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Permanent private equity: Market performance and transactions

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Abstract

Using market data for a comprehensive sample of publicly listed permanent capital private equity funds, I confirm existing results in the private equity literature and establish new empirical facts for private equity investments. Over 2000–2019, only mezzanine funds outperformed public markets, whereas buyout, growth, and funds of funds underperformed somewhat, and venture capital funds underperformed significantly. Buyout funds exhibit performance persistence. Larger funds with higher asset turnover have higher performance, and funds with higher expenses have lower performance. Finally, contemporaneous and out-of-sample performance of buyout and mezzanine funds is associated with deal and exit transaction characteristics.

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1 | INTRODUCTION

Although typical private equity (PE) funds have a fixed life (usually 10 years), after which they are liquidated and capital is returned to investors, some PE fund managers are turning to a long-term or even permanent funding model. For example, in 2020, it was reported that one of the largest PE firms (Blackstone) raised $104 billion in permanent capital to invest in private assets including PE, and that permanent capital constitutes one-fifth of

Blackstone's total funds under management, a 43% increase year over year. Apollo, another major PE firm, announced that half of its $331 billion in assets were permanent capital (Vandevelde, 2020).

Permanent capital fundraising by traditional PE[1] fund managers (such as Blackstone) is a relatively recent development, so little historical data are available on which an analysis of these funds can be based. In contrast, permanent capital funds in the form of publicly listed closed-end funds of PE investments have been in existence for decades. Therefore, I examine a comprehensive sample of these listed private equity (LPE) vehicles. This setting[2] allows me to shed new light on topics that are actively debated in the PE literature, such as performance, performance persistence, economies of scale, transaction-based proxies for performance, and syndication. Furthermore, I make several significant findings that are novel in their own right, including the association between performance and a range of financial characteristics that are not typically observable for traditional funds, such as asset–turnover ratio, expense ratio, debt ratio, and transaction volume. Finally, I leverage my unique data set to examine the predictability of fund performance using contemporaneous and lagged transaction data.

LPE has several attractive features for PE researchers. First, as LPEs are publicly listed entities traded on international stock markets, financial data are readily available. The stock prices and financial history of the LPEs that I study are accessible via the standard databases used in financial research. Second, LPE benefits from the assumption that markets are efficient. PE assets are illiquid and difficult to value; therefore, estimates of the net asset values (NAVs) provided by PE fund managers can be subjective, and there is evidence that some traditional PE firms may manipulate their NAVs, especially when trying to raise new funds (Brown et al., 2016). LPE share prices, in contrast, are an unbiased reflection of the market's best estimates of the true value of the LPEs' assets at any given time. Third, LPE is well suited to studies of performance and performance persistence, as the complete unbroken performance history can be observed for each LPE. Studies of performance persistence using 10-year PE funds depend on having performance data for the entire sequence of funds raised by a GP. But LPs may choose not to invest in every fund raised by a GP, or GPs may choose not to disclose the performance of every fund they raise. Therefore, the performance data they provide may have gaps, which could lead to biased estimates of persistence. This discontinuity issue potentially affects all data sets that rely on investment data sourced from LPs and GPs, including Burgiss, Preqin, and private data sets provided directly to researchers by LPs.

My first main finding is that LPE performance varies considerably across investment styles and time. An annually rebalanced, value-weighted portfolio of mezzanine LPEs has the best raw performance, returning 510% over the full sample period (2000–2019), 189 percentage points more than the 321% returned by the Russell 2000 index. Mezzanine LPEs also beat the S&P 500 by 295 points, and the MSCI Europe SMID by 242 points. All other LPE styles underperform the three market indices: Buyout and growth LPEs each underperform the S&P 500 by about 40 points, funds of funds (FoFs) underperform by 95 points, and VC LPEs underperform by 308 points.

Jegadeesh et al. (2015) estimate the benchmark-adjusted returns for a sample of buyout, VC, and FoF LPEs, and find that these LPEs earn benchmark-adjusted returns that are not significantly different from zero and have betas close to 1. My findings are in line with theirs for buyout and FoF LPEs, but for venture capital (VC), I find negative and significant benchmark-adjusted returns. Hochberg et al. (2014) argue that skill is relatively rare among 10-year VC fund managers as the majority of these fund managers fail to raise a follow-on fund, which the authors attribute to investors discovering that the manager has no skill. Thus, my finding of significant underperformance by VC LPEs is consistent with Hochberg et al. (2014). Harford and Kolasinski (2014) test the hypothesis that the reputedly high returns to leveraged buyout (LBO) sponsors are a result of wealth transfers from debt holders who finance PE deals, and they conclude that this is not generally the case. My findings of outperformance by mezzanine LPEs (which

[1]I use the terms "traditional fund" and "10-year fund" interchangeably to refer to fixed-life private equity partnership funds where the fund managers are known as general partners (GPs) and the fund investors are known as limited partners (LPs).

[2]My article proceeds under the assumption that inferences about LPE performance can yield useful insights about the private equity asset class in general, and about permanent private capital funds in particular. The advantages and disadvantages of the data and approach are discussed in detail in the next section.

provide debt for PE deals) seem to be consistent with Harford and Kolasinski's (2014) conclusions. Looking at buyout funds, Phalippou (2020) argues that measures of performance (especially fund internal rates of return [IRRs]) prominently reported by traditional PE buyout fund managers may give the impression that net returns to PE are higher than they actually are. Instead, he argues that other measures of PE performance (such as net fund multiple and public market equivalent) show that actual net returns to PE are closer to those of relevant public indices. My results are consistent with Phalippou (2020) in that the buyout LPEs in my sample do not significantly outperform the European small-midcap index (MSCI Europe SMID), which seems most relevant for these LPEs.

Next, I show that buyout LPE performance is persistent, echoing the results of several studies of 10-year buyout funds.[3] Sorting LPEs by benchmark-adjusted return into portfolios using a 12-month formation period and 12-month holding period, the winning portfolio of buyout LPEs achieves benchmark-adjusted returns that are higher than the losing portfolio by 0.49% per month (about 6% per year). Buyout fund persistence was strongest before 2010 and has declined in recent years. These findings are in line with prior results for traditional funds, with the advantage that my LPE data set avoids the potential discontinuity issues discussed earlier.

Diseconomies of scale are a feature of open-end equity mutual funds (e.g., Zhu, 2018), but little evidence of diseconomies of scale for PE funds has been found (Harris, Jenkinson, Kaplan, 2014, 2014; Kaplan & Schoar, 2005; Lopez-de-Silanes et al., 2015). For my LPE sample, I find positive economies of scale for buyout LPEs in that larger LPEs earn higher benchmark-adjusted returns. For the other LPE styles, economies of scale are positive when controls are excluded but not significantly different from zero when controls are included. I also find that other LPE financial characteristics are significantly associated with LPE performance. LPEs with higher asset–turnover ratios have consistently higher performance, echoing the study of open-end equity funds by P´astor et al. (2017) who find that funds that trade more generate higher returns. On the other hand, higher expense ratios are consistently associated with lower LPE performance. Following Berk and van Binsbergen (2015), I examine the after-fee value added generated by LPEs, and apart from VC LPEs, which have significantly negative value added, I find that LPEs generate net value added that is not significantly different from zero, suggesting that most LPE managers capture in fees most of the rents they generate. Only mezzanine and FoF LPEs have (weak) positive net value added.

Given the evidence that I find of outperformance by mezzanine LPEs and performance persistence by buyout LPEs, I next examine the characteristics of deals and exits[4] sponsored by these LPEs. I first consider whether the types of targets and transaction styles selected by LPEs are different from those of traditional funds. Using a probit analysis of a large sample of transactions by LPEs and traditional funds, I find that LPEs are significantly more likely than traditional funds to invest in secondary buyouts (SBOs) and make cross-border[5] deals. Using imputed transaction values, I find that LPE deal values are slightly lower than those of traditional funds, but I also find that LPE exit values are not significantly different from those of traditional funds. Geographically, mezzanine LPEs are significantly more likely to invest in targets located in the United States, and buyout LPEs are significantly less likely to do so. This geographic split reflects that there are few US-domiciled buyout LPEs due to US regulatory restrictions and that most mezzanine LPEs in my sample are US-domiciled business development companies (BDCs). Buyout LPEs are more likely to invest in solo deals but mezzanine LPEs are more likely to invest in syndicate deals.

[3]Kaplan and Schoar (2005) find evidence of significant heterogeneity in performance across PE funds and find that persistence was strong for VC and buyout funds raised in the 1980s and 1990s. Robinson and Sensoy (2011) obtain similar results for a sample of buyout funds, again raised largely in the 1980s and 1990s. Chung (2012) studies buyout and VC funds raised through 2000 and finds less persistence than the other papers. Harris, Jenkinson, et al. (2014) find that PE persistence for buyout and VC funds was strong pre-2000, unchanged for VC funds post-2000, and weaker for buyout funds post-2000 especially at the upper end of the performance spectrum. Braun et al. (2017) also show that buyout PE firm deal-level performance is persistent but that this persistence has declined post-2000. They argue that this decline is due to increased competition for deals among PE firms. Ewens and Rhodes-Kropf (2015) find evidence of persistence at the VC firm partner level. Korteweg and Sorensen (2017) find a large amount of long-term PE persistence, which they believe reflects the average outperformance of more skilled PE firms, but they conclude it is difficult for investors to separate skilled PE firms from PE firms that are lucky.

[4]I refer to target acquisitions as deals, and target disposals as exits.

[5]I use the term "cross-border deal" to refer to a deal where at least one of the acquiring PE sponsors is domiciled in a different country from the target company. The term "cross-border exit" refers to an exit where the acquiror is domiciled in a different country from the target company.

Buyout LPEs are more likely to make divisional buyouts and mezzanine LPEs are less likely to do so. Mezzanine LPEs are also less likely than other PE/VC funds to invest in public-to-private deals.

Exit transaction characteristics have been used in the PE literature as proxies for traditional 10-year fund performance. Hochberg et al. (2007) measure fund performance by the proportion of investments that are exited through an initial public offering (IPO) or a trade sale to a nonfinancial company and thus imply that other types of exits, such as SBO exits to other PE firms and management buyout (MBO) exits, signal potential underperformance. This approach to measuring 10-year fund performance is also used by Cumming (2008), Phalippou and Gottschalg (2009), Cornelli et al. (2013), and Fang et al. (2013). In contrast, Jenkinson and Sousa (2015) find that the exit route that maximizes value depends on various portfolio company characteristics and argue that IPO exits are not always optimal.

I find evidence to support the hypothesis that the proportion of IPO or trade sale exits by an LPE is associated with LPE performance. LPEs involved in a higher proportion (by number) of exits via IPOs and trade sales have higher contemporaneous value added. However, I find that other exit-based measures are even more strongly linked to performance. LPEs that simply make a larger number of exits (irrespective of exit type) realize significantly higher value added but have excess returns and benchmark-adjusted returns that are not significantly different from zero. Larger LPEs have lower returns but they trade more, generating higher value added. Deal entry transactions are also strongly associated with contemporaneous LPE performance. Again, LPEs that simply make higher numbers of deals have higher value added.

Officer et al. (2010) argue that syndication may be a form of collusion used by PE firms to reduce competition for deals and drive down acquisition prices. This argument suggests that syndicate deals should have a more positive impact on LPE performance than solo deals (as syndicate deal valuations would be artificially depressed and thus have greater upside potential). I find that the association between syndication and performance is not clear-cut. For both buyout LPEs and mezzanine LPEs, the proportion of solo exits in the LPE's transaction mix is more strongly associated with value added than is the proportion of syndicate exits. The proportion of solo mezzanine deals is strongly associated with mezzanine LPE performance. However, this is not the case for buyout LPEs, where there is no significant relation between performance and the proportion of solo deals, and there is a positive and significant relation for syndicate deals by buyout LPEs.

Few prior studies have examined LPE characteristics and performance. The closest paper to ours is Jegadeesh et al. (2015). The main focus of their study is to estimate the risk and return to the 10-year funds held by FoF LPEs, but they also briefly examine buyout and VC LPEs. I reproduce their findings that buyout and FoF LPEs earn 0 benchmark-adjusted returns and have betas close to 1. They find the same result for VC LPEs, but I find negative benchmark-adjusted returns for these LPEs. I argue that my results, which are based on a longer and more recent sample period, are consistent with a view that many VCs are unskilled. Also, I go further than Jegadeesh et al. (2015) to examine a wider range of LPE styles, including mezzanine and growth, and a broader range of questions regarding LPE characteristics and performance. My study is the first to link PE fund performance directly to transaction data.

2 | DATA

2.1 | LPE funds

LPEs are closed-end funds that raise capital from widely dispersed public investors, which is then used to build a portfolio of PE investments that is actively managed by the LPE. Thus, LPEs[6] perform a similar role for PE as real

[6]Examples include Onex Corp. (a Canadian buyout LPE), Ares Capital Corp. (a mezzanine LPE based in the United States), and Pantheon International PLC (a British FoF LPE).

estate investment trusts (REITs) do for real estate, allowing investors of all sizes and investment horizons gain exposure to the underlying illiquid asset class. Each LPE typically focuses on one of the classic PE investment styles:[7] buyout (taking controlling equity positions in established firms), VC (investing in early- stage firms), mezzanine (providing debt funding to target firms, which is convertible to equity), growth (taking minority positions in growing firms where the owners do not want to relinquish control), or FoFs (investing as LPs in 10-year PE funds).

I construct a comprehensive sample of LPEs, and their characteristics and transactions, based on an exhaustive search of multiple data sources including CapitalIQ, Morningstar, Datastream, and a range of exchange-traded funds and indices that track the LPE sector.

LPX Group has maintained a series of LPE indices since 2004, and from them I obtain a list of publicly listed PE firms and funds classified by investment style. To avoid any potential selection or survivorship bias in the LPX indices, I add to this list all active and inactive publicly listed closed-end PE funds from Morningstar, and all active and inactive publicly listed BDCs from CapitalIQ. BDCs are closed-end funds that are domiciled and regulated in the United States and that invest directly in small and mid-sized businesses. Although BDCs are allowed to invest anywhere in the capital structure, most of the investment is in the form of mezzanine debt. However BDCs are much more actively involved with their target firms than are typical commercial lenders (such as banks), as BDCs are required by law to provide significant managerial assistance[8] to their portfolio companies in much the same way that traditional PE fund managers do. Also from CapitalIQ, I obtain International Securities Identification Numbers (ISINs) of active and inactive investment firms and funds classified as PE/VC, or that invest in LBOs, or that make private placements of PE in nonfinancial firms. For any potential LPE whose LPE status or investment style is unclear, I manually examine the firm descriptions and financial statements, and exclude firms and funds that do not generate most of their revenues from balance sheet investments in PE deals or funds (this criterion excludes the Big Four–listed traditional PE fund managers—Apollo, Blackstone, Carlyle, and KKR—whose revenues are derived primarily from fund management fees). Finally, from Datastream and Morningstar, I obtain monthly market returns, total assets, total liabilities, dividend yields, market values, total asset turnovers, and selling and general administration expenses. All currency values are adjusted for inflation to December 2019 US dollars. The sample period runs from January 1, 2000 to December 31, 2019.

