18.4	18.5	12.3	21.6	0.38	0.38	0.26	0.45
Total 1990-99	232.6	140.7	141.9	148.6	149.5	0.60	0.61	0.64	0.64
Total 2000-10	1064.8	664.8	655.0	785.3	669.0	0.62	0.62	0.74	0.63
Total	1345.6	824.0	815.4	946.2	840.1	0.61	0.61	0.70	0.62

Panel B : Venture Capital Funds

Vintage	Total Fund	Commitments ($bn) by data provider				Fraction of North American Venture Total			
Year	Commitments	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	3.0	1.5	1.7	0.1	0.9	0.49	0.56	0.04	0.28
1985	1.8	1.0	0.9	0.3	0.6	0.56	0.52	0.18	0.33
1986	2.0	1.1	2.7	0.5	0.8	0.52	1.35	0.27	0.38
1987	3.1	2.0	2.0	0.5	1.5	0.65	0.63	0.18	0.48
1988	2.1	1.6	1.5	0.5	1.4	0.79	0.72	0.27	0.67
1989	2.8	1.6	3.7	0.3	1.2	0.57	1.35	0.12	0.43
1990	1.7	1.1	0.8	0.4	1.1	0.67	0.47	0.22	0.69
1991	1.4	0.6	0.7	0.4	0.8	0.44	0.51	0.26	0.55
1992	2.6	2.0	1.8	1.1	1.8	0.78	0.71	0.42	0.70
1993	2.9	2.4	3.1	1.4	1.7	0.84	1.06	0.47	0.60
1994	4.2	2.0	2.6	1.2	1.9	0.49	0.61	0.30	0.46
1995	6.1	2.8	3.3	2.1	2.6	0.46	0.53	0.34	0.43
1996	7.9	3.1	4.0	4.7	3.9	0.39	0.51	0.59	0.50
1997	14.3	6.6	7.7	4.6	5.2	0.46	0.54	0.32	0.37
1998	21.0	11.1	11.4	10.3	8.1	0.53	0.55	0.49	0.39
1999	48.6	28.7	29.9	19.3	19.0	0.59	0.61	0.40	0.39
2000	72.1	41.7	44.1	34.0	35.2	0.58	0.61	0.47	0.49
2001	39.4	20.0	16.8	22.7	21.4	0.51	0.43	0.58	0.54
2002	10.8	6.3	6.0	5.3	7.3	0.58	0.55	0.49	0.68
2003	9.2	6.7	6.4	5.9	5.9	0.72	0.70	0.64	0.64
2004	17.9	13.1	11.1	8.6	9.2	0.73	0.62	0.48	0.51
2005	25.7	18.6	15.0	9.8	10.3	0.72	0.58	0.38	0.40
2006	25.1	26.6	24.6	20.2	22.3	1.06	0.98	0.80	0.89
2007	33.1	29.8	21.2	19.0	20.2	0.90	0.64	0.57	0.61
2008	24.7	21.5	18.8	12.6	15.4	0.87	0.76	0.51	0.62
2009	13.5	14.0	8.5	7.9	8.8	1.04	0.63	0.59	0.65
2010	15.5	12.4	9.3	6.9	7.0	0.80	0.60	0.44	0.45
Total 1984-89	14.7	8.7	12.5	2.4	6.3	0.59	0.85	0.16	0.43
Total 1990-99	110.6	60.4	65.2	45.3	46.2	0.55	0.59	0.41	0.42
Total 2000-10	287.0	210.7	181.9	152.8	163.0	0.73	0.63	0.53	0.57
Total	412.3	279.8	259.6	200.5	215.4	0.68	0.63	0.49	0.52

Table 4: Number of Funds in Datasets outside of North America

This table shows the number of buyout and venture capital funds outside North America recorded by each data provider by vintage year.. Panel A reports on buyout funds, and Panel B on venture capital funds. Samples include a fund only if the data provider reports absolute performance information on the fund.

Panel A : Buyout Funds

Vintage	Burgiss	Cambridge	Pitchbook	Preqin
1984	1	-	-	-
1985	1	-	-	1
1986	-	-	-	4
1987	3	3	-	-
1988	4	3	1	2
1989	6	8	1	4
1990	4	9	1	7
1991	-	3	-	4
1992	1	8	1	7
1993	3	9	-	3
1994	11	24	3	12
1995	7	16	2	11
1996	10	22	3	12
1997	18	37	10	21
1998	21	40	12	22
1999	19	29	13	27
2000	25	41	8	35
2001	18	33	14	26
2002	14	21	9	20
2003	14	24	7	22
2004	27	38	8	24
2005	40	69	17	58
2006	67	64	33	56
2007	77	95	34	76
2008	61	72	37	66
2009	21	27	19	33
2010	22	30	20	28
Total	495	725	253	581
Total 1984-89	15	14	2	11
Total 1990-99	94	197	45	126
Total 2000-10	386	514	206	444

Panel B : Venture Capital Funds

Vintage	Burgiss	Cambridge	Pitchbook	Preqin
1984	1	-	-	6
1985	5	-	-	3
1986	7	2	-	1
1987	3	-	-	4
1988	5	1	1	3
1989	4	7	-	3
1990	1	1	-	5
1991	3	1	-	4
1992	2	2	-	7
1993	5	4	-	6
1994	3	7	1	3
1995	3	5	-	4
1996	3	3	6	6
1997	9	12	2	14
1998	7	10	5	9
1999	11	22	6	10
2000	24	37	8	25
2001	9	22	3	22
2002	6	9	4	16
2003	3	2	1	9
2004	13	6	3	9
2005	16	24	6	16
2006	23	27	1	14
2007	24	30	5	23
2008	25	21	8	25
2009	10	13	1	5
2010	10	7	1	2
Total	235	275	62	254
Total 1984-89	25	10	1	20
Total 1990-99	47	67	20	68
Total 2000-10	163	198	41	166

Table 5: Value of Committed Capital outside North America, Vintage Years 1984-2010

This table shows the committed capital ($ billions) of funds outside North America by data provider and vintage year. Total fund commitments are from Private Equity Analyst for all North American funds. Panel A reports on buyout funds; Panel B on venture capital. Samples include a fund only if the data provider reports absolute performance information on the fund.

Panel A : Buyout Funds

Vintage Year	Total Fund Commitments	Commitments ($bn) by data provider				Fraction of North American Buyout Total			
		Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	1.8	0.3	-	-	-	0.17	-	-	-
1985	2.4	0.4	-	-	0.1	0.15	-	-	0.04
1986	6.8	-	-	-	0.1	-	-	-	0.02
1987	14.7	5.7	0.5	-	-	0.39	0.03	-	-
1988	10.7	0.3	0.3	0.1	0.2	0.03	0.03	0.00	0.02
1989	11.9	0.8	1.5	-	1.7	0.07	0.12	-	0.14
1990	4.8	0.7	1.0	1.5	1.8	0.14	0.22	0.32	0.38
1991	5.6	-	0.2	-	0.3	-	0.04	-	0.06
1992	8.1	0.2	0.6	0.1	0.7	0.03	0.07	0.01	0.09
1993	9.9	0.3	0.8	-	0.6	0.03	0.08	-	0.06
1994	15.2	2.2	5.8	0.1	11.3	0.15	0.39	0.01	0.75
1995	22.5	1.6	2.8	0.6	2.1	0.07	0.12	0.03	0.09
1996	19.7	2.6	3.4	2.9	3.3	0.13	0.17	0.15	0.17
1997	41.5	14.9	15.2	9.2	6.8	0.36	0.37	0.22	0.16
1998	61.9	12.7	18.1	10.9	16.6	0.21	0.29	0.18	0.27
1999	43.4	13.5	14.4	11.1	14.7	0.31	0.33	0.26	0.34
2000	79.6	16.5	22.2	11.5	15.2	0.21	0.28	0.14	0.19
2001	51.5	17.8	22.6	21.2	17.3	0.35	0.44	0.41	0.34
2002	43.1	6.6	10.1	8.7	15.2	0.15	0.23	0.20	0.35
2003	28.4	15.6	10.9	10.6	12.7	0.55	0.38	0.37	0.45
2004	57.4	15.1	22.3	8.6	16.3	0.26	0.39	0.15	0.28
2005	110.8	58.5	70.6	46.8	52.2	0.53	0.64	0.42	0.47
2006	148.8	100.5	73.0	69.2	65.2	0.68	0.49	0.47	0.44
2007	244.6	99.7	98.0	68.4	109.7	0.41	0.40	0.28	0.45
2008	181.0	93.8	95.2	68.1	95.3	0.52	0.53	0.38	0.53
2009	58.4	22.6	23.8	29.0	27.6	0.39	0.41	0.50	0.47
2010	61.2	13.3	17.8	18.7	16.6	0.22	0.29	0.31	0.27
Total 1984-89	48.2	7.5	2.3	0.1	2.2	0.16	0.05	0.00	0.04
Total 1990-99	232.6	48.7	62.4	36.3	58.3	0.21	0.27	0.16	0.25
Total 2000-10	1064.8	460.1	466.3	360.9	443.3	0.43	0.44	0.34	0.42
Total	1345.6	516.4	531.0	397.3	503.8	0.38	0.39	0.30	0.37

Table 5 (cont'd): Value of Committed Capital outside North America, Vintage Years 1984-2010

Panel B : Venture Capital Funds

Vintage Year	Total Fund Commitments	Commitments ($bn) by data provider				Fraction of North American Venture Total			
		Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	3.0	0.1	-	-	0.2	0.03	-	-	0.05
1985	1.8	0.2	-	-	0.1	0.11	-	-	0.04
1986	2.0	0.3	-	-	0.0	0.16	-	-	0.00
1987	3.1	0.3	-	-	0.4	0.10	-	-	0.12
1988	2.1	0.6	-	0.3	0.0	0.27	-	0.14	0.02
1989	2.8	0.1	2.3	-	0.1	0.04	0.82	-	0.05
1990	1.7	0.1	-	-	0.5	0.08	-	-	0.30
1991	1.4	0.5	-	-	0.3	0.38	-	-	0.21
1992	2.6	0.1	-	-	0.3	0.05	-	-	0.12
1993	2.9	0.6	0.1	-	0.3	0.21	0.03	-	0.11
1994	4.2	0.2	0.4	0.1	0.2	0.05	0.09	0.02	0.05
1995	6.1	0.8	0.3	-	0.4	0.13	0.04	-	0.07
1996	7.9	0.3	0.1	1.0	0.6	0.04	0.01	0.12	0.08
1997	14.3	1.3	1.1	0.1	1.6	0.09	0.07	0.01	0.11
1998	21.0	1.0	1.1	1.1	0.5	0.05	0.05	0.05	0.02
1999	48.6	1.1	2.2	2.0	2.0	0.02	0.04	0.04	0.04
2000	72.1	4.7	6.1	1.9	4.3	0.07	0.08	0.03	0.06
2001	39.4	2.1	4.3	0.6	2.8	0.05	0.11	0.02	0.07
2002	10.8	0.6	0.9	0.9	1.0	0.05	0.09	0.08	0.09
2003	9.2	0.2	-	0.4	1.0	0.03	-	0.04	0.11
2004	17.9	2.3	0.5	1.2	0.8	0.13	0.03	0.06	0.05
2005	25.7	2.4	4.3	1.6	2.2	0.09	0.17	0.06	0.09
2006	25.1	5.4	4.7	-	2.0	0.21	0.19	-	0.08
2007	33.1	8.2	5.3	1.6	3.3	0.25	0.16	0.05	0.10
2008	24.7	6.7	3.0	1.3	4.6	0.27	0.12	0.05	0.18
2009	13.5	3.6	2.9	0.4	0.6	0.27	0.21	0.03	0.05
2010	15.5	2.2	1.0	0.3	0.1	0.14	0.07	0.02	0.00
Total 1984-89	14.7	1.6	2.3	0.3	0.8	0.11	0.15	0.02	0.05
Total 1990-99	110.6	6.1	5.2	4.2	6.8	0.06	0.05	0.04	0.06
Total 2000-10	287.0	38.4	32.9	10.1	22.7	0.13	0.11	0.04	0.08
Total	412.3	46.1	40.3	14.6	30.3	0.11	0.10	0.04	0.07

Table 6: Invesment Multiples for North American Funds, Vintage Years 1984-2010

This table shows Investment Multiples (Total Value to Paid In Capital (TVPI)) for North American buyout and venture capital funds with vintage years from 1984 to 2010 for Burgiss, Cambridge Associates (CA), Pitchbook, and Preqin reported as of June 2014. Weighted Average Multiple refers to the capital committed-weighted average (mean). Panel A reports on buyout funds, and Panel B on venture capital funds. Samples include a fund only if the data provider reports absolute performance information on the fund.

