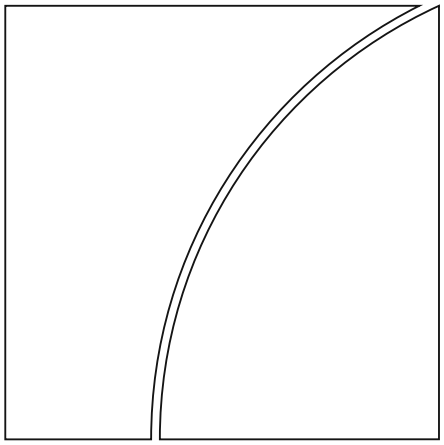
BANK FOR INTERNATIONAL SETTLEMENTS



BIS Working Papers

No 961

Private equity buyouts and firm exports: evidence from UK firms

by Paul Lavery, Jose-Maria Serena, Marina-Eliza Spaliara and Serafeim Tsoukas

Monetary and Economic Department

August 2021

JEL classification: G34, G32.

Keywords: private equity buyouts, exporting, financial constraints, transactions.

BIS Working Papers are written by members of the Monetary and Economic Department of the Bank for International Settlements, and from time to time by other economists, and are published by the Bank. The papers are on subjects of topical interest and are technical in character. The views expressed in them are those of their authors and not necessarily the views of the BIS.

This publication is available on the BIS website (www.bis.org).

© *Bank for International Settlements 2021. All rights reserved. Brief excerpts may be reproduced or translated provided the source is stated.*

ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Private equity buyouts and firm exports: Evidence from UK firms*

Paul Lavery† Jose-Maria Serena‡ Marina-Eliza Spaliara§
Serafeim Tsoukas¶

August 10, 2021

Abstract

This paper examines the impact of private equity buyouts on the export activity of target firms. We exploit data on UK firms over the 2004-2017 period, and use difference-in-differences estimations on matched target versus non-target firms. Following private equity buyouts, non-exporting firms are more likely to begin exporting, and target firms are likewise more likely to increase their value of exports and their export intensity. Evidence from split-sample analysis further suggests that these patterns are consistent with private equity investors relaxing financial constraints and inducing productivity improvements.

Keywords: Private equity buyouts; exporting; financial constraints; transactions.
JEL Classification: G34, G32

*We thank for their helpful comments Kevin Amess, Michael Heinrich Baumann, Kalina Manova, Samuele Guido Sozzani, Martin Strieborny, Nicholas Wilson, Egon Zakrajšek, and participants of the research seminars/conferences at the Bank for International Settlements (BIS), Nottingham University Business School, Royal Economic Society 2021 Annual Conference, Scottish Economic Society 2021 Annual Conference, 2021 World Finance Conference and 2021 International Conference on Macroeconomic Analysis and International Finance. The fourth author gratefully acknowledges support from the BIS and their generous hospitality during the period in which this paper was prepared. The views expressed in this paper are those of their authors and not necessarily reflect the views of the BIS.

†Adam Smith Business School, University of Glasgow, University Avenue, G12 8QQ, UK. E-mail: paul.lavery@glasgow.ac.uk

‡Bank for International Settlements, Centralbahnplatz 2, 4002 Basel, Switzerland. E-mail: jose.serena@bis.org

§Adam Smith Business School, University of Glasgow, University Avenue, G12 8QQ, UK. Email: marina.spaliara@glasgow.ac.uk

¶Adam Smith Business School, University of Glasgow, University Avenue, G12 8QQ, UK. Email: serafeim.tsoukas@glasgow.ac.uk

1 Introduction

This paper sheds light on the role of private equity (PE) buyouts in firms' exporting activity, offering a contribution at the intersection of corporate finance and international trade. From a corporate finance perspective, PE buyouts have a significant impact on their targets' activities. The literature shows that PE firms help targets enhance their operating performance, productivity and employment (see, for example, Boucly et al., 2011; Davis et al., 2014; Biesinger et al., 2020). On the other hand, the international trade literature emphasizes that firm exports may be constrained by various financial frictions linked to country-level financial development (Beck, 2003; Manova, 2013), sector-level financial vulnerability (Manova et al., 2015), and firm-level financial health (Greenaway et al., 2007; Görg and Spaliara, 2014). As far as we are aware, the implications of changes in firms' ownership structure for their international expansion and ensuing activity in export markets remain hitherto unexplored.

With respect to exporting, PE targets receive strategic advice, financial support, and industry specialisation. PE investors with an international presence and operational knowledge of overseas markets may offer a comparative advantage to their portfolio companies relative to non-PE-backed firms. Therefore, target firms are more likely to expand their operations abroad, improve their exporting status, and overcome the sunk cost of entering a foreign market. The upshot is that exporting can provide varied and diverse benefits to PE-backed firms. A very recent report estimates that UK export production supports around 6.5 million jobs, or 23% of total UK full-time equivalent jobs (Black et al., 2021). The report likewise shows that the number of jobs supported by exports has increased considerably over time. Motivated by these considerations, our study provides novel evidence of how PE buyouts affect exporting among portfolio companies at the intensive and extensive margins. Specifically, we document two channels through which PE investors unlock firms' exporting potential, paying attention to the relaxing of financial constraints, and firm-level productivity improvements.

Our empirical work is based on a difference-in-differences analysis to estimate how PE

investment affects firms' exporting activity. On this basis, we define two groups of firms: treated firms with PE-backed investment, and a matched sample of non-PE-backed control firms. We match the latter group to our sample of buyout targets across three key areas: two-digit SIC industry, profitability (ROA), and domestic sales in the pre buyout year. In doing so, we construct a comprehensive panel data set of sponsored and non sponsored firms that are similar in nature prior to the acquisition of our treated sample of PE-backed firms. In the empirical analysis that follows, a probit model examines the probability of exporting among firms with and without private equity backing. We then use a difference-in-differences model to investigate how PE buyouts affect the value and intensity of firms' exports. In extensions of this, we exploit firm-level and deal-level heterogeneity to investigate whether particular segments of firms and deals perform better following PE investment. Through this exercise, we identify a novel channel of financial constraints. Finally, we examine whether PE ownership could induce productivity improvements that affect their portfolio companies' exporting performance. In doing so, we uncover a productivity channel which is yet to be documented.

To conduct the analysis, we merge data from Standard and Poor's (S&P) Capital IQ and Bureau van Dijk's FAME database. This way we link PE transaction data with firm-level accounting data for over 1,400 buyout targets in the UK from 2004 to 2017. The UK is an ideal setting for the empirical analysis for three main reasons. First, it is the largest and most active private equity market in Europe; in recent years it had the highest average annual deal value, and aggregate annual deal value relative to GDP (Bernstein et al., 2019).[1] Consistent with this, commercial data provider Pitchbook reports in its 2019 Annual European Private Equity Breakdown that the UK and Ireland account for 29% of European private equity deal value over the last 10 years, which is more than any other region in Europe. Similarly, it accounts for over 50% of funds raised in Europe over the same period. Second, the law requires all limited companies in the UK to provide certain accounting information to the

[1] Bernstein et al. (2019) also note that international comparisons of country-level private equity activity are difficult due to lack of harmonized data and definitions.

public UK register. The depth and detail of this information varies according to firm size; however, as most firms in our sample are mid-market companies, there is excellent coverage of balance sheet and income statement information in our sample. Accordingly, we have access to accounting statements for a rich dataset of firms, over 98% of which are private. Private companies in our sample are generally small and medium sized, relatively young, and bank-dependent firms. This is vitally important because these firms are more likely to suffer from information asymmetry problems, and hence their exporting is likely to respond more strongly to private equity investment. Finally, the UK is the sixth-largest trader in the world and the third-largest exporter of services. The British government's Department for International Trade has a strong focus on export-promotion strategies to increase the number of firms exporting in international markets. From an economic policy point of view, understanding firms' exporting is important, as export intensity, survival, and firm growth are important aspects of industry dynamics, forming the competitive landscape in an economy.

Our main results, which remain intact after several robustness tests, can be summarized as follows. First, we find that PE-backed firms have a higher probability of exporting, relative to control firms. That is, PE ownership appears to improve firms' exporting at the extensive margin. Second, PE-backed firms have a higher exporting intensity as measured by share of export sales to total sales. Both findings are robust to controlling for various firm-level attributes and a range of fixed effects, implying that differences in exporting behavior are due to changes in ownership structure as opposed to other firm-level or macroeconomic factors. The results are not only statically significant but also economically significant. In particular, we find that the probability of exporting after a PE buyout increases by 4-5%; the value of exports among PE-backed companies rises by around 30% post-buyout relative to non sponsored firms; and the share of export sales to total sales increases by between 2%-3%.

In addition, we document two channels through which PE buyouts could improve firms' export activity. First, we present evidence that the positive effect on the probability of ex-

port, exporting value, and exporting intensity is considerably stronger in companies more likely to be financially constrained in the pre buyout period; that is, companies that are smaller and younger in the pre buyout year experience significantly greater growth in exporting and are more likely to start exporting. At the deal level, private-to-private buyouts drive our results, as opposed to public-to-private transactions or divisional buyouts. We interpret this as evidence of private equity investors mitigating constraints facing their portfolio companies. Second, we find a differential effect of PE across targets with higher and lower productivity prior to being acquired. In particular, we show that less productive PE-backed firms are more likely to improve their exporting status following the buyout compared to their counterparts. This is consistent with the view that PE induces productivity improvements which enhance exporting.

This paper brings together two strands of the literature on firm performance. First, we add to the literature investigating the firm-level effects of PE ownership. Previous research shows that PE buyouts have a positive impact on the performance of portfolio companies. This impact occurs through the easing of financial constraints (Boucly et al., 2011; Davis et al., 2014; Amess et al., 2016; Bernstein and Sheen, 2016; Bernstein et al., 2019). Second, our study broadens the literature on firm-level engagement in international export markets. Existing work supports that access to financing is critical in export activities (Greenaway et al., 2007; Minetti and Zhu, 2011; Manova, 2013; Muûls, 2015; Chaney, 2016). Our evidence provides a key contribution to both strands of literature by documenting the beneficial role of PE investment on firms' exporting, both at the extensive and the intensive margin.

The rest of the paper is set out as follows. In section 2, we provide a short discussion of the related literature and derive our testable hypotheses. Section 3 describes our data and presents some summary statistics. In section 4 we lay out our econometric modelling strategy. Sections 5 and 6 illustrate our main empirical results and robustness tests. Section 7 concludes.

2 Hypotheses development

2.1 Private equity and exporting

A large literature shows that PE investors can add value to their portfolio companies in a range of different ways. For example, PE firms improve targets' operating performance, both in the U.S. (Kaplan, 1989; Guo et al., 2011; Acharya et al., 2012; Fracassi et al., 2018; Cohn et al., 2020) and in Europe (Boucly et al., 2011; Chung, 2011; Biesinger et al., 2020). PE investors also help targets increase their productivity (Harris et al., 2005), investment in innovation (Lerner et al., 2011), and employment (Davis et al., 2014; Lerner et al., 2019). In addition, Bloom et al. (2015) find private equity-backed companies to have improved management practices. Other studies highlight improved recruitment, various forms of operational engineering, by leveraging their network of potential customers, suppliers and industry advisors, and in some cases, by advising on and facilitating bolt-on acquisitions to their target companies (for surveys on how PE investors add value to their portfolio companies see Gompers et al., 2016; Bernstein et al., 2019).

PE investors often have strong relationships with the banking industry (Ivashina and Kovner, 2011) which allows for a lower asymmetric information between banks and borrowers if the acquirer has a more established reputation, or higher collateral backing. In addition, PE investment may help target firms better weather periods of crisis (Bernstein et al., 2019). Nevertheless, PE investments also pose certain risks to operating performance, as they engage in financial engineering and typically increase the leverage of their targets with potential negative implications for performance, wages, and employment (Batt and Appelbaum, 2014, 2020).

We posit that the strategic advice and financial support provided by PE investors may have implications for targets' export activity. In particular, PE sponsorship may allow targets to start exporting, or to increase their export activity. Accordingly, we expect a positive link between PE sponsorship, and firms' ability to grow successfully in export markets. The

specific hypotheses we test are as follows:

Hypothesis 1a: Private equity ownership helps targets to become exporters (extensive margin).

Hypothesis 1b: Private equity ownership helps targets to increase their export intensity (intensive margin).