I estimate LPE performance as the return generated by the LPE in excess of global Fama–French–Carhart (FFC) benchmarks. The approach controls for LPE exposure to international stock markets (capturing business-cycle effects), as well as for size, value, and momentum effects. The FFC benchmarks are commonly used in empirical analyses of mutual fund skill (e.g., Fama & French, 2010) as well as in the modeling of returns to traded portfolios of illiquid assets such as REITs (e.g., van Nieuwerburgh, 2019). Although the FFC benchmarks explain a large portion of the variation in LPE returns, the possibility that benchmark-adjusted returns are affected by an omitted variable cannot be ruled out. For example, benchmark-adjusted returns could include a premium that may arise because of the liquidity benefits provided by LPEs to investors. In this case, Cherkes et al. (2009) argue that generating such a premium is linked to fund manager skill, so it is reasonable to include it in my performance measure. It is also possible that nonzero benchmark-adjusted returns are a symptom of market inefficiency rather than a reflection of LPE performance. Possible causes of market inefficiency are discussed when I examine LPE performance persistence in Section 4.3.

Furthermore, Berk and van Binsbergen (2015) argue that benchmark-adjusted returns may not be an adequate measure of performance for mutual funds that invest in public equities as they do not capture potentially

[7]I consider PE to refer to investment firms or funds that derive most of their revenues from directly or indirectly providing capital as well as significant managerial assistance to a portfolio of private companies. Following this definition, I include FoFs, which invest in traditional funds managed by PE fund managers (thus indirectly providing capital and managerial assistance to private companies), and mezzanine funds, which directly provide debt capital and significant managerial assistance to their portfolio firms.

[8]Significant managerial assistance refers to any arrangement whereby a BDC provides significant guidance and counsel concerning the management, operations, or business objectives and policies of a portfolio company. Examples of such activities include arranging financing, managing relationships with financing sources, recruiting management personnel, and evaluating acquisition and divestiture opportunities (see Boehm et al., 2004).

decreasing returns to scale faced by public equity fund managers. As a robustness check, I estimate net value added (the net benchmark-adjusted return of a fund multiplied by its lagged assets under management [AUM]) based on the measure proposed by Berk and van Binsbergen (2015) to estimate the skill of the fund manager in extracting value from the capital markets in the face of potential diseconomies of scale.

Table 1 presents general summary statistics, Table 2 presents annualized statistics, and Table 3 presents statistics by geographic region. The full sample consists of 251 LPEs, most of which are buyout LPEs located in the United Kingdom and Europe. (In the United States, only large institutions and qualified investors who meet certain minimum wealth and income criteria are allowed to invest in PE funds, other than BDCs. Therefore, investors who may not meet US regulatory restrictions can invest in LPEs traded on stock exchanges outside the United States). The total AUM of buyout LPEs peaked at about $120 billion in 2007, and total AUM stood at about $100 billion in 2019. Mezzanine funds, in contrast, grew rapidly in both number and AUM over the sample period. The number of mezzanine LPEs jumped from 10 in 2000 to 53 at the end of 2019, and their total AUM grew more than tenfold from $8 billion to over $85 billion. Mezzanine LPEs have grown rapidly in the United States after restrictions on lending by commercial banks were introduced in the Dodd–Frank Act after the 2008–2009 financial crisis, creating

TABLE 1 Listed private equity (LPE) summary statistics

		Buyout	Mezzanine	VC	Growth	FoF	Obs.
LPE count	*N*	91	61	48	23	28	251
Market cap	Mean	734	873	222	494	450	251
	Median	129	318	45	56	213	251
Total assets	Mean	1180	1784	322	617	590	245
	Median	190	614	99	106	284	245
Turnover ratio	Mean	54.80	20.29	47.37	17.18	16.19	243
	Median	11.30	16.08	9.26	7.62	7.21	243
Debt ratio	Mean	24.49	43.91	27.25	17.37	13.44	239
	Median	12.50	49.29	13.63	9.85	2.89	239
Expense ratio (monthly)	Mean	3.46	0.93	2.41	0.73	0.44	241
	Median	0.46	0.90	0.50	0.14	0.12	241
Dividend yield (monthly)	Mean	0.24	0.58	0.17	0.25	0.40	250
	Median	0.00	0.66	0.00	0.00	0.17	250
Age (months)	Mean	209	143	164	227	223	251
	Median	235	143	161	239	240	251
Dead by December 2019	*N*	25	8	12	3	7	55

Note: This table presents summary statistics for the LPE sample for January 1, 2000 to December 31, 2019. The buyout subsample consists of LPEs that take controlling equity stakes in their portfolio firms. The mezzanine subsample includes firms and funds that provide mezzanine debt capital to portfolio firms. Venture capital (VC) LPEs invest in startups and pre-initial-public-offering (IPO) firms. Growth LPEs provide growth capital to mature firms by taking minority equity stakes in those firms. Funds of funds (FoF) are LPEs that hold several limited partner investments in unlisted PE funds. The mean and median market capitalization (in millions of US dollars), total assets (in millions of US dollars), asset–turnover ratio, debt ratio, monthly total return, monthly expense ratio, monthly dividend yield, and age (in months) during the last month that each firm appears in the sample are given. Variables are defined in the Appendix. The Obs. column gives the number of LPEs for which each data point is available. The number of LPEs that did not survive to the end of the sample period is given. All currency values are adjusted for inflation to 2019 US dollars.

TABLE 2 Listed private equity (LPE) total assets and market value by year

Year	Firm obs.	Buyout	Mezzanine	VC	Growth	FoF	Total
Panel A: Total assets							
2000	83	54,767	7616	8705	4371	5469	80,928
2001	91	47,969	8745	7386	4129	5828	74,058
2002	93	47,825	10,255	6713	3670	4674	73,136
2003	97	45,105	16,038	7331	4524	5173	78,171
2004	110	56,566	25,118	6342	5393	6319	99,739
2005	122	62,416	35,513	6345	7148	7532	118,953
2006	137	95,581	52,875	11,149	10,351	12,532	182,489
2007	165	121,307	61,278	10,080	13,603	18,026	224,294
2008	171	107,565	52,893	8554	8835	11,230	189,077
2009	171	107,229	48,803	8788	10,204	13,997	189,020
2010	174	102,716	47,861	8295	9429	16,249	184,550
2011	183	99,266	47,999	8307	9610	16,737	181,918
2012	187	91,500	57,357	8764	9906	16,673	184,200
2013	188	98,482	66,892	9825	11,073	17,873	204,144
2014	190	102,464	72,668	9819	11,678	17,617	214,246
2015	192	98,523	70,700	9,614	11,197	16,690	206,725
2016	191	98,762	62,464	9799	10,535	16,814	198,375
2017	190	106,187	72,188	11,558	11,511	15,120	216,564
2018	188	100,653	78,754	11,000	11,627	13,053	215,086
2019	176	95,933	85,051	11,895	13,392	15,089	221,359
Panel B: Market cap							
2000	96	40,773	4149	5608	11,358	6299	68,187
2001	104	29,562	3337	7717	7145	4168	51,929
2002	108	25,064	2741	7139	5254	3412	43,610
2003	112	31,888	3622	15,069	8356	3954	62,889
2004	123	39,286	4699	18,987	7079	5199	75,250
2005	133	44,548	5216	23,744	9950	6303	89,762
2006	151	65,721	7239	32,087	10,043	10,728	125,819
2007	180	78,660	9826	31,264	8837	14,086	142,673
2008	182	30,930	4419	9416	4077	4273	53,115
2009	181	42,686	6542	14,291	5766	6714	76,000
2010	186	45,285	6400	24,757	6900	8424	91,765
2011	194	39,327	5745	22,483	7430	8554	83,539

(Continues)

TABLE 2 (Continued)

Year	Firm obs.	Buyout	Mezzanine	VC	Growth	FoF	Total
2012	199	43,425	5896	31,397	6545	9698	96,960
2013	199	56,115	7125	40,575	11,046	12,290	127,151
2014	202	66,804	7799	44,368	11,091	12,416	142,476
2015	205	67,318	7412	38,601	13,601	12,610	139,542
2016	204	64,160	7691	37,651	9991	12,977	132,470
2017	204	74,736	8715	44,567	11,463	13,692	153,173
2018	201	65,369	9442	39,107	10,731	10,610	135,259
2019	196	63,469	10,895	44,490	9422	11,981	140,258

Note: This table presents the aggregate total assets (Panel A) and market capitalization (Panel B) at the end of each year for 2000–2019. LPEs are classified by investment type: buyout, mezzanine debt, venture capital (VC), growth capital, and funds of funds (FoF). All currency values are in millions of 2019 US dollars.

an opportunity for BDCs to fill the lending gap for PE deals. VC LPEs held about $8 billion in AUM at the beginning of the sample period but grew to only about $12 billion at the end of the sample period, even though they increased in number from 20 to 36. Growth and FoF LPEs also grew at a moderate pace, from about $5 billion each in total AUM in 2000 to $13 billion and $15 billion, respectively. A significant number of LPEs did not survive to the end of the sample period. A total of 55 LPEs exited before 2019, representing over 20% of the total number of LPEs that I examine. My FoF LPE sample is comparable with that of Jegadeesh et al. (2015) who examine 24 FoF LPEs with about $10 billion of total AUM. Jegadeesh et al. (2015) also examine 129 buyout and VC LPE funds during 1994–2008, and I examine 139 buyout and VC LPE firms and funds during 2000–2019.

Although examining performance through the lens of LPE vehicles has distinct advantages, there may be potential limitations to the approach. My objective is to better understand all types of permanent capital PE funds; however, focusing on LPE means that I do not examine permanent capital funds that are raised and managed privately. It is possible that performance and other characteristics of private permanent capital funds may be different from the public funds I examine. My LPE sample consists of about 250 funds, which is a reasonably large number when examining permanent PE funds, but it is relatively small in the PE universe that includes 10-year funds. Also, traditional 10-year PE fund managers face pressures and incentives (Arcot et al., 2015) around timing deal entry and exit, returning investment capital (and profits) to investors, raising follow-on funds, and so on. Permanent capital PE fund managers do not face these issues, though about 44% of the LPE transactions that I examine involve sponsor syndicates that typically include one or more traditional PE fund managers. Therefore, syndicate deal performance for LPEs is comparable to that of their traditional PE cosponsors.[9]

2.2 | Buyout and mezzanine transactions

I obtain transaction data from the S&P CapitalIQ database, which is widely used for PE and merger and acquisition studies. However, PE firms are not required to publicly disclose the transactions they make (unlike, e.g., equity mutual funds regulated by the US Securities and Exchange Commission [SEC]). Instead, PE transaction databases rely on data voluntarily disclosed by PE fund managers or their investors, and therefore it is possible that publicly

[9]Regarding solo deals, McCourt (2017) provides a detailed analysis of solo buyouts during 1990–2017 and finds that the average size, holding period, and performance of LPE buyouts are not significantly different from buyouts by traditional PEs.

TABLE 3 Listed private equity (LPE) summary statistics by region

		Buyout	Mezzanine	VC	Growth	FoF	Obs.	Buyout	Mezzanine	VC	Growth	FoF	Obs.
		Panel A: North America						*Panel B: Europe (excl United Kingdom)*					
LPE count	*N*	7	53	5	2	1	68	39	2	14	9	11	75
Market cap	Mean	1143	813	77	591	574	68	987	1750	129	929	356	75
	Median	158	318	17	591	574	68	228	1750	27	46	157	75
Total assets	Mean	2083	1755	108	623	925	64	1720	2413	200	1117	433	75
	Median	290	637	106	623	925	64	568	2413	77	80	153	75
Turnover ratio	Mean	32.97	20.07	115.18	7.99	3.82	63	91.23	8.65	51.32	4.26	9.99	75
	Median	11.57	16.08	8.31	7.99	3.82	63	26.36	8.65	14.52	3.34	4.03	75
Debt ratio	Mean	19.81	45.26	3.15	0.83	3.36	64	34.02	13.89	38.52	26.87	13.85	75
	Median	11.33	49.90	2.23	0.83	3.36	64	19.69	13.89	43.11	23.15	1.18	75
Expense ratio	Mean	1.83	0.92	0.09	1.85	−1.61	64	6.00	0.38	4.89	0.50	0.40	75
	Median	0.28	0.90	0.20	1.85	−1.61	64	1.22	0.38	1.34	0.01	0.08	75
Dividend yield	Mean	0.09	0.64	0.59	0.81	0.17	67	0.20	0.26	0.20	0.33	0.68	75
	Median	0.00	0.71	0.00	0.81	0.17	67	0.16	0.26	0.00	0.00	0.34	75
Age	Mean	211	136	202	239	147	68	208	100	155	222	209	75
	Median	230	128	239	239	147	68	236	100	139	239	239	75
		Panel C. United Kingdom						*Panel D: Rest of the world*					
LPE count	*N*	42	6	13	8	14	83	3	–	16	4	2	25
Market cap	Mean	473	1106	350	195	560	83	143	–	245	66	138	25
	Median	24	288	104	62	297	83	129	–	86	35	138	25

(Continues)

TABLE 3 (Continued)

		Buyout	Mezzanine	VC	Growth	FoF	Obs.	Buyout	Mezzanine	VC	Growth	FoF	Obs.
Total assets	Mean	571	1819	444	232	725	83	283	–	374	256	339	23
	Median	52	402	99	214	459	83	283	–	172	106	339	23
Turnover ratio	Mean	24.40	26.01	33.85	29.25	17.85	82	43.95	–	41.83	26.68	44.82	23
	Median	8.87	27.88	7.95	15.92	15.27	82	43.95	–	16.48	5.35	44.82	23
Debt ratio	Mean	15.59	42.11	17.19	13.90	11.67	77	23.94	–	30.26	11.18	27.71	23
	Median	5.11	46.94	2.89	4.22	2.84	77	23.94	–	15.42	11.78	27.71	23
Expense ratio	Mean	1.18	1.20	0.08	1.22	0.33	79	3.85	–	2.59	−0.30	2.41	23
	Median	0.18	0.30	0.16	0.35	0.12	79	3.85	–	0.74	0.07	2.41	23
Dividend yield	Mean	0.32	0.18	0.11	0.02	0.09	83	0.17	–	0.06	0.25	1.14	25
	Median	0.00	0.13	0.00	0.00	0.00	83	0.00	–	0.00	0.18	1.14	25
Age	Mean	211	225	163	245	255	83	183	–	159	196	120	25
	Median	237	240	170	240	240	83	162	–	183	197	120	25

Note: This table presents summary statistics by region for listed private equity for January 1, 2000 to December 31, 2019. LPEs are classified by investment type: buyout, mezzanine debt, venture capital (VC), growth capital, and funds of funds (FoF); and by region North America (United States and Canada), Europe (excluding the United Kingdom), United Kingdom, and rest of the world. The average market capitalization (in millions), total assets (in millions), asset–turnover ratio (turnover ratio) (%), debt ratio (%), monthly expense ratio (%), monthly dividend yield (%), and age (in months) during the last year that each firm appears in the sample are given. Variables are defined in the Appendix. The Obs. column gives the number of LPEs for which each data point is available. All currency values are adjusted for inflation to 2019 US dollars.

available transaction data could be incomplete or erroneously classified. Thus, although I have the complete unbiased history of LPE market returns, I caveat this transaction-level analysis by noting that the findings could be biased due to missing or erroneous data. In the description of the transactions data set that follows, I highlight some of the issues that may affect this study.

As CapitalIQ records separate and mostly unlinked transactions for target acquisitions and target disposals, I create two transaction samples: deal transactions (target acquisitions) and exit transactions (target disposals). To create the deals sample, I download from CapitalIQ all buyout and cash merger transactions that were closed during the sample period that involved the acquisition of private nonfinancial targets by all investment firms and public funds, and I add all public-to-private transactions. Similarly, to create the exits sample, I download all transactions involving the disposal of private nonfinancial target firms by all investment firms and public funds, and add all IPOs and bankruptcies. All deal and exit transactions include target firm characteristics (e.g., firm domicile, industry) and sponsor firm characteristics including ISINs, which I use to link transactions to my LPE data set. CapitalIQ gives transaction closed dates, total transaction values, and transaction types (LBO, SBO, divisional buyout, MBO, cash merger, public-to-private, distressed, cross-border for deals; and LBO, SBO, MBO, cash merger, trade sale, IPO, bankruptcy for exits). CapitalIQ also lists the firms involved in a transaction. Firms are classified as public or private companies, public or private investment companies, public funds, and PE/VC fund management firms. However, I find that a number of PE firms are misclassified in CapitalIQ.[10] Some LPEs are classified as ordinary companies rather than as investment companies or as funds or fund management firms. When I come across what I believe to be a misclassification, I attempt to correct it.