Panel A: Buyout Funds

Vintage	Weighted Average Multiple				Average Multiple				Median Multiple			
Year	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	4.09	-	3.37	4.62	2.87	-	2.49	3.21	2.85	-	2.49	3.33
1985	2.39	-	1.96	1.47	2.42	-	2.29	1.80	2.42	-	2.66	1.49
1986	4.47	3.69	-	8.52	3.36	2.52	-	6.96	2.36	2.30	-	2.47
1987	2.28	1.89	4.42	2.28	2.97	2.65	2.66	3.64	2.28	2.19	2.03	3.22
1988	2.24	1.84	3.54	2.23	1.96	1.86	3.54	2.70	1.70	1.64	3.54	2.30
1989	2.85	2.66	2.29	3.19	2.88	2.40	1.95	4.12	3.23	2.05	2.11	3.35
1990	2.72	2.66	-	2.23	2.89	2.16	1.57	2.79	2.87	1.99	1.57	2.47
1991	3.48	2.96	2.59	2.87	3.65	2.73	3.89	2.55	2.97	2.85	3.22	2.71
1992	2.20	3.08	2.04	2.24	1.91	2.61	2.08	2.12	1.88	2.37	2.23	1.91
1993	2.29	2.44	2.42	2.79	2.23	2.49	2.48	2.70	1.94	2.15	2.41	2.25
1994	2.65	2.87	1.45	2.11	2.09	2.00	1.41	1.93	1.72	1.62	1.57	1.82
1995	1.74	1.99	1.40	1.74	1.88	2.06	1.35	1.76	1.49	1.82	1.52	1.61
1996	1.40	1.35	1.58	1.56	1.51	1.40	1.42	1.84	1.36	1.20	1.29	1.74
1997	1.47	1.66	1.21	1.51	1.26	1.33	1.42	1.56	1.24	1.33	1.20	1.56
1998	1.38	1.38	1.34	1.23	1.47	1.54	1.27	1.44	1.45	1.42	1.34	1.39
1999	1.29	1.53	1.51	1.46	1.32	1.55	1.69	1.69	1.48	1.53	1.66	1.64
2000	1.86	1.89	1.80	1.92	1.75	1.83	1.75	1.97	1.73	1.73	1.75	1.90
2001	1.97	2.07	1.99	2.14	1.81	1.94	1.82	2.03	1.91	2.01	1.69	1.93
2002	1.97	2.01	1.86	1.83	1.86	1.74	1.75	1.63	1.85	1.89	1.86	1.76
2003	2.00	2.03	2.00	1.98	2.05	1.84	1.74	1.73	1.76	1.68	1.62	1.65
2004	1.84	1.80	1.74	1.89	1.67	1.74	1.69	1.88	1.65	1.71	1.50	1.77
2005	1.63	1.64	1.76	1.70	1.67	1.64	1.54	1.71	1.53	1.50	1.45	1.56
2006	1.42	1.51	1.44	1.45	1.41	1.59	1.45	1.53	1.48	1.56	1.50	1.53
2007	1.43	1.50	1.47	1.47	1.44	1.50	1.48	1.60	1.40	1.46	1.45	1.53
2008	1.52	1.63	1.48	1.57	1.45	1.67	1.48	1.53	1.43	1.49	1.42	1.44
2009	1.52	1.59	1.43	1.50	1.42	1.61	1.44	1.49	1.38	1.60	1.38	1.43
2010	1.29	1.35	1.35	1.36	1.30	1.42	1.30	1.37	1.29	1.33	1.30	1.35
Average 1980s	3.05	2.52	3.12	3.72	2.74	2.36	2.59	3.74	2.47	2.05	2.57	2.69
Average 1990s	2.06	2.19	1.73	1.97	2.02	1.99	1.86	2.04	1.84	1.83	1.80	1.91
Average 2000s	1.68	1.73	1.66	1.71	1.62	1.68	1.59	1.68	1.58	1.63	1.54	1.62
Average	2.13	2.04	1.98	2.25	2.02	1.91	1.88	2.27	1.88	1.78	1.84	1.97
All Funds	1.61	1.68	1.57	1.65	1.66	1.73	1.60	1.86	1.51	1.60	1.49	1.63

Table 6 (cont'd): Investment Multiples for North American Funds, Vintage Years 1984-2010

Panel B: Venture Capital Funds

Vintage	Weighted Average Multiple				Average Multiple				Median Multiple			
Year	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	1.71	1.79	2.38	2.29	1.69	1.73	2.22	2.37	1.57	1.71	2.22	2.00
1985	2.05	2.72	2.88	2.58	1.97	2.67	3.16	2.77	1.73	2.39	3.28	2.25
1986	1.76	2.89	1.71	2.12	2.14	1.79	1.74	1.97	1.78	1.84	1.74	1.83
1987	2.41	2.69	2.75	2.52	2.37	2.62	1.99	2.62	2.04	2.32	1.48	2.27
1988	2.65	2.65	2.23	2.99	2.12	2.22	1.97	2.82	1.94	2.14	1.91	3.00
1989	2.80	2.57	4.07	3.24	2.49	2.36	2.90	2.57	2.03	1.95	2.29	2.31
1990	3.10	3.24	9.64	2.76	2.63	2.74	4.21	2.60	2.24	2.48	2.04	2.22
1991	2.57	2.50	2.70	3.13	2.55	2.72	2.60	4.65	2.14	2.40	2.60	3.31
1992	2.75	3.06	5.23	3.44	2.64	3.34	5.17	3.27	1.78	2.27	2.01	2.01
1993	4.98	4.18	5.98	5.07	5.21	3.98	7.92	4.27	3.11	2.62	3.57	2.77
1994	7.83	6.50	3.74	7.71	4.92	3.86	3.13	4.79	2.91	2.16	2.23	2.91
1995	5.55	5.15	4.61	4.86	5.40	4.52	2.60	3.87	2.53	2.53	2.74	2.47
1996	6.51	5.57	2.63	2.80	5.92	4.55	3.67	2.85	3.21	2.09	2.01	1.77
1997	3.33	2.98	2.37	3.07	3.56	2.79	2.16	2.82	1.76	1.65	1.12	1.93
1998	1.93	1.92	1.25	1.67	1.86	1.86	1.19	1.58	1.04	1.06	1.22	1.35
1999	0.99	0.99	0.89	0.83	0.94	0.94	0.92	0.93	0.82	0.83	0.83	0.84
2000	1.01	1.00	1.05	1.02	0.97	0.95	1.02	1.19	0.87	0.82	0.97	1.01
2001	1.31	1.23	1.40	1.32	1.40	1.31	1.14	1.32	1.18	1.14	1.06	1.23
2002	1.12	1.10	1.06	1.15	1.09	1.05	1.04	1.05	1.11	1.00	0.94	1.06
2003	1.54	1.60	1.41	1.20	1.30	1.62	1.12	1.32	1.08	1.18	1.22	1.22
2004	1.75	1.45	1.02	1.44	1.72	1.41	1.04	1.41	1.12	1.10	0.95	1.10
2005	1.39	1.60	1.63	1.44	1.48	1.51	1.78	1.29	1.18	1.18	1.31	1.17
2006	1.40	1.43	1.33	1.28	1.30	1.40	1.18	1.25	1.27	1.35	1.21	1.27
2007	1.65	1.67	1.49	1.64	1.56	1.67	1.56	1.57	1.41	1.61	1.43	1.50
2008	1.67	1.70	1.44	1.37	1.69	1.70	1.48	1.53	1.38	1.42	1.37	1.38
2009	1.62	1.64	1.54	1.56	1.52	1.60	1.44	1.55	1.39	1.60	1.42	1.43
2010	1.64	1.80	1.59	1.48	1.64	1.67	1.51	1.56	1.45	1.44	1.38	1.40
Average 1980s	2.23	2.55	2.67	2.62	2.13	2.23	2.33	2.52	1.85	2.06	2.15	2.28
Average 1990s	3.95	3.61	3.90	3.53	3.56	3.13	3.36	3.16	2.15	2.01	2.04	2.16
Average 2000s	1.46	1.47	1.36	1.35	1.42	1.44	1.30	1.37	1.22	1.26	1.21	1.25
Average	2.56	2.50	2.59	2.44	2.37	2.24	2.29	2.29	1.71	1.71	1.72	1.81
All Funds	1.66	1.69	1.40	1.56	1.97	1.95	1.53	1.94	1.34	1.38	1.21	1.43

Table 7: Internal Rate of Returns for North American Funds, Vintage Years 1984-2010

This table shows Internal rates of return (IRRs) for North American buyout and venture capital funds with vintage years from 1984 to 2010 for Burgiss, Cambridge Associates (CA), Pitchbook, and Preqin reported as of June 2014. Weighted Average Multiple refers to the capital committed-weighted average (mean). Panel A reports on buyout funds, and Panel B on venture capital funds. Samples include a fund only if the data provider reports absolute performance information on the fund.

