Liquidity in the Secondaries Private Equity Market

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Abstract

We provide evidence on the determinants of liquidity of private equity (PE) fund interests sold in the secondaries PE market and assess the impact of liquidity on pricing. PE fund liquidity is captured by the number of bids, variation in bids, and excess demand for a fund interest, all measured using auction data provided by a large advisory firm. We document that a PE fund interest is more liquid if the fund is larger, has a buyout-focused strategy, less undrawn capital, has made fewer distributions and is managed by a manager whose funds were previously sold in the secondaries market. PE funds' liquidity improves if more non-traditional buyers, as opposed to dedicated secondary funds, provide bids and the overall market conditions are favourable. Finally, we document that our liquidity proxies are significantly and positively associated with the final bids at which the PE fund interests are sold, relative to the average market bids. Overall, our results indicate that important PE fund characteristics affect their marketability and that liquidity is priced in the winning secondaries PE market bids.

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1. Introduction

Private equity secondaries refer to the buying and selling of pre-existing investor commitments (i.e., private equity fund interests) in an over-the-counter market known as the secondaries market. The recent financial crisis has witnessed a significant increase in limited partners' (LPs') requests to sell the private equity funds interests they own. Some investors needed to liquidate their private equity holdings because of the "denominator effect".[1] Others decided to lower their exposure to private equity due to poor actual or expected performance, reallocation of capital to other asset classes, changes in investment strategies, recent banking regulations, M&A activities or simply because they were short of capital and wanted to avoid defaulting on their capital commitments. This supply of fund interests was met by an increased pool of capital for acquisitions in the secondary market buoyed by the entrance of new investors such as sovereign wealth funds and by successful fundraisings of dedicated secondary funds. In this paper, we use a proprietary dataset with secondary market pricing data to provide unique evidence on the determinants of the liquidity of private equity fund interests. Furthermore, we assess the impact of liquidity on the pricing of the fund interests sold in the secondary market.[2]

Liquidity is the single key characteristic that distinguishes private equity as an asset class from listed stocks. While a broad and elusive concept, liquidity generally denotes the ability to trade large quantities of securities quickly, at low cost, and

[1] As the market value of listed stocks fell dramatically during the crisis, the percentage of allocation to private equity often rose above statutory target limits. This phenomenon, known as the "denominator effect," triggered mandatory sales of private equity commitments in order to re-instate these targets.

[2] Since the selling process in the secondaries market is typically conducted through an auction, one could explore issues such as the design of the auction given that bidders submit one bid for the same asset that is likely to have similar values to them (the so-called common value auction in auction theory), the underlying auction structure and/or the pricing mechanism. In this paper we focus on the pricing mechanism and attempt to better understand

without moving their price.[3] The theoretical and empirical literature in finance pioneered by Amihud and Mendelson (1986) has identified several sources of illiquidity such as exogenous transaction costs (e.g., transaction fees and taxes and processing costs); demand pressure when not all potential buyers are present in the market at all times; search costs when it is difficult to locate a counterparty willing to trade; and costs due to asymmetry of information between transacting parties.[4]

All these frictions are likely to impact the liquidity of private equity fund interests traded in the secondary market. First, transaction costs in the secondary private equity market can be quite large due to complexities in the valuation of these funds. Fund interests sold in this market are not homogenous securities given significant variation in the specification of limited partnership agreements and the types of investments that these funds make. Secondary advisory firms are required to spend significant effort to not only value the portfolios of these funds but also set up the optimal transaction structure and search for the right set of buyers. As a result, they commonly charge transaction fees which can be 2% or more of the value of the transaction. Second, fund interests sold in the secondary market include the current fund investments and the remaining unfunded commitments into these funds which are yet to be invested. Unfunded commitments generate additional uncertainty that increase the information asymmetry between buyers and sellers. Third, the private equity funds sold need to fit within the portfolios of the buyers who likely implement different portfolio allocation strategies. Hence, finding appropriate buyers can be

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the underlying liquidity of the secondaries market. We plan to extend our current analysis by investigating the impact of the quality of the underlying fund NAV measurement on the pricing of fund interests.

[3] See for example, Pástor and Stambaugh (2003).

[4] Similar theoretical studies that investigate the relation between liquidity and asset prices include Constantinides (1986) and Vayanos (1998).

quite difficult given their preference for certain vintage years, managers, geographies or industries. Fourth, sellers may have a significant informational advantage over buyers due to their sometimes long-term relationship with fund managers. Potential buyers may worry that trading with such informed counterparties could significantly lower their future returns and even generate future losses. In addition to seller's private information about fund fundamentals, advisory agents representing the seller have private information about the transaction history of a particular fund which is not shared with the bidders in a secondary auction sale.

While the prior empirical literature in public equity markets (e.g., Amihud, 2002) and bond markets (e.g., Chen, Lesmond and Wei, 2007) has established the effect of liquidity levels in the pricing of assets, more recent work emphasizes the importance of systematic liquidity risk in the returns of public equities or bonds (e.g., Pastor and Stambaugh, 2003; Acharya and Pedersen, 2005; Sadka, 2006; Bushman, Le and Vasvari, 2010). This research argues that the liquidity of an individual security is co-moving with the aggregate market liquidity and documents sizeable liquidity risk premia for both stocks and bonds. One would expect that in secondary private equity markets such premia may be even more dramatic. During the recent crisis, LPs appeared to demand liquidity exactly when very low IPO and M&A activities restricted private equity fund distributions, fundraising came to almost a full stop and the public equity markets plunged. However, the expectations of buyers and sellers diverged significantly resulting in a low volume of transactions in the secondary market.[5]

[5] Indeed, despite the urgent need to sell during 2009, the actual transactions volume dropped in the second half of 2009 (Cogent 2011).

Since liquidity is a rather subjective concept, the finance literature has proposed a series of measures to approximate the extent to which a security is liquid or not. In the case of quoted securities for which frequent transactions data is available researchers have used direct measures of liquidity such as bid-ask spreads, daily average of absolute return per volume of trade, trade sizes, trade and quote frequencies and trading volume.[6] In the case of securities where transactions data is limited (e.g., some corporate bonds), researchers resorted to indirect measures which reflect the securities' characteristics (e.g., bonds' size and age). Using detailed auction data we construct several liquidity measures and attempt to identify the relevant characteristics of the private equity fund interests and market conditions that are associated with better liquidity. Specifically, we focus on three measures of liquidity: (1) the number of bids received for a fund interest, (2) the extent of supply-demand imbalance for a fund and (3) the volatility of the bids submitted by potential bidders. In robustness tests, we also consider other measures of liquidity such as alternative specifications for the dispersion of prices, the difference between maximum and minimum bids (range) or the number of days it takes to close a secondaries market transaction.

First, we investigate the role of several factors expected to drive liquidity in the secondary private equity market: (i) fund characteristics such as type, geographical focus, size, level of funding and distributions; (ii) extent of information asymmetry between counterparties proxied by seller type, bidder type, bidder market participation and fund manager restrictiveness; and (iii) the overall market conditions

[6] Relevant papers that use transactions data on public equities are Chordia, Roll, and Subrahmanyam (2001), Sadka (2006), Acharya and Pedersen (2005), Pastor and Stambaugh (2003), Watanabe and Watanabe (2008), Korajczyk and Sadka (2008), Hasbrouck (2009) and Goyenko, Holden and Trzcinka (2009).

and expectations, captured by equity market volatility and the average level of secondary market prices in the immediate past. We document that a private equity fund interest is more liquid if the fund is larger, has a buyout-focused strategy, less undrawn capital, has made fewer distributions and is managed by a fund manager whose funds were previously on the secondaries market. A fund interest is also more liquid if the seller is a dedicated secondary fund or receives more bids from non-traditional buyers. Consistent with the academic findings for listed stocks, we find that the liquidity is higher when the overall market conditions are favourable.

Second, controlling for relevant fund characteristics and the number and sophistication of the bidders, we document that all three liquidity proxies are significantly and positively associated with the final bids at which the private equity fund interests are sold, relative to the average market bids. This finding emphasizes the importance of fund liquidity in the pricing of private equity fund interests. It also indirectly validates our empirical liquidity measures by confirming the predictions of the theoretical literature that liquidity should be priced.

Our unique evidence on the drivers and impact of liquidity of private equity fund interests contributes to both the academic literature on the role and pricing of liquidity for the private equity class and the current regulatory debate. First, we add to the very limited evidence on the impact of illiquidity on the pricing and risk of the private equity asset class. For example, using an index of venture capital returns Metrick (2007) estimates a 1% annual premium for liquidity risk. Lerner and Schoar (2004) examine the role of transfer restrictions imposed by fund managers as a proxy of the funds' illiquidity and document that these restrictions are more likely in situations where asymmetric information problems are more severe. Franzoni, Nowak and Phalippou (2011) study the relationship between fund returns (measured by

realized internal rates of return or IRRs) and measures of aggregate traded liquidity and show that the investment performance is significantly related to the average innovation in aggregate market liquidity. More related to our study, Lahr and Kaserer (2010) investigate determinants of listed private equity fund premia and document that liquidity, as captured by standard measures of stock market liquidity, is indeed priced. Our findings on the determinants and impact of the secondaries private equity market liquidity enrich the previous findings and show that the secondary market incorporates liquidity in its pricing mechanism.

Second, we contribute to the larger literature on the measurement of risks and returns of private equity investments (e.g., Cochrane, 2005; Kaplan and Schoar, 2005; Lerner, Schoar and Wongsunwai, 2007; Driessen, Lin and Phalippou, 2011; and Phalippou and Gottschalg, 2009). These papers, however, do not take into account the wide-ranging effects of illiquidity on the private equity fund returns. Liquidity is likely to explain the cross-sectional variation of the private equity returns after controlling for other characteristics such as risk and the time series relationship between liquidity and securities' returns. In addition, the liquidity of private equity fund interests in the secondary market might also explain why certain private equity funds that trade at a relatively high discount provide high returns.

Finally, our work adds relevant evidence that could fuel the current debate about the effects of the recently approved regulations over private equity investments in Europe. The Alternative Investment Fund Managers directive introduces new restrictions on the ability of non-EU fund managers or funds to solicit investors across the 27-member bloc. These rules may, in certain instances, force a secondary advisor to split the selling limited partner interests between compliant funds and non-compliant funds. This could make the marketing of a secondary transaction more

complex for sellers using intermediaries and may include blocking certain bidders from transactions thus exacerbating the liquidity premia we document.

The rest of this paper is structured as follows. Section 2 discusses the institutional setting of private equity secondaries. We present the data and descriptive statistics in Section 3. Section 4 discusses the factors that likely affect the liquidity in the secondaries market and presents the results. Section 5 presents supplemental analyses on the impact of liquidity on the secondaries market pricing and discusses robustness tests. The final section concludes the paper.