2.2 The financial constraints channel

Prior research attributes value creation among private equity investors to their ability to ease financial constraints for the companies in which they invest. This channel can be particularly relevant for exporters, who often require external capital to cover their trade costs. A number of theoretical and empirical papers (among others see Manova, 2013; Manova and Yu, 2016) examine how financial constraints affect trade and show that financial frictions impact on whether and how much firms export (extensive and intensive margins). However, such frictions might restrict the number of export destinations, sales by product, and profitable trade activities. Similarly, Muûls (2015) find that the chances of firms being exporters are higher if they enjoy lower financial constraints and higher productivity levels. Finally, Bernstein et al. (2019) note that smaller firms, more leveraged firms, or target firms operating in more financially dependent industries outperform buyout target firms less likely to be ex-ante constrained during the global financial crisis.[2]

The extent to which PE ownership relaxes constraints can be assessed not only by using firm-level characteristics, but also by exploiting the type of buyout transaction conducted. One strategy to identify deal type heterogeneity is to separate public and private firms, which differ in many ways. The former are more likely to be larger, more mature, and suffer from potential agency problems (Jensen, 1986), while the latter are more likely to be smaller and financially constrained (Gao et al., 2013). Boucly et al. (2011) suggest that target firms involved in take-private transactions involving listed firms and divisional buyouts of

[2] Boucly et al. (2011) also observe stronger growth in companies that are ex-ante more likely to be constrained pre buyout.

subsidiaries of larger groups are less likely to be constrained pre buyout, as they are more likely to have better access to capital markets.

Chung (2011) finds supporting evidence that investors alleviate constraints facing private-to-private firms, thereby facilitating their growth, while public-to-private target firms downsize. Similarly, Fracassi et al. (2018), Lerner et al. (2019), and Amess et al. (2016) find post-buyout growth in sales, employment, and patenting in private target firms as opposed to public-to-private and divisional buyouts.

To sum up, the literature suggests that private equity investors can play an important role in relaxing financial constraints in their portfolio companies. This may have implications for exporting, as financially constrained firms gaining access to PE funding may be subsequently able to cover trade costs and expand their sales to foreign markets. Indeed, PE firms help portfolio companies to diversify their sources of financing and the associated risks. To define testable hypotheses, we assess targets' financial constraints using various attributes at the onset of the transaction. We focus on three well-established dimensions: listing status, size, and age. As private firms have limited access to external funding compared to public firms, we should expect that private-to-private buyouts might experience a more potent post-deal increase in exporting activity. Similarly, we should expect that the beneficial impact of PE ownership on firms' exporting might be more significant for small and young firms. Motivated by these considerations, we examine the role of deal- and firm-level heterogeneity in exporting following buyouts. Based on these arguments, our testable hypotheses are as follows.

Hypothesis 2a: Target firms are more likely to experience an increase in exports in private-to-private transactions.

Hypothesis 2b: Small and young target firms are likely to experience an increase in export activity.

2.3 The productivity channel

The growing importance of PE ownership on target firms' productivity is extensively documented in previous research. A recent study by Lerner et al. (2019) finds that buyouts of private firms are associated with a 14.7% increase in productivity, whereas Biesinger et al. (2020) reveal that changes in productivity begin at the time of the PE buyout and last for up to five years after the PE investor exits. They find significant long-term increases in labour productivity (20%), capital intensity (27%), and total factor productivity (TFP) (4%). Amess et al. (2016) show a 6% increase in productivity which increases to 14% for private-to-private transactions. The results of the Wilson et al. (2012) paper suggest positive differentials of 5-15% in productivity for buyout firms relative to their non-buyout counterparts. In addition, Harris et al. (2005) find that MBO plants are less productive than comparable plants before the transaction, but thereafter experience a significant increase in TFP. The significant role of PE investment in productivity at the industry-level has been researched by Bernstein et al. (2017). Their results indicate that private equity ownership increases the total production in PE industries by 15%. In sum, there is a clear scholarly consensus about the positive impact of private equity investment on target firms' productivity.

In the trade literature, theoretical and empirical studies identify a causal link from firm productivity to exporting. Clerides et al. (1998) find that firms facing large sunk costs must become more efficient prior to entry into export markets. Melitz (2003) confirms that export entry is costly and only the most productive firms self-select into export markets. Productivity may improve export performance both directly through channels suggested by Melitz (2003) and indirectly via superior access to financing. In the spirit of the above-mentioned study, Manova (2013) and Feenstra et al. (2014) develop heterogeneous-firm models, which feature a perfect correlation of companies' productivity with access to capital and export performance. They show that credit market imperfections raise the productivity cutoffs for exporting and reduce firms' sales abroad. More productive firms are more likely to engage

in exporting. Whereas all firms with productivity above a certain cutoff become exporters, financial frictions raise this threshold above the first best. Less productive firms would be unable to obtain sufficient external funding and would be forced to export lower quantities to reduce their trade costs. Therefore, there is a large and growing line of work that points to the role of self-selection of the more productive firms into export markets.

The above strands of the literature highlight two important considerations. First, the role of PE ownership in increasing firm-level productivity. Second, the importance of productivity in allowing firms to engage in international markets. As PE targets are less productive before being acquired and experience an improvement in productivity after the deal, we should expect PE targets to experience a growth in exports. In addition, we posit that the differences in the ex-ante productivity level of firms might affect disproportionately the likelihood of exporting and the export intensity. Put differently, we should expect that the beneficial impact of PE ownership on firms' exporting to be more significant for less productive firms which can experience further improvement in their productivity after the buyout. Post-investment changes in corporate ownership may have a more significant effect in low productivity sponsored firms relative to the control group. This leads to our next hypothesis, which reads:

Hypothesis 3: Following the buyout, the export entry, value, and intensity of target firms are likely to be higher for firms that are ex ante less productive.

3 Data and descriptive statistics

3.1 Sample characterization

We construct our dataset using different sources. First, to build our sample of private equity-backed companies, we use Standard and Poor's (S&P) Capital IQ to identify all private equity buyouts with targets in the UK.[3] Capital IQ is the primary source of private equity

[3]We also rely on Thomson Reuters Eikon to supplement our deal search.

transactions in recent academic studies.[4] We consider deals shown as "completed" between 2004 and 2017.[5] We omit deals which are announced but not yet completed. Following prior work, we identify private equity transactions by searching for "leveraged buyout," "going private," "management buyout", and "platform" transactions in Capital IQ. This yields an initial 7,505 private equity transactions. We then drop all deals for which there is no defined buyer/private equity investor, leaving us with 3,310 transactions.

We take all relevant information, such as transaction date, name(s) and location(s) of buyer/investor(s), transaction value, and type of transaction. Using Capital IQ, we also check the name, vintage year, and size of the PE fund through which the transaction is made. When the target company is not explicitly linked to a PE fund in Capital IQ, we take the size of the most recent fund that is in its investment period prior to the transaction (Arcot et al., 2015). In order to identify how and when the private equity investor exits a deal in each case, we use a variety of resources. We use Capital IQ's merger & acquisition database to search for sales to trade buyers and sales to other private equity investors (secondary buyouts). We also use Factiva and manual searches of financial news for acquisitions, initial public offerings, and bankruptcies/liquidations involving the target firms. In some cases, we conduct extensive web searches on a deal-by-deal basis to deduce the ultimate outcome of the transaction.

To source companies' financial accounts, we use the FAME database, published by Bureau Van Dijk Electronic Publishing (BvDEP). This database sources historical accounts of companies in the UK from Companies House, the national UK register. We first download company accounts (balance sheets and income statements) and static firm information (such as industry codes, location, date of incorporation) for all companies in the FAME database for 2000 through 2019. The next step is to match target firms from our list of transactions

[4]Other authors use this database as a source of private equity buyouts (eg Strömberg, 2008; Fang et al., 2013; Jenkinson and Sousa, 2015; Bernstein and Sheen, 2016; Faccio and Hsu, 2017; Fracassi et al., 2018; Bernstein et al., 2019).

[5]The choice of sample years is driven by the desire to have relatively sufficient pre- and post-deal accounting information for target companies, and, as we explain later, we have data from 2000 through to 2019.

from Capital IQ to the FAME database. In order to maximize our matches, we do so manually. An advantage of FAME in this case is that it tracks firms' prior names. If company names differ between our list of transactions from Capital IQ and FAME, we verify that we are tracking the correct company by cross-checking information such as reported sales, total assets, and company address or website are consistent between the two sources. We also use Companies House in this respect. In total, we match 1,434 private equity-backed companies from Capital IQ to FAME over a 14-year period. This equates to 44% of the deals initially identified in Capital IQ with a defined private equity investor. Using similar data sources, Jenkinson and Sousa (2015) report a 40% match from an initial sample of 2,567 exited deals involving European targets.[6]

3.2 Creating a matched control sample

To estimate the difference-in-differences models, we define a matched control group of non-PE-backed firms, which should be similar to sponsored firms in the pre buyout period. To construct a control group, we use a matching procedure inspired by Boucly et al. (2011) and Bernstein et al. (2019). Each matched control company meets the following three criteria: 1) it has the same two-digit SIC code as the target firm; 2) it has domestic sales in the pre deal year within a 50% bracket of the target; 3) it has a ROA in the pre deal year within a 50% bracket of the target firm.

Using this procedure, we match up to five control firms for as many target firms as possible. Where a target generates more than five matches, we retain the five closest matches as measured by the sum of the squares of the difference between the target and the control firm's sales and ROA. Naturally, the choice of percentage bracket involves a trade-off between matching accuracy and finding control firms for as many targets as possible. Using a 50% bracket, we find control firms for 917 of our 1,434 private equity-backed firms, equating to

[6]The only difference is that Jenkinson and Sousa (2015) match from Capital IQ to all of FAME, Amadeus, and Orbis, all of which are managed by Bureau van Dijk. Amadeus and Orbis provide coverage of European firms, whereas FAME only follows UK and Irish firms.

64% success in matching.[7] We finish with a sample of 917 private equity-backed firms and 4,076 control firms.

3.3 Descriptive analysis

Table 1 provides preliminary analysis of our sample of transactions. Panel A shows the industry distribution of the target firms, which tend to be concentrated in the services and manufacturing sectors, similar to other recent work in deal-level private equity research (Chung, 2011; Jenkinson and Sousa, 2015; Bernstein et al., 2019). Other important sectors include retail trade and transportation & communication. Panel B of table 1 gives a breakdown of the types of deals in our sample. Similar to studies such as Strömberg (2008), Kaplan and Stromberg (2009), Boucly et al. (2011), and Bernstein et al. (2019), the majority of the deals in our sample are private-to-private buyouts. Around 5% are public-to-private transactions, a figure very similar to the samples in the above papers. Likewise, our proportion of secondary buyouts is also representative of the literature, which largely reports similar deal type distributions. Our sample contains a slightly lower proportion of divisional sales (17.1%) compared to these studies. This is likely because accounting information is harder to find when divisions are carved out of companies. Finally, in panel C, we can see how the transactions are exited. Consistent with other deal samples, selling to a strategic buyer (trade sale) or to another private equity investor (secondary buyout) are the primary forms of exit, whereas going public via an IPO is less common (Strömberg, 2008; Kaplan and Stromberg, 2009; Jenkinson and Sousa, 2015).[8] Around 65% of the transactions have experienced some form of exit.

Table 2 presents pre buyout descriptive statistics and provides initial evidence that, by construction, our two groups of firms share similar characteristics in the pre buyout period.

[7] This is similar to the matching success in Bernstein et al. (2019) who report a 60% match using a similar matching technique.

[8] Similarly, figures from the BVCA, the leading UK industry body for private equity investors, report that of 5,533 deal divestments from 2007 to 2019, selling to trade acquirers was by far the most common exit route, with almost 25% of target companies being sold to trade.

The distribution of pre-transaction profitability (ROA) and leverage is very similar across both groups, as is the size (as measured by total assets) and firms' cash flow. The mean value of sales is also close, with very little difference between each group. Notably, the pre buyout mean values of export sales, export intensity, and productivity are lower for PE-backed firms, and these differences are statistically significant at the 1% level. This is not surprising considering that PE investors seek targets that have potential for performance improvement and new profitable export opportunities. This preliminary evidence is also in line with prior literature which indicates that PE target firms are less productive than comparable firms, thus providing opportunities for investors to add value (Wilson et al., 2012, 2021).

Moving a step further, table 3 explores the parallel trends assumption behind the difference-in-differences model where we consider the pre buyout two-year growth rates of the same set of variables. Once more, the target firms and controls exhibit similar trends across most variables. Taking the static pre buyout period figures and the pre buyout growth rates together, we can appreciate that both groups of firms are generally similar in nature in the pre transaction period.

To provide a simple visual account of the evolution of firms' exports around the transaction, we present figure 1. Specifically, the graph shows the α_t of the following equation:

$$y_{f_t} = \alpha_t + \alpha_f + \varepsilon_{ft} \tag{3.1}$$

where α_t captures year fixed effects and α_f stands for company fixed effects. The x axis spans four years prior to and four years after the buyout transaction occurs. We examine a four-year window around the buyout since the average holding period of the target company is 4 years. In addition, setting up foreign supply chains and reorganising a firm to engage in exporting activities can be a lengthy process [9]. We use the year before the buyout as the base period and we normalize its corresponding coefficient to zero. We estimate equation 3.1 separately for both the private equity-backed and control samples, with standard errors

[9] We shorten the window where the investor exits in less than four years.

clustered at the firm level. We observe that both our treated and control samples follow similar paths in the run-up to the transaction, after which there is a divergence in exporting behavior. This gives us an initial insight into how private equity ownership may affect the exporting behavior of target firms. Taken together, we can plausibly assume that the parallel trends assumption is satisfied.