Transaction values are missing in CapitalIQ for 59% of deals and 54% of exits where there is a change of control of the target firm,[11] so I follow Str¨omberg (2008), Arcot et al. (2015), and Bernstein et al. (2016) and use a two-stage Heckman procedure to estimate transaction values where they are missing. I impute missing transaction values by constructing fitted values from a regression of transaction values on fixed effects for transaction type, target country, target industry, and transaction year using a sample that includes change-of-control[12] transactions by all investment firms and public funds (not just PE firms). More details are provided in the Internet Appendix.

Figures 1 and 2 show the annual total transaction counts, and counts and values for transactions where there is a change of control in the target firms for buyout and mezzanine LPEs, respectively, and Table 4 provides summary statistics for exit transactions by buyout and mezzanine LPEs (to save space, summary statistics for the smaller sample of deal transactions are given in the Internet Appendix). CapitalIQ has data for 6529 transactions involving LPE sponsors, 3489 of which are change-of-control transactions (1381 deals and 2108 exits[13]). The total imputed value of change-of-control transactions is over $702 billion, of which deals are worth $227 billion and exits are worth $475 billion. CapitalIQ does not have transaction data for 23 of the buyout LPEs and 11 of the mezzanine LPEs in my sample. The CapitalIQ transaction search may not locate transactions for these LPEs for various of reasons, such as nondisclosure by the LPE of their transactions, the delisting of the LPE (going private or going out of business), or the misclassification of the LPE in CapitalIQ.

About 85% of exits involve change-of-control transactions for both buyout and mezzanine LPEs. Focusing on change-of-control exits, most buyout LPE exits are solo rather than syndicate exits (83% solo), whereas the opposite is true for mezzanine LPEs (23% solo). US targets account for 88% of mezzanine LPE exits, and

[10]For example, Apollo Global Management is classified as a hedge fund in CapitalIQ, but the Apollo website does not list any hedge fund activities.
[11]I discuss minority transactions in this section for completeness, but in the remainder of the article I focus on deals and exits where there is a change-of-control for the target firm, unless otherwise stated.
[12]I impute values for transactions where control of the target firm changes from sellers to buyers as these transactions capture the value of the whole firm. Transactions where buyers take a minority stake in a target capture an unknown portion the value of the target firm, so I do not impute the values of minority transactions.
[13]One explanation for why there may be more exits than deals is that LPEs may have entered the sample in 2000, holding a large number of targets acquired before 2000.

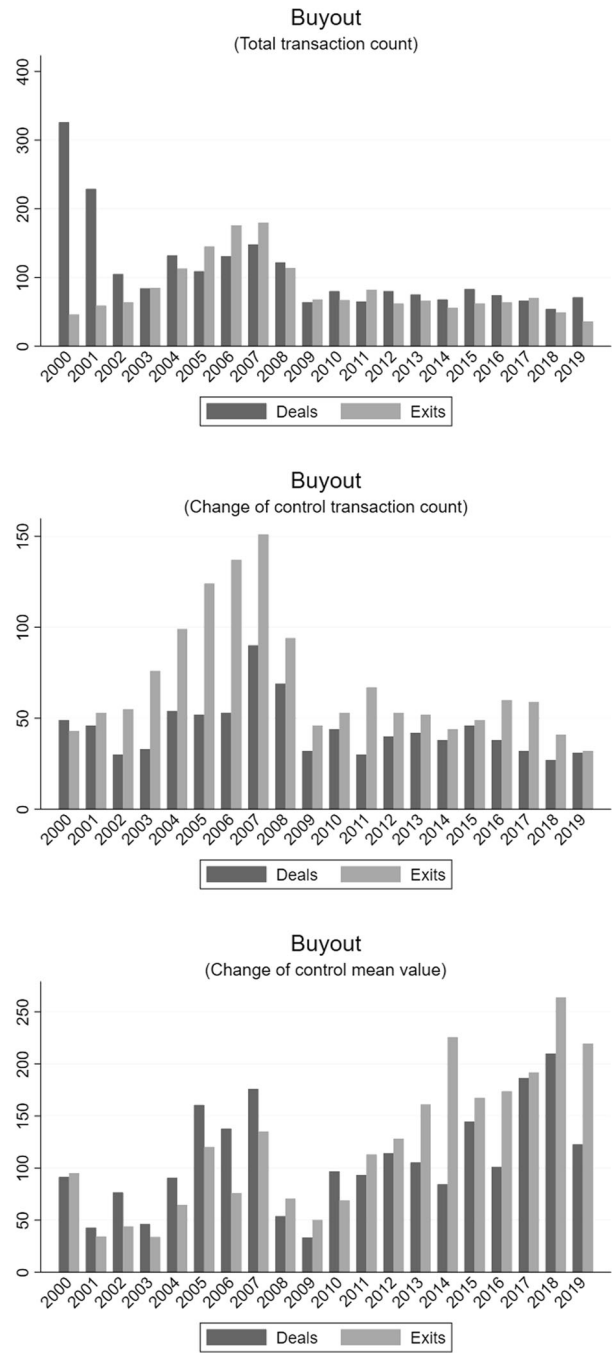

FIGURE 1 Annual buyout listed private equity (LPE) transactions. This figure presents the annual total deal and exit transaction counts (top panel), change-of-control transaction counts (center panel), and mean change-of-control transaction imputed values (bottom panel) for mezzanine LPEs. Change-of-control deal transactions include leveraged buyout (LBO), management buyout (MBO), secondary buyout (SBO), public-to-private (P2P), and cash merger. Change of control exit transactions include LBO, MBO, SBO, IPO, trade sale, cash merger, and bankruptcy

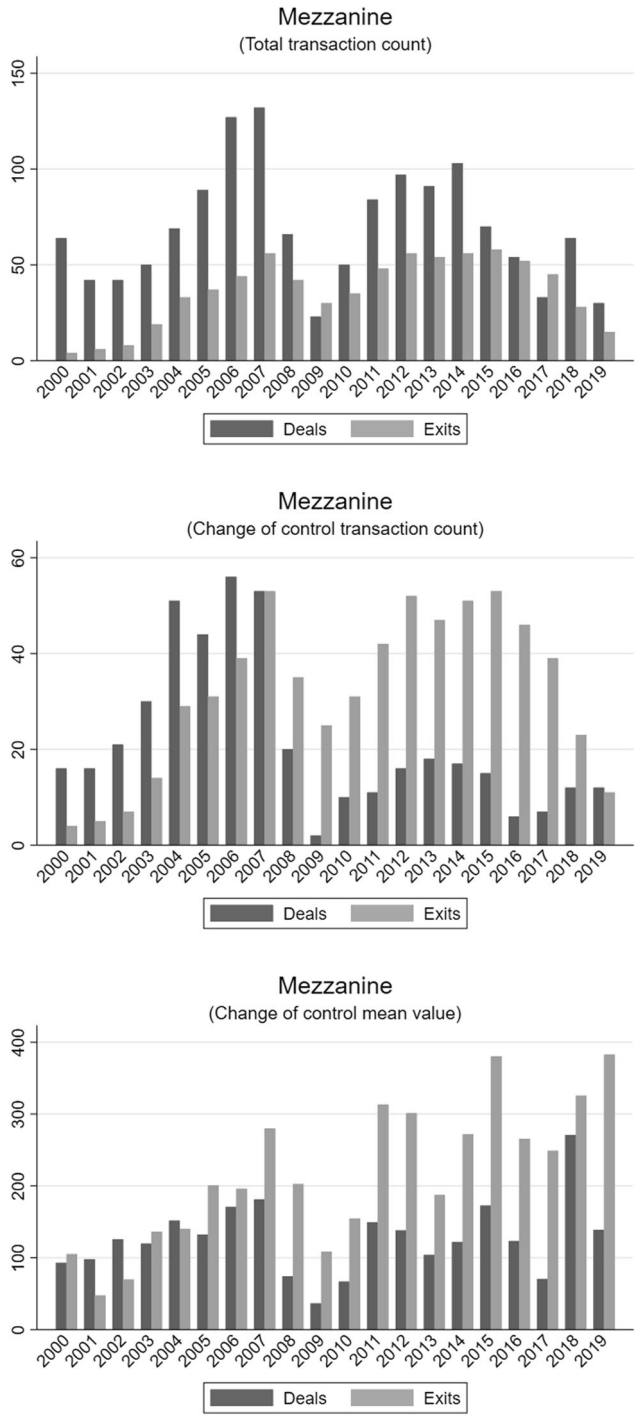

FIGURE 2 Annual mezzanine listed private equity (LPE) transactions. This figure presents the annual total deal and exit transaction counts (top panel), change-of-control transaction counts (center panel), and mean change-of-control transaction imputed values (bottom panel) for mezzanine LPEs

TABLE 4 Buyout and mezzanine listed private equity (LPE) exit transactions

	Buyout			Mezzanine		
	N	Mean value	Total value	*N*	Mean value	Total value
Total (excl. minority)	1442	174	250,896	666	337	224,612
Solo	1203	158	190,086	154	275	42,393
Syndicate	239	254	60,810	512	356	182,220
IPO	23	1501	34,514	6	1981	11,883
Trade sale	974	132	128,652	449	275	123,608
SBO	169	240	40,567	97	551	53,422
MBO	167	101	16,804	33	264	8713
Bankruptcy	40	40	1618	23	29	675
LBO	397	195	77,255	193	425	81,956
Cash merger	784	206	161,780	435	333	145,064
Cross-border	637	197	125,676	136	447	60,791
2000–2004	349	89	31,172	66	174	11,516
2005–2009	571	140	79,781	189	222	41,681
2010–2014	270	236	63,658	228	311	70,266
2015–2019	252	303	76,285	183	553	101,149
United States	135	455	61,406	587	324	188,947
Canada	25	273	6816	16	78	1241
United Kingdom, Ireland	480	89	42,738	21	404	8,474
France, BeNeLux	312	188	58,546	28	483	13,512
Germanic De-Aus-CH	211	201	42,340	3	361	1083
Spain, Italy, Portugal	81	99	8044	3	250	751
Scandinavia	144	148	21,331	2	2704	5407
Korea, Japan	3	43	129			
Australia, New Zealand	3	54	163	3	1194	3582
Rest of the world	48	195	9381	3	538	1615
Consumer discretionary	265	175	46,302	97	373	36,158
Consumer staples	70	122	8555	45	393	17,702
Energy	20	180	3608	27	976	26,358
Healthcare	169	230	38,833	84	463	38,432
Industrials	387	182	70,575	145	286	41,234
Information technology	305	104	31,752	165	204	33,727
Materials	80	262	20,939	37	277	9969
Telecommunication services	112	168	18,792	61	327	19,947
Utilities	8	356	2847	2	275	550

TABLE 4 (Continued)

	Buyout			Mezzanine		
	N	Mean value	Total value	*N*	Mean value	Total value
Real estate	14	409	5727	1	345	345
Other	26	334	8693	3	179	536
Total (incl. minority)	1722			760		
Unique targets	1681			749		
Unique PE firms	58			42		

Note: This table gives details of exit transaction characteristics for buyout and mezzanine LPEs (deal transaction details are given in the Internet Appendix). Transaction characteristics include the type of transaction, the period when the transaction occurred, the regional location of the target, and the industry classification of the target (see the Internet Appendix for detailed variable descriptions). Where change-of-control transaction values are missing in CapitalIQ, I use a two-stage Heckman procedure to impute transaction values (see the Internet Appendix for details). All currency values are adjusted for inflation to millions of 2019 US dollars. BeNeLux refers to the Belgium-Netherlands-Luxemburg region; De-Aus-CH refers to the Germany-Austria-Switzerland region.

European targets account for 85% of buyout LPE exits. Mezzanine and buyout LPEs make a similar proportion of exits via trade sale and IPO (about 68%). Buyout LPE targets have a slightly lower bankruptcy rate (2.8%) than mezzanine targets (3.5%). MBOs account for 5% of exits for mezzanine LPEs and 11% of exits for buyout LPEs. Most buyout LPE exits occurred before 2010 (63%) whereas most mezzanine LPE exits occurred after 2010 (62%).

Change-of-control deals account for 36% of buyout LPE deals and 31% of mezzanine LPE deals. Focusing on change-of-control deals, buyout LPEs account for most deals (65%) and deal value (68%). Like exits, most buyout LPE deals (66%) are solo, whereas 36% of mezzanine LPE deals are solo. MBOs account for 52% of mezzanine LPE deals and 42% of buyout LPE deals. US firms account for nearly 80% of mezzanine LPE targets, and European firms account for 85% of buyout LPE targets.

3 | LPE TRANSACTION SELECTION

In this section I examine the characteristics that make it more or less likely that a deal or exit is sponsored by a buyout or mezzanine LPE rather than by a traditional 10-year PE fund. LPEs may favor investments in specific industries or regions, or may prefer particular deal or exit transaction styles. To examine the likelihood that a deal or exit is sponsored by an LPE, I obtain from CapitalIQ all deals and exits sponsored by all PE/VC firms (including LPEs and traditional 10-year PE funds) over the sample period and use probit analysis where the dependent variable is an indicator variable equal to 1 for LPE transactions, and the independent variables are indicator variables capturing a range of transaction and target characteristics such as transaction type, target industry, target region, and period when the transaction occurred.[14]

I run the analysis for all mezzanine and buyout LPEs together, and separately for the two LPE investment styles. The marginal effects for exits are presented in Table 5 (I focus on the exits sample here as it is larger than the deals sample; the marginal effects for deals are given in the Internet Appendix). The predicted probability that a deal or exit is by an LPE sponsor is the sum of the coefficients of the independent indicator variables that are equal to 1 for the transaction.

[14]In the Internet Appendix, I examine whether levels of global FFC factors plus Pástor–Stambaugh's US liquidity factor predict LPE deals and exits relative to other PE/VC deals and exits (following Bessembinder et al., 2019).

In total, 5.06% of the exits sample involve buyout or mezzanine LPE sponsors (3.54% buyout, 1.52% mezzanine). Panel A of Table 5 shows that[15] cross-border exits are 0.88% more likely to have an LPE sponsor. Solo exits are 1.12% more likely to have a buyout LPE sponsor, but are 1.48% less likely to have a mezzanine LPE sponsor. Exits via bankruptcy are slightly (0.6%) more likely for mezzanine LPEs. Finally, I test whether the exit transaction value affects the likelihood of buyout or mezzanine LPE sponsorship, but I find no significant effects. For all LPEs, exit transaction values are slightly (but not significantly) higher than those of other PE/VCs.

Looking at deals (see the Internet Appendix), LPEs are more likely to make SBO deals (+1.94%) and cross-border deals (+1.95%), and less likely to make solo deals (−4.6%) and MBO deals (−1.8%). Buyout LPEs are more likely to make divisional buyouts (+1.42%), and mezzanine LPEs are less likely to participate in public-to-private deals (−1.88%) and divisional buyouts (−0.91%). LPE deal values are slightly lower (significant at the 10% level) than the control sample of deals by other PE/VCs.

3.1 | Syndication selection

In this section I examine the characteristics that make it more or less likely that a deal or exit is sponsored by a syndicate of sponsors rather than by a solo sponsor. Stanfield (2019) finds that low-skilled PE firms are more likely to make syndicate buyout deals to overcome firm-specific deficiencies and improve performance. Officer et al. (2010) argue that syndication may be a form of collusion used by PE firms to reduce competition for deals and to drive down acquisition prices.