2. The Private Equity Secondary Market

Over the past decade, the secondaries private equity market has experienced rapid and unprecedented growth.[7] As the private equity investors have matured and become increasingly more sophisticated, the economic environment has become more volatile, thus there has been an increase in portfolio rebalancing over shorter timeframes to address rapid changes in circumstances. Fuelled by the development of the primary market, private equity secondaries, or simply secondaries, exist to provide liquidity to an intrinsically illiquid asset class.

Transaction volume in the secondary market has increased from approximately $1.5bn in 1998 to $22bn in 2010 (Cogent, 2011). At the beginning of 2010, there were over 70 dedicated secondary funds which raised a record $23bn in new capital.[8] In addition, other institutional investors such as pension and insurance companies have started to be active buyers in secondary transactions. The average age of limited

[7] Private equity secondaries should be distinguished from a secondary buyout transaction in which a general partner sells a portfolio company to another private equity investor.

partnership interests sold was traditionally more than 7 years, but transactions over the last few years have included a significant percentage of young funds, averaging less than 3 years (Preqin, 2010 and 2011).

There are at least three, and often four, parties involved in secondary transactions: buyers, sellers, intermediaries, and general partners (GPs). We discuss each in the section below. We also present a short overview of the transaction process and the pricing of secondary transactions in the subsections that follow.

2.1 Parties involved in Secondary Transactions

Typical sellers in the secondary market are limited partners (LPs) which include pension and endowment funds, sovereign wealth funds, banks, hedge funds, insurance companies, foundations, family offices, funds of funds, and other institutional investors. There are also secondary funds that subsequently decide to sell portfolios of fund interests purchased earlier, often because they approach the end of their life. Beyond simple access to liquidity, many factors contribute to the LP's decision to sell a stake in the private equity funds they own. Few examples are poor actual or expected fund performance, reallocation of capital to other asset classes, changes in human resources or investment strategies, regulatory changes and M&A activities.

Buyers in the secondary market differ in their approaches, experience and objectives: from being completely opportunistic to having a dedicated secondary investment strategy. Currently, about 40 percent of the buyers are traditional primary

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[8] A report from Dow Jones Private Equity Analyst (2010) noted that secondary funds raised $17.5 billion in 2009, which was more than 80 percent higher than in 2008. It was also the only asset class to improve on 2008 fundraising efforts.

and secondary fund-of-funds as well as specialist secondary funds. The remaining 60 percent are the so-called non-traditional buyers, principally the LPs mentioned above excluding the funds-of-funds (Preqin, 2010). The secondary market facilitates investments in more mature funds allowing buyers to avoid paying early management fees. In this market, buyers can obtain immediate exposure to a diverse range of managers, underlying companies, and vintage years while minimizing, or even eliminating, the risk of investing in a blind pool. Whereas investors in the primary market make commitments to funds to finance future investments in portfolio companies that are not yet known, investors in the secondary market buy an existing pool of assets. Thus, transactions in the secondary private equity market offer greater visibility of the underlying investments, and arguably a more identifiable value.

A significant number of transactions in the secondaries market are intermediated by advisors.[9] These advisors are retained mainly by sellers who wish to dispose of large private equity portfolios. Advisors help with valuation, structuring of the fund offering and the auction execution. Confidentiality remains of critical concern to many GPs during a sale process as it includes the disclosure of fund documents to a potentially large set of buyers.[10] Intermediaries alleviate these concerns by standardizing terms and practices. They also design a more formal and systematic mechanism for the exchange of limited partnership interests which increases the competitiveness of the auctions they run. If a large portfolio of fund interests is up for sale, intermediaries might divide the portfolio into multiple subsets

[9] Cogent Partners, UBS and Campbell Lutyens are the main secondary advisors; other advisors are mainly firms that are normally active as placement agents, such as Probitas Partners and Triago.

[10] The marketing of secondary private equity sales can involve calling on many potential buyers, with varying profiles, sizes, and primary lines of business. At the start of the sales process, advisors frequently inform the GP of

involving multiple buyers. Prospective bidders are then assigned to specific assets. In this case, bidders receive confidential information only on the relevant funds, thereby limiting the distribution of sensitive information.[11]

GPs are typically the ‘‘silent partner’’ in secondary transactions. Their involvement is through control of data sharing on the fund(s); review and approval of potential purchasers; response to due diligence enquiries during the later stages of the sale process; and completion of ownership transfer documentation from seller to buyer. With the recent increase in the frequency of secondary sales, most fund managers treat the process in a non-emotional, professional manner, and often view it as an investor relations opportunity to work with the seller or the intermediary to find a replacement LP of equal or greater quality.

2.2 The intermediated secondary transaction process

An intermediated secondary sale is typically divided into three distinct phases: transaction origination, structuring and execution. During the first phase, secondary advisors evaluate the seller’s situation and motivation and determine the transaction’s feasibility. They also provide up-to-date information on current market conditions and pricing guidance for the specific funds or relevant segments of the private equity industry. In the structuring phase, intermediaries determine the most efficient transaction structure in terms of tax, legal, and regulatory considerations. Structuring

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the interest being auctioned, which helps to obtain the manager’s consent and to identify upfront any concerns a GP may have.

[11] Buyers in secondary auctions also benefit from the services that intermediaries offer through reputation and the reliability of the information provided. In many instances, buyers also rely on intermediaries’ expertise to better understand if the auctioned fund stakes fit with their existing portfolios and strategy.

and packaging a sale is based on the vintage year, sub-asset class, geography, or quality of a GP.

The execution phase is centred on a managed auction process aiming to provide the best value for the seller. The intermediary reaches out to a group of buyers, picked jointly with the seller, typically from a database of active purchasers around the world. Potential buyers undergo the required due diligence after which they are provided with the same set of information, such as fund's financial statements, capital account statements, and fund performance guidance. Based on this information, potential buyers submit bids in a first round of bidding. After the first round of bidding, the seller and the intermediary often shortlist few bidders, and proceed to a second and final round.[12] Altogether the bidding process can take three to six weeks, depending on whether the auction takes place in one or two rounds. The winning bids are not always the highest bids. Sometimes factors such as transaction execution risks or speed of execution might affect the decision of the seller when picking the winner of the auction.

2.3 The pricing practice of secondary transactions

With many sellers of alternative assets being inexperienced, there is often a notable discrepancy between the valuations of a given asset by buyers and sellers. Sellers tend to be guided primarily by the current net asset value (NAV) ascribed by the GP.[13] By contrast, most buyers of secondary assets perform their own independent valuation based on a discounted cash flow analysis which considers: the expected exit

[12] In some instances, the auction ends after the first round of bidding if the seller decides on the winning buyer.

[13] With the implementation of new accounting standards FAS 157 (Financial Accounting Standards Board in the U.S.) and IAS 39 (International Accounting Standards Board based in London), GPs face increased pressure to

value and exit timing for current portfolio investments, the projected future capital calls and the return on future investments made using these capital calls, the legal structure of the fund, and the buyer's target return on the transaction (the discount rate). Regardless of how bidders value the fund interests, their bids are submitted as a percentage of the NAV reported by the fund.

The bidders' valuation process typically includes two separate components. First, the fund's existing portfolio companies are valued. While this follows general valuation principles, there has been an additional challenge in recent times. Companies acquired by private equity funds during the years leading to the financial crisis have been characterized by atypically high leverage ratios, with unusually large debt principal payments coming due over the next few years. Therefore, secondary buyers must assess the credit-worthiness of these companies, whether they will be able to pay off the principal or be forced to refinance at more punitive terms which can have a significant impact on equity values.

The second valuation component is that of the unfunded capital. This component of value is not considered in the fund's reported NAV, yet any secondary buyer will have to assume the existing legal obligation of the selling LP and contribute the unfunded capital commitment going forward. Depending on the buyer's opinion of the fund manager's quality and the current investment environment, this can be considered either as a liability, which will result in a lower bid, or as an asset, which will trigger higher bids.[14] The valuation of unfunded capital subtracts the

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value their underlying portfolio companies at what they believe they could sell the companies for in the current market, which in principle should equal realized market values.

[14] Traditional buyers generally prefer the highest possible visibility into a potential purchase. Funds with unfunded capital have blind pool risk and thus bidders typically assign a larger risk premium to the unfunded position which results in a bid lower than 100 percent of NAV. However, despite being unfunded, some funds receive a premium over the reported NAV. This most often occurs when unexpected positive macroeconomic news arrives and/or the

present value of future fund fees and expenses, and accounts for the expected pattern of capital calls during the remaining investment period of the fund. In sum, bidders estimate the exit value, the timing of current portfolio investments and the future capital calls and distributions taking into account key fund terms, such as management fees, preferred returns, and carried interest.[15]

3. Data Description, Liquidity Measures and Descriptive Statistics

3.1. Sample selection

We obtain anonymised auction bids on private equity fund interests from Cogent Partners, a large secondaries market advisory firm which intermediates a significant percentage of the auctioned secondaries transactions worldwide. Sellers typically auction private equity fund interests in portfolios, thus a secondary deal involves the transfer of ownership of several private equity funds.

All deals in Cogent's dataset contain multiple funds. The nature of the auction process is such that buyers have an option to submit bids either for an individual fund or a set of funds. Accordingly, there are two possible types of bids in the dataset: *spot* and *portfolio*. Spot bids are quoted as percentages of an individual fund's NAV at the time of the auction. Portfolio bids are also quoted as a percentage of NAV and represent the average price a buyer is prepared to pay for a particular set of funds. Bidders can provide simultaneously both portfolio and spot bids. A spot bid allows a bidder to potentially purchase individual funds and gives a signal of the valuation of an individual fund, which is harder to ascertain from a portfolio bid. However,

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manager has a top-tier reputation. Some buyers are willing to pay an ‘‘access premium’’ in order to invest with these managers.

portfolio bids are quite common. They are typically provided by buyers seeking portfolio diversification. From a seller's perspective, portfolio bids generally speed up the execution process as the seller completes the transaction with one counterparty rather than many. These bids make the auction process more efficient especially when the seller wants to liquidate an entire portfolio of private equity funds at once.

For most secondary transaction deals in the Cogent dataset, potential buyers generally submit their bids in two rounds of bidding. The highest 2 to 5 bidders from the first round are jointly selected by Cogent and the seller into the second round where typically the highest bidder wins the auction. The dataset contains bids submitted in both rounds and identifies the auction's winning bid. The dataset also provides unique identifiers for each individual fund auctioned as well as unique identifiers for sellers, bidders and GPs managing the auctioned funds. We aggregate the auctioned funds into portfolios according to their corresponding portfolio bids and assign these portfolios unique identifiers that allow us to track the portfolios in each round of bidding. Finally, the dataset contains extensive information on the characteristics of the funds auctioned (e.g., type, vintage year, approximate size, geographical location, level of distribution and funding), seller and bidder type (e.g., pension fund, endowment fund, dedicated secondary fund, etc.), and reasons for sale.

After requiring data to compute all variables used in our empirical tests, the final dataset consists of a large number of individual fund interests auctioned during the period of 2003-2010. The vintages of these funds span the period from pre-1990 to 2010, with 75 percent of the funds being raised over the period of 1999-2009.