4 Empirical model

4.1 Extensive margin of export

We begin our empirical investigation by testing whether PE buyout targets are more likely to become exporters, relative to the control group by estimating:

$$Prob(EXP_{ft} > 0) = \alpha_t + \alpha_f + \beta_1(PE_f * Post_{ft}) + \beta_2 Post_{ft} + \theta X_f * Post_{ft} + \varepsilon_{ft} \quad (4.1)$$

where f is a firm index, and t is a year index constructed around the buyout. The dependent variable EXP_{ft} is a dummy variable that equals one if firm f has a positive amount of exports in year t, and zero otherwise. PE_f is a dummy variable that equals one for PE-backed companies, and zero for the control group. $Post_{ft}$ is a dummy variable that equals one after the buyout, and zero before. For control firms, $Post_{ft}$ equals one when the matched target firm corresponding to the control has been acquired, and zero before. In line with the literature, we estimate both linear probability and probit models based on the above specifications (see Greenaway et al., 2007; Minetti and Zhu, 2011; Minetti et al., 2015; Muûls, 2015). The model also includes year fixed effects, α_t, and firm fixed effects, α_f, which absorb the PE_f dummy. To deal with serial correlation, we cluster standard errors at the firm level.

We also construct several firm-level control variables to control for pre buyout hetero-

geneity in firm-level characteristics (captured by vector X_f in equation 4.1). In particular, following Bernstein et al. (2019), we control for firm size (total assets), cash flow scaled by total assets, leverage, profitability (ROA), and earnings (EBITDA) normalized by assets. Including such controls helps to alleviate any concerns regarding any differences between the treated and control samples in the pre buyout period. We take these control variables in the pre transaction year and interact them with the $Post_{ft}$ variable in order to avoid any endogeneity concerns.[10]

A positive coefficient for β_1 would signal that after a buyout, target firms are more likely to export relative to control firms. Since the matching ensures that treated and control firms are alike before the buyout, we attribute any post-buyout differences to the effect that PE investors exert on their portfolio companies. Such a result would therefore provide evidence in favour of H1a, indicating that PE firms help their portfolio companies to become exporters.

4.2 Intensive margin of export

In this sub-section we explore whether the value of firms' exports and their exporting intensity are affected by being backed by a private equity sponsor. To do so, we use a standard difference-in-differences (DiD) approach to estimate the changes in firm-level exporting after buyout transactions, relative to changes at control firms.[11] Our baseline specification is:

$$y_{ft} = \alpha_t + \alpha_f + \beta_1(PE_f * Post_{ft}) + \beta_2 Post_{ft} + \theta X_f * Post_{ft} + \varepsilon_{ft} \tag{4.2}$$

where the dependent variable is the log of export value or export sales as a percentage of total sales. The rest of the control variables are equivalent to those in equation 4.1. The main coefficient of interest is again β_1, which captures the estimated change in private equity

[10] In untabulated regressions we control for contemporaneous values of our financial health controls. Our results remain unchanged.

[11] Boucly et al. (2011), Bernstein et al. (2019), or Cohn et al. (2021) use similar models to estimate the impact of private equity on firm dynamics.

targets' exporting from before to after a buyout for target firms relative to control firms. A positive sign would reveal that PE buyouts boost targets' exporting at the intensive margin, relative to the control group. This rests on the identification assumption that treated and control firms experience a similar pre buyout growth trend in exporting. This assumption is validated by the summary statistics on pre buyout growth rates shown in table 3, discussed in detail in section 3. We can therefore interpret that any differences after the buyout relate to the changes brought about as a result of the buyout. Support for H1b is reflected in a positive coefficient for the $PE_f{*}Post_{ft}$ interaction.

4.3 The transmission channels

We conduct a third exercise to test whether PE firms boost the exports of the target firms through easing the financial constraints, as hypothesized in subsection 2.2. Specifically, our main interest lies in examining whether PE-backed firms facing financial constraints exhibit different sensitivities to their exporting after a buyout compared to firms in the control group. To this end, we split the sample of firms into two sub-samples, namely financially constrained and unconstrained based on the deal- and firm-level heterogeneity. In order to ensure robustness, we focus on three dimensions of financial constraints: type of transaction, firm size, and firm age. Private target firms are more likely to face constraints than are publicly-listed targets or divisions of larger firms, which ought to have better access to capital markets (Boucly et al., 2011). As for firm-level heterogeneity, Hadlock and Pierce (2010) provide evidence that both firm size and age are particularly useful predictors of financial constraints. More precisely, large firms cope well with financial constraints and have greater access to external financing, which is necessary to cover the sunk and fixed costs of exports (Greenaway et al., 2007). In addition, younger firms are more likely to face problems of asymmetric information, given that their short track record makes it more difficult to judge their quality (Guariglia, 2008). Finally, Bernstein et al. (2019) find that the positive investment effect of PE ownership was large in more financially constrained

companies.

To implement the test for H2a and H2b, we estimate equations 4.1 and 4.2 for two sub-samples (constrained and unconstrained firms). These specifications capture how heterogeneity, measured by deal type, firm size, and firm age, affects the way exporting responds to private equity investment in firms that are more and less likely to suffer from financial constraints at acquisition. *Large* is a dummy variable that takes the value one if the firm's total assets are above the upper 25th percentile of the distribution of the total assets of all the firms, and zero otherwise. *Old* is a dummy variable that takes the value one if the firm's age is above the upper 25th percentile of the distribution of age of all the firms, and zero otherwise. We opt for the top quartile as a cut-off point due to the skewed distribution of firm size and age.[12] This acknowledges that a significant fraction of the firms in our sample are bunched at low levels of size and age; while only a small fraction of firms stand out as being significantly large, or mature. To support H2a,b we expect the impact of private equity ownership to be stronger for firms classified as financially constrained compared to their unconstrained counterparts.

Finally, we investigate whether PE investors impact exporting through productivity improvements. To do so, we split the sample of target firms into firms which are more and less productive before the buyout. To carry out the test for H3, we estimate equations 4.1 and 4.2 for two sub-samples (high and low-productivity firms). *High Productivity* is a dummy variable that takes the value one if the firm's value added per worker is above the upper 25th percentile of the distribution of the productivity of all the firms, and zero otherwise. To support H3, we should observe positive coefficients for the private equity variable which are significantly larger for the low-productivity firms compared to their counterparts. This would imply that private equity and exporting are positively related, but more so for firms that belong to the low-productivity group.

We offer some preliminary evidence of the positive effect of PE ownership on firm pro-

[12] Bernstein et al. (2019) partition their sample of UK PE-backed firms in a similar manner.

ductivity in figure 2, where we estimate 3.1 on each of the PE-backed and control samples of firms, where y_{ft} denotes value added per worker. Figure 2 shows that PE-backed firms are slightly less productive than control firms prior to being bought out, but thereafter PE-backed firms increase their productivity considerably relative to the sample of control firms after being acquired. This is largely consistent with empirical evidence on the impact of PE ownership on target firms' productivity (Harris et al., 2005; Davis et al., 2014; Lerner et al., 2019).

5 Results

5.1 Extensive margin of export

We start by examining whether private equity-backed firms are more likely to be exporters, relative to comparable non sponsored firms. Specifically, we test whether the difference in the probability of exporting from the pre deal period to the post-deal period is greater for private equity-backed firms relative to control firms. In each specification we include firm, and year fixed effects. Table 4 shows the results. We report coefficient estimates and standard errors clustered at the firm-level.

In column 1 we show the results of a linear probability model, which support that private equity ownership positively and significantly affects firms' probability of exporting after the PE buyout. This is reflected in the positive sign of the key variable of interest, namely the interaction between the firm-level dummy PE_f and the time period dummy $Post_{ft}$ ($PE_f * Post_{ft}$). The effect is economically significant. The probability of entering the export market increases by 4.6 percentage points, when a firm is acquired by a PE company. Our main finding is robust when we add firm-level controls, as we show in column 2 of table 4. Specifically, the model includes interactions between $Post_{ft}$ and firm sales, earnings, leverage, profitability and cash flow. We observe a slight drop in magnitude, which signals the importance of the financial constraints channel, and further motivates the distinction

between different types of firms when studying how PE ownership affects firm outcomes (Boucly et al., 2011; Bernstein et al., 2019)[13]. Moreover, in column 3, we show that the results remain intact when we further add to the model time-varying industry fixed effects. Specifically, we follow Bernstein et al. (2019) and add two-digit SIC industry fixed effects interacted with the $Post_{ft}$ dummy variable to allow us to control for changes in industry demand and other industry considerations. Lastly, the results hold when we estimate the equations with a probit model in columns 4 to 6.

We conclude that private equity buyouts positively affect the extensive margin of exporting. These findings provide strong support for H1a and the idea that PE investors can add value to portfolio companies, helping them to grow and expand, and improve their operating performance relative to non sponsored peers (see Kaplan, 1989; Boucly et al., 2011; Bernstein and Sheen, 2016; Fracassi et al., 2018). The results suggest that PE investors can help target firms to overcome the associated financial and strategic hurdles to geographic expansion.

5.2 Intensive margin of export

We now turn our attention to the impact of private equity ownership on the intensive margin of exporting. Specifically, we examine how private equity buyouts affect the value of foreign sales, and exporting intensity (i.e. foreign sales as a share of total firm sales). We estimate difference-in-differences models and present the results in table 5. In columns 1 to 3 the dependent variable is the logarithm of the value of export sales, and in columns 4 to 6 it is the ratio of export sales to total sales.[14]

We focus on the sign and significance of the double-interaction term ($PE_f * Post_{ft}$), which reveals whether private equity-backed firms are more likely to have a higher export value and exporting intensity compared to our sample of control firms during the post-transaction period. We find that, following the buyout, the intensive margin of exporting is more sensitive

[13] In untabulated regressions, we also find our results to be robust to the inclusion of control variables often used in international trade literature, such as firms' wage bills

[14] In this exercise, we examine only companies that export, hence the lower number of observations relative to table 4.

for sponsored firms. Specifically, we find a positive and highly significant coefficient on the double-interaction term $PE_f * Post_{ft}$, which implies that private-equity backed firms increase the value of their export sales by approximately 36 percentage points, relative to similar non-PE-backed firms. When we control for firm-level covariates in the pre buyout period, the statistical significance and economic magnitude of our baseline coefficient are barely affected (column 2). Finally, our results remain unchanged when we further include time-varying industry fixed effects to control for any potential time-varying, industry-specific variables such as contemporaneous changes in demand (column 3).

Considering exporting intensity, in columns 4-6, we likewise, detect a significant effect of private equity ownership on the share of export sales to total sales. In particular, we find that exports as a share of total firm sales among buyout targets increases by around 3% more than in matched control firms. Once again, this is robust to the inclusion of firm controls, and various sets of fixed effects.

In summary, our results provide strong empirical support for H1b as we observe that private equity-backed firms sell more abroad and have a higher exporting intensity relative to similar non-PE-backed firms. As know-how is a key resource for business, our findings suggest that private equity investors may provide financial and active strategic support to help companies accelerate their growth (Lerner et al., 2012). 53% of PE investors in our sample have an international presence with offices in the UK and abroad. As a result, investors can bring expertise and experience of overseas markets, and act as a source of knowledge transfer for their portfolio companies, allowing them to reap the benefits of PE sponsorship via a growth in international expansion.

5.3 Financial constraints

Our results thus far document an economically and statistically significant association between private equity ownership and exporting. We now turn to the hypothesis relating private equity ownership, financial constraints, and exporting. Specifically, we test whether

the identified effect is driven by easing financial constraints. We conduct three tests to observe the mechanism through which private equity investors alleviate financial constraints. First, in table 6 we split our sample into two groups of deals (private-to-private buyouts, and public-to-private buyouts & divisional buyouts). This empirical exercise is motivated by prior studies that document heterogeneity in the firm-level effects of different buyout types.

In panel A of table 6, we find strong evidence of post-buyout growth at both the extensive and intensive margins of exporting in private-to-private targets, with all coefficients significant at the 1% confidence level. At the extensive margin, private-to-private targets are around 6 percentage points more likely to be exporters relative to matched control firms. At the intensive margin, the value of exports grows by over 47% relative to matched control firms in private-to-private targets, while the coefficient on exporting intensity implies that the ratio of export sales to total sales increases by around 4% post-buyout in private-to-private targets. Immediately, it appears that private-to-private buyouts are the driving force behind our main results.

By contrast, where take-private and divisional carve-out deals are concerned (panel B), the coefficients on the probability of exporting are statistically insignificant (columns 1 and 2). Similarly, we do not find any impact on the value of exports (columns 3 and 4), or the share of exports to sales (columns 5 and 6). Overall, our results parallel prior work noting heterogeneity in post-transaction growth across various deal types, particularly private-to-private deals leading to positive firm growth relative to public-to-private deals (Boucly et al., 2011; Fracassi et al., 2018; Lerner et al., 2019).