To examine the likelihood that a deal or exit is sponsored by a syndicate, I use a sample consisting of all deals and exits in CapitalIQ that are sponsored by any PE/VC firm (including both LPEs and traditional PE fund managers) over the sample period. I then conduct a linear probability analysis[16] where the dependent variable is an indicator variable equal to 1 for syndicate deals and exits, and the independent variables are indicator variables capturing a range of transaction and target characteristics such as LPE sponsor type, transaction type, target industry, target region, and period, interacted with LPE style. The regression results for exits are presented in Table 6 (I focus on the exits sample here as it is larger than the deals sample; the results for deals are given in the Internet Appendix).

Panel A of Table 6 shows that LPEs are 7.3% less likely to be members of a syndicate of sellers compared to other types of PE/VC firms. The effect is driven by buyout LPEs, as these LPEs are over 26.5% less likely to make syndicate exits, whereas mezzanine LPEs are 34.8% more likely to make syndicate exits. Higher value exits are more likely to be syndicated: A 1% increase in exit value increases the likelihood of syndication by nearly 3.8%.

Panel B of Table 6 provides the likelihood of a syndicate exit for a range of exit types for all PE/VC firms and for LPEs. Model (5) shows that after controlling for deal value, cross-border exits are almost 18.9% less likely to involve a syndicate of sellers, as are IPO exits (10.3% less likely) and SBO exits (6% less likely). Bankruptcies are 11% more likely to involve a syndicate. Models (7) and (8) show that mezzanine LPEs are 25.7% more likely to make syndicated trade sale exits than other types of PE/VC firms. Buyout LPE SBO exits

[15]In the Internet Appendix, I show that target location has the greatest impact on the probability that an exit is sponsored by an LPE. Being a target located in the United Kingdom increases the likelihood of having an LPE sponsor by 9.16%, and for targets located in Korea or Japan, the likelihood is reduced by 5.65%. For US targets, there is a sharp difference between buyout and mezzanine LPEs: US targets are 1.7% less likely to have a buyout LPE sponsor, whereas they are 4.75% more likely to have a mezzanine LPE sponsor. In general, European targets are most likely to have buyout LPE sponsors. Target industry also has some predictive power, in that targets in the industrials, energy, and consumer discretionary sectors are more likely to have LPE sponsors. The probability that an exit is sponsored by an LPE decreases over time, especially for buyout LPEs.

[16]A linear probability model is used here as I wish to examine interactions across the subsamples, and such interactions cannot be used in a probit model (Ai & Norton, 2003). I am grateful to an anonymous referee for suggesting this approach.

TABLE 5 Marginal effects for listed private equity (LPE) exits

	Transaction characteristics					
	dydx lpe	dydx bo	dydx mezz	dydx lpe	dydx bo	dydx mezz
	(1)	(2)	(3)	(4)	(5)	(6)
Solo	−0.0094***	0.0112***	−0.0148***	−0.0060	0.0164***	–
	0.0179***	(−3.617)	(4.820)		(−9.602)	(−1.445)
		(4.553)	(−6.885)			
IPO	0.0085	0.0114	0.0024	−0.0081	0.0013	−0.0019
	(0.767)	(1.359)	(0.319)	(−0.513)	(0.100)	(−0.196)
Trade sale	−0.0121*	−0.0073	−0.0041	−0.0129	−0.0054	−0.0072
	(−1.949)	(−1.509)	(−1.030)	(−1.461)	(−0.738)	(−1.380)
MBO	0.0025	0.0038	0.0013	0.0128	0.0058	0.0075
	(0.512)	(1.023)	(0.399)	(1.450)	(0.870)	(1.247)
Bankrupt	−0.0013	−0.0061	0.0063*	0.0163	0.0033	0.0111**
	(−0.206)	(−1.137)	(1.685)	(1.566)	(0.347)	(2.094)
LBO	−0.0016	−0.0043	0.0017	0.0054	0.0067	−0.0025
	(−0.234)	(−0.807)	(0.406)	(0.522)	(0.806)	(−0.407)
SBO	−0.0048	−0.0080**	0.0026	−0.0067	−0.0123*	0.0093*
	(−1.104)	(−2.257)	(1.074)	(−0.832)	(−1.942)	(1.817)
Cross-border	0.0088***	0.0056***	0.0043***	0.0044	0.0035	0.0018
	(3.560)	(2.912)	(2.641)	(1.114)	(1.100)	(0.697)
Exit value				0.0006	0.0004	0.0006
				(0.705)	(0.475)	(1.072)
Year, region, and sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	40,981	40,981	40,161	18,770	18,770	18,032

Note: This table presents the marginal effects from probit regressions using a sample of all change-of-control exits by private equity/venture capital firms (LPEs and traditional funds). The dependent variables are indicator variables equal to 1 if one of the selling sponsors is either a buyout or mezzanine LPE (Models (1) and (4)), just a buyout LPE (Models (2) and (5)), or just a mezzanine LPE (Models (3) and (6)). The independent variables, defined in the Appendix, consist of indicator variables for a range of transaction characteristics. Models (4), (5), and (6) include the actual (not imputed) log total value of the transaction. *z*-statistics are given in parentheses.

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

are 12% more likely to involve a syndicate than SBOs by other PE/VCs, and cross-border exits by buyout LPEs are 6.3% more likely to involve a syndicate.

The linear probability results for syndicated deals are given in the Internet Appendix. Again, the likelihood of deal syndication is strongly determined by deal value: A 1% increase in deal value increases the likelihood of syndication by 2.8%. LPE firms are 24.5% more likely to be members of a syndicate of buyers compared to other types of PE/VC firms (13.2% more likely for buyout LPEs, 44.6% for mezzanine LPEs). Cross-border deals are 13.8% more likely to involve a syndicate of buyers than other deal types, as are MBOs (12.1% more likely) and public-to-private deals (7.8% more likely). LBO deals involving LPEs are 27% more likely to be syndicated

TABLE 6 Linear probability regressions for syndicated exits

		LPE	Buyout	Mezzanine		LPE	Buyout	Mezzanine
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Sponsor style								
Style		−0.0737***	−0.265***	0.348***		−0.092***	−0.278***	0.296***
ln(Exit value)		(−6.930)	(−26.20)	(21.07)	0.038***	(−8.536) 0.039***	(−19.47) 0.038***	(13.20) 0.038***
Constant		0.430***	0.436***	0.421***	(21.95) 0.303***	(22.26) 0.312***	(21.65) 0.317***	(21.58) 0.300***
		(171.2)	(174.7)	(171.1)	(37.34)	(38.09)	(38.96)	(37.07)
Obs.		40,981	40,981	40,981	18,770	18,770	18,770	18,770
R^2		0.001	0.010	0.008	0.024	0.028	0.037	0.031
Panel B: Sponsor style interactions with transaction types								
IPO	−0.004	−0.004	−0.001	−0.008	−0.103***	−0.103***	−0.101***	−0.107***
	(−0.204)	(−0.174)	(−0.0601)	(−0.354)	(−3.771)	(−3.634)	(−3.615)	(−3.881)
IPO × Style		−0.092	−0.125	0.135		−0.075	−0.089	0.161
		(−1.085)	(−1.445)	(0.764)		(−0.679)	(−0.751)	(0.881)
Trade sale	−0.012	−0.022	−0.017	−0.016	0.020	0.011	0.017	0.015
	(−0.876)	(−1.591)	(−1.242)	(−1.172)	(1.172)	(0.592)	(0.955)	(0.848)
Trade sale × Style		0.172***	0.105***	0.258*		0.148**	0.063	0.257**
		(3.916)	(3.020)	(1.911)		(2.526)	(1.219)	(2.011)
MBO	−0.011	−0.006	−0.011	−0.010	−0.003	0.002	−0.003	−0.003
	(−1.055)	(−0.541)	(−0.995)	(−0.987)	(−0.165)	(0.0810)	(−0.138)	(−0.151)
MBO × Style		−0.054*	0.012	−0.046		−0.009	0.054	−0.049
		(−1.761)	(0.354)	(−0.647)		(−0.192)	(1.114)	(−0.465)
Bankrupt	0.027*	0.023*	0.021	0.027**	0.110***	0.105***	0.107***	0.110***
	(1.941)	(1.667)	(1.511)	(1.971)	(4.988)	(4.581)	(4.789)	(4.874)
Bankrupt × Style		0.056	0.117	−0.054		0.055	0.070	−0.068
		(0.950)	(1.619)	(−0.535)		(0.685)	(0.611)	(−0.625)
LBO	−0.031**	−0.039**	−0.035**	−0.034**	−0.004	−0.005	0.001	−0.011
	(−2.119)	(−2.530)	(−2.302)	(−2.306)	(−0.210)	(−0.239)	(0.0422)	(−0.523)
LBO × Style		0.116**	0.068	0.136		0.037	−0.056	0.261*
		(2.347)	(1.604)	(0.971)		(0.542)	(−0.903)	(1.899)
SBO	−0.0017	−0.006	−0.003	−0.004	−0.060***	−0.067***	−0.070***	−0.060***
	(−0.186)	(−0.597)	(−0.346)	(−0.448)	(−3.673)	(−3.798)	(−3.975)	(−3.599)
SBO × Style		0.060**	0.022	0.089		0.076*	0.119**	−0.064
		(1.975)	(0.655)	(1.528)		(1.649)	(2.507)	(−0.666)

TABLE 6 (Continued)

		LPE	Buyout	Mezzanine		LPE	Buyout	Mezzanine
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cross-border	−0.007	−0.005	−0.008	−0.008	−0.189***	−0.034***	−0.038***	−0.035***
	(−1.455)	(−0.943)	(−1.492)	(−1.563)	(−25.25)	(−4.379)	(−4.935)	(−4.676)
Cross-border × Style		−0.052***	0.009	−0.004		−0.027	0.063**	−0.025
ln(Exit value)		(−2.983)	(0.451)	(−0.100)	0.032***	(−1.100) 0.032***	(2.165) 0.033***	(−0.540) 0.032***
					(17.86)	(17.42)	(17.90)	(17.69)
ln(Exit value) × Style						−0.005	−0.025***	−0.009
						(−0.760)	(−3.229)	(−0.727)
Style		−0.105**	−0.147***	−0.036		−0.078	−0.045	−0.012
		(−2.423)	(−4.360)	(−0.268)		(−1.260)	(−0.793)	(−0.0822)
Sector, region, and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.285***	0.295***	0.293***	0.292***	0.228***	0.237***	0.233***	0.238***
	(9.968)	(10.17)	(10.13)	(10.19)	(5.846)	(6.007)	(5.924)	(6.076)
Obs.	40,981	40,981	40,981	40,981	18,770	18,770	18,770	18,770
R^2	0.221	0.221	0.221	0.223	0.231	0.232	0.233	0.234

Note: This table presents the results of linear probability regressions using a sample of all change-of-control exits by private equity (PE)/venture capital (VC) firms (listed private equity [LPE] and traditional funds). The dependent variable in all models is an indicator variable equal to 1 for exits where the PE sponsor belongs to a syndicate. The independent variables in Panel A consist of indicator variables for PE-sponsor style: all PE/VC (Models (1) and (5)), all LPEs (Models (2) and (6)), buyout LPEs (Models (3) and (7)), and mezzanine LPEs (Models (4) and (8)). Models (5)–(8) include the actual (not imputed) log total value of the exit transaction. The independent variables in Panel B include a range of transaction characteristics interacted with PE-sponsor style. Variables are defined in the Appendix. *t*-statistics estimated using robust standard errors are given in parentheses.

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

than LBO deals not involving an LPE, as are SBOs (12.2% more likely for LPE deals), whereas MBO deals involving an LPE are nearly 14% less likely to be syndicated than deals not involving an LPE.

This analysis suggests that although buyout LPE deals are more likely to involve a syndicate of buyers, their exits are less likely to involve a syndicate of sellers. One potential explanation for this is that buyout LPEs may choose to time their exits differently from their traditional PE coinvestors. This difference in timing could be a result of the permanent nature of buyout LPEs' capital, where LPEs have more discretion over the timing of their exits compared to traditional PE funds, which are required to exit their investments at the end of the fund's 10-year life. I leave a comprehensive investigation of this interesting question to future research.

Later in this article, I examine the impact of solo versus syndicate transactions on LPE performance.

TABLE 7 Listed private equity (LPE) position in syndicate deals

	Buyout		Mezzanine	
	Freq.	Percent	Freq.	Percent
Solo	602	66.59	170	35.64
Syndicate lead sponsor	154	17.04	198	41.51
Syndicate 2nd	118	13.05	81	16.98
Syndicate 3rd	21	2.32	25	5.24
Syndicate 4th	6	0.66	3	0.63
Syndicate 5th	1	0.11		
Syndicate 6th				
Syndicate 7th	2	0.22		
Total	904	100	477	100

Note: This table presents the position of LPE sponsors in syndicate deals. The position is determined from the list of deal sponsors given in CapitalIQ. The lead sponsor is first in the list, the second sponsor is 2nd in the list, and so on.

3.2 | LPE position in syndicate deals

To evaluate whether LPEs play a leading role in the deals they sponsor, I estimate the position of the LPE in their deals relative to other cosponsors. The position is determined from the list of deal sponsors recorded in CapitalIQ, where the first investment firm on the list is deemed to be the syndicate lead, the second firm is the second sponsor, and so on. As well as identifying suitable targets and where necessary assembling a syndicate of investors, the lead investment firm in PE deals is expected to provide the bulk of the funding required to complete the deal and to lead the monitoring and management of the target firms.

Table 7 provides the position of buyout and mezzanine LPEs in the deals they sponsor. The analysis shows that buyout LPEs are the sole sponsor or the lead sponsor in 84% of the deals in which they are involved. Mezzanine LPEs are the sole or lead sponsor in 77% of their deals. Thus LPEs generally play a leading role in their deals.

4 | LPE PERFORMANCE

Now, I examine LPE performance. I start with an overview of raw total market returns, positioning LPE against market indices in the United States and Europe. I then consider performance adjusted for FFC benchmarks. This leads to an analysis of performance persistence using winner-minus-loser portfolios with a 12-month formation period and a 12-month holding period. I also examine the returns to scale for LPEs and estimate the value-added measure proposed by Berk and van Binsbergen (2015).

Finally, I consider the association between LPE performance and LPE financial ratios including debt ratio, expense ratio, turnover ratio, and dividend yield.

4.1 | LPE performance vs market indices

Figure 3 graphs the cumulative raw total returns for the full 20-year sample period and for the 10-year periods before and after 2010. LPEs are grouped by investment style into value-weighted portfolios that are rebalanced monthly. Graphs for the total returns of the Russell 2000, S&P 500, and MSCI Europe SMID (European small and midcap index) are included for comparison. Table 8 presents the results in tabular form.