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[15] The method the GP uses to account for carry may substantially depress secondary market pricing. In some cases the GP may have accrued carried interest but may not have taken it yet. If the accrued carried interest has not been deducted from the LP's capital account, then the nominal price of the fund will be much lower.

Table 1 presents first round auction-specific information used in our analysis such as the total number of individual bidders, the total number of bids, the total number of spot bids, average bids and average spot bids. The sample covers a total of 554 unique bidder-year observations containing a total of 28,811 portfolio and spot bids. This number of bids is reached after removing extreme observations at the top and bottom 1 percent tails of the sample distribution and requiring that none of the explanatory or dependent variables has missing values. Over the whole sample period the average bids were 0.75 (or 75 percent of NAV) in the pooled bid sample of spot and portfolio bids.

3.2. Liquidity measures

Since the intermediary and the seller have a say in which bidders progress into the second round of the auction process, we focus on measuring liquidity of fund interests using only auction data from the first round of bidding to avoid any potential selection bias. The distributional statistics of the second round bids are likely to be less informative since the process in the second round is managed by the intermediary who decides together with the seller on a short list of bidders and the most optimal clustering of fund interests into a portfolio.

We construct our own measures of liquidity using auction data from the first round of bidding as measures of liquidity used in the prior literature are not entirely applicable to this setting. In the proprietary dataset we use generally we do not observe repeated sales of the same fund interests as only few funds trade more than once. As a result we are unable to measure the level of trading activity (i.e., volume) for a particular fund. Also, we need to control for the uniqueness of the assets traded

by taking into account that the size of the position being sold or the type of the fund manager might affect the level of observed pricing.

We measure liquidity using a number of proxies that are based on the following fundamental principles: the fund is more likely to be liquid when the bidder interest is higher and the bid range is tighter. We use two proxies for measuring the bidder interest in the fund: the number of actual bids received and the demand for a particular fund. We use dispersion of prices as a measure of how close prices for a given fund are.

Our first measure of fund liquidity in the secondaries market (*Number of Bids*) is computed as the natural logarithm of the number of individual spot or portfolio bids received for a particular private equity fund in the first round of bidding. Portfolio bids are included if a given fund is part of a portfolio on which a bid is placed. This measure is highly correlated with the number of bidders.[16] It follows similar measures used by the prior literature in another over the counter market, the corporate bond market (e.g., Gehr and Martell, 1992; Jankowitsch et al., 2002). We argue that a larger number of bids makes it easier to trade a specific fund, because it is easier to find a counterparty for the transaction. A more liquid fund interest is likely to generate greater buyer interest which should translate into a greater number of bids.

Similar arguments justify our second liquidity measure, *Excess Demand*, which is computed as the natural logarithm of the total monetary bid received for the fund in the first round of bidding minus the maximum bid (both divided by the NAV

[16] We also use the number of unique individual bidders in the first round and replicate our tests with this measure (see Table 5). Our results are robust to using this alternative proxy.

of the fund).[17] The larger the number of bids provided and the greater the premium offered over the NAV of the fund, the greater is the excess demand for the fund and thus the greater is the liquidity of the fund.[18]

Our final liquidity proxy, *Variation in Bids*, captures the bid dispersion defined as the negative of the standard deviation of bids submitted in the first round (thus greater values of this variable indicate more liquidity). This measure reflects the extent to which market participants agree on the value of a fund or a portfolio of funds auctioned. The further the bids are from each other, the more illiquid the fund is likely to be. More heterogeneous beliefs should increase the liquidity premium given that a larger diffusion among bidders exacerbates the uncertainty about prices. We require at least five bid observations for a given fund when measuring the variation in bids to mitigate the effect of potential outliers. We construct this measure for spot and portfolio bids separately. This additional data requirement reduces the initial sample of fund-years by almost one half.[19]

Table 2 presents descriptive statistics for our liquidity measures and control variables for the spot bid (Panel A) and the pooled spot and portfolio bid (Panel B) samples as measured during the first round of the bidding process. Detailed definitions of the variables are provided in the notes to the tables. We focus mainly on the first round spot bid sample in our analysis and use the pooled sample in sensitivity tests. As can be seen from Table 2, the logarithm of the number of bids has a mean of

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[17] For instance, assume that a fund has a NAV of $1000 and the fund receives three bids: 120, 135, and 115. The excess demand measure is computed as ln [(120%*1000 +115%*1000 - 135%*1000) /1000].

[18] One potential concern with this measure is that it might capture market expectations rather than liquidity. To mitigate this concern we control for market expectations in our analysis by taking into account contemporaneous prices of listed private equity funds which reflect market sentiment.

[19] We also used the price range (the difference between maximum and minimum bids for a given fund) and other definitions of price dispersion (e.g., one minus the standard deviation of prices and inverse of the standard deviation of prices). Our results are robust across these alternative definitions.

1.54 for spot bids (1.40 for spot and portfolio bids combined), which is equal to approximately 5 spot bids (4 spot and portfolio bids) for an average private equity fund in our sample.[20] The logarithm of excess demand has a mean of 1.24 for spot bids and 1.30 for the pooled spot and portfolio bids, which translates to excess demand multiples of 3.45 and 3.67 times the NAV of the average fund auctioned. The average of the negative dispersion of bids (the negative of the variation in bids reflects more liquidity) is -0.16 both in the spot bids sample and in the pooled sample.

4. Results

In this section we start with a discussion of the main factors that potentially affect private equity fund liquidity in the secondary market. We then provide an interpretation of the results of our determinants of liquidity tests. Finally, we discuss the liquidity pricing impact analysis.

4.1. Liquidity Drivers

Several factors are likely to impact the liquidity of private equity fund interests in the secondary market. We discuss how each of these variables is measured, what makes them likely liquidity drivers and their predicted relation with our liquidity proxies. We provide a concise set of definitions for each of these variables in the Appendix.

Fund Characteristics

[20] Some funds only receive portfolio bids in the first round thus the overall average number of bids is lower in the pooled sample.

The first set of factors we consider are fund characteristics, starting with the fund type. In particular, we take into account whether a fund offered in the secondary market is a buyout fund or not (*Buyout*). Compared with venture funds in particular, buyout funds represent a more mature asset class and are certainly more tangible. In addition, most of the fundraising in private equity is focused on the buyout side which historically has performed better (Preqin, 2010). Hence we expect a positive impact on liquidity if a fund is a buyout fund.

Second, we take into account the geographical location of a fund. Since the majority of our sample consists of funds originating in North America (see Table 2), we use an indicator variable for whether a fund is from North America (*North American fund*) or not. This indicator variable may be viewed as proxy for maturity of the industry and for the geographic proximity to most investors, since the majority of bidders during our sample period are from North America. Hence, this indicator variable could proxy for better known and, arguably, more transparent assets; and thus it should be associated with more fund liquidity. However, the North American funds may be less liquid if the North American bidders demand more geographical diversification of their private equity portfolios.

The third factor is the fund size (*Fund Size*). There are several reasons why one would expect a positive relationship between size and liquidity. First, the size of the underlying asset has been documented to be a dominant driver of liquidity in the market microstructure literature (in the case of both public equity and bond securities) as the degree of visibility and analyst (research) following is directly related to the overall economic interest in the market place. The larger a company is, the more it is researched and followed by analysts, the lower is the information asymmetry about this firm. A similar argument can be made for larger private equity funds: the larger is

the fund, the more likely it is to be visible or known to the investors seeking to buy interest in this fund. Second, the fund size in private equity is highly correlated with the past performance and quality of the fund manager, among other factors, which is likely to improve investors' interest. Third, larger funds generally command more interest. In other words, there are more LPs who already have an interest in the fund and for them the incremental effort in completing due diligence on a potential purchase is minimal (practically zero). Also, from an administrative point of view, there is no need to develop a relationship with a new GP. These factors contribute to lower transaction costs for these LPs which, at the margin, should improve the liquidity of the fund.[21]

Fourth, we consider the percentage of capital that remains unfunded in the underlying fund (*Percentage unfunded*). For highly unfunded funds, the value of the fund is derived primarily from GP's reputation and hence bidders have higher exposure to blind pool risk. Moreover, some bidders in the secondary market want to avoid the blind pool risk altogether thus further reducing the set of potential buyers. These arguments indicate that unfunded funds are likely to be less liquid. The negative relationship with respect to the fund's liquidity should be even more acute when financial markets become illiquid and LPs fail to meet their capital commitments. In Figures 1 to 3 we plot the time series evolution of the extent of underfunding in the secondary market and our three liquidity measures. Consistent

[21] One potential concern might be that price is driven by the fund size directly rather than its liquidity. To mitigate this concern we control for fund size in our pricing tests. We also conduct quartile regressions based on fund size as part of our robustness tests. Our findings remain consistent in this specification and do not appear to be driven by fund size only.

with our priors all graphs indicate a negative relation between this measure and secondary market liquidity.

Fifth, we consider the percentage of capital distributed to committed capital, *Percentage distributed*. Funds with large distribution ratios are already in the harvesting period. They may have fewer assets left in the portfolio and/or they might have exited the most successful early investments. If the majority of the assets left are residuals at the end of the fund's life, then the value is difficult to measure giving rise to significant uncertainty. In this case, we hypothesise that the percentage distributed variable will be negatively associated with the liquidity level.

Information asymmetry proxies

Next, we control for several constructs that capture the extent of information asymmetry between counterparties in private equity secondary transactions. First, we take into account whether the seller is sophisticated or not (*Sophisticated seller*). We assume that a seller is sophisticated if they are a private equity or a secondary fund. A secondary fund is more used to the secondary transaction process and is driven by price maximization. Hence, such sophisticated sellers will be ready to involve a larger group of buyers and would be willing to spend effort to decrease the information asymmetry gap by presenting more information and responding to more detailed fund due diligence requests. Furthermore, these sellers will likely be better able to time the sale when the market conditions are more favourable. All these arguments suggest that seller’s sophistication could improve an auctioned fund's liquidity. However, it may also deter bidders on the ground of asymmetric information as a sophisticated seller might be more able to present information in a more favourable way.

Second, the information asymmetry might be lower if the GP of the fund had the same fund or other funds managed offered for sale over a period of six months

prior to the sale in question (*GP with funds for sale during previous year*). Having had funds for sale in the previous year also implies that some bidders might have already undertaken the due diligence of funds managed by this GP and hence the visibility of the GP is likely to have improved. On the other hand, there could be a negative signal about the quality of a particular GP when his fund interests are auctioned frequently.

Third, similarly to Lerner and Schoar (2004), we consider constraints imposed by fund managers on access to information about the fund (*Restrictive GP*).[22] Certain restrictions on who might access fund-specific information could limit the number of bidders. Although we do not have data on GPs' behaviour in each particular auction process, we expect this variable to reduce the number of bids and hence have a negative effect on liquidity.