We provide further evidence of private equity investors alleviating constraints in portfolio companies. In table 7, we identify large firms by looking at the top quartile of real total assets in the pre buyout year and classify the remaining firms as small. Similarly, in table 8, we partition firms on the basis of their age, where we classify the top quartile of firms on the basis of their pre buyout age as old, and the remainder of firms as young.

In columns 1 and 2 of table 7 we examine the probability of smaller and larger target

firms exporting. The coefficients in columns 1 and 2 indicate that the positive effect on the probability of firms exporting is considerably stronger in magnitude and in significance on smaller target firms. The coefficients for larger firms are negative and statistically insignificant. Where the intensive margin of exporting is concerned, the differences between the coefficients on the export value of smaller and larger companies in columns 3 and 4 are statistically insignificant, implying private equity ownership's effect on export value is similar for both groups of firms. However, when we consider the exporting intensity of firms in columns 5 and 6, the effect is strongly significant on smaller firms and suggests an increase of over 2 percentage points. The same coefficients for larger firms yield no statistical significance.

Finally, in table 8 we split our sample based on companies' pre buyout age. The results in table 8 echo those in table 7: Companies that are younger and therefore more likely to be financially constrained, exhibit considerably higher post-transaction growth in exporting activity relative to older firms. Specifically, the coefficients in columns 1 and 2 concerning the probability of exporting show clear differences between younger and older firms. The coefficients on younger targets are positive and statistically significant at the 1% confidence level, implying the probability of exporting increases by over 5 percentage points, whereas the coefficients on older target firms are small in economic magnitude and statistically insignificant. Likewise, the coefficients on the intensive margin of export in columns 3 to 6 parallel those in table 7. The coefficients on exporting intensity in columns 5 and 6 imply that the effect of buyouts on the post-transaction exporting intensity is only statistically significant for companies that are ex-ante more likely to be constrained; that is, younger firms. The coefficients regarding the value of exports are larger in magnitude for younger firms, but the difference is statistically insignificant from older target firms.

In summary, the results in tables 6, 7, and 8 provide strong empirical support for both H2a and H2b. We find evidence that targets of private-to-private deals and targets that are ex-ante more likely to be financially constrained exhibit greater sensitivity of post-transaction

growth in exporting to buyout transactions. Thus, availability of outside capital through private equity investment plays an important role when markets face higher trade costs and exporters require more external financing to meet these costs.

5.4 Productivity

Here, we focus on how private equity buyouts induce productivity improvements that make exporting newly or more profitable. Figure 2 already shows how PE investors positively impact portfolio companies' productivity relative to non sponsored peers. We start with a decomposition exercise, whereby we augment our baseline models with a productivity variable, as measured by value added per worker. The results are shown in table 9. We find that productivity attracts a positive and significant coefficient. This is consistent with theoretical models of trade which show that given the associated fixed and variable trade costs, more productive firms are more likely to meet the threshold for profitable exporting and to export at higher scale (Melitz, 2003). Empirical evidence supports this prediction (Bernard and Jensen, 2004; Greenaway and Kneller, 2004). Productivity improvements brought about by PE investors could result from better firm governance and reductions in moral hazard, as well as from operational improvements (Gompers et al., 2016). Importantly, once productivity is accounted for, we observe a reduction in the coefficient on the double-interaction term ($PE_f * Post_{ft}$). This signals the importance of the productivity channel, which we explore in greater detail below.

To assess whether different levels of firm productivity drive the relationship between private equity ownership and exporting, we report estimates separately for firms that are categorized as high/low productivity in the pre deal period. We present the results in table 10. Focusing on columns 1 and 2, we can see that the coefficients associated with the double-interaction term $PE_f * Post_{ft}$ are only significant for the low productivity firms. The p-values for the equality of the coefficients, reported at the foot of the table, indicate a statistically significant difference between the two sets of coefficients. In other words, the impact of PE

on the extensive margin of trade is only apparent for low-productivity firms. This is not surprising, as PE targets have lower than average productivity thus providing opportunities for investors to realize performance improvement and growth post-investment (Wilson et al., 2021). PE investors add value to the low-productivity targeted companies by increasing their productivity level post-buyout and their likelihood to engage in exporting. Moving across the remaining columns of the table we observe that the effect of PE acquisitions on high and low productive firms is no longer statistically different. This suggests that the productivity channel does not operate at the intensive margin.

In a nutshell, our results in this sub-section suggest that the extensive margin of exporting, and to a lesser extent the intensive margin, adjusts disproportionately more for less productive target firms, compared to high-productivity targets. This aligns with the literature which finds PE targets to grow post-buyout through changes in governance, operational improvements, and increased capital investment (Harris et al., 2005; Lerner et al., 2019) and to become more productive in order to enter export markets (Melitz, 2003; Manova, 2013). Therefore, we offer support for H3, primarily at the extensive margin of trade.

6 Robustness tests

We now put our findings through a battery of checks in order to investigate their robustness. We summarize these robustness tests below, but do not report them due to space constraints. They are available in the online appendix.

6.1 Alternative matching methodologies

Our results may be sensitive to the construction of the matched control group. We address this issue by adjusting our matching technique in two ways. First, we follow Bernstein et al. (2019) and tighten our matching bandwidths from 50% to 30%. This reduces our sample to 876 sponsored firms and 3,682 control firms. Second, we add pre buyout leverage to the

matching procedure, along with industry, firm sales, and profitability. This decreases our sample of private equity-backed firms to 733. We continue to find that private equity ownership positively affects firm-level exporting at both the extensive margin and the intensive margin. The baseline regression results when using these alternative matching methodologies are in tables A4 and A5. We confirm that our main results remain unchanged.

6.2 Pre buyout growth patterns

One potential concern regarding the results presented thus far, is that private equity investors may simply choose to invest in companies that are already growing faster than other firms in the pre transaction period. Indeed, table 3 illustrates that PE-equity backed firms have a slightly higher growth rate in sales in the pre deal years, and it may be that this is driving our results. In order to control for pre buyout growth, we include an interaction term between the three-year pre buyout growth rate in sales and the $Post_{ft}$ variable. Thus, we estimate the following specification:

$$y_{ft} = \alpha_t + \alpha_f + \beta_1(PE_f * Post_{ft}) + \beta_2(SalesGr_f * Post_{ft}) + \theta X_f * Post_{ft} + \varepsilon_{ft} \qquad (6.1)$$

where *SalesGr* is the three-year growth in sales prior to the transaction year. We report the results in table A6 in the online appendix. Although we find that growth in pre buyout sales has a positive effect on the post buyout growth in the value of exports, its inclusion does not have a material impact on our estimates of private equity buyouts on firms' exporting activity. In other words, we find that it does not diminish the effect of private equity ownership, and our results remain intact after controlling for pre buyout growth trends.

6.3 Attrition bias

In order to account for any potential attrition bias from firms exiting via acquisition or liquidation, we reduce our sample to include only those deals that experience an exit. The results are in table A7. This process of elimination reduces our sample of private equity-backed firms from 917 to 459. Nevertheless, the significance of our results concerning both the extensive and intensive margins of exporting remain intact.

6.4 Controlling for management buyouts (MBOs)

We allow for the fact that after a transaction, new management teams may drive the improvement in firms' exporting. The difference-in-differences setting partly resolves this potential concern based on firm fixed effects for removing channels that may influence firms during the sample period. However, to ensure the robustness of our main results, we repeat our baseline estimations after dropping all management buyouts (MBOs) from the sample. An MBO is a buyout in which the existing management team takes a significant stake from the existing owners and therefore has increased incentives to improve operating performance. As such, Bernstein et al. (2019) suggest that MBOs may have lower engagement from PE investors. In our matched sample of deals, 44% of the private equity buyouts are MBOs.[15] Table A8 presents the results, which demonstrate a significant impact of PE investment on both extensive and intensive margins of export. We conclude that the inclusion of MBOs does not have a material effect on our results.

6.5 Controlling for secondary buyouts

We also rerun the main specifications after dropping all secondary buyouts from our sample in table A9. Recent research finds the rationale and motives for secondary buyouts to differ from that of primary buyouts (Wang, 2012; Arcot et al., 2015; Degeorge et al., 2016).

[15] In our initial sample of all 3,310 UK buyouts from Capital IQ from 2004 to 2017, 40% of deals are MBOs.

Accordingly, to control for the potential that including secondary buyouts may affect our results, we omit these deals from our sample and the main results hold. We continue to observe that PE ownership has a significant and positive effect on firm exporting at both the extensive and intensive margins.

6.6 Investor experience

To supplement our findings we further exploit deal level heterogeneity, this time by accounting for differences across PE investors buyout experience. As more experienced PE firms invest more frequently in public-to-private buyouts and in larger portfolio companies, we expect their exporting behavior to be in line with the public-to-private buyouts in table 6. We identify portfolio companies as backed by more experienced investors by taking the top quartile of investor experience at the time of the deal across four measures of experience: investor age, the number of funds raised, the value of funds raised, and the number of investments made.[16]

We split the sample on the basis of investor experience and present the outputs in table A10. The results clearly show that investors' prior experience does not matter for portfolio companies' exporting performance. We argue that the results reflect that the oldest/largest GPs (general partners) are more prevalent in executing deals involving larger target companies and in engaging in more public-to-private buyouts.[17] The probability to start exporting in international markets and the potential growth prospect in exporting is diminishing.

[16]The median investor age is 13 at acquisition, the median number of funds raised is three (at a median value of 1.1 $billion) and the median number of prior buyout deals is 39.

[17]This is consistent with the data. In table A11 in the appendix, we show that investors are, on average, significantly older and more experienced in the sample of public-to-private buyouts relative to the sample of private-to-private buyouts. For example, investors in public-to-private buyouts have on average raised funds totalling $12 billion and executed over 450 buyouts deals. In comparison, investors in private-to-private buyouts have, on average, raised less than half of this amount ($5.9 billion) and have been involved in considerably fewer deal (117). These differences are strongly statistically significant. Moreover, in table A12 in the appendix, we also find that the most experienced investors typically invest in larger target firms. This is in line with Gompers et al. (2016), who present survey evidence showing that the target companies in deals of older, larger investors are considerably larger in size.

6.7 Further evidence on financial constraints

We present further evidence that PE investors ease financial constraints for their portfolio companies. We split our sample on the basis of those defined as SMEs by the European Commission (EC).[18] Under the EC guidelines, firms with a headcount of fewer than 250 and either turnover of less than 50 million euros or a balance sheet total of less than 43 million euros are SMEs. Given that SMEs are typically more likely to be constrained in access to financing, we partition the sample based on whether the firm is an SME. The results in table A13 are consistent with our findings so far, as we find that private equity ownership's effect on firm exporting is stronger for firms defined as SMEs by the EC, at both the extensive and the intensive margin.

6.8 Alternative proxy of productivity

Finally, we rerun the estimations in tables 9 and 10 using an alternative proxy for firm productivity. In tables A14 and A15 we use sales per worker to measure productivity, and we continue to find that productivity is a significant driver of exporting. Moreover, PE investment continues to drive the export activity of target firms which were less productive at the time of the buyout taking place.

7 Conclusion

Recent literature on corporate finance measures how private equity investment affects firm performance. Our study builds on these foundations, focusing on private equity buyouts and their effect on target firms' export performance. Our results from a panel of 917 private equity-backed firms and 4,076 control firms from 2004 to 2017 show that private equity investors are able to relax financial constraints, making their portfolio companies subject to

[18] In unreported analysis, when we split the sample based on pre deal firm leverage, likewise, the effect on firm exporting is greater on more leveraged (and hence more constrained) firms.

fewer distortions and hence improving their exporting infrastructure. This effect holds for both the intensive and the extensive margin of export.

When we split our sample into different deal types and groups of firms, we uncover significant heterogeneity. In particular, the positive effect of private equity ownership is more potent for private-to-private deals and financially constrained firms in the pre buyout period. This finding implies that the availability of outside capital through private equity investment plays an important role when markets face higher trade costs and exporters require more external finance to meet these costs. Our results are robust to re-specifications and alternative matching methodologies.

Finally, we examine the role of productivity after the buyout in affecting firm exporting. When we separate the firms into low and high productivity groups, we show that the extensive margin of exporting, and to a lesser extent the intensive margin, adjust disproportionately more for less productive target firms, compared to high-productivity targets. In sum, we show that productivity is also an empirically important driver of exporting in the context of private equity ownership.

Exporting provides many benefits to firms, including higher survival amid economic crisis. By helping their portfolio companies to increase their exports, private equity firms protect them from crises. This boon is particularly important now that the Covid-19 pandemic has badly hit the corporate sector.

References

Acharya, V. V., Gottschalg, O. F., Hahn, M., and Kehoe, C. (2012). Corporate governance and value creation: Evidence from private equity. *The Review of Financial Studies*, 26(2):368–402.