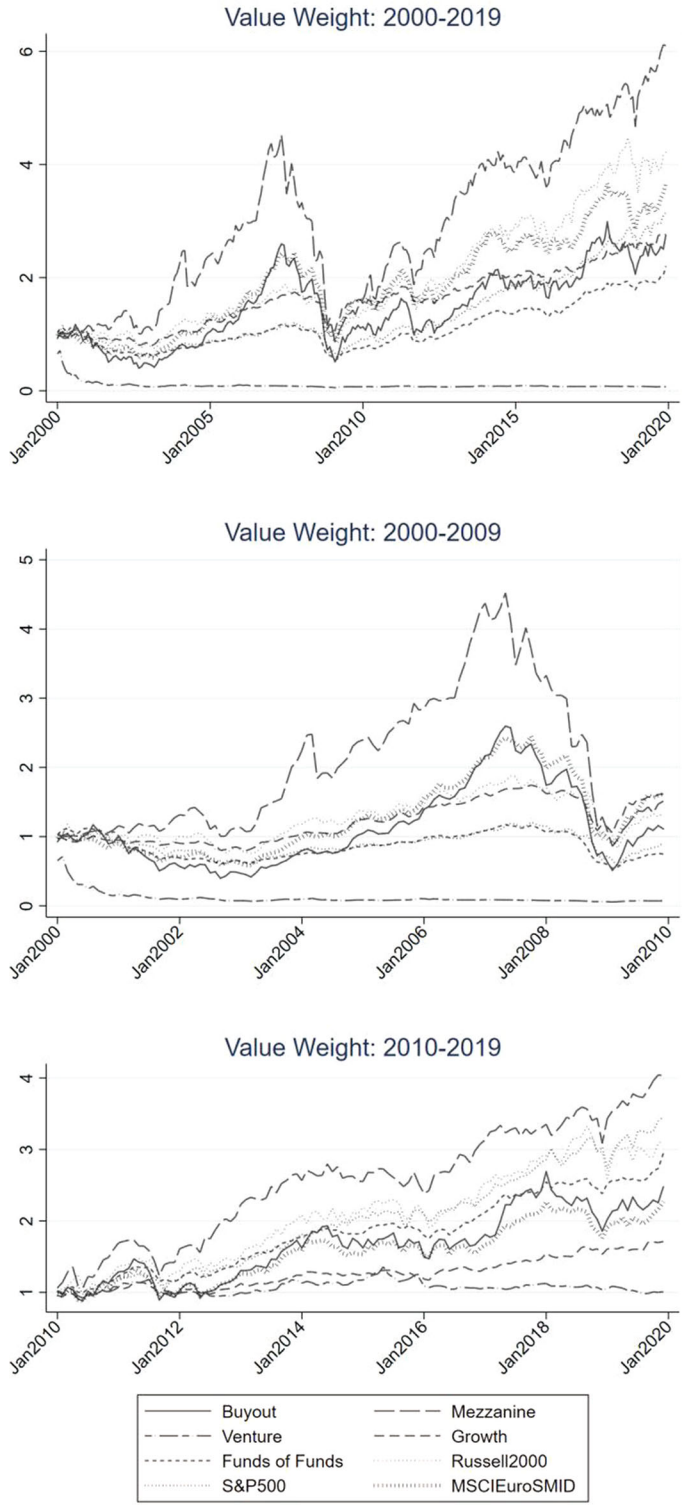

FIGURE 3 Listed private equity (LPE) cumulative performance. This figure presents the monthly cumulative returns of value-weighted portfolios of LPEs for January 2000 to December 2019 (top panel), January 2000 to December 2009 (center panel), and January 2010 to December 2019 (bottom panel)

Buyout LPEs had a cumulative total return of 175% over the full sample period, under performing the S&P 500 by 40%, the Russell 2000 by 146%, and the MSCI Europe SMID by 92%. However, before 2010, buyout LPEs actually outperformed the S&P 500 by 20%, but underperformed the Russell 2000 by 24% and the MSCI Europe SMID by 51%. From 2010, cumulative buyout LPE returns were 148%, which was more than their pre-2010 growth (111%), and although they outperformed the MSCI Europe SMID by 21% during this period, they underperformed the S&P 500 by nearly 100% and the Russell 2000 by 65%. Looking at the 2000–2009 and 2010–2019 graphs, apart from a break (drop) in 2009, buyout LPE performance more or less tracked the MSCI Europe SMID index, suggesting that buyout LPEs are proxies for the performance of small to medium-sized European businesses. Perhaps the most striking results from these tests are for the mezzanine LPE sample. These LPEs had cumulative total returns of 510%, beating the Russell 2000 by 188% and the S&P 500 by 295%. Before 2010, mezzanine LPEs outperformed the S&P 500 by 60% and the Russell 2000 by 16%, but underperformed the MSCI Europe SMID by 11%. After 2010, mezzanine LPEs beat all the market indices by a large margin: the S&P 500 by 57.5%, the Russell 2000 by 90%, and the MSCI Europe SMID by 176%. Therefore, although buyout LPEs may have tracked small-midcap European stocks, I cannot say that mezzanine LPEs tracked small-midcap US stocks—mezzanine LPEs significantly outperformed those stocks.

VC LPEs performed miserably at this same time, with cumulative performance of −93% over the full sample period. All of this loss in value occurred before 2010, and from 2010 to 2019, the cumulative 10-year return was 0%.[17] In contrast, growth LPEs returned a cumulative 177% over the full sample period, with this growth was spread fairly evenly between pre-2010 and post-2010 periods. The pre-2010 performance is remarkable, however, as it was the strongest of all the LPE samples at 62% and beat all the market indices except the MSCI Europe SMID. FoF LPEs returned 120% over the full sample period and were thus the second worst performing LPE style (ahead of VC). FoFs did badly before 2010, returning −25%, but performed very strongly since 2010 when they returned 195%, beating all other LPE styles except mezzanine (but not beating the Russell 2000 or S&P 500). The performance for FoFs LPEs is a conservative reflection of the performance of the traditional 10-year funds held by these LPEs as they charge an additional layer of fees on top of the fees charged by the managers of the traditional funds that they hold (Jegadeesh et al., 2015).

4.2 | LPE benchmark-adjusted returns

Benchmark-adjusted returns (alphas) of each of the LPE subsamples are estimated by regressing the average monthly returns in excess of the risk-free rate (R^e) of the subsample on global FFC market (MKTRF), size (SML), value (HML), and momentum (WML) factors:

$$R_t^e = a + \beta^{\text{mkt}}\text{MKTRF}_t + \beta^{\text{sml}}\text{SML}_t + \beta^{\text{hml}}\text{HML}_t + \beta^{\text{wml}}\text{WML}_t.$$

LPEs potentially provide liquidity benefits to investors because the underlying PE investments are illiquid.[18] My estimates of benchmark-adjusted return incorporate any illiquidity premium earned by the LPE's underlying unlisted PE investments that is not captured by the other benchmark loadings.[19]

[17]In unreported tests, I find that the poor performance by VC LPEs is also observable across geographic subsamples.

[18]Cherkes et al. (2009) link closed-end fund performance to the liquidity benefits provided by closed-end funds. They argue that investors who trade illiquid assets directly (such as unlisted PE investors) incur potentially large transaction costs. However, if investors trade the assets indirectly, by buying or selling the relatively liquid shares of a closed-end fund such as an LPE, the underlying illiquid assets do not change hands, and the investors avoid these large illiquidity costs. The liquidity benefits represent the liquidity difference between the closed-end fund shares and its underlying assets.

[19]The Internet Appendix provides benchmark-adjusted returns estimated using the capital asset pricing model (CAPM), Dimson, FFC plus Pástor–Stambaugh liquidity factor, and Fama–French five-factor models. I also estimate excess returns using a variety of market portfolios, including Fama–French global markets, MSCI Europe SMID, and MSCI Emerging Markets.

TABLE 8 Cumulative returns for the listed private equity (LPE) samples

	Return	SD	Sharpe	LPE-SP500	LPE-R2K	LPE-SMID
Panel A: 2000–2019						
Buyout	1.752	8.046	0.170	−0.399	−1.464	−0.922
Mezzanine	5.099	6.852	0.689	2.949	1.883	2.426
Venture capital	−0.928	6.569	−0.199	−3.078	−4.143	−3.601
Growth	1.767	3.465	0.400	−0.383	−1.448	−0.906
Funds of funds	1.204	3.408	0.241	−0.946	−2.012	−1.470
Russell 2000	3.216	6.204	0.457	1.066	0.000	0.542
S&P 500	2.150	4.584	0.386	0.000	−1.066	−0.523
MSCI Europe SMID	2.673	5.636	0.407	0.523	−0.542	0.000
Risk-free	0.381	0.152	0.000	−1.769	−2.835	−2.293
Panel B: 2000–2009						
Buyout	0.111	9.410	−0.021	0.200	−0.237	−0.509
Mezzanine	0.513	8.263	0.024	0.602	0.165	−0.107
Venture capital	−0.928	8.653	−0.143	−0.839	−1.276	−1.548
Growth	0.616	3.962	0.077	0.705	0.268	−0.004
Funds of funds	−0.252	3.888	−0.145	−0.163	−0.600	−0.872
Russell 2000	0.348	6.865	0.005	0.437	0.000	−0.271
S&P 500	−0.089	5.099	−0.079	0.000	−0.437	−0.708
MSCI Europe SMID	0.620	6.190	0.050	0.708	0.271	0.000
Risk-free	0.312	0.158	0.000	0.401	−0.036	−0.308
Panel C: 2010–2019						
Buyout	1.477	6.434	0.221	−0.980	−0.650	0.209
Mezzanine	3.031	5.084	0.586	0.575	0.904	1.763
Venture capital	0.008	3.179	−0.014	−2.449	−2.119	−1.260
Growth	0.713	2.901	0.228	−1.744	−1.415	−0.556
Funds of funds	1.947	2.756	0.687	−0.510	−0.181	0.679
Russell 2000	2.127	5.482	0.378	−0.329	0.000	0.859
S&P 500	2.457	3.959	0.607	0.000	0.329	1.189
MSCI Europe SMID	1.268	5.046	0.241	−1.189	−0.859	0.000
Risk-free	0.052	0.065	0.000	−2.404	−2.075	−1.216

Note: This table presents the monthly cumulative raw returns, standard deviations, and Sharpe ratios for value-weighted portfolios of the LPE samples that are rebalanced monthly. Results for the full 20-year sample period (January 2000–December 2019) are given, as well as for the 10-year subsamples (2000–2009 and 2010–2019). The difference in the cumulative returns for the LPE samples (and for the indexes and risk-free rate) and the S&P500 (SP500), Russell 2000 (R2K), and MSCI Europe Small-Midcap (SMID) indices are also given.

TABLE 9 Benchmark-adjusted returns for the LPE samples

	Buyout	Mezzanine	Venture capital	Growth	Funds of funds
Panel A: Equal weighted					
Monthly excess return	0.296	0.524	−0.577	0.006	0.463
	(1.013)	(1.591)	(−1.481)	(0.0213)	(1.493)
MKTRF	0.879***	0.786***	0.957***	0.792***	0.860***
	(25.79)	(12.36)	(18.73)	(16.22)	(15.32)
SMB	0.539***	0.694***	0.987***	0.484***	0.520***
	(7.354)	(5.730)	(9.339)	(4.043)	(4.725)
HML	0.035	−0.043	−0.511***	−0.078	−0.003
	(0.700)	(−0.409)	(−5.443)	(−0.967)	(−0.033)
WML	−0.052	−0.209***	−0.146***	−0.061	−0.059
	(−1.403)	(−3.039)	(−2.860)	(−1.118)	(−1.030)
Constant	−0.158	0.165	−0.907***	−0.355*	0.038
	(−1.166)	(0.735)	(−4.889)	(−1.896)	(0.207)
Obs.	240	240	240	240	240
R^2	0.814	0.650	0.774	0.639	0.702
Panel B: Value weighted					
Monthly excess return	0.460	0.744**	−0.757	0.616*	0.491
	(1.194)	(1.972)	(−1.263)	(1.722)	(1.475)
MKTRF	1.203***	0.934***	1.236***	1.025***	0.929***
	(29.19)	(11.37)	(12.07)	(18.67)	(15.08)
SMB	0.296***	0.401***	1.556***	0.362*	0.565***
	(3.044)	(2.656)	(5.245)	(1.925)	(4.183)
HML	0.026	0.423***	−0.531***	0.072	0.000
	(0.355)	(3.626)	(−2.803)	(0.713)	(0.00145)
WML	−0.090**	−0.190***	−0.157	0.066	−0.061
	(−2.025)	(−2.796)	(−1.280)	(1.020)	(−0.745)
Constant	−0.062	0.198	−1.296***	0.081	0.029
	(−0.362)	(0.724)	(−3.153)	(0.394)	(0.144)
Obs.	240	240	240	240	240
R^2	0.822	0.596	0.544	0.655	0.678

Note: This table presents the monthly returns in excess of the risk-free rate (in percent), benchmark-adjusted returns, and regression coefficients for equal-weighted (Panel A) and value-weighted (Panel B) portfolios of the LPE samples. The four benchmarks (market RMRF, size SMB, value HML, and momentum WML) are the Fama–French–Carhart global factors downloaded from Kenneth French's website: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. Variables are defined in the Appendix. The sample period is January 2000–December 2019. *z*- statistics estimated using bootstrapped standard errors are in parentheses.

*p < 0.10; **p < 0.05; ***p < 0.01.

Table 9 reports regression results for equal-weighted (Panel A) and value-weighted (Panel B) portfolios. Excess returns are positive for all samples except VC, and are significant at the 5% level for the value-weighted mezzanine subsample. The global FFC factors explain over 81% of the variation in excess returns for buyout LPE portfolios, and the R^2s for equal-weighted, mezzanine, growth, and FoF portfolios are 65%, 77%, 65%, and 70%, respectively. The value-weighted R^2s are a little lower. Benchmark-adjusted returns are negative, but not significant, for buyout LPEs, whereas they are positive (but not significant) for mezzanine and FoF LPEs. The value-weighted growth portfolio has positive (but statistically insignificant) benchmark-adjusted returns, whereas the equal-weighted portfolio has negative and weakly significant (10% level) returns. VC funds have negative benchmark-adjusted returns that are economically and statistically meaningful: −1.3% per month, with a *z*-statistic greater than 3 for the value-weighted portfolio. This result is robust to the choice of common benchmark models (see the Internet Appendix). Thus, investors in VC funds may face limits to arbitrage (the negative alphas are not competed away), or the common benchmark models fail to explain VC LPE returns.

4.3 | LPE performance persistence

The persistence of traditional 10-year fund performance has been extensively discussed in the PE literature (see the Introduction for a brief literature review). In this section I test for performance persistence in the LPE subsamples by grouping LPEs each month into quartile portfolios according to their total returns over an 11-month formation period, skipping a month to avoid microstructure effects, and then estimating the performance of these portfolios over a 12-month holding period.[20] The difference in holding-period returns for winner (P4) and loser (P1) portfolios represents performance persistence (winners continue to win; losers continue to lose). The benchmark-adjusted returns of the winner-minus-loser portfolio has been interpreted in the open-end equity fund literature as the difference in contribution to performance by skilled and unskilled managers (e.g., Ferreira et al., 2012

Table 10 presents the results. Buyout LPEs achieve economically significant winner-minus-loser excess returns of 60 basis points per month (7.2% per year) and benchmark-adjusted returns of about 49 basis points per month (6% per year), which are statistically significant at the 5% level. Growth LPEs also have large winner-minus-loser excess returns (84 basis points per month or 10.1% per year, significant at the 5% level), but the benchmark-adjusted winner-minus-loser returns for Growth are not statistically significant. For the other subsamples, the winner-minus-loser portfolio returns are not significant.

The effect is driven by significant underperformance by the loser portfolio. The question then arises: Why is this underperformance not immediately arbitraged away by competitive investors? One explanation could be that information about LPE skill diffuses slowly into the stock market, enabling informed traders with early information about LPE skill to earn momentum profits (Hong & Stein, 1999).[21] Furthermore, I find evidence of significant economies of scale for buyout LPEs, so the loser LPEs are smaller and therefore likely to run in to limits to arbitrage, such as high short-selling costs, that impede informed traders from acting on their information to correct the mispricing.