Fourth, the degree of bidder sophistication should also affect the bidding behaviour. We define sophisticated bidders in the same way as we define sophisticated sellers: private equity funds and secondary funds are considered to be sophisticated buyers (*Percentage of sophisticated buyers*). This variable may work in two directions. Generally, sophisticated buyers are considered to be more informed. The more informed the bidders are, the more liquid is the market in which they participate since they are expected to deal effectively with any informational advantage that the sellers might have. On the other hand, the fund might be more illiquid since non-traditional buyers who are less sophisticated shy away from competing with informed buyers.

[22] The fund manager's written consent is invariably required for any transfer and generally may be withheld at its discretion.

Fifth, we add a variable that captures how active the bidders have been in the previous six months prior to placing the observed bid (*Percentage of bidders with other bids*). This variable captures the level of information accumulated by the buyers in the secondary private equity market. The more bids buyers provide on other deals, the more information they collect from other funds prospectuses and due diligence processes. We generally expect this variable to act similarly to the *Percentage of sophisticated buyers*.

Market Conditions

Undoubtedly, the overall market conditions affect the pricing in the secondary market as well. Since the majority of the funds in our sample are from North America, we proxy for the overall market conditions in the US market by estimating the volatility of the public equity market, as measured by the volatility of the S&P1500 index (*Volatility*). The negative correlation between volatility and liquidity is well documented in the market microstructure literature. Our volatility measure is market-wide volatility where asymmetric information is not as relevant. Instead, the volatility of the overall market shows the prevalent macroeconomic conditions and market sentiment.

We also control for the overall secondaries market sentiment by using average prices available for the listed private equity funds (LPE) in the S&P Listed Private Equity index (*Average market bid (LPE)*). It is an open debate if private equity fund NAVs are lagging the public equity market or not. The NAV prices of LPEs could genuinely indicate a market concern about the private equity asset class in general. As a result, a low level of NAV pricing can be an indicator of low sentiment and less market liquidity.

Finally, because liquidity varies over time due to the general macroeconomic conditions and investment cycles, we expect that there is time-specific unobserved heterogeneity. Therefore, we include year fixed effects in all of our estimations to take into account the impact of this unobserved heterogeneity on liquidity over time. This allows us to proxy for potential market-wide investor uncertainty about what transaction costs investors will incur in the future when they need to sell an asset. Brunnermeier and Pedersen (2005) offer a model that explains such variations over time.[23]

As can be seen from Table 2, Panel A, 53 percent of the spot bids received in the first round are for buyout funds and 79 percent are for funds from North America. Funds for which bids are received have on average 60 percent of distributed capital and are 16 percent unfunded. On average, 3 percent of sellers in our sample are sophisticated sellers and 40 percent of GPs in our sample have had funds for sale during the year prior to a given transaction. In addition, 4 percent of GPs in our sample were on average restrictive. The volatility of the S&P1500 index has a mean of 19 percent during the whole sample period, and the average market bid, proxied by the index of the listed private equity S&PLPE index has a price of 137 percent of the NAV in our sample.

In terms of the characteristics of buyers, on average 64 percent of all bidders were sophisticated and 72 percent had placed bids for other funds during the year prior to the bid in question.

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[23] In robustness tests we also check whether our results are sensitive to the definition of fixed effects. In particular, we also test whether vintage fixed effects, buyer fixed effects and seller fixed effects impact our findings. We believe our current specification is more appropriate as it avoids over-fitting and loss of identification for specific fund, buyer and seller effects.

Table 3 shows Pearson correlations for the spot and pooled samples above and below the diagonal, respectively for the measures of liquidity and factors explaining liquidity. We note a significant and large positive correlation between the *Number of Bids* measure and the *Excess Demand* measure. However, both of these measures' correlations with the *Variation in Bids* is mildly negative suggesting that bid's dispersion is capturing other dimensions that underlie market liquidity.

4.2. Determinants of Liquidity

We test the impact of the above factors on the liquidity of funds in the secondary private equity market by estimating a set of regressions with the liquidity measures as dependent variables and factors that affect liquidity as control variables for each fund *i* across time *t*. We group the factors as fund characteristics, information asymmetries proxies and market conditions:

$$LiquidityMeasure_{it} = \beta Fund_{it} + \gamma Info\,Asymmetry_{it} + \delta Market_{it} + \upsilon_t + \varepsilon_{it}$$

We estimate this equation for each liquidity measure using a panel estimation technique with time fixed effects (expressed as υ_t in the equation above). We cluster the standard errors of our t-statistics at the fund level. Our main results using this equation are presented in Table 4. Models (1), (4) and (7) estimate the impact of the fund and sophisticated seller characteristics on the fund liquidity using *Number of Bids*, *Excess Demand* and *Variation in Bids* as proxies for liquidity respectively. Models (2), (5) and (8) add seller characteristics to fund characteristics for the same three measures of liquidity. Finally, Models (3), (6) and (9) combine all factors that might affect fund liquidity as specified in the equation above.

In line with our expectations described in the previous section, liquidity is significantly higher for buyout-focussed funds, that are larger in size, have

sophisticated sellers and have GPs who have seen interests in their funds being sold during the year prior to the first round of bidding. In particular, in the fully specified model, being a buyout fund increases the number of bids by 13 percent on average.[24] Similarly, the excess demand measure increases by an economically significant 16 percent. In the fully specified model there is no significant impact of being a buyout fund on the variation in bids measure of liquidity.

Similarly, larger funds appear to be more liquid. In particular, according to the results of Model (3) in Table 4, the elasticity of the number of bids to fund size is 10 percent. This implies that a one percentage point increase in the size of the fund will increase the number of bidders for this fund by 10 percent. Similarly the elasticity of excess demand with respect to fund size is approximately 14 percent (Table 4, Model 5). Fund size also significantly decreases the variation in bids (Table 4, Model 9); in particular, a one percentage point increase in the size of the fund results in a one percentage point decrease in the variation in bids.

Also in line with our expectations, funds with a higher percentage of the fund remaining to be funded are less liquid. In particular, a one percentage point decrease in the level of funding leads to a 34 percent decrease in the number of bidders for this fund. Similarly, a one percentage point decrease in the level of funding, leads to a 17 percent decrease in the level of excess demand for this fund. Finally, a one percent decrease in the level of funding leads to a 9 percent increase in the variation of bids for this fund. We also find that funds with a higher percentage of the fund having been distributed are less liquid. In particular, a one percentage increase in the level of

[24] Calculated as $e^{0.1257}$-1.

distribution of the fund leads to a 9 percent decrease in the number of bidders and a 9 percent decrease in the amount of excess demand. There is no significant impact of the percentage of fund distributed on the level of variation in bids; however, the sign remains negative.

Funds that are being sold by a sophisticated seller (private equity firm or a secondary fund) are more liquid. In particular, having a sophisticated seller increases the number of bids by 16 percent in the full model. The sophisticated seller variable has a positive but insignificant effect on the other two liquidity proxies specified in the full models (6) and (9) in Table 4. Funds with GPs that have had other interests for sale during the year prior to the observed bid are more liquid in terms of the number of bids they receive (12 percent increase) and excess demand (13 percent increase) they attract.

Not surprisingly, having a restrictive GP reduces liquidity as measured by the number of bids (a 35 percent decrease in the number of bids) and excess demand (a 32 percent decrease). However, having a restrictive GP actually decreases the variation in bids by 5 percent. This is likely to be due to the following two effects: we require at least five bids in order to estimate variation in bids (hence we might not include some of the observations as a result) and restrictive GPs are likely to choose bidders that are similar (hence also reducing the variation in bids).

High volatility in the stock market during the six months prior to the first round of bidding has a negative impact on liquidity as measured by the number of bids (decrease of 185 percent) and excess demand (by 9-fold). High volatility in the equity market, however, decreases the variation in bids by 14 percent (i.e., it increases liquidity). Prices of listed private equity funds appear to only have an impact on the excess demand liquidity measure. Percentage of sophisticated buyers has a negative

impact on the number of bids (a 168 percent decrease in the number of bidders) and excess demand (a 126 percent decrease in excess demand) while the impact on the variation of bids is positive (variation in bids decreases by 2 percent, hence increasing liquidity). Finally, the percentage of bidders with other bids variable decreases the number of bids by 9 percent, excess demand by 16 percent and the variation of bids by 5 percent.

Table 5 presents similar results for when we use the pooled sample of spot and portfolio bids (first three columns). We also use an additional proxy for liquidity *Number of Bidders*, which is computed as a natural logarithm of the number of individual bidders that submit spot and portfolio bids for a given fund. As Table 5 shows, we find similar results to those of the *Number of Bids* liquidity measure.

4.3. The Impact of Liquidity on Pricing

Our final test is to investigate whether higher liquidity in the first round of bidding leads to better pricing in the secondary market. We use the final winning bids to test whether more liquid fund interests receive relatively higher final prices compared to less liquid fund interests. For this test we rely on the final outcome of the bidding process in the second round of the bidding (or first round final winning price if a fund interest is sold through only one round of bidding).

We use two proxies for fund interest prices to measure the impact of liquidity on prices. In both cases we compute an "abnormal fund price" by adjusting the winning fund bid price using a relevant benchmark. Our first proxy is the final bid divided by the average listed private equity price for the previous six months (*Final Bid / LPE Index Bid)*. The listed private equity price stated as a percentage of NAV is from the S&P Listed Private Equity Index. Our second measure of the impact of liquidity is the

the final bid divided by the average secondaries market bid (*Final Bid / Avg Mkt Bid*). We measure the average market bid using all bids in the Cogent database during the 6 months prior to the auction as observed in our sample.

We estimate the following set of equations for these two price proxies using our liquidity measures and adding few control variables specific to the second round of bidding (*Other*):

$$Price_{it} = \alpha Liquidity_{it} + \beta Fund_{it} + \gamma Info\,Asymmetry_{it} + \delta Market_{it} + \varphi Other_{it} + \upsilon_t + \varepsilon_{it}$$

As can be seen from the summary statistics presented in Table 6, Panel A, the final bid, on average, was 38 percent greater than the six-month average of the in-sample bids prior to the date of the bid and 30 percent lower than the six-month average price of the listed private equity funds. We also include proxies for the number of bidders in the second round (on average 1.1), whether sophisticated buyers are present in the second round (on average 66 percent of the buyers in the second round are sophisticated) and the volatility of the equity market six months prior to the date of the second round (on average 16 percent).

Table 6, Panel B presents the results of estimating the models of the effect of liquidity measures on pricing and shows that all three measures of liquidity have a positive and significant incremental effect on prices of funds in the secondary market after controlling for fund, seller, buyer and market characteristics.[25]

In particular, we find that one additional bid increases the price of a fund interest as a percentage of the LPE by 2.5 percent and as a percentage of the overall market bid by about 8 percent. One additional point of excess demand increases fund

[25] These controls capture some important characteristics such as the stage in the fundraising cycle, cost of capital and risk preference differences.

price as a percentage of LPE by 4 percent and as a percentage of the overall market bid by 9 percent. Finally, one percentage point decrease in the variation of bids leads to a 9.7 percent increase in the prices as a percentage of the LPE price and 17 percent increase as a percentage of the overall market prices measures in this sample. These results indicate that higher liquidity in the secondary market as proxied by our three measures of liquidity, on average leads to a higher price paid for the underlying fund.