Amess, K., Stiebale, J., and Wright, M. (2016). The impact of private equity on firms patenting activity. *European Economic Review*, 86:147–160.

Arcot, S., Fluck, Z., Gaspar, J.-M., and Hege, U. (2015). Fund managers under pressure: Rationale and determinants of secondary buyouts. *Journal of Financial Economics*, 115(1):102–135.

Batt, R. and Appelbaum, E. (2014). *Private equity at work. When wall street manages main street*. Russell Sage Foundation.

Batt, R. and Appelbaum, E. (2020). The agency costs of private equity: Why do limited partners still invest? *forthcoming in Academy of Management Perspectives*.

Beck, T. (2003). Financial dependence and international trade. *Review of International Economics*, 11(2):296–316.

Bernard, A. B. and Jensen, J. B. (2004). Why some firms export. *Review of Economics and Statistics*, 86(2):561–569.

Bernstein, S., Lerner, J., and Mezzanotti, F. (2019). Private equity and financial fragility during the crisis. *The Review of Financial Studies*, 32(4):1309–1373.

Bernstein, S., Lerner, J., Sorensen, M., and Strömberg, P. (2017). Private equity and industry performance. *Management Science*, 63(4):1198–1213.

Bernstein, S. and Sheen, A. (2016). The operational consequences of private equity buyouts: Evidence from the restaurant industry. *The Review of Financial Studies*, 29(9):2387–2418.

Biesinger, M., Bircan, C., and Ljungqvist, A. (2020). Value creation in private equity. *EBRD Working Paper No. 242, Swedish House of Finance Research Paper No. 20-17*.

Black, J., Spowage, M., Cooper, B., McGeoch, A., and Watts, R. (2021). Estimating the relationship between exports and the labour market in the UK. *UK Government report, Department for International Trade*.

Bloom, N., Sadun, R., and Van Reenen, J. (2015). Do private equity owned firms have better management practices? *American Economic Review*, 105(5):442–46.

Boucly, Q., Sraer, D., and Thesmar, D. (2011). Growth LBOs. *Journal of Financial Economics*, 102(2):432–453.

Chaney, T. (2016). Liquidity constrained exporters. *Journal of Economic Dynamics and Control*, 72:141–154.

Chung, J.-W. (2011). Leveraged buyouts of private companies. *Available at SSRN 1904342*.

Clerides, S. K., Lach, S., and Tybout, J. R. (1998). Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico, and Morocco. *The Quarterly Journal of Economics*, 113(3):903–947.

Cohn, J. B., Hotchkiss, E. S., and Towery, E. (2020). The motives for private equity buyouts of private firms: Evidence from u.s. corporate tax returns. *Available at SSRN 2318916*.

Cohn, J. B., Nestoriak, N., and Wardlaw, M. (2021). Private equity buyouts and workplace safety. *The Review of Financial Studies*.

Davis, S. J., Haltiwanger, J., Handley, K., Jarmin, R., Lerner, J., and Miranda, J. (2014). Private equity, jobs, and productivity. *The American Economic Review*, 104(12):3956–90.

Degeorge, F., Martin, J., and Phalippou, L. (2016). On secondary buyouts. *Journal of Financial Economics*, 120(1):124–145.

Faccio, M. and Hsu, H.-C. (2017). Politically connected private equity and employment. *The Journal of Finance*, 72(2):539–574.

Fang, L., Ivashina, V., and Lerner, J. (2013). Combining banking with private equity investing. *The Review of Financial Studies*, 26(9):2139–2173.

Feenstra, R. C., Li, Z., and Yu, M. (2014). Exports and credit constraints under incomplete information: Theory and evidence from china. *Review of Economics and Statistics*, 96(4):729–744.

Fracassi, C., Previtero, A., and Sheen, A. (2018). Barbarians at the store? private equity, products, and consumers. *Private Equity, Products, and Consumers (June 19, 2018). Kelley School of Business Research Paper*, (17-12).

Gao, H., Harford, J., and Li, K. (2013). determinants of corporate cash policy: Insights from private firms. *Journal of Financial Economics*, 109:623–639.

Gompers, P., Kaplan, S. N., and Mukharlyamov, V. (2016). What do private equity firms say they do? *Journal of Financial Economics*, 121(3):449–476.

Görg, H. and Spaliara, M.-E. (2014). Financial health, exports and firm survival: evidence from uk and french firms. *Economica*, 81(323):419–444.

Greenaway, D., Guariglia, A., and Kneller, R. (2007). Financial factors and exporting decisions. *Journal of International Economics*, 73(2):377–395.

Greenaway, D. and Kneller, R. (2004). Exporting and productivity in the United Kingdom. *Oxford Review of Economic Policy*, 20(3):358–371.

Guariglia, A. (2008). Internal financial constraints, external financial constraints, and investment choice: Evidence from a panel of UK firms. *Journal of Banking and Finance*, 32(9):1795–1809.

Guo, S., Hotchkiss, E. S., and Song, W. (2011). Do buyouts (still) create value? *The Journal of Finance*, 66(2):479–517.

Hadlock, C. and Pierce, J. (2010). New evidence on measuring financial constraints: Moving beyond the KZ index. *The Review of Financial Studies*, 23(5):1909–1940.

Harris, R., Siegel, D. S., and Wright, M. (2005). Assessing the impact of management buyouts on economic efficiency: Plant-level evidence from the United Kingdom. *Review of Economics and Statistics*, 87(1):148–153.

Ivashina, V. and Kovner, A. (2011). The private equity advantage: Leveraged buyout firms and relationship banking. *The Review of Financial Studies*, 24(7):2462–2498.

Jenkinson, T. and Sousa, M. (2015). What determines the exit decision for leveraged buyouts? *Journal of Banking and Finance*, 59:399–408.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review*, 76(2):323–329.

Kaplan, S. (1989). The effects of management buyouts on operating performance and value. *Journal of Financial Economics*, 24(2):217–254.

Kaplan, S. N. and Stromberg, P. (2009). Leveraged buyouts and private equity. *Journal of Economic Perspectives*, 23(1):121–46.

Lerner, J., Davis, S., Haltiwanger, J., Hanley, K., Jarmin, R. S., and Miranda, J. (2019). The economic effects of private equity buyouts. *Harvard Business School Working Paper 20-046*.

Lerner, J., Leamon, A., and Hardymon, F. (2012). *Venture capital, private equity, and the financing of entrepreneurship: The power of active investing*. John Wiley & Sons.

Lerner, J., Sorensen, M., and Strömberg, P. (2011). Private equity and long-run investment: The case of innovation. *The Journal of Finance*, 66(2):445–477.

Manova, K. (2013). Credit constraints, heterogeneous firms, and international trade. *Review of Economic Studies*, 80(2):711–744.

Manova, K., Wei, S.-J., and Zhang, Z. (2015). Firm exports and multinational activity under credit constraints. *Review of Economics and Statistics*, 97(3):574–588.

Manova, K. and Yu, Z. (2016). How firms export: Processing vs. ordinary trade with financial frictions. *Journal of International Economics*, 100:120–137.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725.

Minetti, R., Murro, P., and Zhu, S. C. (2015). Family firms, corporate governance, and export. *Economica*, 82:1177–1216.

Minetti, R. and Zhu, S. C. (2011). Credit constraints and firm export: Microeconomic evidence from Italy. *Journal of International Economics*, 83(2):109–125.

Muûls, M. (2015). Exporters, importers, and credit constraints. *Journal of International Economics*, 95(2):333–343.

Strömberg, P. (2008). The new demography of private equity. Technical report, New York: World Economic Forum USA.

Wang, Y. (2012). Secondary buyouts: Why buy and at what price? *Journal of Corporate Finance*, 18(5):1306–1325.

Wilson, N., Amini, S., and Wright, M. (2021). Determining the characteristics of the private equity targets: Uk evidence. *British Journal of Management*, 0:1–22.

Wilson, N., Wright, M., Siegel, D. S., and Scholes, L. (2012). Private equity portfolio company performance during the global recession. *Journal of Corporate Finance*, 18(1):193–205.

Figures

Figure 1: The effect of PE ownership on export activity

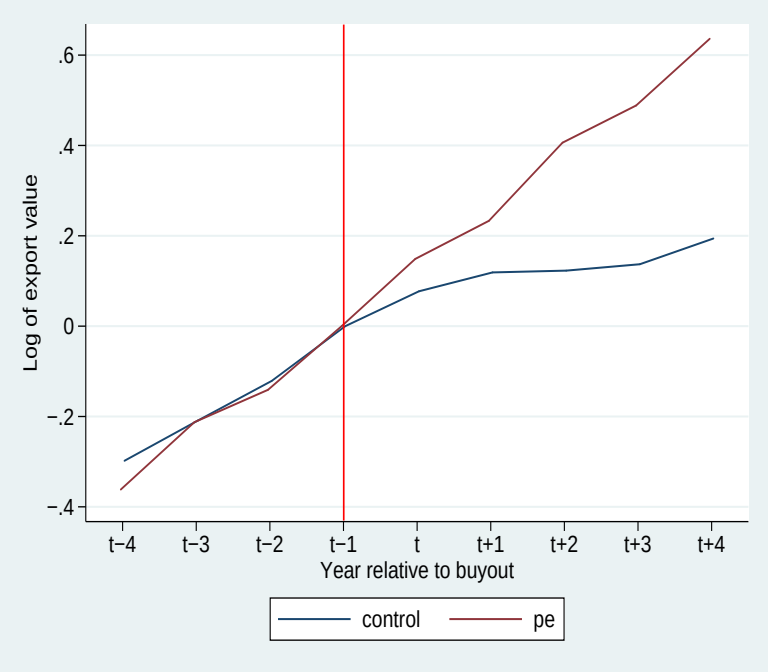
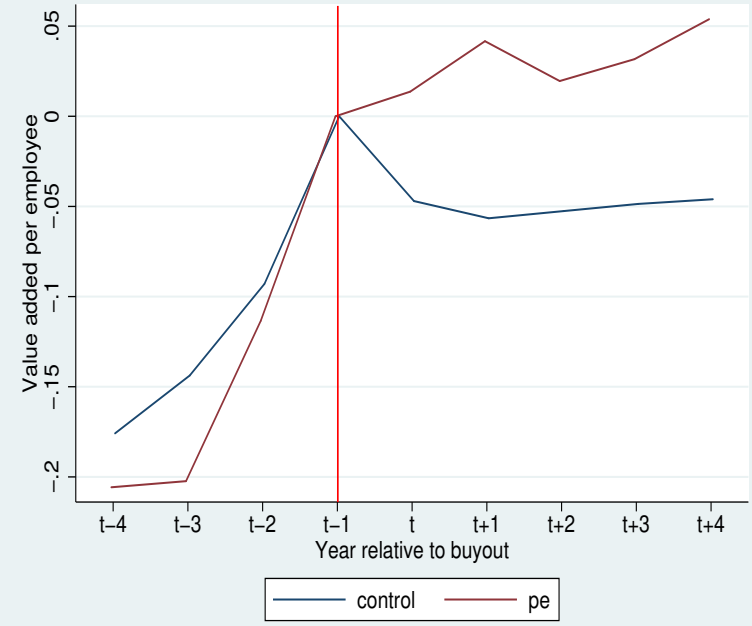


Figure 2: The effect of PE ownership on productivity



Tables

Table 1: Sample statistics

The table provides sample statistics on the transactions used in our study. Panel A displays the industry distribution of the target company involved in the transactions. Panel B describes deal types and panel C details the exit status of the deals.

	Number	Percentage
Panel A: Industry distribution		
Agriculture, forestry, fishing	5	0.4%
Mining	14	1.0%
Construction	39	2.7%
Manufacturing	344	24.2%
Transportation & communication	130	9.2%
Wholesale trade	76	5.4%
Retail trade	147	10.4%
Finance, insurance, real estate	131	9.2%
Services	530	37.3%
Public administration	4	0.3%
Panel B: Deal Type		
Private-to-private	881	61.5%
Public-to-private	79	5.5%
Secondary buyout	228	15.9%
Divisional buyout	245	17.1%
Panel C: Exits		
Sale	485	34.1%
Secondary buyout	266	18.7%
IPO	54	3.8%
Write-off	85	6.0%
Other/Unknown	16	1.1%
Not yet exited	517	36.3%

Table 2: Descriptive statistics

The table reports summary statistics for the pre-transaction year across PE-backed companies and control firms. *PE-backed* refers to all PE-backed companies; *Control* refers to a sample of non-PE-backed firms, matched on their two-digit SIC code, total sales, and ROA (net income/total assets) within a 50% bracket in the pre-transaction year. *Export sales* is the value of export sales. *Export intensity* is exports as a percentage of total sales. *Size* is total assets, measured in thousands of pounds. *Sales* is total firm sales. *Cash flow* is net income plus depreciation and is scaled by total assets. *Earnings* is earnings before interest, taxes, depreciation, and amortization (EBITDA) normalized by total assets. *ROA* is the ratio of net income to total assets. *Leverage* is the ratio of total debt to total assets. *Productivity* is value added per employee. All ratios are winsorized at 1%.