A possible explanation for why some LPEs have positive and significant benchmark-adjusted returns could be that these LPEs' returns capture a liquidity premium that is omitted in the benchmark model. For example, in the winner-minus-loser test, the winner stocks could be more exposed than loser stocks to marketwide liquidity conditions, and thus their return would be more positively loaded on a risk factor that captures such conditions. In

[20]Because overlapping returns are used to calculate the cumulative returns in event time, the autocorrelation-consistent bootstrapped standard errors are used to compute the *z*-statistics for the cumulative returns (see Romano & Thombs, 1996).

[21]Korteweg and Sorensen (2017) also find evidence of performance persistence for traditional buyout fund managers and use an argument that resembles that of Hong and Stein (1999) to say that as skilled managers are scarce, investors with the ability to identify skilled managers may also be scarce; therefore, these skilled investors should earn rents.

TABLE 10 Portfolios of listed private equity (LPE) stocks formed on lagged 1-year price return

	P1 (low)			P4 (high)	P4–P1	P1 (low)			P4 (high)	P4–P1
	Buyout					Mezzanine				
Excess return	0.104	0.597	0.664*	0.701*	0.597**	0.755	0.913**	0.803**	0.802**	0.047
	(0.226)	(1.389)	(1.655)	(1.778)	(2.446)	(1.616)	(2.089)	(2.024)	(2.045)	(0.186)
MKTRF	1.188***	1.183***	1.164***	1.176***	−0.011	0.963***	0.922***	0.948***	1.032***	0.069
	(18.79)	(22.19)	(24.27)	(23.98)	(−0.189)	(8.760)	(9.274)	(11.40)	(13.43)	(0.935)
SMB	0.132	0.200*	0.247**	0.306**	0.174	0.448*	0.475**	0.269*	0.144	−0.305
	(0.776)	(1.756)	(2.105)	(2.257)	(0.936)	(1.895)	(2.227)	(1.670)	(0.971)	(−1.617)
HML	0.294**	0.155*	0.054	0.045	−0.248**	0.202	0.424**	0.625***	0.587***	0.385
	(2.298)	(1.763)	(0.593)	(0.495)	(−2.135)	(0.677)	(2.061)	(3.868)	(4.225)	(1.394)
WML	−0.291***	−0.299***	−0.157**	0.0019	0.293***	−0.374**	−0.335**	−0.180**	−0.133*	0.241*
	(−3.211)	(−5.336)	(−2.508)	(0.0355)	(4.276)	(−2.280)	(−2.323)	(−2.230)	(−1.755)	(1.798)
Constant	−0.455*	0.060	0.086	0.036	0.491**	0.307	0.417	0.220	0.187	−0.121
	(−1.866)	(0.318)	(0.469)	(0.186)	(2.021)	(0.805)	(1.190)	(0.794)	(0.729)	(−0.442)
Obs.	228	228	228	228	228	228	228	228	228	228
R^2	0.723	0.812	0.803	0.776	0.120	0.492	0.548	0.599	0.649	0.084
	Venture capital					**Growth**				
Excess return	−0.109	−0.210	−0.249	−0.157	−0.049	−0.008	0.668*	0.795**	0.834**	0.843**
	(−0.157)	(−0.348)	(−0.427)	(−0.280)	(−0.0929)	(−0.0208)	(1.821)	(2.293)	(2.247)	(2.523)
MKTRF	1.263***	1.170***	1.178***	1.190***	−0.072	0.835***	0.979***	1.005***	1.130***	0.296***
	(9.267)	(9.898)	(10.55)	(11.74)	(−0.642)	(9.770)	(16.52)	(17.82)	(19.34)	(3.505)

TABLE 10 (Continued)

	P1 (low)			P4 (high)	P4–P1	P1 (low)			P4 (high)	P4–P1
SMB	1.661***	1.948***	1.858***	1.661***	−0.000	0.124	0.252*	0.186	0.193	0.069
	(4.751)	(5.842)	(5.935)	(5.026)	(−0.000482)	(0.736)	(1.740)	(1.312)	(1.369)	(0.370)
HML	−0.418*	−0.345	−0.399*	0.015	0.432	−0.376**	−0.145	0.274**	0.197	0.573***
	(−1.891)	(−1.545)	(−1.763)	(0.0654)	(1.538)	(−2.422)	(−1.285)	(2.091)	(1.497)	(2.886)
WML	−0.604***	−0.322**	−0.120	0.116	0.720***	−0.170	−0.093	0.033	0.162**	0.332***
	(−3.720)	(−2.184)	(−0.915)	(0.875)	(4.207)	(−1.633)	(−1.119)	(0.414)	(2.073)	(3.032)
Constant	−0.703	−0.953**	−1.059**	−1.130***	−0.428	−0.299	0.196	0.177	0.109	0.409
	(−1.363)	(−2.112)	(−2.455)	(−2.634)	(−0.873)	(−0.982)	(0.834)	(0.818)	(0.472)	(1.193)
Obs.	228	228	228	228	228	228	228	228	228	228
R^2	0.485	0.503	0.487	0.445	0.147	0.496	0.642	0.649	0.665	0.127
	Funds of funds									
Excess return	0.303	0.495	0.575	0.630**	0.328					
	(0.724)	(1.372)	(1.571)	(1.980)	(1.312)					
MKTRF	0.973***	0.980***	0.993***	0.900***	−0.073					
	(14.24)	(15.56)	(13.35)	(16.33)	(−1.406)					
SMB	0.533***	0.404***	0.378**	0.427***	−0.106					
	(2.708)	(2.985)	(2.101)	(3.871)	(−0.566)					
HML	−0.290*	0.157	0.030	0.089	0.379***					
	(−1.784)	(1.247)	(0.151)	(0.776)	(3.048)					
WML	−0.336***	−0.140**	0.034	0.068	0.404***					
	(−3.665)	(−1.963)	(0.251)	(1.060)	(4.670)					

(Continues)

TABLE 10 (Continued)

	P1 (low)			P4 (high)	P4–P1	P1 (low)	P4 (high)	P4–P1
Constant	−0.079	−0.049	−0.022	0.043	0.123			
	(−0.309)	(−0.218)	(−0.080)	(0.214)	(0.545)			
Obs.	228	228	228	228	228			
R^2	0.638	0.681	0.602	0.658	0.251			

Note: This table presents the benchmark-adjusted returns of the quartile portfolios formed by ranking all stocks in each subsample by past 12-month returns (skipping the most recent month), held for 12 months, and the winner-minus-loser (P4–P1) portfolio. Stocks with the highest 1-year past return comprise the quartile 4 portfolio, and stocks with the lowest 1-year past return comprise the quartile 1 portfolio. *z*-statistics estimated using bootstrapped standard errors are in parentheses. The four benchmarks (market RMRF, size SMB, value HML, and momentum WML) are the Fama–French–Carhart global factors downloaded from Kenneth French's website (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). Variables are defined in the Appendix.

*p < 0.10; **p < 0.05; ***p < 0.01.

the FFC plus Pástor–Stambaugh liquidity benchmark model, which captures exposure to marketwide liquidity conditions, the loading of the winner-minus-loser portfolio on the liquidity factor is actually negative (see the Internet Appendix), suggesting that the loser portfolio is more exposed to macroeconomic liquidity risk than the winner portfolio, and thus the winner stocks are not boosted by a liquidity premium relative to loser stocks; in fact, the opposite may be true.

As winner-minus-loser portfolios are prone to crash risk (Barroso & Santa-Clara, 2015; Grundy & Martin, 2001), in the Internet Appendix I present winner-minus-loser portfolio excess returns and benchmark-adjusted returns for the 5-year subsamples (2001–2004, 2005–2009, 2010–2014, and 2015–2019). These tests find little evidence of momentum crashes: Winner-minus-loser portfolios returns are never negative and significant. However it is apparent that although winner-minus-loser returns for buyout LPEs are significant in the 2001–2004 and 2005–2009 periods, they are not significant in the 2010–2014 and 2015–2019 periods. This could be evidence that buyout LPE persistence has weakened over time, consistent with the finding of Braun et al. (2017) who argue that performance persistence of traditional PE fund managers has declined as the PE sector has matured and become more competitive.

4.4 | LPE size and performance

A possible explanation for the performance persistence of buyout LPEs observed in the previous section is negative economies of scale: Larger buyout LPEs may persistently underperform those that are smaller. In the open-end equity mutual fund literature, the argument that fund performance decreases with fund size is proposed by Berk and Green (2004), who posit that larger funds face greater liquidity constraints as these funds' trades have a greater impact on asset prices, which makes it harder for managers of larger funds to trade profitably compared to managers of smaller funds. Also, fund managers have a finite supply of positive net present value investment ideas, and once these are exhausted, fund managers may not be able to find additional value-enhancing investments to absorb excess capital.

Therefore, the performance persistence that I observe for buyout LPEs may simply be a result of small LPEs persistently outperforming large LPEs. To test this hypothesis, I first regress performance measures on LPE market value. I use LPEs' market value rather than their reported total assets as the measure of LPE size, as the reported total assets of an LPE are subjective estimates.[22] The results of univariate regressions are presented in Table 11. These tests indicate that there are positive and significant economies of scale for buyout, growth, and FoF LPEs, but the results are not significant for mezzanine and VC LPEs. Later (see Table 13), results are presented for multiple regressions where other LPE financial ratios are included (debt ratio, expense ratio, turnover ratio, dividend yield), and only buyout funds continue to exhibit positive economies of scale where benchmark-adjusted returns are the performance measure.

Overall, the results do not support the hypothesis that buyout LPE performance persistence can be explained by smaller LPEs persistently outperforming large LPEs; rather, the opposite effect seems to be supported by the data: Smaller buyout LPEs underperform larger LPEs. This finding is consistent with the idea that small stocks may be inefficiently priced by the market because of the slow diffusion of information (Chen & Lu, 2017; Hong & Stein, 1999) and limits to arbitrage (such as high short-selling costs) for small stocks.

Berk and van Binsbergen (2015) argue that as benchmark-adjusted returns may be driven by mechanically decreasing returns to scale rather than fund manager skill, fund manager skill should be measured as the dollar value that the manager extracts from financial markets in excess of their benchmark. The value-added skill measure is then defined as the product of the fund's (lagged) AUM and its benchmark-adjusted return.

[22]However, in unreported tests, I find that using reported total assets as the LPE size measure does not significantly change the inferences.

TABLE 11 Listed private equity (LPE) size and performance

	Buyout		Mezzanine		Venture capital		Growth		Funds of funds	
	Adjusted return (log) (1)	Value added (2)	Adjusted return (log) (3)	Value added (4)	Adjusted return (log) (5)	Value added (6)	Adjusted return (log) (7)	Value added (8)	Adjusted return (log) (9)	Value added (10)
Market value (log)	0.0014***	0.0020***	0.0005	0.0008	−0.0009	0.0003	0.0029***	0.0039***	0.0015	0.0025**
	(3.489)	(5.507)	(0.710)	(1.359)	(−1.234)	(0.499)	(2.670)	(3.782)	(1.255)	(2.171)
Constant	−0.0090***	−0.0156***	−0.0008	−0.0058	−0.0090***	−0.0151***	−0.0187***	−0.0265***	−0.0057	−0.0151**
	(−3.836)	(−7.120)	(−0.179)	(−1.530)	(−2.632)	(−4.681)	(−3.266)	(−4.828)	(−0.861)	(−2.303)
Obs.	14,659	14,022	8346	7919	6828	6494	4123	3962	5011	4815
R^2	0.001	0.003	0.000	0.000	0.000	0.000	0.002	0.005	0.001	0.003

Note: This table presents the results of regressions of monthly (log) benchmark-adjusted returns, and net value added, (log) LPE market value. Bootstrapped *z*-statistics are given in parentheses.

**$p < 0.05$; ***$p < 0.01$.

To estimate the value added for LPEs, I use the benchmark-adjusted return earned each month by each LPE, estimated as the monthly total return for the LPE in excess of its benchmark return, where the benchmark return for an LPE is the systematic risk component of its return, estimated using FFC benchmarks:

$$R_{it}^{B} = \beta_i^{\text{mkt}}\text{MKTRF}_t + \beta_i^{\text{sml}}\text{SML}_t + \beta_i^{\text{hml}}\text{HML}_t + \beta_i^{\text{wml}}\text{WML}_t$$

where R_{it}^{B} is the benchmark return for LPE i in period t; MKTRF_t, SML_t, HML_t, and WML_t are the realizations of the four benchmarks (the global FFC factors); and β_i are coefficients of the ith LPE, which can be estimated by regressing the LPE's excess return on the factors.

I then estimate LPE value added as follows: Each month t, for each LPE, the market value of the LPE in month $t-1$ is multiplied by its benchmark-adjusted return in month t; value added for the LPE is the mean monthly value of this product. The cross-sectional mean value added (denoted Sn) is computed as the average value added of all funds, and the cross-sectional weighted mean value added (denoted Sw) is computed as the mean value added of surviving funds (i.e., the average value added is estimated by weighting each fund by the number of periods it appears in the sample):

$$V_{it} = q_{i,t-1}\left(R_{it} - R_{it}^{B}\right)S_i = \sum_{i=1}^{T_i}\frac{V_{it}}{T_i}S_n = \frac{1}{N}\sum_{i=1}^{N}S_iS_w = \frac{\sum_{i=1}^{N}T_iS_i}{\sum_{i=1}^{N}T_i},$$

where V_{it} denotes the value added for LPE i in period t, $q_{i,t-1}$ is the market value of LPE $_i$ in period $t-1$, R_{it} is the total return for LPE i in period t, T_i is the number of periods that LPE i exists in the sample, and N is the number of LPEs in the sample. As R_{it} is net of expenses, my value-added measure is the net value generated by the LPE for its investors. Thus, my estimates underestimate the LPEs' gross value added.

Table 12 provides results for the LPE samples. The median and mean values added for buyout LPEs are negative, but the values are economically small (median: −$2000 per month, weighted mean: −$6000 per month) and statistically insignificant. For mezzanine LPEs, the median value added is 0, but the means are positive (weighted mean: $12,000), but again not significantly different from zero. VC LPEs destroy significant value, as the weighted mean value added is −$116,000 per month, significant at the 10% level. Growth LPEs have negative (but insignificant) mean value added, but the median values are positive. FoF LPEs have the best value added, as all mean and median values are positive, and the unweighted mean value added ($39,000 per month) is statistically significant at the 10% level. Berk and van Binsbergen (2015) find that the average open-end equity fund generates significant value added of $3.2 million per year (about $267,000 per month), but this finding is based on gross returns. Berk and van Binsbergen (2015) point out that on a value-weighted basis, relative to the FFC model, equity mutual fund investors actually earned a negative and significant net alpha, and they conclude that there is no evidence that equity fund investors share in the fruits of fund manager skill, so the gross value added they find is captured by the fund managers in fees and expenses. Thus, my finding of insignificant value added after fees for buyout and mezzanine LPEs is relatively positive for investors, and the positive net value added for FoF is remarkable.

4.5 | LPE characteristics and performance

Table 13 provides results of several multiple regressions of LPE performance measures on a range of LPE financial ratios. Looking at buyout LPEs, the economies of scale effects identified in the univariate regression survive the inclusion of variables such as debt ratio, expense ratio, dividend yield, asset–turnover ratio, and age. Asset–turnover ratio and age are positively related to benchmark-adjusted returns, whereas debt ratio and expense ratio are negatively related. Buyout LPE value added is strongly associated with just one covariate, asset–turnover ratio.