4.4. Robustness tests, limitations and avenues for further research

We conduct a number of robustness tests to ensure that our findings are not driven by variable specifications or size of the underlying fund. In particular, in an unreported analysis we test whether our findings are consistent across different definitions of price dispersion measured as one minus the standard deviation of prices, inverse of the standard deviation of prices and the range of prices. Our findings are consistent across all of these alternative specifications.

One common concern in the auction theory is that common value auctions suffer from the "winner's curse" whereby the winner of the auction overpays for the underlying asset when winning the auction (in other words, if the underlying asset has the same fair value to all bidders but bidders do not know it precisely, the highest bidder is likely to have overestimated the value the most and hence pays too much for the asset compared to its underlying value). In order to mitigate this potential concern, we recomputed our dispersion and impact of liquidity measures by using the second highest bid instead. In particular, when computing the dispersion measure, we remove the highest bid from the calculation. Similarly, when computing the two measures of the impact of liquidity on pricing, we use the second highest bid instead of the winning bid. Our results are robust to these alternative definitions.

Another potential concern in this market is whether the funds that are being sold in the secondaries transactions are of poor quality (i.e., is this market for "lemons"). As we have mentioned already, information asymmetry certainly exists between buyers and sellers. However, we mitigate some of these concerns by using data from a market that is managed by an intermediary with its own reputation at stake.[26] An intermediary serves several roles: it provides standardized information to bidders thus removing some of the information asymmetry and it plays a certification role for the quality of assets being sold. The latter arises from the fact that these auctions represent repeated interactions between buyers and the intermediary and hence allow the intermediary to protect its reputation and be able to engage in future transactions. Ultimately, the intermediary is interested to avoid creating a market for lemons to preserve its reputation for future transactions. The lemons problem is also less likely to occur in an auction setting when multiple bidders submit their valuations to the intermediary and the seller.[27]

Finally, it is possible that buyers can be prepared to bid for a portfolio of good and bad assets to get access to a particular fund. Given that the bidding process is more managed at the second round, this concern is most likely to arise in the second round of bidding when most bidders submit portfolio bids. As we do not observe many funds that only receive a spot bid, we construct an alternative measure of liquidity based the number of spot bids received. We obtain similar results in unreported robustness tests.

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[26] Cogent Partners is the leading advisory firm in the secondaries market.
[27] The lemons problem is, however, likely to be more acute in secondary transactions that do not go through intermediaries with reputation.

5. Conclusions

Following the latest global financial crisis, the secondaries private equity (PE) market has been increasingly recognised as a central mechanism to provide exit opportunities to investments in PE funds. Using a proprietary dataset on auction bids provided by a large advisory firm, we investigate determinants of the liquidity and the impact of liquidity on the pricing of PE fund interests sold in the secondaries market. We measure PE fund liquidity by using three proxies computed based on data collected from the first round of bidding for fund interests in the secondary market: the number of bids, the excess demand for a fund interest expressed by bidders, and the variation in bids.

We find that a PE fund interest is more liquid if the fund is larger, buyout-focused, has less undrawn capital and lower distributions and is managed by a GP whose funds were previously on the secondaries market. PE funds are also more liquid if more non-traditional buyers, as opposed to dedicated secondary funds, provide bids and the overall market conditions are favourable (i.e., low volatility of the public equity market and better pricing in the secondary market). Finally, we document that our liquidity proxies are significantly and positively associated with the final bids at which the PE fund interests are sold, relative to the average market bids.

Overall, our results add to the very limited academic literature on how secondary market liquidity impacts the private equity asset class and highlight the importance of liquidity in measuring appropriately the risks and returns provided by private equity funds. Our results indicate that important PE fund characteristics affect their marketability and that liquidity is priced in the winning secondaries PE market bids. Our findings are robust across alternative measure specifications.

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APPENDIX: Variable definitions

Variable Name	Definition
Number of Bids	Natural logarithm of the number of bids received by a fund or a portfolio
Excess Demand	Natural logarithm of excess demand defined as the total monetary bid less the maximum bid divided by NAV (either at the portfolio or fund level)
Variation in Bids	A negative of the dispersion of spot or pooled (spot and portfolio) first round bids. A larger dispersion indicates more illiquidity
Number of Bidders	Natural logarithm of the number of bidders (spot and portfolio combined)
Final Bid / LPE Index Bid	Change in the bids measured as the final bid divided by the average listed private equity price for the previous six months. The listed private equity price is from the S&P Listed Private Equity Index
Final Bid / Avg Mkt Bid	Change in the bids measured as the final bid divided by the average market bid (measured using all bids in the secondary market available in the sample during the previous 6 months)
Buyout	Indicator variable for whether a fund is a buyout fund
North American fund	Indicator variable for whether a fund is from North America
Fund Size	Natural logarithm of the total size of the bid measured as the size of the fund or the size of the portfolio
Percentage distributed	Fund's (portfolio's) distributed amount as a percentage of committed capital
Percentage unfunded	Fund's (portfolio's) unfunded commitments as a percentage of committed capital
Sophisticated seller	Indicator variable for sophistication of the seller, equals 1 if a seller is a private equity or secondary fund
GP with funds for sale during	Proxy for the information asymmetry about a GP, computed as the number of funds managed by the same GP put up for

Variable Name	Definition
previous year	sale during the year prior to the date of the first round of bids
Restrictive GP	Indicator variable for whether a GP of the fund imposes restrictions on who receives access to the information about the fund.
Volatility (Round 1 date) or (Round 2 date)	Equity market volatility (6-month annualised) at the time of the first (second) round of bidding
Average market bid (LPE)	Average market price for listed private equity funds in the six months prior to the first round of bidding in a given deal (using S&P Listed Private Equity Index)
Percentage of sophisticated buyers	Percentage of sophisticated bidders in a portfolio bid; indicator variable for a sophisticated buyer in a spot bid. A buyer is classified as sophisticated if it is a private equity fund or a secondary fund
Sophisticated buyer in round 2	Indicator variable for the presence of sophisticated buyers in the second round. A buyer is classified as sophisticated if it is a private equity fund or a secondary fund
Percentage of bidders with other bids	Percentage of bidders that placed a bid over the prior 6 months. This variable captures the level of information asymmetry between the bidders and the sellers. Bidders that have accessed the market in the recent past should be more informed
Number of bidders in the second round	Natural logarithm of the number of bidders for the fund (or portfolio) in the second round

Figures 1, 2 3: Time series evolution of the Percentage Unfunded (half-yearly averages) and liquidity measures

Figure 1 presents the evolution of the *Number of Bids* liquidity measure over time (left-hand side axis). where Figure 2 presents the evolution of the *Excess Demand* liquidity measure over time (left-hand side axis). Figure 3 presents the evolution of the *Variation in Bids* liquidity measure over time (left-hand side axis). The evolution of the percentage unfunded is on the right-hand side axis. All measures are computed as 6-month averages for the first round of bidding. *Number of Bids* is the natural logarithm of the number of bids received by a fund or a portfolio; *Excess Demand* is the natural logarithm of the total monetary bid less the maximum bid divided by NAV (either at the portfolio or fund level); and *Variation in Bids* is the negative dispersion of spot or pooled (spot and portfolio) first round bids.