Panel A : Buyout Funds

Vintage	Weighted Average IRR				Average IRR				Median IRR			
Year	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	24.8	-	16.9	30.1	15.5	-	13.1	33.0	14.9	-	13.1	23.7
1985	36.9	-	7.3	8.6	28.0	-	9.1	8.8	15.7	-	13.7	7.7
1986	16.8	20.2	21.9	40.8	14.2	14.6	23.2	58.5	16.8	15.2	23.2	28.9
1987	15.0	9.6	9.8	10.7	17.1	14.9	17.4	21.6	15.1	11.3	19.5	22.1
1988	16.5	14.6	17.4	13.2	13.3	13.6	27.6	19.6	11.2	11.4	21.9	14.0
1989	24.8	20.3	15.4	31.0	26.4	17.8	15.9	33.4	27.3	20.7	14.8	30.0
1990	19.1	34.7	-	18.7	20.6	23.7	-12.5	24.4	17.1	20.2	-12.5	23.6
1991	33.2	27.7	22.1	25.3	36.8	29.2	31.1	23.7	37.5	26.9	29.2	21.4
1992	26.4	38.3	32.4	33.8	16.6	32.0	12.7	20.1	18.8	20.9	15.9	19.1
1993	21.4	27.0	22.4	26.8	21.2	20.8	22.7	28.1	18.3	30.0	19.0	25.3
1994	28.2	29.5	26.8	25.6	20.9	18.3	18.3	21.4	19.6	13.7	18.2	19.8
1995	15.8	20.1	9.0	16.5	18.3	21.0	4.0	17.5	10.5	15.4	10.3	10.7
1996	9.1	7.2	8.1	11.9	10.4	7.6	5.2	15.2	8.0	4.2	5.8	9.8
1997	7.1	10.2	6.6	7.3	3.9	4.8	4.1	8.8	3.5	5.5	5.7	10.3
1998	4.7	5.7	4.9	1.6	6.0	8.4	0.6	5.5	8.3	8.2	5.3	6.5
1999	3.5	8.1	8.3	6.0	3.6	8.4	9.2	8.3	7.4	9.8	10.4	10.1
2000	15.3	15.7	14.4	15.8	12.8	13.0	12.4	16.1	13.2	12.9	12.2	15.4
2001	19.2	20.5	20.9	25.2	19.5	19.9	16.3	20.1	17.3	20.7	13.2	19.5
2002	18.8	18.7	18.0	19.3	16.1	10.6	13.0	14.1	14.9	15.7	13.6	13.4
2003	21.2	20.9	22.0	19.7	16.4	17.0	15.5	12.5	13.6	14.0	13.1	15.0
2004	15.3	12.9	12.2	16.9	12.5	11.7	11.1	14.7	11.9	11.5	9.8	12.6
2005	9.8	9.5	11.6	11.0	10.8	9.7	9.0	11.8	9.5	8.8	8.4	10.3
2006	7.4	8.4	7.6	7.5	7.8	10.5	6.6	8.6	8.2	9.4	8.3	9.7
2007	10.5	11.4	10.1	11.2	10.4	11.6	10.4	13.2	10.4	11.8	10.0	12.6
2008	15.8	16.7	13.9	16.2	13.9	17.0	9.9	14.1	13.7	15.9	12.2	14.0
2009	18.2	18.4	15.7	17.6	15.8	20.4	14.7	18.6	14.1	21.0	14.9	14.8
2010	15.5	15.1	14.3	15.5	15.5	18.1	9.8	15.9	13.9	15.3	13.0	15.1
Average 1980s	22.5	16.2	14.8	22.4	19.1	15.2	17.7	29.1	16.8	14.6	17.7	21.1
Average 1990s	16.9	20.8	15.6	17.3	15.8	17.4	9.5	17.3	14.9	15.5	10.7	15.6
Average 2000s	15.2	15.3	14.6	16.0	13.8	14.5	11.7	14.5	12.8	14.3	11.7	13.8
Average	17.4	17.6	15.0	17.9	15.7	15.8	12.2	18.8	14.5	14.8	12.7	16.1
All funds	12.4	13.0	11.9	12.8	12.4	13.4	10.4	14.9	11.2	12.1	10.8	13.0

Table 7 (cont'd): Internal Rates of Return for North American Funds, Vintage Years 1984-2010

Panel B : Venture Capital Funds

Vintage	Weighted Average IRR				Average IRR				Median IRR			
Year	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1984	7.7	8.3	16.5	13.9	7.3	7.9	14.2	13.3	6.3	6.3	12.6	12.8
1985	7.7	12.6	13.7	13.9	5.5	12.0	12.5	14.4	8.0	13.1	11.8	13.0
1986	8.7	13.1	8.1	13.0	10.7	8.4	6.8	10.4	8.6	9.1	6.5	9.9
1987	15.5	17.8	12.0	12.4	12.7	15.2	8.5	13.4	13.9	15.9	5.2	14.8
1988	20.5	19.4	23.3	28.0	13.4	14.9	18.5	24.2	11.6	12.0	15.4	23.1
1989	20.3	17.8	30.6	36.1	16.3	16.0	16.5	21.2	14.4	12.3	16.1	14.7
1990	26.2	31.4	29.2	22.7	20.6	24.2	16.1	16.9	20.4	21.9	17.7	20.0
1991	23.7	18.7	18.8	38.1	21.3	19.4	19.5	57.1	18.1	17.6	20.5	28.7
1992	27.4	26.8	45.2	26.3	22.4	28.3	42.1	23.3	13.4	22.0	25.5	18.2
1993	47.3	35.4	50.1	46.0	45.2	32.4	47.2	32.6	38.6	24.5	40.6	34.1
1994	50.9	44.8	37.3	51.9	37.6	31.8	31.7	36.4	31.0	26.5	27.1	29.8
1995	58.9	54.7	47.5	65.8	57.0	50.1	24.5	58.5	27.7	28.5	15.4	26.9
1996	80.8	71.0	37.2	30.0	67.8	55.1	45.4	37.9	44.9	30.8	24.3	22.7
1997	65.9	63.8	37.9	70.3	60.1	57.9	28.3	56.9	22.6	23.1	8.1	31.9
1998	16.0	25.3	8.6	20.9	15.2	25.8	6.0	15.6	0.7	1.2	1.4	6.3
1999	-3.1	-3.1	-4.4	-4.7	-2.1	-3.7	-4.3	-1.5	-2.5	-2.2	-3.6	-2.5
2000	-0.7	-0.9	0.0	-0.8	-2.0	-3.4	-2.4	-0.5	-2.0	-2.7	-0.4	0.2
2001	2.1	2.8	6.5	4.2	2.3	0.8	-0.8	2.8	3.1	2.2	0.9	3.7
2002	1.5	0.7	-1.9	0.9	0.1	-0.5	-2.3	-1.5	1.8	0.0	-1.3	1.3
2003	3.7	2.7	3.7	3.6	1.2	2.1	-1.5	3.2	1.4	3.4	4.1	4.9
2004	5.1	3.5	-1.5	3.2	3.8	1.7	-2.3	2.2	1.8	1.7	-0.8	1.6
2005	4.7	4.1	9.6	5.3	4.0	2.5	9.0	2.3	3.4	4.4	5.4	4.4
2006	5.9	6.1	0.9	4.7	3.3	5.3	-0.4	3.3	5.0	6.7	4.7	4.6
2007	11.8	11.2	9.3	10.2	10.0	11.7	9.9	9.8	9.9	12.8	8.7	10.1
2008	11.0	14.8	8.7	8.6	10.2	14.0	10.0	10.9	11.7	12.3	11.1	12.0
2009	18.7	19.8	16.7	15.8	15.8	18.3	13.9	16.6	15.4	16.5	14.7	16.5
2010	22.3	25.1	24.1	18.6	22.5	22.0	20.2	21.3	19.7	18.4	12.7	15.5
Average 1980s	13.4	14.8	17.4	19.6	11.0	12.4	12.8	16.2	10.5	11.4	11.3	14.7
Average 1990s	39.4	36.9	30.7	36.7	34.5	32.1	25.6	33.4	21.5	19.4	17.7	21.6
Average 2000s	7.8	8.2	6.9	6.7	6.5	6.8	4.8	6.4	6.5	6.9	5.4	6.8
Average	20.8	20.3	18.1	20.7	17.9	17.4	14.3	18.6	12.9	12.5	11.3	14.0
All funds	10.2	11.0	7.5	9.4	13.0	14.3	8.5	14.4	6.4	7.1	4.7	7.9

Table 8: Private Equity Performance Relative to Public Markets for North American Funds

This table shows Public Market Equivalents (PMEs) relative to the S&P 500 for North American buyout and venture capital funds for vintage years from 1984 to 2010 based on Burgiss and Cambridge Associates data as of June 2014. Weighted Average Multiple refers to the capital committed-weighted average (mean). Cambridge Associates reports modified PMEs (mPMEs) on a pooled basis. The market adjusted multiple for CA is the ratio of TVPI to mPME and thus measures the relative performance of private and public equity. KS-PME is the Kaplan Schoar PME. Pooled data are derived by combining the cash flows and NAVs of all funds into a single time series. Panel A focuses on buyout funds and Panel B on venture funds.

Panel A : Buyout Funds

Vintage	Burgiss		Cambridge Associates				
	KS-PME		"Market adjusted" multiple		TVPI		mPME
Year	Cap-Weighted	Pooled	using Cap-Wgt. TVPI	using pooled TVPI	Cap-Weighted	Pooled	Pooled
1984	1.41	1.44	-	-	-	-	-
1985	1.25	1.26	-	-	-	-	-
1986	1.36	1.39	1.58	1.59	3.69	3.69	2.33
1987	1.09	1.05	0.70	0.70	1.89	1.89	2.71
1988	1.07	1.06	1.03	1.03	1.84	1.85	1.79
1989	1.35	1.33	1.46	1.47	2.66	2.67	1.82
1990	1.18	1.20	1.50	1.41	2.66	2.50	1.77
1991	1.63	1.57	1.57	1.63	2.96	3.06	1.88
1992	1.13	1.09	1.69	1.69	3.08	3.08	1.82
1993	1.13	1.14	1.39	1.38	2.44	2.42	1.75
1994	1.46	1.50	1.69	1.69	2.87	2.87	1.70
1995	1.17	1.19	1.34	1.37	1.99	2.03	1.48
1996	1.05	1.00	1.01	1.01	1.35	1.35	1.34
1997	1.27	1.27	1.46	1.46	1.66	1.67	1.14
1998	1.31	1.31	1.30	1.30	1.38	1.38	1.06
1999	1.13	1.14	1.38	1.37	1.53	1.52	1.11
2000	1.48	1.48	1.55	1.55	1.89	1.89	1.22
2001	1.48	1.48	1.62	1.61	2.07	2.06	1.28
2002	1.51	1.50	1.51	1.49	2.01	1.98	1.33
2003	1.55	1.56	1.60	1.61	2.03	2.05	1.27
2004	1.45	1.44	1.36	1.35	1.80	1.78	1.32
2005	1.26	1.25	1.24	1.24	1.64	1.64	1.32
2006	1.02	1.02	1.06	1.06	1.51	1.51	1.42
2007	0.99	0.99	0.99	0.99	1.50	1.50	1.52
2008	1.03	1.02	1.08	1.05	1.63	1.58	1.51
2009	1.01	1.03	1.04	1.04	1.59	1.58	1.53
2010	0.93	0.93	0.95	0.95	1.35	1.35	1.42
Average 1980s	1.26	1.26	1.19	1.20	2.52	2.52	2.16
Average 1990s	1.25	1.24	1.43	1.43	2.19	2.19	1.51
Average 2000s	1.25	1.25	1.27	1.27	1.73	1.72	1.38
Average	1.25	1.25	1.32	1.32	2.04	2.04	1.55

Table 8 (cont'd): Private Equity Performance Relative to Public Markets for North American Funds