TABLE 12 Listed private equity (LPE) value added

	Buyout		Mezzanine		Venture capital		Growth		Funds of funds	
	Sn	*Sw*	*Sn*	*Sw*	*Sn*	*Sw*	*Sn*	*Sw*	*Sn*	*Sw*
P1	−1333	−508	−293	−266	−1774	−2988	−107	−143	−115	−153
P5	−156	−140	−103	−124	−315	−350	−105	−87	−74	−89
P10	−88	−54	−33	−51	−208	−327	−88	−81	−66	−68
P25	−11	−9	−17	−12	−79	−58	−43	−39	−9	−8
Median	−2	−2	0	0	−20	−11	−26	−13	13	10
Mean	−21	−6	11	12	−90**	−116*	7	18	39*	29
	(−1.316)	(−0.631)	(0.971)	(0.893)	(−2.306)	(−1.835)	(0.309)	(0.604)	(1.883)	(1.657)
P75	6	6	26	23	−3	−2	38	42	64	54
P90	39	46	84	68	2	1	74	99	127	95
P95	90	59	151	156	16	5	83	111	378	243
P99	270	403	300	526	150	142	459	613	379	338

Note: This table presents statistical properties of the distribution of the cross-sectional mean annual value added (*Sn*) and the cross-sectional weighted mean monthly value added (*Sw*) for the LPE samples. Values are in thousands of 2019 US dollars. The mean and median values are given, as well as the 1st, 5th, 10th, 25th, 75th, 90th, 95th, and 99th percentile values (denoted P1, P5, P99). *t*-statistics of the mean are given in parentheses.

*$p < 0.10$; **$p < 0.05$.

Mezzanine LPE performance is negatively associated with expense ratio and positively associated with asset–turnover ratio; however, unlike buyout LPEs, debt ratio is (weakly) positively associated with mezzanine LPE performance. VC LPE returns are positively associated with asset–turnover ratio, dividend yield, and age, but negatively associated with debt ratio. The expense ratio coefficient is also negative for VC LPE but the effect is not significant for benchmark-adjusted returns. VC value added is positively associated with dividend yield. The univariate economies-of-scale effects for growth LPEs disappear in the multiple regression. Asset–turnover ratio is strongly associated with all growth LPE performance measures, whereas expense ratio is negatively associated with performance. FoF value added is negatively associated with debt ratio and dividend yield, but positively associated with age.

In general, a couple of striking features emerge from these results: the consistently positive relation between asset–turnover ratio and performance, and the consistently negative relation between expense ratio and performance. The turnover ratio result suggests that LPEs that trade more make more, echoing the findings of Pástor et al. (2017) for open-end equity mutual funds. In contrast, management fees and expenses seem to be associated with destruction of net value. This result seems consistent with Phalippou (2020) who argues that a large portion of the value generated by PE funds are paid in fees to a relatively small number of fund management professionals.

5 | TRANSACTION CHARACTERISTICS AND LPE PERFORMANCE

Given the evidence of performance persistence for buyout LPEs and of outperformance by mezzanine LPEs, I consider the determinants of the performance of these LPEs. Specifically, I focus on the association between LPE performance and the characteristics of the deals and exits they sponsor. Exit characteristics have been used in the PE literature as proxies for fund performance. Hochberg et al. (2007) measure fund performance by the proportion

TABLE 13 Listed private equity (LPE) characteristics and performance

	Buyout		Mezzanine		Venture capital		Growth		Funds of funds	
	Adjusted return (log) (1)	Value added (2)	Adjusted return (log) (3)	Value added (4)	Adjusted return (log) (5)	Value added (6)	Adjusted return (log) (7)	Value added (8)	Adjusted return (log) (9)	Value added (10)
Debt ratio	−0.0285***	−10.75	0.0051	10.39*	−0.0279***	−3.409	−0.0303***	0.0487	−0.0220**	−10.16*
	(−5.009)	(−1.456)	(0.837)	(1.650)	(−3.745)	(−0.889)	(−3.246)	(0.0242)	(−2.378)	(−1.753)
Expense ratio	−0.0813***	−28.01	−0.293**	−263.4**	−0.0715	0.916	−0.186***	−35.35***	−0.439**	−131.4
	(−2.853)	(−1.596)	(−2.519)	(−2.185)	(−1.189)	(0.0450)	(−2.814)	(−5.153)	(−2.310)	(−0.802)
Dividend yield	0.508**	251.4	0.397	−273.0	0.683*	352.5***	0.585	14.38	−0.253	−155.2**
	(2.127)	(0.774)	(1.249)	(−0.770)	(1.707)	(2.739)	(1.524)	(0.135)	(−0.889)	(−1.986)
Asset–turnover ratio	0.0119***	4.757***	0.0172***	8.269*	0.0088**	0.808	0.0114***	1.303***	0.0124*	−2.003
	(6.597)	(3.299)	(2.984)	(1.775)	(2.334)	(0.782)	(2.992)	(3.404)	(1.938)	(−0.495)
Age (log)	0.0022*	0	−0.0003	1.338	0.0033*	1.188	0.0019	1.698	0.0078***	3.720***
	(1.850)	(0.101)	(−0.300)	(1.234)	(1.930)	(0.484)	(0.748)	(1.428)	(5.356)	(4.103)
Constant	−0.0266***	−1.138	−0.00157	−5.813	−0.0271***	−8.739	−0.020*	−8.368*	−0.0341***	−15.22***
	(−4.665)	(−0.128)	(−0.263)	(−1.012)	(−3.135)	(−0.773)	(−1.687)	(−1.777)	(−4.458)	(−3.617)
Obs.	12,341	12,341	6,803	6,803	5,550	5,550	3,543	3,543	4,382	4,382
R^2	0.011	0.001	0.004	0.002	0.006	0.000	0.015	0.001	0.015	0.008

Note: This table gives the results of regressions of monthly (log) benchmark-adjusted returns and net value-add on LPE characteristics including debt ratio, expense ratio, dividend yield, asset–turnover ratio, and (log) age. Variables are defined in the Appendix. Bootstrapped *z*-statistics are given in parentheses.

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

of investments that are exited through an IPO or a strategic trade sale to a nonfinancial company, and thus imply that other types of exits such as SBO and MBO exits should underperform. This approach to measuring 10-year fund performance is also used by Cumming (2008), Phalippou and Gottschalg (2009), Cornelli et al. (2013), and Fang et al. (2013).

For each LPE, I use a rolling 3-year window to estimate the total quantity of all transactions and the quantity ratio of each transaction type, where the quantity ratio is the ratio of the number of transactions of that type by an LPE to the total number of transactions by the LPE during the 3-year window. I estimate the value ratio of all transactions as the sum of the values of all transactions by an LPE during the 3-year window scaled by market value of the LPE at the end of the first year of the 3-year window. The value ratios of each transaction type are estimated in a similar way. Using quantity ratios and value ratios rather than raw counts and values ensures that my tests are not simply picking up LPEs that make more or bigger trades. I then examine the contemporaneous association of the quantity and value ratios with LPE performance during the same 3-year window by regressing 3-year performance on 3-year quantity and value ratios. I also conduct out-of-sample tests to see whether transaction-type ratios can predict LPE performance 1 year after the 3-year window.

I use two performance measures as dependent variables: the benchmark-adjusted return and the value added. In the benchmark-adjusted return tests, the final-year LPE size and financial ratios are included as controls, so the estimated coefficients can be viewed as the change in benchmark-adjusted return for LPEs, where size and financial ratios are fixed but transaction quantities or values may vary. In the value-added tests, LPE financial ratios, but not LPE size, are included as controls. It turns out that the 3-year value-added measure is more sensitive to fund size than to benchmark-adjusted returns (see the Internet Appendix). Therefore, positive and significant value-added coefficients identify explanatory variables that are associated with the performance of larger LPEs.

5.1 | Transactions and contemporaneous performance

Table 14 shows the contemporaneous association between 3-year buyout and mezzanine LPE performance and transaction quantity and value ratios. From the literature, I expect to see a strong positive relation between an LPE's performance and the number of IPO and trade sale exits by that LPE. In the data, I find support for this hypothesis in that the quantity ratios for these exit types have positive and significant coefficients in the buyout and mezzanine value-added models (Column 6 in Panel C and Column 8 in Panel D), but the coefficients are insignificant in the benchmark-adjusted return models. The impact of IPOs and trade sale quantity ratios on the value added for mezzanine LPEs is highly significant when they are considered either as separate independent variables or aggregated into one independent variable.

However, the results highlight other transaction-based variables that have strong and consistent associations with LPE performance. The unscaled quantity of exits has a positive and significant association with value added for both buyout (Column 6 in Panel C of Table 14) and mezzanine (Column 8 in Panel D) LPEs, but a negative association with benchmark-adjusted returns. This result is consistent with the view that larger funds trade more, generating higher value added, and is also consistent with the earlier finding that LPE value added is positively associated with asset turnover.

The scaled quantities of solo exits, SBO exits, and cross-border exits have a positive and significant association with value added. Syndicate exit quantities have a positive association with mezzanine LPE value added but not with buyout LPEs, perhaps reflecting that mezzanine LPEs make more syndicate transactions than do buyout LPEs. MBO exit quantities are the only exit type that have a negative association with value added and thus could be seen as a negative proxy for LPE skill.

The value ratio for change-of-control exits has a negative association with value added for buyout LPEs (Column 2 in Panel A of Table 14) but a positive association with value added for mezzanine LPEs (Column 4 in Panel B). When this result is considered alongside the quantity ratio results, it seems that buyout LPEs that focus on

TABLE 14 Transaction characteristics and contemporaneous listed private equity (LPE) performance

Exits	*Panel A: Buyout value*		*Panel B: Mezzanine value*		*Panel C: Buyout quantity*		*Panel D: Mezzanine quantity*	
	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change-of-control exits (s)	0.020*	−0.059***	−0.059*	0.903***	0.024	0.432***	−0.046	0.619***
	(1.952)	(−3.816)	(−1.876)	(9.784)	(0.920)	(5.280)	(−1.744)	(6.990)
Solo exits (s)	0.0174*	−0.052***	0.031	0.180***	0.054*	0.361***	−0.028	0.219***
	(1.770)	(−4.234)	(1.092)	(4.222)	(2.003)	(7.339)	(−0.883)	(3.662)
Syndicate exits (s)	0.017	−0.047**	0.095***	−0.248***	−0.014	0.063	−0.004	0.103***
	(1.447)	(−2.290)	(3.703)	(−4.955)	(−0.573)	(1.603)	(−0.141)	(3.050)
SBO exits (s)	−0.006	−0.060***	0.035**	−0.082***	−0.062**	0.245***	−0.018	0.162***
	(−0.203)	(−3.204)	(2.651)	(−4.450)	(−2.316)	(4.299)	(−1.238)	(3.239)
MBO exits (s)	−0.004	−0.033	−0.015	0.030	0.024	−0.080**	−0.016	−0.007
	(−0.148)	(−1.301)	(−0.596)	(0.876)	(1.124)	(−2.201)	(−1.391)	(−0.177)
Cross-border exits (s)	0.049**	−0.034	0.045*	−0.049	0.008	0.394***	−0.030	0.195***
	(2.275)	(−1.581)	(1.977)	(−1.095)	(0.738)	(7.577)	(−0.988)	(4.084)
Trade sale exits (s)	0.019*	−0.054***	0.080*	−0.248***	0.011	0.158***	0.022	0.250***
	(1.888)	(−4.396)	(1.886)	(−3.216)	(0.390)	(3.156)	(1.556)	(15.83)
IPO exits (s)	0.0110	0.168	0.018	0.197	0.038***	0.479*	0.007	0.452***
	(0.328)	(1.465)	(1.285)	(1.612)	(2.984)	(1.760)	(0.607)	(5.731)
IPO and Trade sale exits (s)	0.019*	−0.051***	0.084*	−0.170**	0.021	0.279***	0.023	0.289***
	(1.955)	(−5.040)	(2.069)	(−2.306)	(0.678)	(3.613)	(1.587)	(13.88)

(Continues)

TABLE 14 (Continued)

Exits	*Panel A: Buyout value*		*Panel B: Mezzanine value*		*Panel C: Buyout quantity*		*Panel D: Mezzanine quantity*	
	Adjusted return (log) (1)	Value added (2)	Adjusted return (log) (3)	Value added (4)	Adjusted return (log) (5)	Value added (6)	Adjusted return (log) (7)	Value added (8)
Minority exits (s)					0.044*	0.046	−0.078**	0.211***
					(1.834)	(0.747)	(−2.677)	(3.691)
All exits					−0.069***	0.600***	−0.054*	0.595***
					(−3.425)	(6.712)	(−2.091)	(6.708)
Deals								
	Adjusted return (log) (1)	**Value added (2)**	**Adjusted return (log) (3)**	**Value added (4)**	**Adjusted return (log) (5)**	**Value added (6)**	**Adjusted return (log) (7)**	**Value added (8)**
Change-of-control deals (s)	0.066***	−0.055	0.0493***	−0.026	0.067*	0.251***	−0.0138	0.243**
	(3.689)	(−1.532)	(3.286)	(−0.578)	(1.773)	(7.451)	(−0.370)	(2.508)
Solo deals (s)	0.080**	−0.134***	−0.010	0.360***	0.049	0.062	0.069***	0.253***
	(2.737)	(−3.162)	(−0.531)	(4.534)	(1.219)	(1.444)	(3.009)	(4.231)
Syndicate deals (s)	0.017	0.0461	0.050***	−0.064	−0.072**	0.219***	−0.051**	−0.089**
	(0.924)	(1.367)	(3.512)	(−1.443)	(−2.550)	(5.804)	(−2.779)	(−2.316)
SBO deals (s)	0.044***	−0.053***	0.022*	−0.025	0.002	0.371***	−0.010	0.245**
	(4.183)	(−3.109)	(1.857)	(−0.536)	(0.137)	(4.379)	(−1.033)	(2.421)
MBO deals (s)	0.023*	0.115*	0.041***	−0.005	0.017	0.450***	0.017	0.180***
	(1.994)	(2.045)	(3.001)	(−0.112)	(1.714)	(5.109)	(0.700)	(2.968)

TABLE 14 (Continued)

Deals								
	Adjusted return (log) (1)	Value added (2)	Adjusted return (log) (3)	Value added (4)	Adjusted return (log) (5)	Value added (6)	Adjusted return (log) (7)	Value added (8)
Cross-border deals (s)	0.026	0.017	0.019	0.051	−0.087***	0.601***	0.001	0.329**
	(1.034)	(0.264)	(1.199)	(1.328)	(−3.396)	(5.336)	(0.034)	(2.838)
P2P deals (s)	0.009	0.415**	0.039***	0.061	0.009	0.401***	0.001	0.066
	(0.707)	(2.475)	(3.860)	(1.282)	(0.423)	(4.352)	(0.025)	(1.511)
Minority deals (s)					−0.078***	0.041	0.017	−0.044
					(−3.324)	(0.837)	(0.747)	(−0.906)
All deals					−0.115***	0.669***	0.026	0.266**
					(−6.916)	(3.605)	(1.345)	(2.909)

Note: This table presents the results of regressions of buyout and mezzanine LPE performance measures on exit (Panels A–D) and deal (Panels E–H) transaction characteristics estimated over rolling 3-year periods. The dependent variables are the log of each LPE's 3-year benchmark-adjusted return (Models (1), (3), (5), and (7)) and 3-year dollar value-add (Models (2), (4), (6), and (8)). Independent variables are the total number of transactions, and the number of minority transactions, change-of-control (solo, syndicate, SBO, MBO, cross-border, trade sale, and IPO) transactions and transaction-type counts of each LPE scaled by the total number of transactions by the LPE (Models (5)–(8)), and LPE-level aggregate transaction values scaled by LPE size (Models (1)–(4)). Scaled variables are marked (s). Models (1) and (2) and (5) and (6) use the buyout LPE sample, and Models (3) and (4) and (7) and (8) use the mezzanine LPE sample. Independent variables are standardized to have mean 0 and standard deviation of 1. Each row consists of a separate regression involving the independent variable and control variables (debt ratio, expense ratio, asset–turnover ratio, and dividend yield). LPE size is included as a control where benchmark-adjusted return is the independent variable. Variables are defined in the Appendix. Year fixed effects are included, and robust standard errors corrected for year-level clustering are in parentheses.