Figure 1

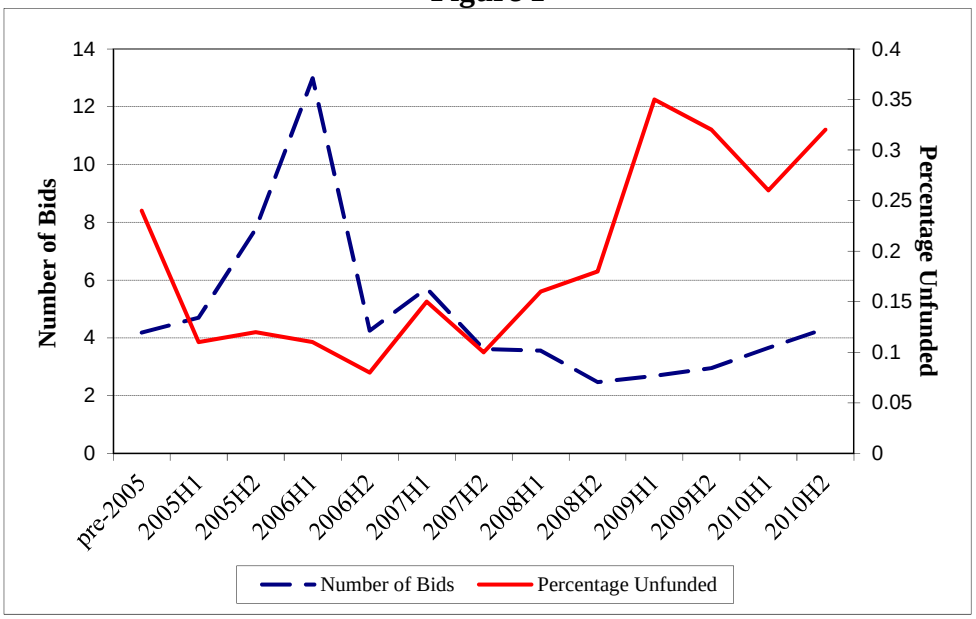

Figure 2

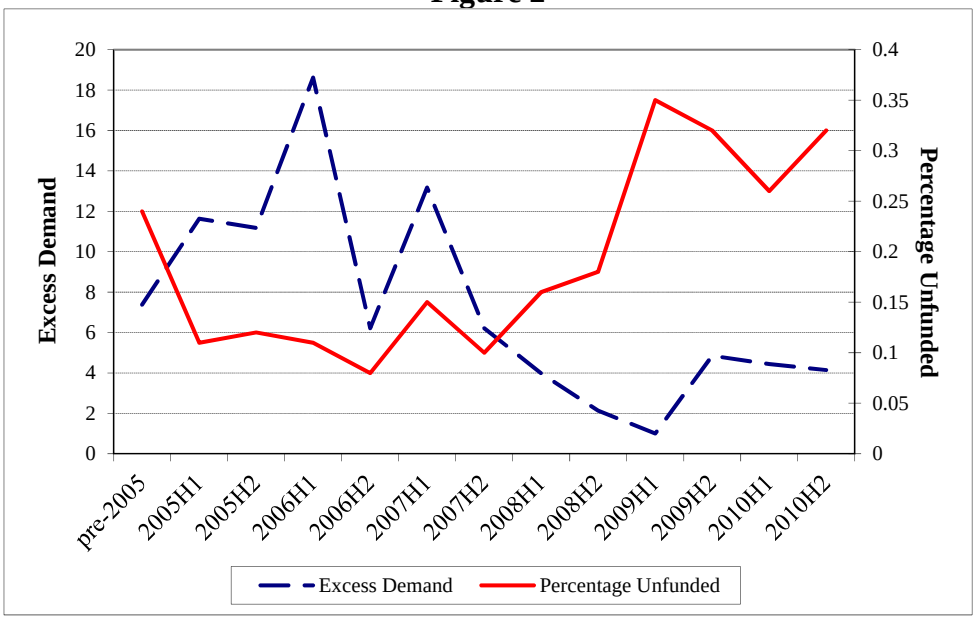

Figure 3

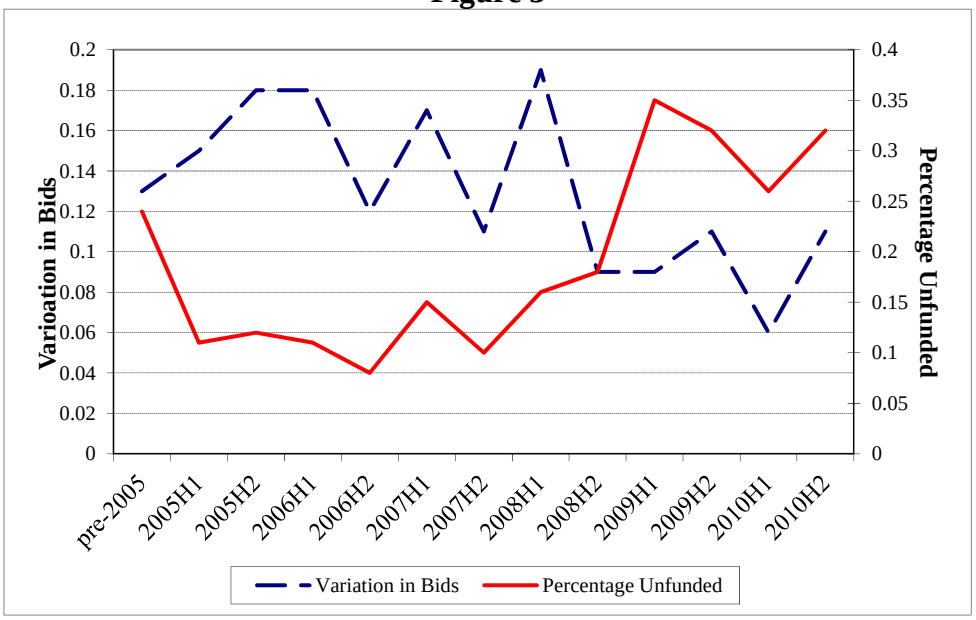
Varioation in Bids
Percentage Unfunded
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
pre-2005
2005H1
2005H2
2006H1
2006H2
2007H1
2007H2
2008H1
2008H2
2009H1
2009H2
2010H1
2010H2
Variation in Bids
Percentage Unfunded

Table 1: Sample composition

This table presents sample composition between 2003 and 2010. *Number of Bidders* is the number of bidders participating in the secondaries market during a given year (spot and portfolio combined); *Number of Bids* is the number of bids received for funds during a given year (spot and portfolio combined); *Average Bid* is the average bid received during a given year (spot and portfolio combined); *Number of Spot Bids* refers to spot bids received during a given year; and *Average Spot Bid* is the average spot bid received during a given year.

Year	Number of Bidders	Number of Bids	Average Bid	Number of Spot Bids	Average Spot Bid
2003	39	607	0.6253	201	0.5784
2004	38	1,110	0.7088	1,068	0.7009
2005	57	6,417	0.8341	6,062	0.8313
2006	60	7,778	0.9128	7,479	0.9099
2007	90	4,427	0.8831	3,583	0.8765
2008	76	4,594	0.7063	4,242	0.7247
2009	108	2,034	0.4329	1,883	0.4129
2010	86	2,451	0.7581	2,215	0.7581
Total	**554**	**28,811**	**0.7480**	**26,532**	**0.7449**

Table 2: Descriptive statistics for the spot and pooled samples (first round of bidding)

This table presents summary statistics for the dependent and control variables used in the empirical tests. *Number of Bids* is the natural logarithm of the number of bids received by a fund or a portfolio; *Excess Demand* is the natural logarithm of the total monetary bid less the maximum bid divided by NAV (either at the portfolio or fund level); *Variation in Bids* is the negative dispersion of spot or pooled (spot and portfolio) first round bids; where larger dispersion indicates more illiquidity; *Buyout* is an indicator variable for whether a fund is a buyout fund; *North American fund* is an indicator variable for whether a fund is from North America; *Fund Size* is the natural logarithm of the total size of the bid measured as the size of the fund or the size of the portfolio; *Percentage distributed* is a fund's (portfolio's) distributed amount as a percentage of committed capital; *Percentage unfunded* is fund's (portfolio's) unfunded commitments as a percentage of committed capital; *Sophisticated seller* is an indicator variable for sophistication of the seller, equals 1 if a seller is a private equity or secondary fund; *GP with funds for sale during previous year* is a proxy for the information asymmetry about a GP, computed as the number of funds managed by the same GP put up for sale during the year prior to the date of the first round of bids; *Restrictive GP* is an indicator variable for whether a GP of the fund imposes restrictions on who receives access to the information about the fund; *Volatility (Round 1 date)* is the equity market volatility (6-month annualised) at the time of the first round of bidding; *Average market bid (LPE)* is the average market price for listed private equity funds in the six months prior to the first round of bidding in a given deal (using S&P Listed Private Equity Index); *Percentage of sophisticated buyers* is a percentage of sophisticated bidders in a portfolio bid or an indicator variable for a sophisticated buyer in a spot bid; where a buyer is classified as sophisticated if it is a private equity fund or a secondary fund; and *Percentage of bidders with other bids* is a percentage of bidders that placed a bid over the prior 6 months capturing the level of information asymmetry between the bidders and the sellers. Dependent variables are adjusted for the effect of the outliers by removing the top and bottom 1% of the distribution. Panel A presents results for spot bids and panel B presents results for the pooled sample with spot and portfolio bids combined.

Panel A	**Spot Round 1**					
	N	**Mean**	**Std**	**P25**	**P50**	**P75**
Number of Bids	4,108	1.54	0.70	1.10	1.61	2.08
Excess Demand	4,108	1.24	0.88	0.65	1.31	1.89
Variation in Bids	2,302	-0.16	0.08	-0.20	-0.14	-0.11
Buyout	4,108	0.53	0.50	0.00	1.00	1.00
North American fund	4,108	0.79	0.41	1.00	1.00	1.00
Fund size	4,108	18.00	1.32	17.12	17.91	18.89
Percentage distributed	4,108	0.60	0.81	0.06	0.32	0.88
Percentage unfunded	4,108	0.16	0.20	0.01	0.08	0.22
Sophisticated seller	4,108	0.03	0.17	0.00	0.00	0.00
GP with funds for sale during previous year	4,108	0.39	0.49	0.00	0.00	1.00
Restrictive GP	4,108	0.04	0.19	0.00	0.00	0.00
Volatility (Round 1 date)	4,108	0.19	0.12	0.11	0.15	0.21
Average market bid (LPE)	4,108	1.37	0.35	1.22	1.44	1.58
Percentage of sophisticated buyers	4,108	0.64	0.20	0.56	0.67	0.75
Percentage of bidders with other bids	4,108	0.72	0.28	0.56	0.75	1.00

Panel B	Pooled Round 1					
	N	Mean	Std	P25	P50	P75
Number of Bids	4,756	1.40	0.78	0.69	1.61	1.95
Excess Demand	4,756	1.30	0.96	0.66	1.36	1.95
Variation in Bids	2,374	-0.16	0.08	-0.19	-0.14	-0.10
Buyout	4,756	0.54	0.50	0.00	1.00	1.00
North American fund	4,756	0.78	0.42	1.00	1.00	1.00
Fund size	4,756	18.26	1.50	17.22	18.13	19.27
Percentage distributed	4,756	0.61	0.79	0.07	0.36	0.85
Percentage unfunded	4,756	0.16	0.20	0.01	0.09	0.22
Sophisticated seller	4,756	0.03	0.16	0.00	0.00	0.00
GP with funds for sale during previous year	4,756	0.41	0.49	0.00	0.00	1.00
Restrictive GP	4,756	0.04	0.19	0.00	0.00	0.00
Volatility (Round 1 date)	4,756	0.19	0.12	0.11	0.16	0.21
Average market bid (LPE)	4,756	1.37	0.36	1.15	1.44	1.60
Percentage of sophisticated buyers	4,756	0.65	0.20	0.57	0.67	0.76
Percentage of bidders with other bids	4,756	0.72	0.29	0.56	0.75	1.00

Table 3: Correlation of main measures and control variables (spot and pooled samples, first round of bidding)

This table shows Pearson correlation coefficients for the spot (above the diagonal) and pooled (below the diagonal) samples. *Number of Bids* is the natural logarithm of the number of bids received by a fund or a portfolio; *Excess Demand* is the natural logarithm of the total monetary bid less the maximum bid divided by NAV (either at the portfolio or fund level); *Variation in Bids* is the negative dispersion of spot or pooled (spot and portfolio) first round bids; where larger dispersion indicates more illiquidity; *Buyout* is an indicator variable for whether a fund is a buyout fund; *North American fund* is an indicator variable for whether a fund is from North America; *Fund Size* is the natural logarithm of the total size of the bid measured as the size of the fund or the size of the portfolio; *Percentage distributed* is a fund's (portfolio's) distributed amount as a percentage of committed capital; *Percentage unfunded* is fund's (portfolio's) unfunded commitments as a percentage of committed capital; *Sophisticated seller* is an indicator variable for sophistication of the seller, equals 1 if a seller is a private equity or secondary fund; *GP with funds for sale during previous year* is a proxy for the information asymmetry about a GP, computed as the number of funds managed by the same GP put up for sale during the year prior to the date of the first round of bids; *Restrictive GP* is an indicator variable for whether a GP of the fund imposes restrictions on who receives access to the information about the fund; *Volatility (Round 1 date)* is the equity market volatility (6-month annualised) at the time of the first round of bidding; *Average market bid (LPE)* is the average market price for listed private equity funds in the six months prior to the first round of bidding in a given deal (using S&P Listed Private Equity Index); *Percentage of sophisticated buyers* is a percentage of sophisticated bidders in a portfolio bid or an indicator variable for a sophisticated buyer in a spot bid; where a buyer is classified as sophisticated if it is a private equity fund or a secondary fund; and *Percentage of bidders with other bids* is a percentage of bidders that placed a bid over the prior 6 months capturing the level of information asymmetry between the bidders and the sellers. * refers to significance at the 5% level or less.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	**Number of Bids**	1	0.9291*	-0.0837*	0.0779*	0.0606*	0.0763*	-0.0576*	-0.0694*	0.0779*
(2)	**Excess Demand**	0.6815*	1	-0.1511*	0.0503*	0.1105*	0.0567*	-0.0192	-0.0681*	0.0594*
(3)	**Variation in Bids**	-0.0958*	-0.0930*	1	0.1595*	-0.0615*	0.2386*	0.026	-0.1075*	-0.1236*
(4)	**Buyout**	0.0595*	0.0572*	0.1590*	1	-0.2088*	0.3947*	0.0052	0.0487*	-0.1077*
(5)	**North American fund**	0.0484*	0.0589*	-0.0688*	-0.2163*	1	-0.0003	0.0736*	-0.0974*	0.0380*
(6)	**Fund size**	-0.1546*	0.1930*	0.2539*	0.3643*	-0.0336*	1	-0.1165*	0.1784*	-0.1416*
(7)	**Percentage distributed**	-0.0400*	0.0016	0.0356	-0.0119	0.0834*	-0.0946*	1	-0.3917*	-0.0937*
(8)	**Percentage unfunded**	-0.0900*	-0.0775*	-0.1089*	0.0598*	-0.0939*	0.1718*	-0.4007*	1	0.0292
(9)	**Sophisticated seller**	0.0733*	0.0484*	-0.1255*	-0.1130*	0.0441*	-0.1342*	-0.0935*	0.0280	1
(10)	**GP with funds for sale during previous year**	-0.0225	-0.0053	0.1108*	0.1362*	-0.0150	0.3493*	0.0416*	-0.0176	-0.1076*
(11)	**Restrictive GP**	-0.0873*	-0.1019*	0.0957*	0.0565*	-0.0265	0.1081*	0.0042	0.0562*	-0.0196
(12)	**Volatility (Round 1 date)**	-0.3493*	-0.5017*	0.1967*	0.1207*	-0.1329*	0.2070*	-0.0827*	0.1437*	-0.1192*
(13)	**Average market bid (LPE)**	0.1278*	0.3002*	-0.1248*	-0.1180*	0.0946*	-0.1752*	0.2185*	-0.2985*	0.0100
(14)	**Percentage of sophisticated buyers**	-0.1609*	-0.0681*	0.1382*	0.0483*	0.0537*	0.0505*	0.1470*	-0.2146*	-0.2856*
(15)	**Percentage of bidders with other bids**	-0.0737*	-0.0389*	0.2331*	0.1879*	0.0604*	0.1703*	0.0836*	-0.0883*	-0.1995*