Panel B : Venture Funds

Vintage Year	Burgiss KS-PME		Cambridge Associates "Market adjusted" multiple		Cambridge Associates TVPI		Cambridge Associates mPME
	Cap-Weighted	Pooled	Cap-Weighted TVPI	Pooled TVPI	Cap-Weighted	Pooled	Pooled
1984	0.67	0.66	0.71	0.71	1.79	1.79	2.53
1985	0.72	0.70	1.07	1.07	2.72	2.72	2.54
1986	0.78	0.77	1.01	1.01	2.89	2.89	2.85
1987	1.08	1.05	1.41	1.41	2.69	2.69	1.91
1988	1.29	1.27	1.32	1.32	2.65	2.65	2.01
1989	1.36	1.33	1.12	1.12	2.57	2.56	2.29
1990	1.52	1.52	1.92	1.90	3.24	3.21	1.69
1991	1.20	1.23	1.14	1.15	2.50	2.51	2.19
1992	1.35	1.35	1.53	1.54	3.06	3.09	2.00
1993	2.28	2.32	2.22	2.22	4.18	4.17	1.88
1994	3.42	3.18	3.51	3.15	6.50	5.83	1.85
1995	3.14	3.19	3.26	3.27	5.15	5.17	1.58
1996	4.34	4.44	3.98	3.99	5.57	5.58	1.40
1997	2.68	2.68	2.48	2.47	2.98	2.97	1.20
1998	1.74	1.77	1.78	1.77	1.92	1.92	1.08
1999	0.89	0.88	0.90	0.89	0.99	0.98	1.10
2000	0.78	0.78	0.74	0.74	1.00	1.00	1.35
2001	0.91	0.86	0.87	0.86	1.23	1.22	1.42
2002	0.79	0.79	0.71	0.71	1.10	1.10	1.54
2003	1.09	1.07	1.13	1.14	1.60	1.61	1.42
2004	1.23	1.17	0.97	0.97	1.45	1.44	1.49
2005	0.98	0.97	1.11	1.07	1.60	1.55	1.44
2006	0.95	0.96	0.93	0.95	1.43	1.45	1.53
2007	1.08	1.10	1.08	1.10	1.67	1.70	1.55
2008	1.05	1.09	1.06	1.05	1.70	1.68	1.60
2009	1.05	1.06	1.04	1.05	1.64	1.65	1.57
2010	1.13	1.12	1.21	1.20	1.80	1.79	1.49
Average 1980s	0.98	0.96	1.11	1.11	2.55	2.55	2.36
Average 1990s	2.26	2.26	2.27	2.24	3.61	3.54	1.60
Average 2000s	1.00	1.00	0.99	0.99	1.47	1.47	1.49
Average	1.46	1.46	1.49	1.48	2.50	2.48	1.72

Table 9: Investment Multiples for Funds Outside North America Funds, Vintage Years 1984-2010

This table shows Investment Multiples (Total Value to Paid In Capital (TVPI)) for buyout and venture capital funds outside North America for vintage years from 1984 to 2010, reported as of June 2014. Weighted Average Multiple refers to the capital committed-weighted average (mean). Panel A reports on buyout funds, and Panel B on venture capital funds.

Panel A : Buyout Funds

Vintage	Weighted Average Multiple				Average Multiple				Median Multiple			
Year	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1994	2.48	1.90	1.51	1.94	1.98	1.96	1.93	2.31	2.08	1.67	1.82	1.83
1995	1.48	1.67	-	1.65	1.16	1.36	-	1.51	0.91	1.03	-	1.56
1996	1.70	1.68	2.23	1.78	1.59	1.50	1.89	1.88	1.61	1.59	1.89	1.68
1997	1.65	1.80	1.89	1.72	1.69	2.00	2.15	1.61	1.50	1.82	1.84	1.50
1998	1.76	1.80	1.69	1.87	1.73	2.02	1.30	1.75	1.63	1.61	1.34	1.69
1999	1.82	1.96	2.01	1.89	1.43	1.95	1.92	2.16	1.34	1.99	1.81	1.80
2000	2.05	2.13	2.00	1.92	2.14	2.01	1.72	1.98	1.86	1.94	1.57	2.06
2001	2.15	2.34	2.33	2.41	2.25	2.25	2.27	2.29	2.07	2.14	2.14	2.25
2002	2.20	2.11	2.06	1.95	2.14	2.23	2.07	2.33	1.92	2.05	1.94	1.97
2003	1.96	2.01	1.86	2.11	1.81	2.00	1.98	2.04	1.67	1.81	1.74	1.90
2004	1.76	1.75	1.62	1.72	1.69	1.74	1.66	2.04	1.78	1.55	1.56	1.91
2005	1.54	1.53	1.47	1.60	1.60	1.70	1.48	1.65	1.48	1.48	1.42	1.50
2006	1.29	1.25	1.36	1.39	1.36	1.41	1.29	1.62	1.36	1.31	1.29	1.37
2007	1.33	1.35	1.30	1.33	1.35	1.36	1.36	1.44	1.29	1.33	1.37	1.43
2008	1.34	1.39	1.29	1.41	1.27	1.31	1.21	1.44	1.27	1.33	1.24	1.32
2009	1.29	1.47	1.30	1.30	1.26	1.45	1.30	1.29	1.17	1.19	1.26	1.23
2010	1.13	1.24	1.23	1.21	1.12	1.25	1.24	1.27	1.12	1.20	1.18	1.23
Average 1990s	1.82	1.80	1.87	1.81	1.60	1.80	1.84	1.87	1.51	1.62	1.74	1.68
Average 2000s	1.64	1.69	1.62	1.67	1.64	1.70	1.60	1.76	1.54	1.58	1.52	1.65
Average	1.70	1.73	1.70	1.72	1.62	1.74	1.67	1.80	1.53	1.59	1.59	1.66
All Funds	1.48	1.54	1.48	1.54	1.53	1.67	1.50	1.70	1.38	-	1.40	1.52

Panel B : Venture Capital Funds

Vintage	Weighted Average Multiple				Average Multiple				Median Multiple			
Year	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin	Burgiss	CA	Pitchbook	Preqin
1994	1.30	1.78	1.33	3.53	1.29	1.75	1.33	3.54	1.23	1.42	1.33	2.12
1995	4.08	1.29	-	4.05	3.73	1.36	-	2.89	3.55	1.19	-	2.26
1996	1.13	1.58	1.33	1.51	1.01	1.48	1.25	1.68	1.45	-	1.31	1.76
1997	1.67	1.42	1.77	2.24	1.32	1.80	2.00	2.33	1.29	1.16	2.00	2.07
1998	0.91	1.08	1.33	1.15	0.95	1.68	0.88	1.53	0.80	1.31	0.69	1.34
1999	1.03	0.79	1.02	1.64	0.91	0.88	1.02	2.34	0.74	0.68	1.14	1.57
2000	0.94	0.95	0.93	0.94	0.76	0.89	0.83	0.93	0.68	0.92	0.88	0.96
2001	1.18	1.14	1.25	1.34	0.99	1.29	1.06	1.67	0.93	1.14	0.85	1.38
2002	1.62	1.08	2.23	1.61	1.67	0.95	1.95	1.45	1.62	0.88	1.86	1.19
2003	1.00	-	1.16	1.15	0.96	-	1.16	1.28	0.91	-	1.16	1.16
2004	1.26	1.55	1.19	1.13	1.10	1.80	1.12	1.18	1.14	1.38	1.20	1.23
2005	1.65	1.67	1.32	1.39	1.60	1.65	1.13	1.31	1.54	1.28	0.89	1.33
2006	1.58	1.57	-	1.64	1.51	1.55	1.07	1.37	1.51	1.50	1.07	1.27
2007	1.42	1.62	1.48	1.10	1.48	1.50	1.31	1.12	1.16	1.37	1.31	1.11
2008	1.44	2.11	1.52	1.46	1.26	2.07	1.51	1.62	1.17	1.38	1.39	1.29
2009	1.41	1.66	1.16	1.13	1.28	1.52	1.16	1.06	1.16	1.23	1.16	0.86
2010	1.37	1.90	0.86	0.91	1.22	1.56	0.86	0.92	1.06	1.59	0.86	0.92
Average 1990s	1.69	1.32	1.36	2.35	1.54	1.49	1.30	2.38	1.51	1.15	1.30	1.85
Average 2000s	1.35	1.53	1.31	1.25	1.26	1.48	1.20	1.27	1.17	1.27	1.15	1.15
Average	1.47	1.45	1.32	1.64	1.36	1.48	1.23	1.66	1.29	1.23	1.19	1.40
All Funds	1.41	1.42	1.29	1.42	1.27	1.41	1.22	1.53	1.15	-	1.20	1.24

Table 10: Public Market Equivalents outside North America, Vintage Years 1994-2010

This table shows Public Market Equivalents (PMEs) for buyout and venture funds outsude North America, for vintage years from 1994 to 2010 for Burgiss and Cambridge Associates, reported as of June 2014. The KS-PME is the capital weighted Kaplan Schoar PME. Cambridge Associates reports modified PMEs (mPMEs) on a pooled basis. The market adjusted multiple for CA is the ratio of the capital weighted TVPI to mPME and thus measures the relative performance of private and public equity. Pooled data are derived by combining the cash flows and NAVs of all funds into a single time series. Panel A reports on buyout funds and Panel B on venture funds.

Panel A : Buyout Funds

Vintage Year	Burgiss	Cambridge		
	KS-PME	"Mkt-Adjusted" Multiple	Cap. Wt. TVPI	Pooled mPME
1994	1.35	1.05	1.90	1.81
1995	1.06	1.11	1.67	1.51
1996	1.19	1.18	1.68	1.42
1997	1.46	1.59	1.80	1.13
1998	1.69	1.76	1.80	1.02
1999	1.62	1.80	1.96	1.09
2000	1.79	1.82	2.13	1.17
2001	1.70	1.84	2.34	1.27
2002	1.69	1.66	2.11	1.27
2003	1.59	1.60	2.01	1.26
2004	1.37	1.38	1.75	1.27
2005	1.20	1.15	1.53	1.33
2006	0.95	0.87	1.25	1.44
2007	0.91	0.88	1.35	1.53
2008	0.91	0.89	1.39	1.57
2009	0.87	0.94	1.47	1.56
2010	0.80	0.85	1.24	1.46
Average 1990s	1.40	1.42	1.80	1.33
Average 2000s	1.25	1.26	1.69	1.38
Average	1.30	1.32	1.73	1.36

Panel B : Venture Capital Funds

Vintage Year	Burgiss	Cambridge		
	KS-PME	"Mkt-Adjusted" Multiple	Cap. Wt. TVPI	Pooled mPME
1994	0.77	0.97	1.78	1.83
1995	2.20	0.73	1.29	1.76
1996	0.89	0.94	1.58	1.68
1997	1.38	1.17	1.42	1.21
1998	0.82	0.90	1.08	1.20
1999	0.96	0.69	0.79	1.15
2000	0.74	0.70	0.95	1.35
2001	0.89	0.80	1.14	1.42
2002	1.15	0.68	1.08	1.60
2003	0.62	-	-	-
2004	0.90	1.14	1.55	1.36
2005	1.15	1.12	1.67	1.49
2006	1.01	1.01	1.57	1.56
2007	0.95	0.99	1.62	1.64
2008	0.88	1.26	2.11	1.67
2009	0.91	1.04	1.66	1.60
2010	0.94	1.27	1.90	1.50
Average 1990s	1.17	0.90	1.32	1.47
Average 2000s	0.92	1.00	1.53	1.52
Average	1.01	0.96	1.45	1.50

Table 11: Public Market Equivalents for North America and outside North America

This table compares Public Market Equivalents (PMEs) of buyout funds in North America to those in the rest of the world, for vintage years from 1994 to 2010.reported as of June 2014. KS-PME is the capital-weighted Kaplan Schoar PME from Burgiss data. The Market Adjusted Multiple (Mkt-adj Mult) is the ratio of the capital weighted TVPI to the pooled mPME from Cambridge Associates. Values are taken from Tables 8 and 10. The Difference is North America minus the rest of the world.