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

TABLE 15 Transaction characteristics and predicted listed private equity (LPE) performance

Exits								
	Panel A: Buyout value		*Panel B: Mezzanine value*		*Panel C: Buyout quantity*		*Panel D: Mezzanine quantity*	
	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All exits					−0.008	−0.098***	−0.018	−0.131***
					(−1.387)	(−4.384)	(−0.758)	(−3.137)
Minority exits (s)					0.019*	0.015	0.027	0.028*
					(1.968)	(0.726)	(1.376)	(1.807)
Change-of-control exits (s)	−0.013**	−0.004	0.011	0.019	−0.014	−0.039*	0.008	0.011
	(−2.380)	(−0.901)	(0.456)	(0.998)	(−0.770)	(−2.038)	(0.534)	(0.621)
Solo exits (s)	−0.015***	−0.005	0.031	0.032*	−0.002	−0.031*	0.044	0.025
	(−4.090)	(−1.056)	(1.224)	(1.837)	(−0.0856)	(−2.061)	(1.101)	(1.118)
Syndicate exits (s)	0.018	0.003	0.006	0.013	0.003	0.003	−0.004	0.015
	(1.643)	(0.643)	(0.260)	(0.746)	(0.297)	(0.434)	(−0.253)	(1.084)
SBO exits (s)	0.018**	−0.002	0.002	−0.004	0.007	−0.005	−0.004	−0.014
	(2.815)	(−0.363)	(0.199)	(−0.347)	(0.495)	(−0.537)	(−0.592)	(−1.315)
MBO exits (s)	0.003	0.001	−0.015*	0.006	0.015	−0.015	−0.005	0.010
	(0.294)	(0.193)	(−1.762)	(0.156)	(1.297)	(−1.434)	(−0.854)	(0.572)
Cross-border exits (s)	0.011	−0.003	0.020	0.041**	−0.014	−0.020	0.009	0.048*
	(1.078)	(−0.722)	(1.278)	(2.462)	(−0.873)	(−0.875)	(0.619)	(1.811)
Trade sale exits (s)	−0.014***	−0.004	0.018	0.013	−0.020	−0.043*	0.003	0.010
	(−3.447)	(−0.781)	(0.404)	(0.554)	(−1.189)	(−1.749)	(0.209)	(0.591)

TABLE 15 (Continued)

Exits								
	Panel A: Buyout value		*Panel B: Mezzanine value*		*Panel C: Buyout quantity*		*Panel D: Mezzanine quantity*	
	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IPO exits (s)	−0.010	−0.005	0.018	0.010	−0.007	−0.017	−0.015	−0.004
	(−0.823)	(−0.247)	(1.310)	(0.773)	(−1.151)	(−1.034)	(−1.154)	(−0.211)
IPO and Trade sale exits (s)	−0.015***	−0.003	0.021	0.015	−0.022	−0.048*	0.002	0.010
	(−3.518)	(−0.818)	(0.464)	(0.571)	(−1.227)	(−1.865)	(0.129)	(0.579)

Deals									
Panel E: Buyout value		*Panel F: Mezzanine value*		*Panel G: Buyout quantity*		*Panel H: Mezzanine quantity*			
Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
All deals					−0.039***	−0.186***	−0.011	−0.089*	
					(−3.142)	(−6.197)	(−0.584)	(−1.865)	
Minority deals (s)					−0.011	−0.003	−0.015	0.027	
					(−0.615)	(−0.153)	(−0.968)	(1.491)	
Change-of-control deals (s)	0.033***	0.004	0.023	−0.021	−0.013	0.001	0.003	−0.033*	
	(5.176)	(0.780)	(1.202)	(−0.723)	(−1.134)	(0.046)	(0.211)	(−1.910)	
Solo deals (s)	0.029***	0.005	0.019	−0.029	−0.002	0.025	0.007	−0.020	
	(4.126)	(0.641)	(1.040)	(−0.844)	(−0.136)	(0.927)	(0.265)	(−0.532)	
Syndicate deals (s)	0.017	0.001	0.020	−0.016	−0.031	−0.032	−0.017	0.013	
	(1.504)	(0.104)	(1.113)	(−0.502)	(−1.446)	(−1.441)	(−0.807)	(0.392)	

(Continues)

TABLE 15 (Continued)

Deals								
Panel E: Buyout value		*Panel F: Mezzanine value*		*Panel G: Buyout quantity*		*Panel H: Mezzanine quantity*		
Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added	Adjusted return (log)	Value added	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
SBO deals (s)	0.013***	0.002	0.003	−0.034*	0.001	−0.006	−0.004	−0.022
	(3.029)	(0.387)	(0.279)	(−2.002)	(0.112)	(−0.321)	(−0.502)	(−1.323)
MBO deals (s)	−0.017**	−0.011	0.008	−0.034	−0.010	0.003	0.022	−0.022
	(−2.591)	(−1.709)	(0.614)	(−1.565)	(−0.689)	(0.157)	(1.381)	(−1.101)
Cross-border deals (s)	0.030***	0.000	−0.005	−0.054**	0.005	0.006	−0.010	−0.062**
	(4.078)	(0.0584)	(−0.408)	(−2.429)	(0.536)	(0.160)	(−0.579)	(−2.873)
P2P deals (s)	0.009	−0.014	0.039	0.058	−0.011	−0.018	0.019**	0.055***
	(0.708)	(−0.544)	(1.047)	(0.573)	(−0.774)	(−0.571)	(2.398)	(4.762)

Note: This table presents the results of regressions of rolling 1-year buyout and mezzanine LPE performance on exit (Panels A–D) and deal (Panels E–H) characteristics measured over lagged 3-year periods. The dependent variables are the log of the 1-year benchmark-adjusted return and the 1-year dollar value added. Independent variables are the lagged 3-year total transaction values of an LPE scaled by its market value, the total number of transactions by the LPE, and transaction type counts scaled by the total number of transactions by the LPE. Scaled variables are marked (s). Independent variables are standardized to have mean 0 and standard deviation of 1. Each row consists of a separate regression involving the independent variable and control variables (LPE market value, debt ratio, expense ratio, turnover ratio, dividend yield, and independent variable, all lagged 1 year). Variables are defined in the Appendix. LPE and year fixed effects are included. Robust standard errors corrected for LPE and year-level clustering are in parentheses.

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

a larger number of smaller deals have the highest value added, whereas mezzanine LPEs that participate in large quantities of large (solo) deals have the highest value added. Value ratio exit variables tend to be weakly and positively associated with benchmark-adjusted returns, suggesting that smaller LPEs that make higher value exits as a proportion of their market value do well.

Looking at deals, I observe patterns generally similar to those for exits. There is a strong and generally positive association between deal quantities and value added for buyout LPEs (Column 6 in Panel G of Table 14) and mezzanine LPEs (Column 8 in Panel H), except for syndicate deal quantity ratio for mezzanine LPEs, which has a negative coefficient. Higher deal quantities are negatively associated with benchmark-adjusted returns, whereas higher deal value ratios are positively associated with benchmark-adjusted returns. It can be inferred that smaller LPEs tend to have higher benchmark-adjusted returns but lower value added. These LPEs make fewer deals, but the aggregate value of those deals are high relative to the market value of the LPE.

5.2 | Transactions and predicted performance

Using the same transaction quantity and value explanatory variables as in the analysis of contemporaneous performance, I examine the relation between LPE transactions in a 3-year window and performance 1 year after the 3-year window. The results are presented in Table 15. LPEs with higher transaction quantities have generally lower 1-year out-of-sample benchmark-adjusted returns and lower value added (Columns 5–8 in Panels C, D, G, and H, respectively). This finding holds for deal and exit transactions, and for buyout and mezzanine LPEs. Buyout LPEs with higher past deal value ratios have higher 1-year benchmark-adjusted returns (Column 1 in Panel E). For mezzanine LPEs, past cross-border exit values (Panel B) and quantities (Panel D) have a generally positive association with out-of-sample performance, but past cross-border deal quantities (Panel F) and especially values (Panel H) are negatively associated with mezzanine LPE performance. Mezzanine LPE performance is strongly associated with past public-to-private deal quantity ratios (Panel H).

It is interesting to compare how predicted and contemporaneous performance relate to transaction variables. LPEs with higher transaction quantities have lower out-of-sample benchmark-adjusted returns. This is similar to the outcome for contemporaneous performance, where LPEs with higher transaction quantities have lower contemporaneous returns. Thus, benchmark-adjusted returns are persistently lower for LPEs with higher trans action quantities (or persistently higher for LPEs with lower transaction quantities). LPEs with higher transaction quantities have lower out-of-sample value added; however, this is the opposite of the outcome for contemporaneous performance, where LPEs with higher transaction quantities have higher contemporaneous value added. Thus, value added is not persistent for LPEs that have higher transaction quantities.

6 | CONCLUSIONS

I examine characteristics and performance of listed permanent capital PE firms and funds. Specifically, I address a range of questions: How does LPE performance compare with public equity indices? Is there evidence of performance persistence for LPEs? Do LPEs face diseconomies of scale? Are LPE financial ratios associated with performance? Focusing on LPEs that make buyout and mezzanine debt investments, I examine whether the characteristics of target firms selected for investment by LPEs are different from those selected by traditional PE funds: Do LPEs prefer solo or syndicate buyout transactions? What type of transactions do LPEs use for acquisitions and disposals? Is LPE performance associated with the number, size, or type of transactions they make? I believe my article is novel in that it is the first to link PE fund performance directly to transaction data in this way.

I document the remarkable 20-year performance of mezzanine LPEs, which has exceeded that of comparable public equity indices by a significant margin, including the Russell 2000, which they beat by 180 percentage points

over 2000–2019. In recent years, buyout and FoF LPEs performed more or less in line with comparable equity indices, whereas growth LPEs underperformed slightly. The VC LPEs in my sample lost 90% of their value between 2000 and 2005 and have failed to recover any ground since then. Consistent with studies of traditional 10-year buyout funds, I find evidence of performance persistence for buyout funds, in that top-quartile funds beat bottom-quartile funds by about 6% annually on a benchmark-adjusted basis. I find little evidence of diseconomies of scale for LPEs; in fact, buyout LPEs exhibit significant positive economies of scale. LPEs with higher asset turnover earn higher benchmark-adjusted returns, whereas LPEs with higher expense ratios earn lower returns. Buyout LPE performance is negatively associated with LPE leverage, but LPE leverage has no significant effect on mezzanine LPE performance.

Buyout LPEs primarily make solo investments in European targets and are more inclined to invest in MBOs rather than divisional buyouts, SBOs, or public-to-private transactions. Mezzanine LPEs prefer syndicate investments in North American targets but are also likely to invest in MBOs, followed by SBOs and divisional buyouts. Trade sale exits are preferred by both buyout and mezzanine LPEs, whereas buyout LPEs are slightly more likely to make IPO exits than mezzanine LPEs and are less likely to exit via bankruptcy. Both buyout and mezzanine LPEs are more likely than other PE firms to invest in SBOs, suggesting that LPEs may take advantage of their permanent capital status to exploit traditional 10-year PE fund managers that are under pressure to liquidate their funds.

In general, I find that LPEs with higher contemporaneous transaction quantities have higher value added but lower benchmark-adjusted returns, whereas LPEs with higher transaction value ratios have higher benchmark-adjusted returns but lower value added. This is because larger LPEs make more transactions, and the value-added measure is more sensitive to LPE size than to benchmark-adjusted returns. It is not surprising that the proportion of IPO exits in an LPE's exit mix has a strong positive association with value added, but these exits are rare. The proportion of IPOs and trade sale exits is a popular proxy for fund performance among researchers, and I find a positive correlation for this measure with value added. The proportion of SBO transactions is also positively correlated with value added. MBO exits are the only exit type that is negatively associated with value added, although MBO deals (acquisitions) are positively associated with performance. The proportion of solo exits has a stronger correlation with value added than does the proportion of syndicate exits, suggesting that LPEs that make more solo deals are more skilled than LPEs that make more syndicate deals. Higher proportions of cross-border deals and exits also have a positive impact on value added. Public-to-private deals have a strong positive impact on buyout LPE performance, but these deals are rare. Although the relation between contemporaneous transaction quantities and LPE value added is positive, LPE value added is negatively related to past transaction quantities, suggesting that LPEs may not be immune to the well-documented boom–bust nature of PE markets.

My findings point to several interesting avenues of further research. For example, I find a positive association between cross-border exits and LPE performance, so it would be interesting to understand how LPEs that make more cross-border exits source their targets when making deals, and how they find buyers when they exit. Do the LPEs' managers have better international networks? Or is their performance simply driven by good market timing? The transaction timing hypothesis could itself be examined more generally, for example, by following Bessembinder et al. (2019) to determine whether skilled fund managers acquire targets when certain factor premiums are high and dispose of them when those factor premiums are low.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX: VARIABLE DEFINITIONS

Variable	Definition
Risk-free rate	1-month Treasury bill rate
Excess return	Total return, less the risk-free rate
Benchmark-adjusted return	Excess return less the systematic return component estimated using a Fama–French–Carhart four-factor model
Value added	Benchmark-adjusted return times lagged total assets
Market cap	Market capitalization (in millions of 2019 US dollars)

Variable	Definition
Total assets	Total assets (in millions of 2019 US dollars)
Debt ratio	Total liabilities divided by total assets
Expense ratio	Ratio of sales and general administrative expenses to net assets
Asset–turnover ratio	Net sales or revenues divided by total assets
Dividend yield	Dividend per share as a percentage of the share price
Age	Firm age (months)
Deal	Transaction where one or more private equity firms invest in a target firm
Exit	Transaction where one or more private equity firms sell their investment in a target firm
Change of control	Transaction where there is a change of control in the target firm
Minority	Transaction where there is not a change of control in the target firm
Deal value	Value (in millions of 2019 US dollars) of the transaction to acquire a target
Exit value	Value (in millions of 2019 US dollars) of the transaction to dispose of a target
Solo	Indicator equal to 1 for a change-of-control deal (exit) involving just one buyer (seller)
Syndicate	Indicator equal to 1 for a change-of-control deal (exit) involving more than one buyer (seller)
P2P	Indicator equal to 1 for a change-of-control deal where a publicly listed target firm is taken private
Divisional buyout	Indicator equal to 1 for a change-of-control deal where the target is a division or subsidiary of the nonfinancial selling firm
SBO	Indicator equal to 1 for a change-of-control deal (exit) where at least one of the buyer (seller) firms is a private equity firm
MBO	Indicator equal to 1 for a change-of-control deal (exit) where the buyers (sellers) are the management of the target firm
Distressed	Indicator equal to 1 for a change-of-control deal where the target firm is financially distressed
Bankrupt	Indicator equal to 1 for a change-of-control exit where the target firm is bankrupt
Cross-border	Indicator equal to 1 for a change-of-control deal (exit) where at least one of the buyers (sellers) is domiciled in a different country from the target firm
IPO	Indicator equal to 1 for an initial public offering exit
LBO	Indicator equal to 1 for a deal (exit) that is a leveraged buyout
Trade sale	Indicator equal to 1 for an exit where the buyer is a nonfinancial firm
Public	Indicator equal to 1 for a deal (exit) involving at least one publicly listed private equity buyer (seller)
MKTRF	Fama-French-Carhart market factor
HML	Fama-French-Carhart value factor
SML	Fama-French-Carhart size factor
WML	Fama-French-Carhart momentum factor