Table 3: (continued)

		(10)	(11)	(12)	(13)	(14)	(15)
(1)	**Number of Bids**	0.0212	-0.1120*	-0.3802*	0.1101*	-0.1701*	-0.1157*
(2)	**Excess Demand**	-0.0067	-0.1014*	-0.5371*	0.2738*	-0.1315*	-0.1086*
(3)	**Variation in Bids**	0.1164*	0.0990*	0.1982*	-0.1523*	0.1373*	0.2252*
(4)	**Buyout**	0.1356*	0.0584*	0.1412*	-0.1132*	0.0539*	0.2044*
(5)	**North American fund**	-0.0024	-0.0357*	-0.1593*	0.1079*	0.0381*	0.0508*
(6)	**Fund size**	0.3694*	0.1394*	0.2327*	-0.2076*	0.0058	0.1888*
(7)	**Percentage distributed**	0.0460*	-0.0034	-0.0859*	0.2072*	0.1405*	0.0577*
(8)	**Percentage unfunded**	-0.029	0.0627*	0.1390*	-0.2815*	-0.2214*	-0.0754*
(9)	**Sophisticated seller**	-0.1021*	-0.0191	-0.1181*	0.0137	-0.2964*	-0.2111*
(10)	**GP with funds for sale during previous**	1	0.0388*	0.1848*	-0.1121*	0.0837*	0.1423*
(11)	**Restrictive GP**	0.0464*	1	0.1066*	-0.0548*	-0.0384*	0.0723*
(12)	**Volatility (Round 1 date)**	0.1957*	0.1003*	1	-0.4806*	-0.1549*	0.1099*
(13)	**Average market bid (LPE)**	-0.1229*	-0.0531*	-0.4669*	1	0.1113*	0.1035*
(14)	**Percentage of sophisticated buyers**	0.0737*	-0.0381*	-0.1468*	0.1077*	1	0.2573*
(15)	**Percentage of bidders with other bids**	0.1245*	0.0758*	0.0811*	0.1371*	0.2690*	1

Table 4: Multivariate regressions (spot bids, first round of bidding)

This table presents the results of the tests of liquidity measures for spot bids in the first round of bidding. Models (1) - (3) show the results with the number of bids received in the first auction round as a measure of liquidity. Models (4) - (6) show the results with excess demand as a measure of liquidity. Models (7) - (9) show the results with the variation in bids as a measure of liquidity. *Number of Bids* is the natural logarithm of the number of bids received by a fund or a portfolio; *Excess Demand* is the natural logarithm of the total monetary bid less the maximum bid divided by NAV (either at the portfolio or fund level); *Variation in Bids* is the negative dispersion of spot or pooled (spot and portfolio) first round bids; where larger dispersion indicates more illiquidity; *Buyout* is an indicator variable for whether a fund is a buyout fund; *North American fund* is an indicator variable for whether a fund is from North America; *Fund Size* is the natural logarithm of the total size of the bid measured as the size of the fund or the size of the portfolio; *Percentage distributed* is a fund's (portfolio's) distributed amount as a percentage of committed capital; *Percentage unfunded* is fund's (portfolio's) unfunded commitments as a percentage of committed capital; *Sophisticated seller* is an indicator variable for sophistication of the seller, equals 1 if a seller is a private equity or secondary fund; *GP with funds for sale during previous year* is a proxy for the information asymmetry about a GP, computed as the number of funds managed by the same GP put up for sale during the year prior to the date of the first round of bids; *Restrictive GP* is an indicator variable for whether a GP of the fund imposes restrictions on who receives access to the information about the fund; *Volatility (Round 1 date)* is the equity market volatility (6-month annualised) at the time of the first round of bidding; *Average market bid (LPE)* is the average market price for listed private equity funds in the six months prior to the first round of bidding in a given deal (using S&P Listed Private Equity Index); *Percentage of sophisticated buyers* is a percentage of sophisticated bidders in a portfolio bid or an indicator variable for a sophisticated buyer in a spot bid; where a buyer is classified as sophisticated if it is a private equity fund or a secondary fund; and *Percentage of bidders with other bids* is a percentage of bidders that placed a bid over the prior 6 months capturing the level of information asymmetry between the bidders and the sellers. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the fund level. ***, **, * designate significance at 1%, 5% and 10% levels respectively.

	(1) Number of Bids	(2) Number of Bids	(3) Number of Bids	(4) Excess Demand	(5) Excess Demand	(6) Excess Demand	(7) Variation in Bids	(8) Variation in Bids	(9) Variation in Bids
Buyout	0.1007***	0.1055***	0.1257***	0.1202***	0.1250***	0.1448***	0.0082**	0.0084**	0.0033
	(4.794)	(5.023)	(6.374)	(4.938)	(5.138)	(6.491)	(2.255)	(2.312)	(0.901)
North American fund	-0.0533**	-0.0572**	-0.0617***	0.0078	0.0038	-0.0023	-0.0050	-0.0060	-0.0088**
	(-2.217)	(-2.380)	(-2.578)	(0.260)	(0.127)	(-0.079)	(-1.214)	(-1.452)	(-2.009)
Fund size	0.1061***	0.1009***	0.1031***	0.1396***	0.1348***	0.1387***	0.0122***	0.0110***	0.0096***
	(13.293)	(11.801)	(12.538)	(14.094)	(12.941)	(14.225)	(8.622)	(6.756)	(5.798)
Percentage distributed	-0.0935***	-0.0926***	-0.0876***	-0.0860***	-0.0848***	-0.0846***	-0.0000	-0.0005	-0.0005
	(-7.570)	(-7.391)	(-7.301)	(-5.900)	(-5.756)	(-6.281)	(-0.013)	(-0.196)	(-0.195)
Percentage unfunded	-0.1279**	-0.1005*	-0.2942***	0.0661	0.0938	-0.1555**	-0.0926***	-0.0932***	-0.0877***
	(-2.233)	(-1.752)	(-5.250)	(0.996)	(1.407)	(-2.453)	(-3.923)	(-4.044)	(-3.849)

	(1) Number of Bids	(2) Number of Bids	(3) Number of Bids	(4) Excess Demand	(5) Excess Demand	(6) Excess Demand	(7) Variation in Bids	(8) Variation in Bids	(9) Variation in Bids
Sophisticated seller	0.5898***	0.5767***	0.1511***	0.6050***	0.5914***	0.0579	-0.0405***	-0.0380***	-0.0078
	(11.768)	(11.458)	(3.108)	(6.907)	(6.695)	(0.739)	(-4.260)	(-4.016)	(-0.764)
GP with funds for sale during prev. year		0.0811***	0.1157***		0.0802***	0.1227***		0.0053	0.0041
		(3.691)	(5.473)		(3.207)	(5.257)		(1.395)	(1.103)
Restrictive GP		-0.3053***	-0.3023***		-0.3221***	-0.2790***		0.0520***	0.0488***
		(-7.355)	(-6.976)		(-5.700)	(-5.001)		(3.897)	(3.199)
Volatility (Round 1 date)			-1.0510***			-2.3734***			0.1434***
			(-6.207)			(-12.510)			(6.750)
Average market bid (LPE)			0.1007			0.3610**			0.0029
			(0.770)			(2.265)			(0.097)
Percentage of sophisticated buyers			-0.9848***			-1.1823***			0.0273*
			(-16.361)			(-17.197)			(1.945)
Percentage of bidders with other bids			-0.0842*			-0.1503***			0.0509***
			(-1.753)			(-2.850)			(5.070)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	**4,108**	**4,108**	**4,108**	**4,108**	**4,108**	**4,108**	**2,302**	**2,302**	**2,302**
Adjusted R-squared	**0.30**	**0.31**	**0.40**	**0.40**	**0.40**	**0.50**	**0.12**	**0.12**	**0.15**

Table 5: Sensitivity analyses (pooled sample)

This table presents the regressions in the previous table using the pooled sample. Model (1) shows the results with the number of bids received as a measure of liquidity. Model (2) shows the results with the excess demand as a measure of liquidity. Model (3) shows the results with the negative of standard deviation of the bids as a measure of liquidity. Model (4) shows the results with an alternative liquidity measure, the total number of unique bidders. *Number of Bids* is the natural logarithm of the number of bids received by a fund or a portfolio; *Excess Demand* is the natural logarithm of the total monetary bid less the maximum bid divided by NAV (either at the portfolio or fund level); *Variation in Bids* is the negative dispersion of spot or pooled (spot and portfolio) first round bids; where larger dispersion indicates more illiquidity; *Buyout* is an indicator variable for whether a fund is a buyout fund; *North American fund* is an indicator variable for whether a fund is from North America; *Fund Size* is the natural logarithm of the total size of the bid measured as the size of the fund or the size of the portfolio; *Percentage distributed* is a fund's (portfolio's) distributed amount as a percentage of committed capital; *Percentage unfunded* is fund's (portfolio's) unfunded commitments as a percentage of committed capital; *Sophisticated seller* is an indicator variable for sophistication of the seller, equals 1 if a seller is a private equity or secondary fund; *GP with funds for sale during previous year* is a proxy for the information asymmetry about a GP, computed as the number of funds managed by the same GP put up for sale during the year prior to the date of the first round of bids; *Restrictive GP* is an indicator variable for whether a GP of the fund imposes restrictions on who receives access to the information about the fund; *Volatility (Round 1 date)* is the equity market volatility (6-month annualised) at the time of the first round of bidding; *Average market bid (LPE)* is the average market price for listed private equity funds in the six months prior to the first round of bidding in a given deal (using S&P Listed Private Equity Index); *Percentage of sophisticated buyers* is a percentage of sophisticated bidders in a portfolio bid or an indicator variable for a sophisticated buyer in a spot bid; where a buyer is classified as sophisticated if it is a private equity fund or a secondary fund; and *Percentage of bidders with other bids* is a percentage of bidders that placed a bid over the prior 6 months capturing the level of information asymmetry between the bidders and the sellers. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the fund level. ***, **, * designate significance at 1%, 5% and 10% levels respectively.