	North America		Outside North America		Difference	
Vintage	Burgiss	Cambridge	Burgiss	Cambridge	Burgiss	Cambridge
Year	KS-PME	Mkt-adj Mult.	KS-PME	Mkt-adj Mult.	KS-PME	Mkt-adj Mult.
1994	1.46	1.69	1.35	1.05	0.11	0.64
1995	1.17	1.34	1.06	1.11	0.11	0.24
1996	1.05	1.01	1.19	1.18	-0.14	-0.18
1997	1.27	1.46	1.46	1.59	-0.19	-0.14
1998	1.31	1.30	1.69	1.76	-0.38	-0.46
1999	1.13	1.38	1.62	1.80	-0.49	-0.42
2000	1.48	1.55	1.79	1.82	-0.31	-0.27
2001	1.48	1.62	1.70	1.84	-0.22	-0.23
2002	1.51	1.51	1.69	1.66	-0.18	-0.15
2003	1.55	1.60	1.59	1.60	-0.04	0.00
2004	1.45	1.36	1.37	1.38	0.08	-0.01
2005	1.26	1.24	1.20	1.15	0.06	0.09
2006	1.02	1.06	0.95	0.87	0.07	0.20
2007	0.99	0.99	0.91	0.88	0.08	0.10
2008	1.03	1.08	0.91	0.89	0.12	0.19
2009	1.01	1.04	0.87	0.94	0.14	0.10
2010	0.93	0.95	0.80	0.85	0.13	0.10
Average 1990s	1.23	1.36	1.40	1.42	-0.16	-0.05
Average 2000s	1.25	1.27	1.25	1.26	-0.01	0.01
Average	1.24	1.30	1.30	1.32	-0.06	-0.01

Figure 1: Buyouts Sample Sizes, Vintage Years 1984-2010

This figure shows North American buyout sample sizes by vintage year for the four data providers (Burgiss, Cambridge Associates, PitchBook and Preqin) over the period 1984-2010.

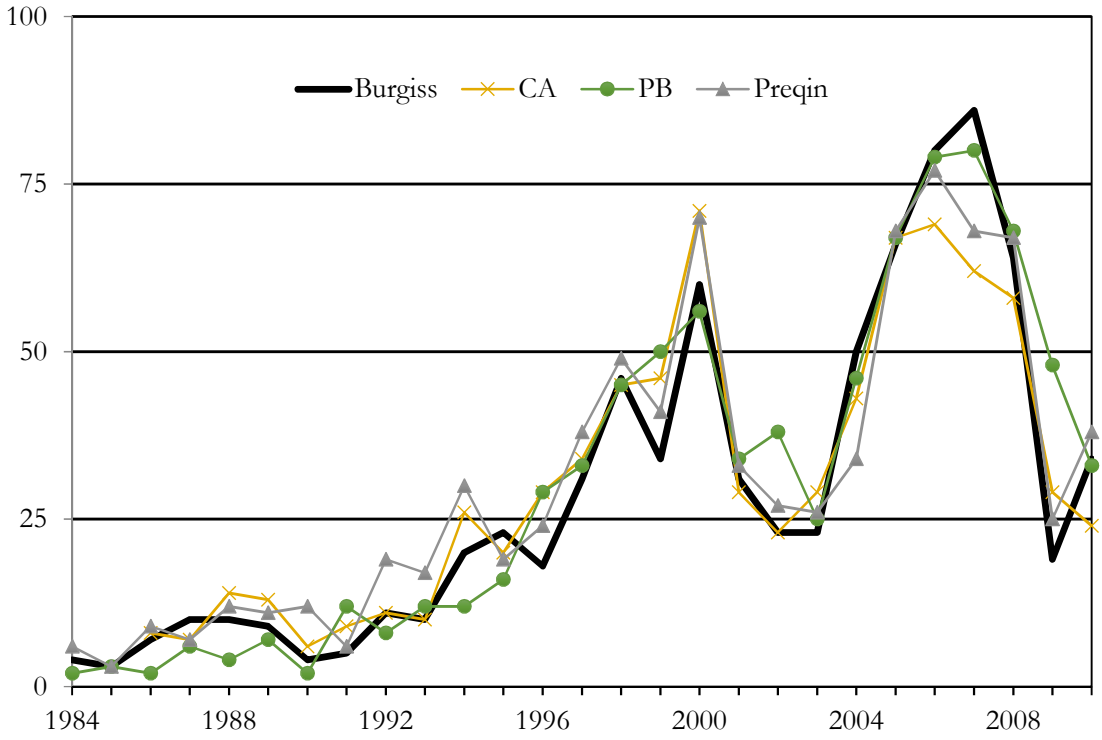


Figure 2: Venture Capital Sample Sizes, Vintage Years 1984-2010

This figure shows North American venture capital sample sizes by vintage year for the four data providers (Burgiss, Cambridge Associates (CA), PitchBook and Preqin) over the period 1984-2010.

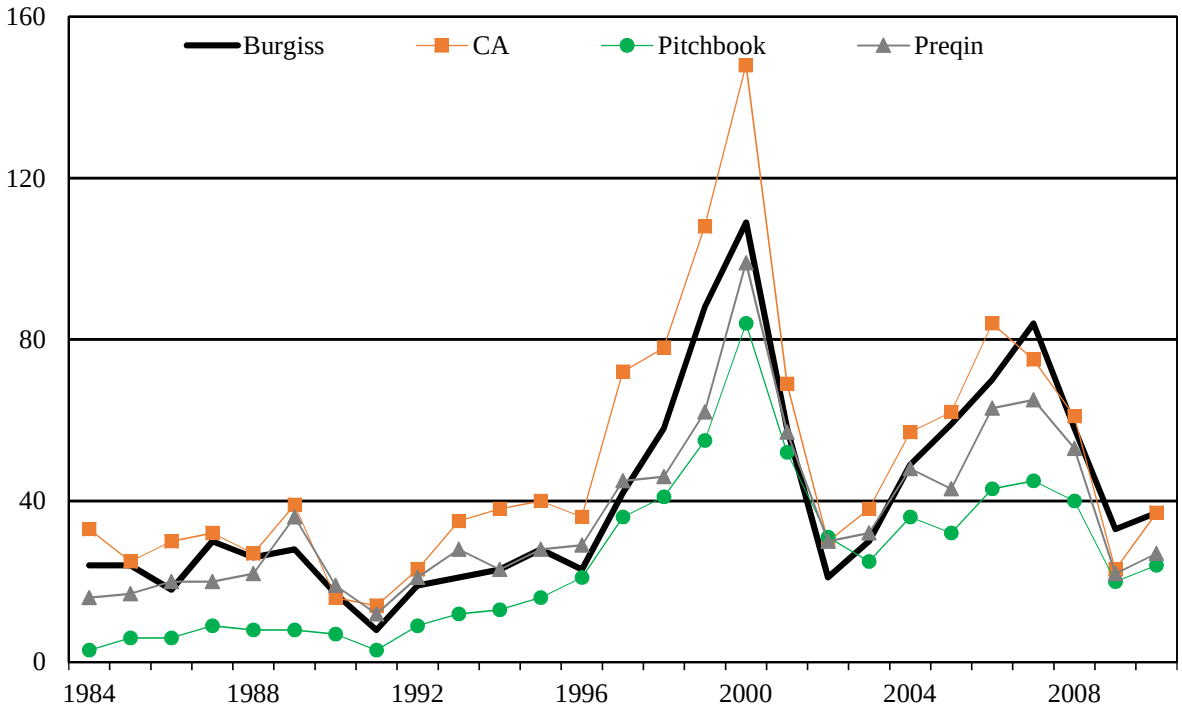


Figure 3: Weighted Average Investment Multiples for North American Buyout Funds, Vintage Years 1984-2010

This figure shows vintage year average investment multiples (weighted by capital committments) for buyout funds by vintage year for the four data providers (Burgiss, Cambridge Associates, PitchBook and Preqin) over the period 1984-2010.

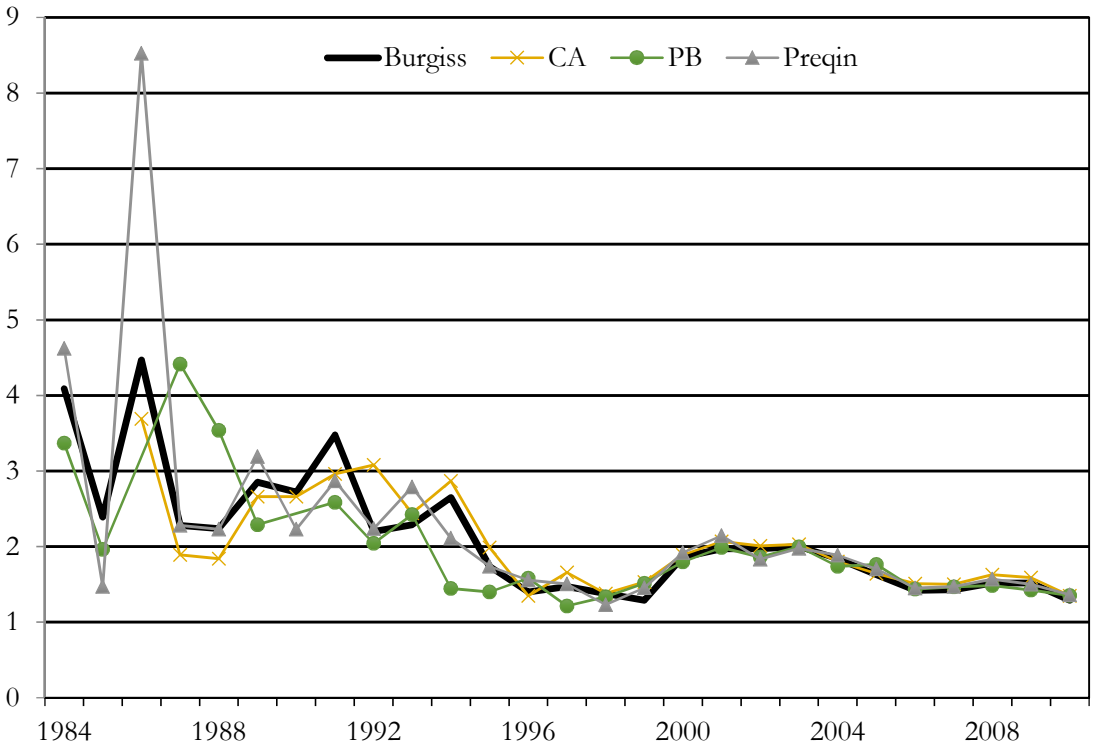


Figure 4: Weighted Average Investment Multiples for North American Venture Funds, Vintage Years 1984-2010

This figure shows vintage year average investment multiples (weighted by capital committments) for venture capital funds by vintage year for the four data providers (Burgiss, Cambridge Associates, PitchBook and Preqin) over the period 1984-2010.