	PE				Control				
Variable	N	Mean	Median	SD	N	Mean	Median	SD	Mean-diff
Exporting									
Export sales	340	12,538	4,444	27,264	1,255	18,125	5,602	48,291	-5,586***
Export intensity	340	0.31	0.19	0.30	1,255	0.36	0.24	0.34	-0.05***
Firm Variables									
Size	917	91,813	17,881	397,308	4,076	97,800	13,209	576,089	-5,987
Sales	917	64,395	23,949	137,304	4,076	53,673	21,633	114,739	10,721*
Cash flow	893	0.17	0.14	0.13	3,680	0.16	0.14	0.12	0.01
Earnings	915	0.27	0.18	1.65	4,069	0.20	0.16	0.17	0.07
ROA	917	0.14	0.11	0.13	4,076	0.14	0.10	0.13	0.00
Leverage	768	0.63	0.63	0.27	2,989	0.62	0.61	0.35	0.01
Productivity	749	81.80	58.13	94.51	3,036	97.45	56.95	127.88	-15.66***

Table 3: Growth rates

The table displays two-year pre-transaction growth rates for firm-level variables across treated PE-backed and control firms. *PE-backed* refers to all PE-backed companies; *Control* refers to a sample of non-PE-backed firms, matched on their two-digit SIC code, total sales, and ROA (net income/total assets) within a 50% bracket in the pre-transaction year. *Export sales* is the value of export sales. *Export intensity* is exports as a percentage of total sales. *Export intensity* is foreign sales as a percentage of total sales. *Size* is total assets, measured in thousands of pounds. *Sales* is total firm sales. *Cash flow* is net income plus depreciation and is scaled by total assets. *Earnings* is earnings before interest, taxes, depreciation, and amortization (EBITDA) normalized by total assets. *ROA* is the ratio of net income to total assets. *Leverage* is the ratio of total debt to total assets. *Productivity* is value added per employee. All growth rates are winsorized at 1%.

	PE				Control				
Variable	N	Mean	Median	SD	N	Mean	Median	SD	Mean-diff
Exporting - two-year growth rate									
Export sales	253	0.28	0.25	0.76	904	0.23	0.17	0.74	0.05
Export intensity	253	0.34	0.05	1.60	904	0.38	0.02	1.71	-0.04
Firm variables - two-year growth rate									
Size	884	0.58	0.32	1.02	3,830	0.59	0.21	1.46	-0.01
Sales	780	0.50	0.26	1.05	3,397	0.44	0.17	1.24	0.06
Cash flow	785	0.41	0.09	2.58	3,156	0.25	0.06	3.02	0.16
Earnings	807	0.44	0.07	3.51	3,549	0.21	0.02	3.64	0.23
ROA	704	1.19	0.19	3.58	3,045	1.40	0.12	4.81	-0.21
Leverage	666	-0.05	-0.06	0.24	2,533	-0.05	-0.06	0.28	0.00
Productivity	632	0.29	0.11	0.79	2,503	0.26	0.08	0.84	0.03

Table 4: Extensive margin of export

We estimate specifications in columns 1-3 using a linear probability model, and in columns 4-6 using a probit model. The dependent variable is a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise. PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. Columns 2, 3, 5, and 6 include firm-level controls taken in the pre buyout year and are interacted with the Post variable. Firm controls include sales, earnings, leverage, profitability (ROA), and cash flow. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Linear Prob			Probit		
	(1)	(2)	(3)	(4)	(5)	(6)
PE*Post	0.046***	0.031***	0.030***	0.272***	0.266***	0.255***
	(0.012)	(0.010)	(0.010)	(0.081)	(0.081)	(0.083)
Post	-0.018***	0.155**	0.163**	-0.122***	1.326**	1.142**
	(0.005)	(0.041)	(0.040)	(0.042)	(0.324)	(0.328)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
Industry x Post FE	No	No	Yes	No	No	Yes
Firm controls	No	Yes	Yes	No	Yes	Yes
Observations	41,713	41,713	41,713	40,750	40,750	40,750

Table 5: Intensive margin of exporting

We estimate all specifications using a difference-in-differences estimator. The dependent variables are the log value of exports (columns 1-3), and the ratio of export sales to total sales (columns 4-6). PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. Columns 2, 3, 5, and 6 include firm-level controls taken in the pre buyout year and are interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA), and cash flow. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	LogExport			Export intensity		
	(1)	(2)	(3)	(4)	(5)	(6)
PE*Post	0.379***	0.365***	0.361***	0.030***	0.030***	0.029***
	(0.065)	(0.065)	(0.066)	(0.009)	(0.009)	(0.009)
Post	-0.074**	-0.102	-0.127	-0.009**	-0.014	-0.018
	(0.034)	(0.311)	(0.312)	(0.004)	(0.039)	(0.038)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
Industry x Post FE	No	No	Yes	No	No	Yes
Firm controls	No	Yes	Yes	No	Yes	Yes
Observations	12,257	12,257	12,257	12,257	12,257	12,257

Table 6: Deal types

We estimate specifications in columns 1-2 using a linear probability model, and columns 3-6 using difference-in-differences estimators. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-2), the log of export value (columns 3-4), and the ratio of export sales to total sales (columns 5-6). PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. Panel A shows results on the subsample of private-to-private buyouts. Panel B shows results on the subsample of public-to-private and divisional buyouts. In columns 2, 4 and 6 we augment the baseline model with firm controls measured in the pre buyout year and interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA), and cash flow. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy		LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Private-to-private						
PE*Post	0.062***	0.060***	0.489***	0.472***	0.043***	0.044***
	(0.014)	(0.015)	(0.081)	(0.082)	(0.011)	(0.012)
Post	-0.018**	0.167**	-0.100**	-0.311	-0.012**	-0.028
	(0.006)	(0.048)	(0.043)	(0.400)	(0.005)	(0.053)
Observations	28,792	28,792	8,169	8,169	8,169	8,169
Panel B: Public-to-private & divisional buyouts						
PE*Post	-0.047	-0.043	-0.118	-0.136	-0.006	-0.005
	(0.032)	(0.032)	(0.144)	(0.142)	(0.018)	(0.018)
Post	-0.016	0.242*	0.118	0.277	-0.003	-0.008
	(0.015)	(0.106)	(0.086)	(0.815)	(0.010)	(0.077)
Observations	5,582	5,582	1,823	1,823	1,823	1,823
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes

Table 7: Financial constraints: Size

We estimate specifications in columns 1-2 using a linear probability model, and columns 3-6 using difference-in-differences estimators. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-2), the log of export value (columns 3-4), and the ratio of export sales to total sales (columns 5-6). *Large* is a dummy variable that takes the value one if the firm's total assets in the pre deal year are in the top quartile of the distribution, and zero otherwise. PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. In columns 2, 4, and 6 we augment the baseline model with firm controls taken in the pre buyout year and are interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA) and cash flow. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy		LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Large=0						
PE*Post	0.065***	0.063***	0.371***	0.341***	0.030***	0.028***
	(0.014)	(0.014)	(0.074)	(0.076)	(0.010)	(0.010)
Post	-0.014**	-0.055	-0.055	-0.048	-0.008	-0.107*
	(0.006)	(0.057)	(0.039)	(0.457)	(0.005)	(0.061)
Observations	31,374	31,374	9,493	9,493	9,493	9,493
Panel B: Large=1						
PE*Post	0.008	0.006	0.410***	0.387***	0.030	0.030
	(0.021)	(0.021)	(0.132)	(0.132)	(0.020)	(0.019)
Post	-0.031**	0.113	-0.131*	0.290	-0.013	0.216*
	(0.011)	(0.085)	(0.074)	(0.839)	(0.010)	(0.095)
Observations	10,339	10,339	2,764	2,764	2,764	2,764
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Test of equality (P-value) for PE*Post	0.000	0.000	0.389	0.344	0.000	0.000

Table 8: Financial constraints: Age

We estimate specifications in columns 1-2 using a linear probability model, and columns 3-6 using difference-in-differences estimators. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-2), the log of export value (columns 3-4), and the ratio of export sales to total sales (columns 5-6). *Old* is a dummy variable that takes the value one if the firm's age in the pre deal year is in the top quartile of the distribution of the age of all the firms, and zero otherwise. PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. In columns 2, 4, and 6 we augment the baseline model with firm variables taken in the pre buyout year and interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA) and cash flow. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy		LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Old=0						
PE*Post	0.049***	0.047***	0.398***	0.385***	0.035***	0.035***
	(0.013)	(0.013)	(0.080)	(0.079)	(0.010)	(0.011)
Post	-0.016**	0.093*	-0.088**	-0.089	-0.012**	-0.041
	(0.007)	(0.046)	(0.044)	(0.396)	(0.006)	(0.043)
Observations	31,533	31,533	8,271	8,271	8,271	8,271
Panel B: Old=1						
PE*Post	0.034	0.041	0.337***	0.325***	0.023	0.020
	(0.027)	(0.026)	(0.112)	(0.115)	(0.016)	(0.106)
Post	-0.022**	0.279	-0.062	-0.089	-0.001	0.055
	(0.011)	(0.083)	(0.056)	(0.511)	(0.007)	(0.073)
Observations	10,180	10,180	3,986	3,986	3,986	3,986
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Test of equality (P-value) for PE*Post	0.000	0.000	0.448	0.464	0.000	0.000

Table 9: Controlling for firm productivity

We estimate specifications in columns 1-3 using a linear probability model, and in columns 4-9 using a difference-in-differences estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-3), the log of export value (columns 4-6), and the ratio of export sales to total sales (columns 7-9). Columns 1, 4, and 7 are the baseline estimates from Tables 4 and 5. PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post buyout years, and 0 otherwise. In columns 3, 6, and 9 we augment the baseline model with firm variables taken in the pre buyout year and interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA) and cash flow. We likewise control for firm productivity, where productivity is defined as value added per worker. This is measured in the pre deal year and interacted with the Post dummy. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy			LogExport			Export intensity		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PE*Post	0.046***	0.030***	0.029***	0.379***	0.331***	0.328***	0.030***	0.020***	0.018***
	(0.012)	(0.012)	(0.012)	(0.065)	(0.065)	(0.066)	(0.009)	(0.009)	(0.009)
Post	-0.018***	-0.057***	0.142**	-0.074**	-0.097*	-0.105	-0.009**	-0.017*	-0.021
	(0.005)	(0.007)	(0.040)	(0.034)	(0.059)	(0.309)	(0.004)	(0.009)	(0.040)
Productivity*Post		0.013***	0.014***		0.007**	0.005*		0.002**	0.002*
		(0.002)	(0.002)		(0.002)	(0.002)		(0.001)	(0.001)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	41,713	31,431	31,431	12,257	10,971	10,971	12,257	10,971	10,971

Table 10: High and low-productivity firms

We estimate specifications in columns 1-2 using a linear probability model, and columns 3-6 using difference-in-differences estimators. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-2), the log of export value (columns 3-4), and the ratio of export sales to total sales (columns 5-6). *High-productivity* is a dummy variable that takes the value one if the firm's value added per employee in the pre deal year is in the top quartile of the distribution of the productivity of all the firms, and zero otherwise. PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. In columns 2, 4, and 6 we augment the baseline model with firm variables taken in the pre buyout year and interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA) and cash flow. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy		LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: High-productivity=1						
PE*Post	0.008	0.006	0.402***	0.401***	0.027*	0.026
	(0.030)	(0.029)	(0.132)	(0.133)	(0.016)	(0.016)
Post	-0.014	0.298**	-0.171***	0.955*	-0.007	0.078
	(0.013)	(0.109)	(0.058)	(0.561)	(0.009)	(0.085)
Observations	7,863	7,863	2,759	2,759	2,759	2,759
Panel B: High-productivity=0						
PE*Post	0.030**	0.030**	0.317***	0.313***	0.012*	0.011
	(0.014)	(0.014)	(0.067)	(0.068)	(0.009)	(0.009)
Post	0.003	0.099*	-0.087***	0.045	-0.002	-0.025
	(0.007)	(0.055)	(0.032)	(0.341)	(0.004)	(0.041)
Observations	23,766	23,766	7,864	7,864	7,864	7,864
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Test of equality (P-value) for PE*Post	0.000	0.000	0.282	0.279	0.231	0.212

Online appendix for "Private equity buyouts and firm exports: Evidence from UK firms"

August 2021

Definition of the variables and data sources

Variables definitions

Table A1 contains definitions of all the variables used in the empirical models.

Buyout transaction data

Table A2 offers an initial insight into our sample of transactions by showing the evolution of deals over our sample period. Deal activity increases in the run-up to 2007, before dropping dramatically at the onset of the global financial crisis, and recovering thereafter (Shivdasani and Wang (2011)). We have a relatively equal spread of deals across each year.