	(1) Number of Bids	(2) Excess Demand	(3) Variation in Bids	(4) Number of Bidders
Buyout	0.2472***	0.0474**	0.0016	0.2270***
	(11.548)	(1.977)	(0.460)	(11.839)
North American fund	-0.0087	-0.1005***	-0.0093**	0.0256
	(-0.340)	(-3.479)	(-2.223)	(1.107)
Fund size	-0.0514***	0.2481***	0.0108***	0.0797***
	(-5.965)	(25.409)	(7.059)	(11.395)
Percentage distributed	-0.0997***	-0.0574***	0.0005	-0.0812***
	(-7.637)	(-3.860)	(0.205)	(-6.768)
Percentage unfunded	-0.2583***	-0.1896***	-0.0886***	-0.1629***
	(-4.572)	(-2.891)	(-3.900)	(-3.120)
Sophisticated seller	0.1005*	0.1263	-0.0090	-0.1722***
	(1.695)	(1.628)	(-0.891)	(-4.400)
GP with funds for sale during prev. year	0.1822***	0.0393	0.0020	0.2004***
	(8.114)	(1.605)	(0.552)	(10.306)
Restrictive GP	-0.1743***	-0.3799***	0.0467***	-0.3692***
	(-3.641)	(-6.856)	(3.038)	(-7.624)
Volatility (Round 1 date)	-0.8755***	-2.5737***	0.1389***	-2.0699***
	(-5.146)	(-14.267)	(6.595)	(-14.796)
Average market bid (LPE)	0.2511*	0.2746*	-0.0011	-0.0413
	(1.895)	(1.746)	(-0.036)	(-0.365)
Percentage of sophisticated buyers	-0.9888***	-0.9484***	0.0273**	-0.4604***
	(-16.663)	(-14.611)	(1.997)	(-7.081)
Percentage of bidders with other bids	0.0154	-0.0441	0.0522***	-0.0458

	(1) Number of Bids	(2) Excess Demand	(3) Variation in Bids	(4) Number of Bidders
	(0.350)	(-0.885)	(5.319)	(-1.091)
Year fixed effects	Yes	Yes	Yes	Yes
Observations	**4,756**	**4,756**	**2,374**	**4,756**
Adjusted R-squared	**0.30**	**0.47**	**0.16**	**0.44**

Table 6: Pricing effect of first round liquidity

This table present results on the pricing impact of the liquidity measures. Panel A presents summary statistics for additional control variables used and Panel B shows the impact of the liquidity measures on the final price of the fund interests. *Final Bid / LPE Index Bid* is the ratio of the final winning bid in the auction to the average bid as a percentage of NAV observed over the prior 6 months for the listed private equity fund index provided by Standard and Poor's. *Final Bid / Avg Mkt Bid* is the ratio of the final winning bid in the auction to the average bid as a percentage of NAV observed over the prior 6 months in the Cogent's database. Models (1) - (3) show the pricing impact of the liquidity measures on *Final Bid / LPE Index Bid*. Models (4) - (6) show the pricing impact of the liquidity measures on *Final Bid / Avg Mkt Bid*. *Number of Bids* is the natural logarithm of the number of bids received by a fund or a portfolio; *Excess Demand* is the natural logarithm of the total monetary bid less the maximum bid divided by NAV (either at the portfolio or fund level); *Variation in Bids* is the negative dispersion of spot or pooled (spot and portfolio) first round bids; where larger dispersion indicates more illiquidity; *Buyout* is an indicator variable for whether a fund is a buyout fund; *North American* fund is an indicator variable for whether a fund is from North America; *Fund Size* is the natural logarithm of the total size of the bid measured as the size of the fund or the size of the portfolio; *Percentage distributed* is a fund's (portfolio's) distributed amount as a percentage of committed capital; *Percentage unfunded* is fund's (portfolio's) unfunded commitments as a percentage of committed capital; *Sophisticated seller* is an indicator variable for sophistication of the seller, equals 1 if a seller is a private equity or secondary fund; *GP with funds for sale during previous year* is a proxy for the information asymmetry about a GP, computed as the number of funds managed by the same GP put up for sale during the year prior to the date of the first round of bids; *Restrictive GP* is an indicator variable for whether a GP of the fund imposes restrictions on who receives access to the information about the fund; *Volatility (Round 1 date)* is the equity market volatility (6-month annualised) at the time of the first round of bidding; *Volatility (Round 2 date)* is the equity market volatility (6-month annualised) at the time of the second round of bidding; *Average market bid (LPE)* is the average market price for listed private equity funds in the six months prior to the first round of bidding in a given deal (using S&P Listed Private Equity Index); *Percentage of sophisticated buyers* is a percentage of sophisticated bidders in a portfolio bid or an indicator variable for a sophisticated buyer in a spot bid; where a buyer is classified as sophisticated if it is a private equity fund or a secondary fund; *Percentage of bidders with other bids* is a percentage of bidders that placed a bid over the prior 6 months capturing the level of information asymmetry between the bidders and the sellers; *Number of bidders in the second round* is the natural logarithm of the number of bidders for the fund (or portfolio) in the second round; *Sophisticated buyer in round 2* is and indicator variable for the presence of sophisticated buyers in the second round. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the fund level. ***, **, * designate significance at 1%, 5% and 10% levels respectively.

Panel A	**Spot Round 1**					
	N	**Mean**	**Std**	**P25**	**P50**	**P75**
Final Bid / LPE Index Bid	2,052	0.62	0.15	0.52	0.61	0.77
Final Bid / Avg Mkt Bid	2,052	1.30	0.26	1.23	1.36	1.48
Number of bidders in the second round	2,052	1.14	0.46	1.10	1.10	1.39
Sophisticated buyer in round 2	2,052	0.66	0.47	0.00	1.00	1.00
Volatility (Round 2 date)	2,052	0.16	0.10	0.11	0.11	0.21

Panel B	(1) Final Bid / LPE Index Bid	(2) Final Bid / LPE Index Bid	(3) Final Bid / LPE Index Bid	(4) Final Bid / Avg Mkt Bid	(5) Final Bid / Avg Mkt Bid	(6) Final Bid / Avg Mkt Bid
Number of Bids	0.0249***			0.0482***		
	(3.886)			(4.166)		
Excess Demand		0.0441***			0.0882***	
		(7.950)			(8.924)	
Variation in Bids			0.0965***			0.1735***
			(3.890)			(3.424)
Buyout	0.0303***	0.0262***	0.0333***	0.0555***	0.0471***	0.0576***
	(6.246)	(5.466)	(7.259)	(5.755)	(4.954)	(6.297)
North American fund	0.0399***	0.0384***	0.0313***	0.0472***	0.0442***	0.0373***
	(5.877)	(5.708)	(5.332)	(3.741)	(3.600)	(3.397)
Fund size	0.0031	0.0006	0.0110***	0.0122***	0.0071	0.0207***
	(1.301)	(0.250)	(4.972)	(2.642)	(1.494)	(4.774)
Percentage distributed	-0.0113***	-0.0097***	-0.0041	-0.0240***	-0.0206***	-0.0076
	(-4.680)	(-4.151)	(-1.410)	(-4.446)	(-3.955)	(-1.556)
Percentage unfunded	0.0329**	0.0316**	0.0534***	0.0372	0.0347	0.0882***
	(2.232)	(2.149)	(3.969)	(1.381)	(1.303)	(3.205)
Sophisticated seller	0.0402	0.0330	0.2317***	0.0251	0.0085	0.2547***
	(1.014)	(0.886)	(6.855)	(0.426)	(0.155)	(4.974)
GP with funds for sale during previous year	-0.0010	-0.0054	0.0057	-0.0143	-0.0232**	-0.0007
	(-0.199)	(-1.059)	(1.243)	(-1.360)	(-2.208)	(-0.076)
Restrictive GP	0.0093	0.0168	-0.0874**	-0.0075	0.0083	-0.1826*
	(0.413)	(0.773)	(-2.108)	(-0.146)	(0.168)	(-1.669)
Volatility (Round 1 date)	0.3861**	0.3830**	1.3337***	1.5251***	1.5160***	2.5111***
	(2.397)	(2.334)	(14.514)	(6.091)	(6.297)	(12.995)
Percentage of sophisticated buyers	-0.0561***	-0.0322*	-0.1185***	-0.0528	-0.0032	-0.1708***

Panel B	**(1)** **Final Bid / LPE Index Bid**	**(2)** **Final Bid / LPE Index Bid**	**(3)** **Final Bid / LPE Index Bid**	**(4)** **Final Bid / Avg Mkt Bid**	**(5)** **Final Bid / Avg Mkt Bid**	**(6)** **Final Bid / Avg Mkt Bid**
	(-3.090)	(-1.793)	(-5.768)	(-1.434)	(-0.090)	(-3.640)
Percentage of bidders with other bids	-0.1357***	-0.1089***	-0.1742***	-0.1274***	-0.0719**	-0.1621***
	(-7.807)	(-6.489)	(-10.402)	(-4.341)	(-2.515)	(-4.562)
Number of bidders in the second round	0.0248***	0.0179***	0.0397***	0.0179*	0.0037	0.0266**
	(4.706)	(3.432)	(7.138)	(1.865)	(0.395)	(2.281)
Sophisticated buyer in round 2	0.0313***	0.0258***	0.0358***	0.0608***	0.0495***	0.0622***
	(4.986)	(4.162)	(5.333)	(4.957)	(4.144)	(4.589)
Volatility (Round 2 date)	-0.7084***	-0.6693***	-1.0330***	-2.2632***	-2.1839***	-2.7150***
	(-7.962)	(-7.619)	(-14.452)	(-12.009)	(-11.750)	(-18.211)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	**2,052**	**2,052**	**1,345**	**2,052**	**2,052**	**1,345**
Adjusted R-squared	**0.57**	**0.58**	**0.70**	**0.45**	**0.47**	**0.54**