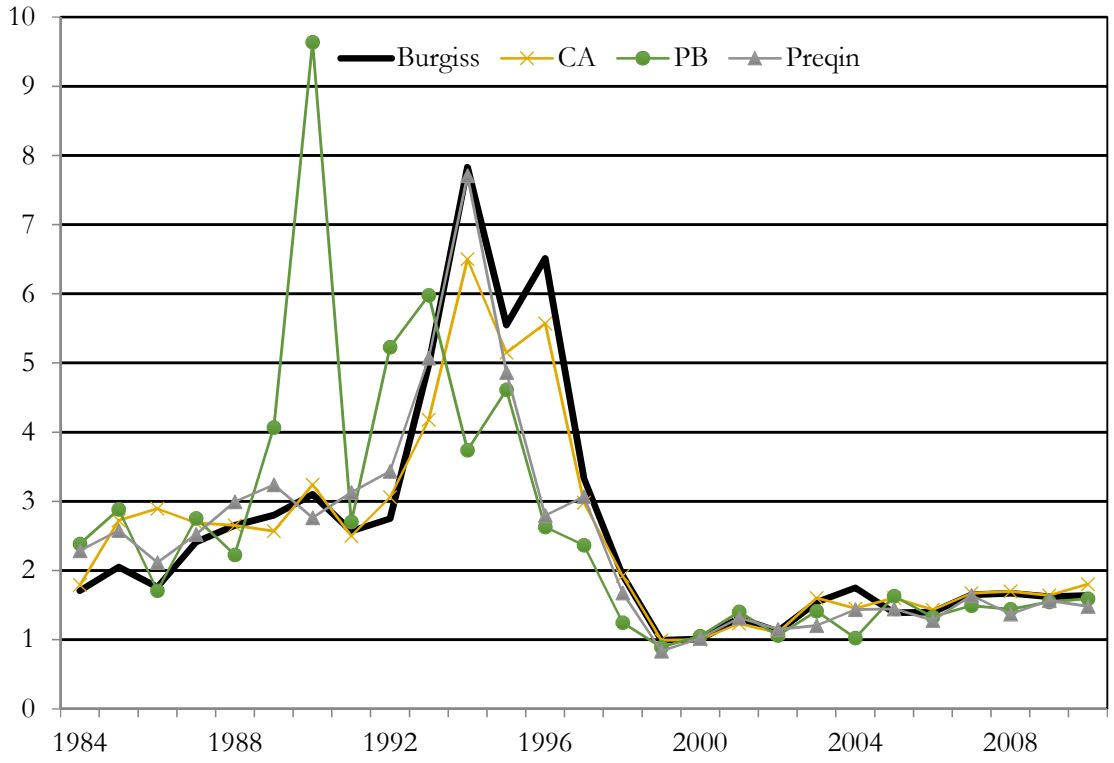


Figure 5: Differences in Vintage Year Multiples Comparing Buyout Funds in North America to those outside North America , 1994-2010

This figure shows the difference in capital weighted multiples (North America minus outside North America) for buyout funds. A series of differences is plotted for each of the four data providers (Burgiss, Cambridge Associates, PitchBook and Preqin) over the period 1994 to 2010.

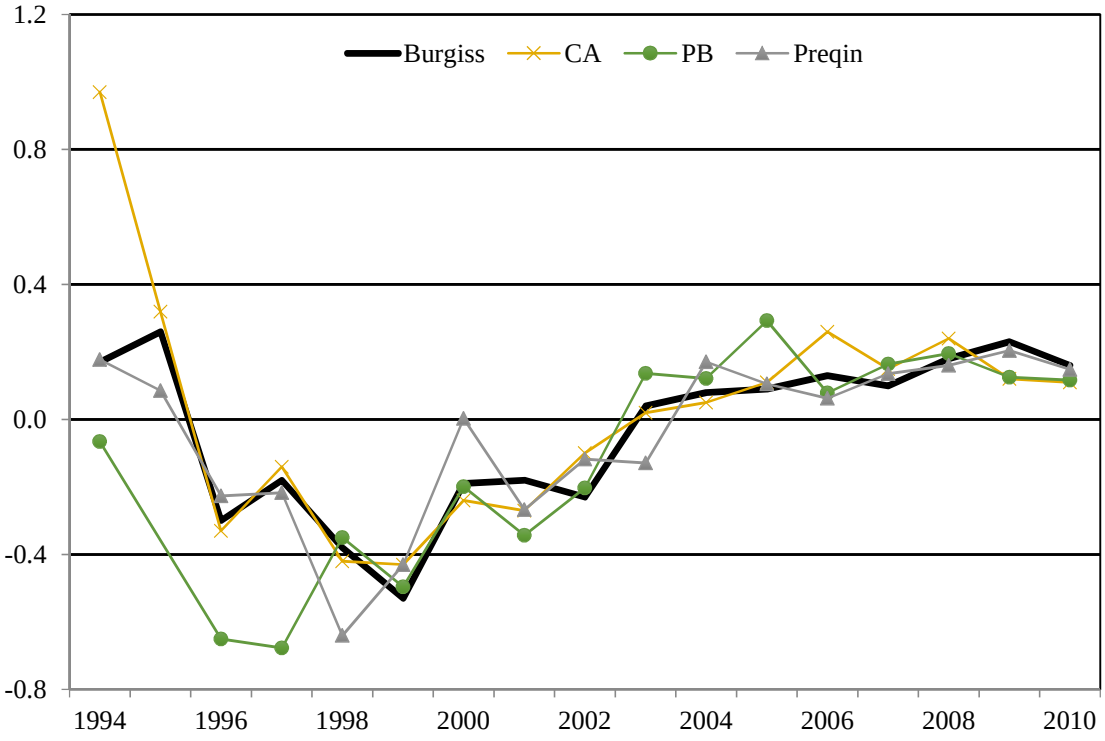
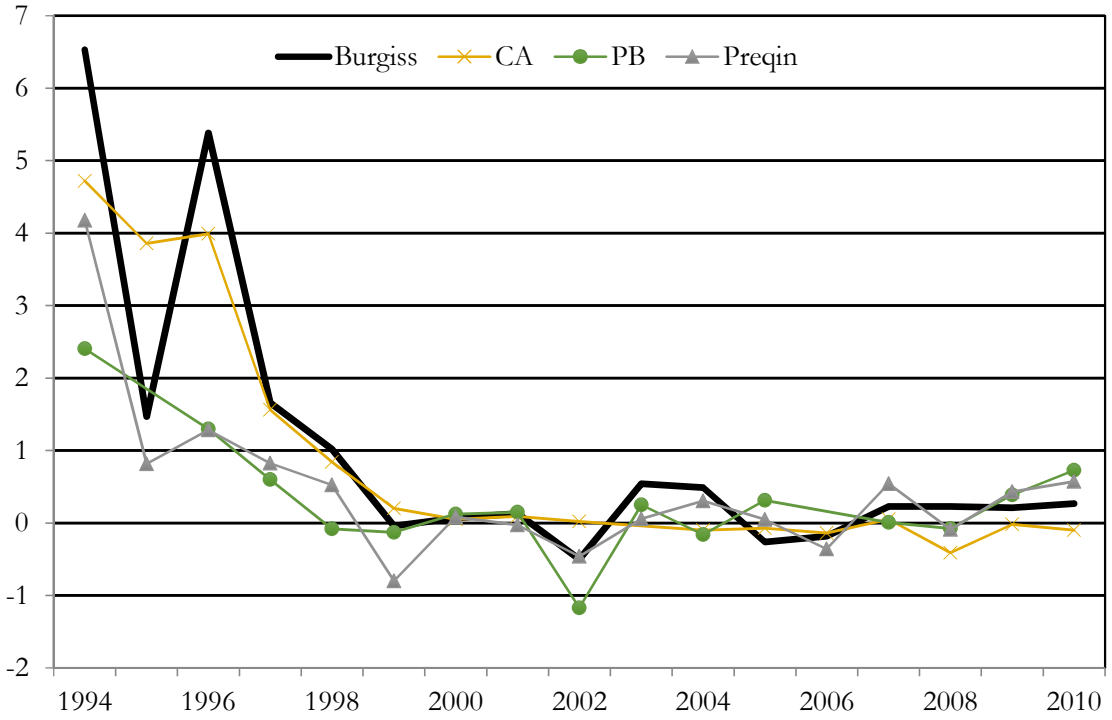


Figure 6: Differences in Vintage Year Multiples Comparing Venture Capital Funds in North America to those outside North America , 1994-2010

This figure shows the difference in capital weighted multiples (North America minus outside North America) for venture capital funds. A series of differences is plotted for each of the four data providers (Burgiss, Cambridge Associates, PitchBook and Preqin) over 1984 to 2010.



Appendix: Sourcing, Sample Construction and Fund Classification

This Appendix provides information on the four sources of data used in the paper. We thank all four providers for their cooperation in the study and comments on the paper. While our focus is on buyout and venture capital funds, each of the providers also has information on an array of other funds, including real estate, natural resources, etc. The first portion of the appendix provides background on sourcing since each data provider has its own business strategy and means of obtaining information. These factors help in understanding possible issues related to data quality and sample composition. The second portion of the appendix provides an overview of classification schemes. Each provider has its own classification scheme based on a fund's strategy (e.g. buyout, venture), geography or other factors. Unfortunately for researchers, different classification schemes and criteria create additional challenges when comparing data from different sources.

Burgiss Sourcing

Burgiss provides investment decision support tools for the private capital market. Through these tools and with authorization from its clients, Burgiss accumulates various data on private capital markets, including the "Burgiss Manager Universe – a set of detailed, verified and cross-checked set of histories for nearly 6,000 funds with a total capitalization of almost $4 trillion (as of June 2014)." According to Burgiss, this dataset "is representative of actual investor experience because it is sourced exclusively from limited partners and includes their complete transactional and valuation history between themselves and their primary fund investments." Among other details, the data include actual dates for the LPs' contributions to, and distributions from, the funds as well as remaining values for each fund. LP data are aggregated to the fund level based on the LP's share (capital committed) in a fund. The data are sourced from the portfolio monitoring systems used by the LPs for performance measurement and reporting, and are cross-checked by investors in the same fund. The LP's data are kept up to date and used in quarterly reporting by most investors. As part of their data confidentiality policy, Burgiss does not disclose the identities of the underlying investors nor funds. Burgiss assigns vintages based on the year of the initial cash flow date of the fund.

The data is sourced from nearly 300 institutional investors that represent approximately $0.75 trillion in committed capital as of late 2014. The LPs comprise a wide array of institutions.

Nearly one-third is represented by small institutional investors, defined by Burgiss as having private capital commitments of less than $100 million. Of the remaining two-thirds, about 60% are pension funds (a mix of public and corporate), and over 20% are endowments or foundations.

We thank Burgiss for supplying us with access to fund-level data as of Q2 2014.

Cambridge Associates Sourcing

Cambridge Associates (CA) provides an array of investment management services to its clients. These include advisory services, outsourcing and discretionary management, and investment office tools and services. The CA Private Investments Database contains fund- level cash flows and remaining values to capture "the historical performance records of over 1,700 fund managers, their 5,800 funds (as of Q2 2014), and gross performance information of over 67,000 investments underlying these funds." [1]

As described by CA, the dataset "utilizes the quarterly unaudited and annual audited fund financial statements produced by the fund managers (GPs) for their Limited Partners (LPs). These documents are provided to Cambridge Associates by the fund managers themselves. … We leverage a number of touch points with LPs and managers to encourage managers to submit their performance data to our database: (1) CA's hundreds of clients for whom we provide private investment performance reporting, (2) our 40-person private investment research organization's regular meetings with managers, (3) manager outreach for special projects designed to enhance existing benchmarks or launch new ones, (4) relationships with over ten globally-diverse fund manager associations, (5) CA's partnership with Thomson Reuters, and finally, (6) our exclusive relationship with the Institutional Limited Partners Association (ILPA)."

For the funds where CA has historical performance, about two thirds come from LPs who are private investment performance reporting clients. The nature of CA's relationship with these clients varies depending on the services provided. For about half of the funds attributable to performance reporting clients (thus one-third of the overall sample), conversation with CA reveals that it plays an advisory role and may have some influence on fund manager selection. For the

[1] Language in quotes comes from documents that Cambridge Associates provides to clients and made available to us. Other information in this section was reviewed by Cambridge Associate and results from our conversations with them.

other two thirds of the funds in the sample (sourced from non-advisory performance reporting clients and other sources described above), CA does not influence fund selection. Of the approximately 400 LPs who are CA's reporting clients, 29% are private/family clients (approximately $100 million minimum account level), 26% foundations, 21% endowments, 12% other not for profits, and the remaining 12% includes pensions, sovereign wealth funds and others. Based on dollars committed, pensions and sovereign wealth funds represent about 58%, not for profits (inclusive of endowments and foundations) 31%, and private/family clients 11%. Just over 80% of these clients are headquartered in North America.