Aside from the details in the main text of the paper, other aspects of our sample of transactions also relate to recent studies involving samples of buyouts and private equity investors. The median (mean) deal size in our sample is £46 million (£182 million), which is not dissimilar to other studies. Strömberg (2008) reports a median deal size of $64 million in the US and $36 million in the UK from 2001 to 2007, and according to Boucly et al. (2011) the median-sized French deal is $63 million. The median holding period in our sample of deals is five years, similar to other studies which examine European private equity transactions (Strömberg (2008); Jenkinson and Sousa (2015)).

With regards to our sample of private equity investors, domestic (UK-based) investors are prevalent, with 77% of transactions involving a UK-based private equity acquirer. Nevertheless, international invetsors acquire a significant proportion of targets. Specifically, around 16% of deals involve a U.S.-based investor, and 5% involve European investors. Table A3 details the top 15 most active investors in our sample of transactions. LDC, the mid-market buyout arm of Lloyds Banking Group, is involved in the most transactions (94). The majority of the other most frequent investors operate somewhere in the lower to upper mid-market space. Larger, global private equity investors such as KKR, Apollo, and Blackstone also appear frequently in our sample.

Last, we consider the size of our investors. Our range of transactions covers small-cap buyouts to mid-market transactions and deals made by larger, global "mega-funds." With regard to the size of the corresponding fund through which the investor executes the transaction, our sample has a median (mean) fund size of $600 million ($1.82 billion).[1] This is also consistent with other studies. Barber and Yasuda (2017) cite a median (mean) U.S. buyout fund size of $650 million ($1.53 billion), and in a global sample of buyout funds, Metrick and Yasuda (2010) report a median fund size of $600 million.[2]

Robustness tests

We discuss in section 6 nine checks that ensure the robustness of our main findings.

Alternative matching methodologies. Tables A4 and A5 report regressions after adjusting our matching technique. These modifications do not alter our findings.

Pre-buyout growth patterns. In table A6 we show results for including an interaction term between the three-year pre-buyout growth rate in sales and the *Post* variable. We find that PE investment has a significant impact on exporting, vindicating our approach in the main text of the paper.

Attrition bias. We examine whether our results hold when we reduce our sample to include only those deals that experience an exit. The results, shown in table A7, confirm our main findings.

Controlling for management buyouts (MBOs). We re-run our baseline estimations after dropping management buyouts (MBOs) from the sample. We show in table A8 that our results are robust to this modification.

Controlling for secondary buyouts. We reestimate the main models after dropping all secondary buyouts from our sample. We report the results in table A9. The main results

[1] Where Capital IQ does not specify the exact fund through which a deal is executed, we take the size of the most recent fund raised relative to the transaction date, which is still investing.

[2] Harris et al. (2014a) and Harris et al. (2014b) also report similar summary statistics on buyout fund size.

are hold.

Accounting for investors' experience. We split the sample on the basis of investor experience and present the outputs in table A10. Our findings show that investors' prior experience does not appear to affect portfolio companies' exporting performance.

Alternative classification scheme. We use firms' classification as SMEs by the European Commission as an alternative sample-splitting criterion for credit constraints. We show in table A13 that our results are robust to an alternative definition of credit-constrained firms.

Alternative productivity proxy. Finally, we use sales per employee an alternative measure of labour productivity. We show in tables A14 and A15 that our results remain intact using this alternative measure of firm productivity.

Table A1: Variable definitions and sources

A. Dependent variables		
Export dummy	Dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise	FAME
Log(export)	The natural logarithm of the value of export sales	FAME
Export intensity	Export sales as a percentage of total sales	FAME
B. Main explanatory variables		
PE	Dummy variable equal to 1 for PE-backed firms, and 0 for control firms	Capital IQ
Post	Dummy variable equal to 1 for post-buyout years, and 0 otherwise	Capital IQ
PE*Post	Interaction term between the PE and Post variables	Capital IQ
C. Control variables		
Size	Total firm assets	FAME
Sales	Total firm sales	FAME
Earnings	Earnings before interest, taxes, depreciation, and amortization (EBITDA) normalized by total assets	FAME
Cash flow	Net income plus depreciation divided by total assets	FAME
Leverage	Total debt divided by total assets	FAME
ROA	Net income divided by total assets	FAME
Productivity	Value added divided by the number of employees	FAME
Employees	Total number of employees	FAME
Wage bill	The natural logarithm of the total firm wage bill	FAME

Table A2: Deal time-series distribution

The table reports the time-series distribution of the buyout transactions in our sample.

Year	Number	Percentage
2004	70	4.9%
2005	87	6.1%
2006	116	8.1%
2007	128	8.9%
2008	112	7.8%
2009	41	2.9%
2010	90	6.3%
2011	90	6.3%
2012	109	7.6%
2013	117	8.2%
2014	123	8.6%
2015	133	9.3%
2016	116	8.1%
2017	102	7.1%
Total	1,434	100.0%

Table A3: Sample statistics: Transactions by PE investor

The table shows the top 15 most active PE investors in our sample of transactions.

PE Firm	Number of deals	Percentage of total sample
Lloyds Development Capital Limited	94	5.8%
Inflexion Private Equity Partners LLP	40	2.4%
Livingbridge EP LLP	29	1.8%
ECI Partners LLP	28	1.8%
Equistone Partners Europe	27	1.7%
Phoenix Equity Partners Limited	26	1.6%
3i Group plc	24	1.5%
Bowmark Capital LLP	23	1.5%
The Carlyle Group Inc.	22	1.4%
Bridgepoint Advisers Limited	21	1.3%
HgCapital LLP	21	1.3%
Sovereign Capital Partners LLP	21	1.3%
CBPE Capital LLP	20	1.2%
Exponent Private Equity LLP	20	1.2%
Lyceum Capital Partners LLP	20	1.2%

Table A4: Alternative matching technique: 30% brackets

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *PE* is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. *Post* is a dummy variable equal to 1 for post buyout years, and 0 otherwise. We match firms using narrower bandwidths of 30% for size (domestic sales) and ROA (net income/assets). Firm controls include firm sales, earnings, leverage, profitability (ROA) and cash flow. We measure these controls in the pre deal year and interact them with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE*Post	0.044***	0.042***	0.254***	0.255**	0.390***	0.380***	0.029***	0.029***
	(0.012)	(0.014)	(0.083)	(0.083)	(0.067)	(0.068)	(0.009)	(0.010)
Post	-0.019	0.122***	-0.177***	0.948**	-0.116***	-0.185	-0.013***	-0.037
	(0.006)	(0.042)	(0.044)	(0.446)	(0.037)	(0.365)	(0.005)	(0.044)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	38,047	38,047	37,580	37,580	10,972	10,972	10,972	10,972

Table A5: Alternative matching technique: Adding leverage

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *PE* is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. *Post* is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. We conduct the matching using 50% brackets but add leverage (total debt/total assets) as an additional matching criteria. Firm controls include firm sales, earnings, leverage, profitability (ROA), and cash flow. We measure these controls in the pre deal year and are interacted with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE*Post	0.039***	0.040***	0.224**	0.231***	0.329***	0.312***	0.028**	0.027**
	(0.014)	(0.014)	(0.093)	(0.091)	(0.070)	(0.070)	(0.017)	(0.019)
Post	-0.021***	0.237***	-0.124**	1.725**	-0.079**	-0.254	-0.008*	0.003
	(0.007)	(0.052)	(0.048)	(0.427)	(0.037)	(0.315)	(0.004)	(0.037)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	31,618	31,618	31,328	31,328	9,718	9,718	9,718	9,718

Table A6: Accounting for pre buyout growth

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *PE* is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. *Post* is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. We include an interaction term of the three-year pre buyout growth in sales (SalesGr) with Post. Firm controls include firm sales, earnings, leverage, profitability (ROA), and cash flow. We measure these controls in the pre deal year and interact them with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE*Post	0.046***	0.046***	0.273***	0.267***	0.376***	0.365***	0.030***	0.031***
	(0.012)	(0.012)	(0.081)	(0.082)	(0.064)	(0.065)	(0.009)	(0.010)
Post	-0.019***	0.156**	-0.126***	1.363**	-0.092**	-0.118	-0.009**	-0.014
	(0.006)	(0.040)	(0.042)	(0.524)	(0.035)	(0.307)	(0.004)	(0.038)
SalesGr*Post	0.001	0.001	0.002**	0.002**	0.034**	0.035**	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.013)	(0.014)	(0.001)	(0.001)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	41,713	41,713	40,750	40,750	12,257	12,257	12,257	12,257

Table A7: Exited deals only

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *PE* is a dummy variable equal to 1 for PE-backed firms, and 0 for control firms. *Post* is a dummy variable equal to 1 for post buyout years, and 0 otherwise. We use a sub-sample of firms which have experienced an exit. Firm controls include firm sales, earnings, leverage, profitability (ROA), and cash flow. We take these controls in the pre deal year and interact them with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE*Post	0.044***	0.043***	0.281***	0.276***	0.387***	0.377***	0.028**	0.027**
	(0.014)	(0.014)	(0.099)	(0.100)	(0.083)	(0.084)	(0.011)	(0.012)
Post	-0.019***	0.160**	-0.127**	1.495***	-0.055	0.127	-0.007	0.049
	(0.007)	(0.051)	(0.053)	(0.424)	(0.043)	(0.383)	(0.006)	(0.047)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	26,621	26,621	25,913	25,913	7,755	7,755	7,755	7,755

Table A8: Excluding MBOs

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *PE* is a dummy variable equal to 1 for PE-backed firms, and 0 for control firms. *Post* is a dummy variable equal to 1 for post buyout years, and 0 otherwise. We use a subsample of firms that excludes MBOs. Firm controls include firm sales, earnings, leverage, profitability (ROA), and cash flow. We measure these controls in the pre deal year and intercat them with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE*Post	0.032*	0.025	0.138*	0.118*	0.333***	0.310***	0.028**	0.030**
	(0.018)	(0.018)	(0.098)	(0.113)	(0.105)	(0.104)	(0.014)	(0.013)
Post	-0.011*	0.144	-0.054	0.208	-0.077**	0.111	-0.009**	-0.022
	(0.007)	(0.122)	(0.065)	(0.290)	(0.014)	(0.108)	(0.002)	(0.018)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	18,511	18,511	17,929	17,929	5,176	5,176	5,176	5,176

Table A9: Excluding secondary buyouts

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *PE* is a dummy variable equal to 1 for PE-backed firms, and 0 for control firms. *Post* is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. We use a subsample of firms that excludes secondary buyouts. Firm controls include firm sales, earnings, leverage, profitability (ROA), and cash flow. We take these controls in the pre deal year and interact them with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE*Post	0.042***	0.043***	0.226**	0.219**	0.375***	0.361***	0.034***	0.035***
	(0.013)	(0.014)	(0.091)	(0.091)	(0.072)	(0.073)	(0.010)	(0.010)
Post	-0.017***	0.191**	-0.115**	1.301**	-0.076**	-0.251	-0.010**	-0.025
	(0.006)	(0.044)	(0.047)	(0.872)	(0.038)	(0.361)	(0.005)	(0.045)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	34,374	34,374	33,498	33,498	9,992	9,992	9,992	9,992

Table A10: Investor experience

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *PE* is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. *Post* is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. Firm controls include sales, earnings, leverage, profitability (ROA) and cash flow. We measure these controls in the pre deal year and interact them with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Investor age								
Experienced=0								
PE*Post	0.058***	0.058***	0.357***	0.359***	0.499***	0.489***	0.038***	0.039***
	(0.014)	(0.014)	(0.094)	(0.094)	(0.079)	(0.080)	(0.010)	(0.010)
Post	-0.024***	0.128***	-0.177***	1.302**	-0.100**	0.093	-0.013**	-0.032
	(0.006)	(0.046)	(0.049)	(0.475)	(0.040)	(0.369)	(0.005)	(0.044)
Observations	32,400	32,400	31,338	31,338	9,336	9,336	9,336	9,336
Experienced=1								
PE*Post	0.007	0.006	0.014	-0.011	0.136	0.061	0.013	0.005
	(0.025)	(0.025)	(0.175)	(0.176)	(0.123)	(0.122)	(0.020)	(0.020)
Post	0.008	0.245**	0.058	1.450*	-0.035	-0.077	-0.001	0.083
	(0.013)	(0.095)	(0.096)	(0.721)	(0.069)	(0.564)	(0.010)	(0.093)
Observations	9,313	9,313	9,241	9,241	2,921	2,921	2,921	2,921
P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Panel B: Number of funds raised								
Experienced=0								
PE*Post	0.039***	0.040***	0.375***	0.376***	0.317***	0.308***	0.024**	0.023**
	(0.012)	(0.012)	(0.094)	(0.095)	(0.063)	(0.065)	(0.007)	(0.008)
Post	-0.002	0.118**	0.070	0.908*	-0.088***	0.464	-0.002	-0.005
	(0.005)	(0.042)	(0.047)	(0.398)	(0.028)	(0.365)	(0.003)	(0.002)
Observations	34,068	34,068	33,084	33,084	9,989	9,989	9,989	9,989
Experienced=1								