CA's sample includes only closed-end, co-mingled "institutional quality" funds (funds that accept third party money and are structured to align LP and GP interests) and "require the complete set of financial statements from the fund's inception to the most current reporting date". CA outlines a number of processes to assure data quality. These include independently calculating and verifying returns from the supplied quarterly cash flows and net asset values, direct contact with fund managers to reconcile any discrepancies, and ongoing meetings and calls with fund managers.

"When fund managers stop reporting before their fund's return history is complete, an element of 'survivorship bias' may be introduced to a performance database, which could skew the reported returns upwards if the funds dropping out had poorer returns than those funds that remained. Survivorship bias can affect all investment manager databases, including those for public stock managers and hedge funds. Compared to public stocks and hedge funds, however, the illiquid nature of private investments can actually help limit this survivorship effect. Whereas an underperforming stock manager may simply close up shop or drop out of databases as clients liquidate their positions and fire the manager, private investment partnerships owning illiquid assets continue to exist and require reporting to the limited partners, even if the original manager ceases to exist." When an active fund stops providing financial statements before the fund is liquidated, CA's approach is to "reach out to the manager and make several attempts to encourage them to continue submitting their data. We may, during this communication period, roll forward the fund's last reported quarter's net asset value (NAV) for several quarters. When we are convinced that the manager will not resume reporting to us, the fund's entire performance history is removed from the database. Over the last six years the number of funds that stopped reporting to Cambridge Associates before liquidation represented between 0.3% to 0.8% (per year) of the total number of funds in the Cambridge Associates database during the respective year, and 0.2% to

0.5% (per year) as a percentage of total NAV in the database during that respective year. During that same period the overall number of funds in our database increased by between 7-12% per year. The performance of the funds that stopped reporting has been spread almost evenly across all quartiles and has not been concentrated consistently in the poorer performing quartiles."

We thank CA for supplying us with summary level information on fund-level data as of Q2 2014. CA provided one summary for venture funds and one for the combined set of funds classified as buyout and as growth equity by CA. In the paper we refer to this latter group as buyout. In its reports to clients, CA's current standard is to define vintage year based on the legal inception date of the fund. Their online platform allows users to pick alternate definitions. In an effort to make data more comparable across sources, CA agreed to our request and supplied data with vintage assignments based on the year of the "first transaction/first cash flow".

PitchBook Sourcing

PitchBook provides a wide array of deal-level information on private equity transactions. This coverage includes periodic summaries of deal multiples, updates on fund raising, information on exits and financing rounds, and communications on recent developments in the private equity industry. PitchBook also provides specific deal level information for analysis of multiples or other issues (e.g. pre- and post-money valuations and financial information for a company). In addition, PitchBook provides detailed fund-level performance information with benchmarking capabilities through its website.

An advantage of PitchBook is that it provides the name of each private equity fund and shows reported performance for each reporting LP. Thus, one can obtain information specific to an individual LP's investment performance in a given fund (e.g. IRRs, multiples). This is possible given a strategy of obtaining information from public sources and direct requests for voluntary submission. PitchBook states "The methods of obtaining fund performance information relies (sic) heavily on FOIA requests to a variety of public pensions, with additional data being obtained from online sources, listed private equity sources, filings and those GPs who choose to report their performance data. It is requested Net of Fees in order to have all performance metrics show the LP's benefit from participation in the fund following all fees and carry required for involvement in

the investments made by the GP."[2] Outside the United States, PitchBook uses FOIA-like requests that conform to a country's legal and regulatory situation. "The performance data included in the PitchBook platform includes IRR and multiples (TVPI, RVPI, and DPI) as available from our research and collection methods. We use IRR as reported by LPs, Net of Fees, and by GPs who choose to submit their fund performance data to us Net of Fees. We don't calculate any IRRs since the resulting IRR is very sensitive to the timing of cash flows, and we get data mainly as an aggregate of all contributions and distributions that have occurred within a given quarter. The Since Inception multiples are calculated by us based on the reported Net cash flows, or as directly reported by LPs, if they have been provided." PitchBook assigns vintage based on a tiered set of references. The first tier is the GP's designation of vintage year. If that is not available to PitchBook, the next tier is the date of the first cash flow (if PitchBook has that information since inception), followed by the date of the first investment (if available, e.g. through news or filings) and finally, if none of the other tiers are available, the date of the fund's final close.

As of late 2014 PitchBook "have over 81,000 commitments connecting limited partners to specific funds, and well over 60,000 of those are associated with returns information in our data base. Most public pensions make their data available quarterly and we obtain it through FOIA or FOIA-type requests, or from their online access portal." Based on recent quarterly information in December 2014, PitchBook indicates that across the limited partners routinely reporting returns by these two methods (over 300 in total), it relies on FOIA or FOIA-like requests to gather data for 46% (23% US/ Canada and 23% International), nearly all of which are public pensions, and online sources to provide data for the other 54% (24% US/ Canada and 30% International). "The "Other" LP types are more likely to only have reports available annually or semi-annually, although occasionally quarterly."

The nature and frequency of data varies by supplier. Some sources provide only summary IRRs while others provide cash flows and net asset values. FOIA data are typically quarterly, while "periodic" fund performance data from other sources is usually available less frequently (e.g., annual or semiannual). Table A-1 displays the nature of PitchBook data depending on its source. As the table shows, the vast majority of suppliers of quarterly (i.e. not "periodic") cash

[2] Items in quotes come from documentation provided to the authors by PitchBook.

flow data are public pension funds (about 69%). Other sources contribute significantly on "periodic" (.e.g. semiannual and annual) intervals. PitchBook subscribers have access to fund-level information as supplied by each reporting LP. PitchBook shared that their data have an average of approximately six LPs reporting on each fund with reported performance information.

Table A-1: PitchBook Sourcing for U.S. and Canadian Suppliers of Data

This table presents the percent of the total number of entities supplying data. "Periodic" means that data are available from the source less frequently than quarterly (e.g. annual or semiannual). Data come from PitchBook as of late 2014.

U.S. & Canada LPs	Provides IRR	Provides Good Cash Flow	Provides Both
Public Pension Fund	63%	69%	73%
Endowment	6%	10%	7%
GP	25%	13%	15%
Fund of Funds	4%	3%	2%
Other	2%	4%	2%
Total Quarterly	**100%**	**100%**	**100%**
Insurance Company		81%	
Foundation		7%	
Other		12%	
Total Peridodic		**100%**	

Each LP provides data on a number of funds. As of late 2014, PitchBook indicates that the average number of funds reported by the public pension funds is 70.6. The corresponding figure is 40.8 for endowments, 99.9 for funds of funds, 16 for insurance companies and 14.9 for foundations. For a grouping of "GP and other non LP reporters" the average is 22.5.Across all LPs the average number of funds reported is 27.5. Since public pension funds tend to have more private equity funds than do other suppliers, the figures in the table likely understate the importance of public pension funds on the PitchBook fund-level data. For instance, we replicated the Table, but used fund counts, which we approximated by multiplying the actual number of suppliers in a category by the average number of funds for a supplier in that category (e.g. 70.6 private equity funds for each public pension fund). Fund counts from public pensions represent 81% of the quarterly cash flow information and 78% of the quarterly IRRs. We note that the same

private equity fund will be held by a number of separate LPs; moreover, our calculations are only approximations based on average figures.

Sourcing in the UK relies even more heavily on public pension funds for quarterly information (over 90% of quarterly suppliers). Data suppliers outside North America and the UK are more limited and much more varied, with a higher representation of funds of funds. We note, however, that the geography of an LP will often not be the same as that of private equity funds in which it invests. As a consequence, one should be careful in drawing conclusions based solely on the geography of the LP. For instance, Table A-2 shows the regional breakdown of fund performance reported quarterly by limited partners by geographic location. Of those limited partner reports including IRRs, good cash flow data, or both, for European based funds, 65% come from U.S. / Canada limited partners and 35% are from limited partners in the European Union, predominantly in the UK.

Table A-2: PitchBook Sourcing for U.S. and European Funds by Geography

This table presents the percent of the total number of entities supplying data. Data come from PitchBook as of late 2014.

	European Union Funds	U.S./Canada Funds
European Union LPs	35%	4%
U.S./Canada LPs	65%	96%
Grand Total	100%	100%

We thank PitchBook for supplying us with detailed files at the LP level for data as of Q2 2014. From these files we were able to create fund-level summaries. In doing so, we aggregate from LP-level to fund-level data. We report two groups of funds: venture and buyout where the latter category includes funds classified as growth equity by PitchBook.

We used two alternative schemes to create fund level performance measures. In the first, we simply require that at least one LP report an IRR for a fund. Among the values reported by LPs we use the median value (e.g. median IRR or multiple). As explained earlier, given PitchBook's sourcing strategy, LPs report on different time schedules (quarterly or semiannually) and there is no guarantee that the LP has long history of reporting. Our second approach attempts to control for

the quality of the source of information available to PitchBook on a fund. In our second approach, we required an LP's data to have a reported IRR and that the LP have at least some reporting on a quarterly basis for it to qualify for our aggregation to fund-level data. We then base the fund-level figures on the LP whose data deviate the least from the median LP figures. We measure deviation by summing absolute deviations from the median figures for IRR, TVPI, Contributions and Distributions where the latter two are scaled by committed capital. Each measure is rescaled to range from 0 to 1. These procedures are designed to weed out funds for which data are not frequently reported and to use information from LPs who report more regularly. Ideally one would have data (e.g. full performance histories) to look at patterns of reporting over the life of the fund to form opinions on an LP's data quality. Later in this appendix we report on the effects of these two approaches on sample sizes.

Preqin Sourcing

Preqin (originally Private Equity Intelligence) obtains its data from various sources including public filings and reports, general partners (GPs) and by requesting information from public institutional investors. Access to its data is available to us by subscription and we thank Preqin for fielding technical questions. We compiled data in early 2015 using the "as of" Q2 2014 feature in Preqin to measure performance at the same time as shown in the other data sets. We required that the fund have a reported IRR. Preqin assigns vintage years based on the first capital call to LPs.

Preqin provides a wide array of information on private equity including updates on fund raising and communications on recent developments in the private equity industry. Preqin also provides detailed fund-level performance information with benchmarking capabilities through its website. Preqin provides the name of each private equity fund and shows reported performance. Thus one can obtain information on investment performance in a given fund (e.g. IRRs, multiples). This is possible given a strategy of obtaining information from public sources and direct requests for voluntary submission.

As described on Preqin's website[3], "our products and services are utilized by more than 24,000 professionals located in over 94 countries for a range of activities including investor relations, fundraising and marketing, and market research." "Preqin provides data and information on the private equity, real estate, hedge fund, infrastructure and private debt asset classes, encompassing the following areas: funds and fundraising, performance, fund managers, institutional investors, deals and fund terms."

Preqin collects fund performance data from a variety of sources. Since its inception, Preqin has collected performance figures from LP's via Freedom of Information Act (FOIA) requests. They also obtain information from GPs (fund managers) who voluntarily share information on their partnerships. Even when data comes from a GP, Preqin's aim is to show the net position for LPs, after management fees and carry. As of fall 2015, Preqin reports that 1,120 GPs are actively contributing data on their funds. Other sources of data include listed firm financial reports, public filings and annual reports. Preqin crosschecks fund data across sources and standardizes information to be consistent with its methodologies.