PE*Post	-0.054	-0.051	-0.396	-0.377	0.274**	0.230**	0.028	0.020
	(0.028)	(0.026)	(0.210)	(0.216)	(0.118)	(0.117)	(0.019)	(0.017)
Post	0.003	0.097	0.197*	0.603	-0.123**	0.275	-0.006	0.041
	(0.011)	(0.089)	(0.100)	(0.754)	(0.060)	(0.564)	(0.010)	(0.069)
Observations	7,645	7,645	7,516	7,516	2,268	2,268	2,268	2,268
P value	0.000	0.000	0.000	0.000	0.374	0.280	0.000	0.000
Panel C: Value of funds raised								
Experienced=0								
PE*Post	0.048***	0.049***	0.365***	0.371***	0.275***	0.257***	0.034**	0.033**
	(0.012)	(0.012)	(0.095)	(0.095)	(0.063)	(0.063)	(0.011)	(0.012)
Post	-0.001	0.100**	0.110**	0.822**	-0.073**	0.306	-0.002	-0.011
	(0.005)	(0.045)	(0.048)	(0.046)	(0.029)	(0.300)	(0.004)	(0.032)
Observations	33,934	33,934	33,046	33,046	10,006	10,006	10,006	10,006
Experienced=1								
PE*Post	-0.045	-0.044	-0.287	-0.305	0.411***	0.384***	0.025	0.024
	(0.026)	(0.024)	(0.200)	(0.202)	(0.130)	(0.131)	(0.015)	(0.016)
Post	0.001	0.059	0.073	0.362	-0.180**	0.899	-0.007	0.019
	(0.011)	(0.089)	(0.100)	(0.794)	(0.066)	(0.767)	(0.008)	(0.070)
Observations	7,779	7,779	7,545	7,545	2,251	2,251	2,251	2,251
P value	0.000	0.000	0.000	0.000	0.173	0.194	0.000	0.000
Panel D: Number of investments made								
Experienced=0								
PE*Post	0.046***	0.048***	0.345***	0.341***	0.335***	0.327***	0.039**	0.040**
	(0.012)	(0.012)	(0.097)	(0.098)	(0.064)	(0.064)	(0.017)	(0.018)
Post	-0.006	0.111**	0.029	0.820**	-0.071**	0.122	-0.001	-0.033
	(0.005)	(0.042)	(0.048)	(0.391)	(0.030)	(0.344)	(0.004)	(0.036)
Observations	32,381	32,281	31,099	31,099	9,299	9,299	9,299	9,299
Experienced=1								
PE*Post	-0.028	-0.026	-0.148	-0.115	0.214*	0.191	0.005	0.002
	(0.023)	(0.023)	(0.182)	(0.184)	(0.119)	(0.122)	(0.016)	(0.017)
Post	0.016	0.148	0.297**	0.998	-0.154***	0.996*	-0.008	0.122
	(0.011)	(0.094)	(0.095)	(0.752)	(0.051)	(0.556)	(0.008)	(0.081)

Observations	9,432	9,432	9,270	9,270	2,958	2,958	2,958	2,958
P value	0.000	0.000	0.000	0.000	0.133	0.000	0.000	0.000
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes

Table A11: Deal type and investor experience

The table reports the mean of each of the four proxies of investor experience for each deal type in our sample. The p-value reports the difference in means between public-to-private deals and private-to-private deals. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

Variable	Public-to-private	Divisional buyout	Secondary buyout	Private-to-private	P-value
PE firm age	18	18	18	15	3*
Number of funds raised	9	5	7	5	4*
Value of funds raised	12,016	5,783	9,789	6,109	5,907**
Number of deals made	486	166	144	117	369**

Table A12: Target size and investor experience

This table reports the mean total assets and sales of portfolio companies in the pre buyout year based on PE investors' prior experience at acquisition. *EXP* is a dummy variable that equals 1 where the investor is in the top quartile based on level of experience and zero otherwise. The p-value is the difference in means of target assets and sales between more and less experienced investors. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level

	PE firm age			Number of funds raised			Value of funds raised			Number of deals made		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	EXP=1	EXP=0	P-value	EXP=1	EXP=0	P-value	EXP=1	EXP=0	P-value	EXP=1	EXP=0	P-value
Total assets	103,283	93,339	9,944	158,268	68,745	89,523***	229,858	45,825	184,573***	113,781	94,452	19,329
Sales	77,586	73,727	3,859	55,575	15,438	40,137***	178,746	46,678	132,068***	98,817	69,755	29,062*

Table A13: Financial constraints: SMEs

We estimate specifications in columns 1-2 using a linear probability model, we estimate specifications in columns 3-4 using a probit model, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *SME* is a dummy variable that equals 1 for firms the European Commission defines as SMEs, and zero otherwise. *PE* is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. *Post* is a dummy variable equal to 1 for post buyout years, and 0 otherwise. Firm controls include sales, earnings, leverage, profitability (ROA), and cash flow. We take these controls in the pre deal year and interact them with the Post variable. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)		
Panel A: SME=1								
PE*Post	0.068***	0.062**	0.357***	0.314***	0.341***	0.282***	0.036***	0.037***
	(0.020)	(0.020)	(0.122)	(0.122)	(0.092)	(0.091)	(0.012)	(0.012)
Post	-0.013	0.111	-0.043	1.685**	-0.073*	1.054*	-0.010*	-0.245**
	(0.008)	(0.072)	(0.057)	(0.606)	(0.044)	(0.581)	(0.006)	(0.075)
Observations	21,536	21,536	20,743	20,743	6,678	6,678	6,678	6,678
Panel B: SME=0								
PE*Post	0.028*	0.028*	0.157	0.098	0.360***	0.308***	0.018*	0.017*
	(0.015)	(0.015)	(0.113)	(0.115)	(0.091)	(0.092)	(0.007)	(0.008)
Post	-0.015	0.169**	-0.142**	2.441**	-0.061	1.880**	-0.011	0.099
	(0.007)	(0.065)	(0.068)	(0.619)	(0.056)	(0.689)	(0.007)	(0.071)
Observations	18,796	18,796	18,160	18,160	5,376	5,376	5,376	5,376
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
P-value	0.046	0.072	0.000	0.000	0.444	0.420	0.082	0.083

Table A14: Controlling for firm productivity - alternative proxy

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post buyout years, and 0 otherwise. In columns 2, 4, 6, and 8 we augment the baseline model with firm variables taken in the pre-buyout year and interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA) and cash flow. We likewise control for firm productivity, where productivity is defined as sales per worker. This is measured in the pre-deal year and interacted with the Post dummy. Standard errors are clustered at the firm-level. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE*Post	0.024***	0.021***	0.213***	0.189***	0.278***	0.265***	0.019***	0.018***
	(0.010)	(0.011)	(0.081)	(0.081)	(0.065)	(0.065)	(0.006)	(0.006)
Post	-0.057***	0.141***	-0.301***	1.121**	-0.097	-0.120	-0.017*	-0.021
	(0.007)	(0.040)	(0.072)	(0.426)	(0.069)	(0.308)	(0.009)	(0.040)
Productivity*Post	0.013***	0.014***	0.054***	0.057***	0.003*	0.002	0.002**	0.002*
	(0.002)	(0.002)	(0.018)	(0.018)	(0.001)	(0.001)	(0.001)	(0.001)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	41,713	41,713	40,750	40,750	12,257	12,257	12,257	12,257

Table A15: High and low-productivity firms - alternative proxy

We estimate specifications in columns 1-2 using a linear probability model, columns 3-4 use a probit estimator, and we estimate all specifications in columns 5-8 using a difference-in-difference estimator. The dependent variables are a dummy variable equal to 1 for firm-year observations where export sales exceed zero, and 0 otherwise (columns 1-4), the log of export value (columns 5-6), and the ratio of export sales to total sales (columns 7-8). *High-productivity firms* are those with productivity, where productivity is defined as sales per employee, in the top quartile of firms in the pre-buyout year. *Low-productivity firms* are all remaining firms. PE is a dummy variable equal to 1 for PE-backed firms and 0 for control firms. Post is a dummy variable equal to 1 for post-buyout years, and 0 otherwise. In columns 2, 4, 6, and 8 we augment the baseline model with firm variables taken in the pre-buyout year and interacted with the Post dummy. Firm controls include sales, earnings, leverage, profitability (ROA) and cash flow. *** denotes statistical significance at the 1% level, ** denotes the 5% level, and * denotes the 10% level.

	Exporting dummy				LogExport		Export intensity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High-productivity firms								
PE*Post	0.010	0.010	-0.037	-0.065	0.576***	0.551***	0.038**	0.040**
	(0.033)	(0.033)	(0.199)	(0.202)	(0.141)	(0.150)	(0.018)	(0.019)
Post	-0.006	0.189*	0.059	1.258*	-0.040	1.290*	-0.003	0.086
	(0.012)	(0.185)	(0.087)	(0.754)	(0.081)	(0.764)	(0.010)	(0.082)
Observations	9,455	9,455	9,289	9,289	2,831	2,831	2,831	2,831
Low-productivity firms								
PE*Post	0.052***	0.053***	0.326***	0.312***	0.346***	0.324***	0.027***	0.027***
	(0.013)	(0.014)	(0.091)	(0.092)	(0.150)	(0.141)	(0.010)	(0.010)
Post	-0.026**	0.192***	-0.167**	1.545**	-0.076*	-0.464	-0.010**	-0.030
	(0.007)	(0.049)	(0.051)	(0.489)	(0.038)	(0.352)	(0.005)	(0.046)
Observations	28,411	28,411	27,314	27,314	9,040	9,040	9,040	9,040
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
P-value	0.000	0.000	0.000	0.000	0.133	0.161	0.298	0.274

References

Barber, B. M. and Yasuda, A. (2017). Interim fund performance and fundraising in private equity. *Journal of Financial Economics*, 124(1):172–194.

Boucly, Q., Sraer, D., and Thesmar, D. (2011). Growth lbos. *Journal of Financial Economics*, 102(2):432–453.

Harris, R. S., Jenkinson, T., and Kaplan, S. N. (2014a). Private equity performance: What do we know? *The Journal of Finance*, 69(5):1851–1882.

Harris, R. S., Jenkinson, T., Kaplan, S. N., and Stucke, R. (2014b). Has persistence persisted in private equity? evidence from buyout and venture capital funds. Technical report, Darden Business School Working Paper.

Jenkinson, T. and Sousa, M. (2015). What determines the exit decision for leveraged buyouts? *Journal of Banking and Finance*, 59:399–408.

Metrick, A. and Yasuda, A. (2010). The economics of private equity funds. *The Review of Financial Studies*, 23(6):2303–2341.

Shivdasani, A. and Wang, Y. (2011). Did structured credit fuel the lbo boom? *The Journal of Finance*, 66(4):1291–1328.

Strömberg, P. (2008). The new demography of private equity. Technical report, New York: World Economic Forum USA.

Previous volumes in this series

960 August 2021	Is window dressing by banks systemically important?	Luis Garcia, Ulf Lewrick,and Taja Sečnik
959 August 2021	Macroeconomic effects of Covid-19: a mid-term review	Phurichai Rungcharoenkitkul
958 August 2021	Sharing asymmetric tail risk: Smoothing, asset pricing and terms of trade	Giancarlo Corsetti, Anna Lipińska and Giovanni Lombardo
957 August 2021	Ripple effects of monetary policy	Frederic Boissay, Emilia Garcia-Appendini, and Steven Ongena
956 August 2021	Are households indifferent to monetary policy announcements?	Fiorella De Fiore, Marco Lombardi and Johannes Schuffels
955 August 2021	Quantifying the high-frequency trading "arms race"	Matteo Aquilina, Eric Budish and Peter O'Neill
954 July 2021	Fiscal and monetary policy interactions in a low interest rate world	Boris Hofmann, Marco J Lombardi, Benoît Mojon and Athanasios Orphanides
953 July 2021	Limits of stress-test based bank regulation	Isha Agarwal and Tirupam Goel
952 July 2021	Passive funds affect prices: Evidence from the most ETF-dominated asset classes	Karamfil Todorov
951 July 2021	Distrust or speculation? The socioeconomic drivers of US cryptocurrency investments	Raphael Auer and David Tercero-Lucas
950 June 2021	Fiscal regimes and the exchange rate	Enrique Alberola, Carlos Cantú, Paolo Cavallino and Nikola Mirkov
949 June 2021	The natural interest rate in China	Sun Guofeng and Daniel M Rees
948 June 2021	Central bank digital currency: the quest for minimally invasive technology	Raphael Auer and Rainer Böhme
947 June 2021	Money, technology and banking: what lessons can China teach the rest of the world?	Michael Chui

All volumes are available on our website www.bis.org.