Preqin was kind enough to share information on the composition of its sources. Across all funds followed by Preqin as of fall 2015, the average number of sources for a fund was 10.8; the range was 72 down to one. As shown in Table A-3, globally LPs comprise 38% of Preqin's sources, GPs comprise 59% and another 3% come from public filings. For funds outside the U. S., about three quarters of the sourcing information comes from GPs. In the U.S. there is a closer balance between LPs and GPs with over half of the sources being LPs.

[3] Quoted language for Preqin comes from its website as of early 2015.

Table A-3: Breakdown of Preqin Data Sources by Fund (Provided by Preqin, October 2015)

	Public Institutional Investors	**Direct from GPs**	**Public Filings**
Overall	38%	59%	3%
U.S. Buyout	53%	43%	5%
Non U.S. Buyout	22%	76%	2%
U.S. Venture	53%	41%	6%
Non-U.S. Venture	24%	72%	4%

"Performance" Sample Sizes

For all sources, we focus on vintage years ending in 2010 using data and performance measures as of Q2 2014. This excludes funds that started in 2011 or later since they have had limited time to invest or for any meaningful measurement of performance. As a result, our samples will be smaller than the full set of funds followed by a source at the time. For instance, in the Burgiss data, our global sample contains 2596 funds (buyout plus venture) over vintage years 1984-2010. If we had included funds with vintages 2011-2014 the total number of funds (buyout plus venture) would increase to 3158, 22% higher. Data sources also grow over time as new vintage years and funds are added. For instance, if we had sampled Burgiss as of Q1 2015, its global sample size (buyout plus venture) would be 3410, including all vintages starting with 1984.

Given the limited life of private equity funds, the vast majority of the investments have been realized for the early vintage funds, whereas the opposite is true for the later vintages. For both Burgiss and CA samples we have summary data on the percent of value realized by vintage year. Specifically, both Burgiss and CA supplied the percent of value realized by the median fund, where percent realized is the cash returned to investors divided by the sum of that cash and the remaining NAV as estimated by the PE fund manager. The two sources provide very similar figures. The figures for North America are illustrative. In each vintage through the late 1990s, the percent realized is 100% (or very close) for buyout. For venture, the percent starts to drop below 100% after 1997 and is 80 to 85% by 2000. By vintage 2005 the figure is around two thirds for buyout but below half for venture. By the 2008 vintage the figure is around a third for buyout and

a fourth for venture. The final vintage of 2010 has figures in the low double digits for both buyout and venture[4].

PitchBook and Preqin provide a wide array of information on private equity and thus often report sample sizes for funds, only some of which have reported performance data. Given our focus on measuring fund performance, in this paper we select samples that contain only funds with reported absolute performance information. PitchBook was kind enough to share LP level data which allowed us to analyze the potential impact of screens for financial performance data. Table A-4 shows sample sizes of funds across vintage years 1984-2010 as provided to us by PitchBook for performance as of Q2 2014.

Table A-4: PitchBook Sample Sizes based on Screens for Performance Information

Effects of Screens on PitchBook Sample Size
Data as of Q2 2014 for Vintage Years 1984-2010

	North America		Rest of World		Global
	Buyout	Venture	Buyout	Venture	**Total**
Number of Funds					
No Screen for reported IRR	1121	945	428	143	2637
Require a reported IRR	899	780	313	81	2073
Add: at least one LP with some quarterly reporting	817	685	253	62	1817
Percentage satisfying screens					
No Screen for reported IRR	100%	100%	100%	100%	100%
Require a reported IRR	80%	83%	73%	57%	79%
Add: at least one LP with some quarterly reporting	73%	72%	59%	43%	69%

Prior to any screens for performance information, the table reports 2637 funds in PitchBook's global sample of buyout (inclusive of growth equity) and venture funds. North American buyout funds are the largest single grouping (1121 funds), followed by North American venture (945). Coverage outside North America is much smaller: 428 buyout funds and 143 venture funds. The rows of the table show how sample size changes when we apply screens. The last block of rows in the table converts the figures to percentages. For instance, a screen for a

[4] Harris, Jenkinson and Kaplan (2015) report the Burgiss figures for percent realized for each of the 1984-2010 vintage years.

reported IRR reduces the global sample from 2637 to 2073, a change to 79% of its unscreened level. This overall reduction of 21%, reflects much higher percentage drops for funds outside North America.

As noted earlier, some PitchBook sources (primarily insurance companies) provide information on only an annual or semiannual basis. Ideally one would have quarterly information as supplied by most LPs and funds and as reported by Burgiss and CA. We imposed a screen that at least one LP had quarterly reporting on the fund. This screen did not require a full quarterly history, but rather simply required a record of quarterly reporting by an LP. If no LP had ever reported quarterly on a fund, then that fund would fail the screen. The screen for some quarterly reporting takes the global sample to 1817, 69% of the unscreened total. Overall Table A-4 shows that there is a sample size drop of about 20% if we require an IRR and another 10% if we add some quarterly reporting requirement. The impact of the screens is more dramatic for funds outside North America. In the body of the paper we use the PitchBook sample of 1817 funds and the performance measures gleaned from that sample as discussed earlier. While the additional screen imposed by this approach slightly reduces sample size, the approach puts more weight on using higher quality data for performance estimates[5].

For both PitchBook and Preqin, then, we use samples as long as there is a reported IRR. Our Preqin data are not at the LP level and do not allow us to screen for quarterly reporting as we did with PitchBook. Unlike Burgiss and CA samples, neither the PitchBook nor Preqin samples that we report require a full quarterly performance history of cash flows. Such a requirement would reduce the samples considerably. For instance, using the PitchBook data at the LP level, if we required an LP to have an uninterrupted quarterly performance history to qualify for the sample, PitchBook's global sample size would have been slightly less than half of the 1817 sample size that we report and about a third of the 2637 sample size prior to screens for any performance information. Our screens on the LP data supplied to us by PitchBook may underestimate fund

[5] Comparison of the two approaches to estimating fund level metrics from PitchBook data reveals similar patterns in some respects. As an example, for North American buyout funds, both approaches lead to the same average across vintage years of individual vintage year estimates of the mean multiple, and the series of vintage year averages have a correlation of .84. Looking at corresponding figures for North American venture funds, the approaches lead to a difference of .26 in mean multiple and have a correlation of .82. That said, the PitchBook data suggest a number of additional challenges for researchers when one does not have full performance histories for a fund. The two approaches show more pronounced differences in performance metrics when one weights by capital or uses IRRs.

sample sizes with full performance histories since PitchBook can sometimes pull together a full performance history by combining information from multiple LPs. While we cannot estimate the magnitude of this underestimation precisely, the order of magnitude of this effect would not change the general conclusion of a dramatic reduction in sample size if full performance histories are required[6].

Preqin offers a "private equity cash flow" download (from the Preqin website) containing the "full cash flow information" on funds. Preqin was kind enough to share with us information on this set of funds for which Preqin has cash flow information. As of July 2015, they report 859 buyout funds (602 in the U.S. and 257 elsewhere) and 680 venture funds (611 in the U.S. and 79 in the rest of the world) To put these figures in perspective, Burgiss data as of July 2015 included 1727 buyout funds and 1683 venture funds (vintages starting with 1984) with full performance history. Compared to these Burgiss figures, the Preqin "full cash flow information" samples would be 50% as large for buyout and 40% for venture. While we do not have CA data after the 2010 vintage, we suspect the percentages would be even smaller if Preqin were compared to CA given that CA had the largest global sample of funds as shown in the body of the paper.

Classification Schemes

Each data source has a different scheme for fund classification. We focus on two broad groupings: buyout and venture. As described in Table A-5, these broad categories combine subcategories (e.g. different stages of venture, different size categories for buyout). We rely on provider designations. Categorizing many funds is straightforward, but some present special challenges. For instance, in recent years some funds have branded themselves as "growth equity" reflecting a strategy of providing capital for business expansion but not necessarily obtaining control. Such funds have attributes of both traditional buyout and venture capital. CA, PitchBook and Preqin have categories corresponding to growth equity while Burgiss does not. In the PitchBook and Preqin data passing our screen for sample inclusion, the "growth" categories represent well less than 10 % of the total number of funds classified as buyout. CA declined to

[6] PitchBook kindly repeated the screens shown in Table A-4 on their own platform which aggregated across all sources of fund information. The results show small increases in sample sizes –i.e., less than a one percent increase for the sample with reported IRRs and about a 7% increase for the sample of funds with quarterly reporting.

provide a sample for growth equity alone since vintage year samples are often very small for that category. CA was, however, kind enough to provide a set that combined their buyout and growth equity groupings. They noted that such a combination was a presentation they felt appropriate, as opposed to combining growth equity with venture. Our presentation includes growth equity as part of buyout for CA, PitchBook and Preqin. The classification scheme in Table A-5 is as of late 2014 and providers may add or change classifications over time. For instance, CA added an infrastructure category for benchmarking in June 2015.

Providers also have different schemes to organize funds by geographic location or a country's stage of development (e.g. developed versus emerging economy). We segment funds into two geographic groups: North America and the "rest of the world". North America has historically been the home of substantial private equity investment and the subject of much research. Our "rest of the world" category is a catchall that allows us initial insights into the scale of activity outside North America and the size of samples available.

Table A-5: Fund Categories Used by Different Commercial Sources (as of 2014)

This organization was imposed by the authors. Each source has its own presentation. Criteria for categories and subcategories vary both within a source and across sources. For instance, some subcategories may be based on industry focus and other based on the maturity of the company in which investments are made.

Fund Category*	Burgiss	Cambridge Associates	PitchBook	Preqin
Buyout*	Buyout	Buyout	Buyout	Buyout
Growth Equity**		Growth Equity	PE Growth-Expansion (n=88)	Growth (n=81)
Venture Capital	Balanced	Multi-Stage	Venture (general)	Venture (general)
	Early Stage	Early Stage	Early Stage	Early Stage (with subcats)
	Late Stage	Late/Expansion Stage	Later Stage	Expansion / Late Stage
				Venture Debt (n=22)
Real Assets	Timber	Timber	Timber	Timber
	Energy	Energy	Energy	Natural Resources
		(with subcategories)	(with subcategories)	incl. energy & metals
	Infrastructure		Infrastructure	Infrastructure
			includes project finance	
	Other		Mining	
Real Estate	Real Estate	Real Estate	Real Estate	Real Estate
	(with subcategories)	(with subcategories)		
Fund of Funds	Primary	Primary	Fund of Funds	Fund of Funds
	(with subcategories)	(with subcategories)		(with subcategories)
	Secondary	Secondary Funds	Secondaries	Secondaries
				(with subcategories)
			Co-Investment	Co-investment
				(with subcategories)
Other Categories	Mezzanine	Mezzanine	Mezzanine	Mezzanine
	Distressed Securities	Distressed	Restructuring-Distressed Debt	Distressed Debt
	Special Situations			Special Situations
				Turnaround
			Diversified Private Equity	
			Bridge Financing	
			Debt	
			Hedge Fund	
			Other	
			Sovereign Wealth Fund	
			Angel	
			Crowdsource	

* In many instances a researcher can add fund size, industry focus or geography (e.g. US, Europe) to sort in addition to the category heading.

** Not all sources have a separate growth equity category. CA was willing to share data that combined their buyout and growth equity samples. We note the growth samples sizes when we have them, showing the relatively small number of growth equity funds in the vintage years *1984-2010.*