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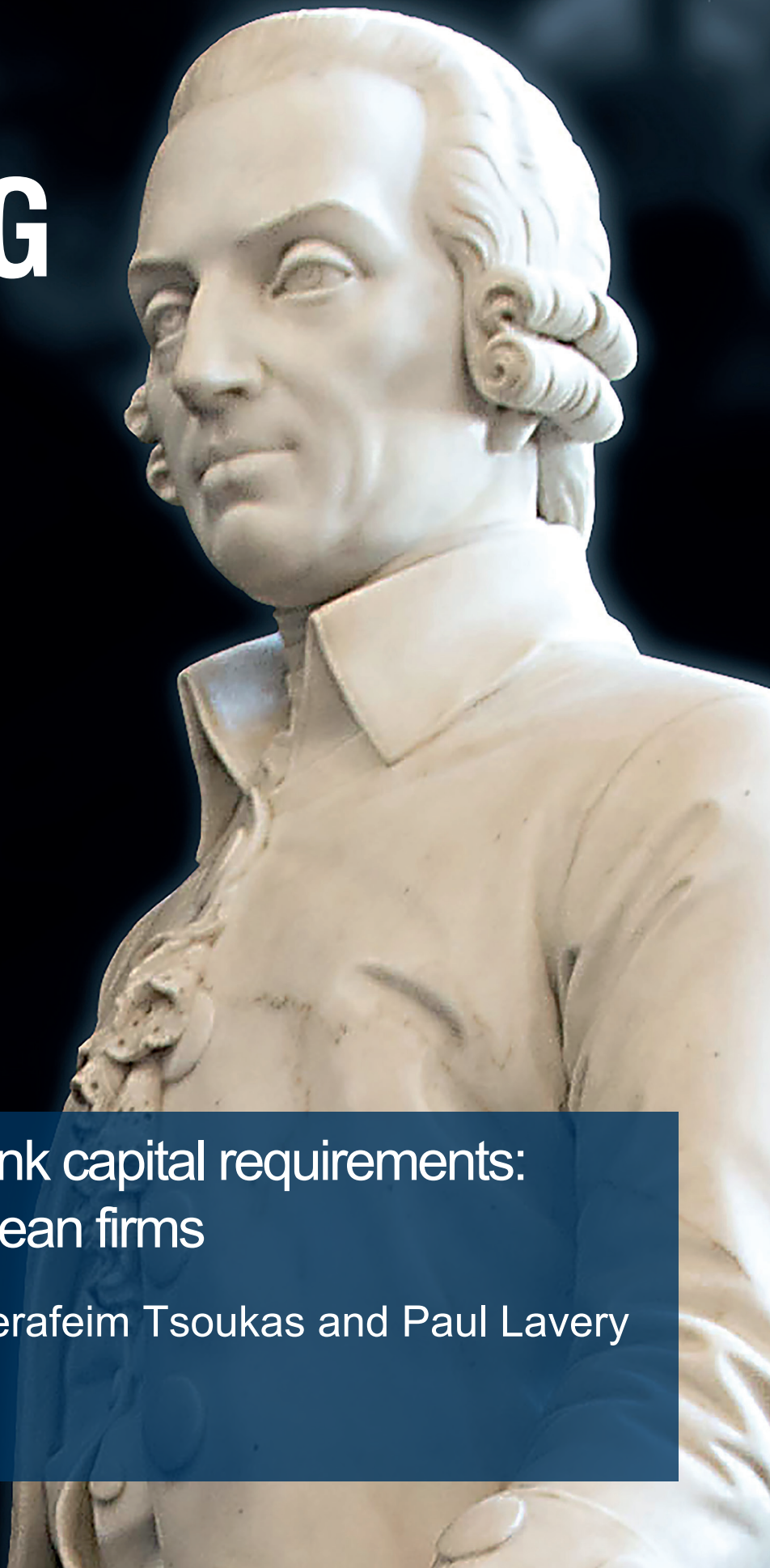

Private equity and bank capital requirements: Evidence from European firms

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Abstract

Using firm-level data from 16 euro-area countries over 2008-2014, we investigate how the growth and investment of bank-affiliated private equity-backed companies evolve after the European Banking Authority (EBA) increases capital requirements for their parent banks. We find that portfolio companies connected to affected banks reduce their investment, asset growth, and employment growth following the capital exercise. We further show that the effect is stronger for companies likely to face financial constraints. Finally, the findings indicate that the negative effect of the capital exercise is muted when the private equity sponsor is more experienced.

Keywords: Private equity buyouts; bank capital requirements; financial constraints; company performance.

JEL Classification: G32, G34

1 Introduction

The last decades have seen a significant growth in the empirical investigation of private equity (PE) firms' post-buyout performance (Amess et al., 2016; Cumming et al., 2020; Wilson et al., 2021; Kellard et al., 2021). Over this period, syndicated bank debt has become an increasingly important source of funding in this market. Based on data from S&P Capital IQ over the period 1990 to 2018, the PE arms of banks were responsible for 12% of European private equity buyouts. Fang et al. (2013) report that this is the case for almost 30% of U.S. deals completed between 1983 and 2009. Nevertheless, banks maintain an important role in European private equity markets. Although a rich literature to date considers how banks can transmit banking sector shocks onto the real economy via their commercial lending arms (for a survey, see Gueller et al., 2021), there is no empirical evidence on how an exogenous shock to a bank affects its private equity arm and the portfolio companies in which it invests. The purpose of this paper is to provide, for the first time, a systematic empirical analysis of the mechanism through which an exogenous increase in capital requirements affects the portfolio companies of the PE arms of affected banks.

In a standard, independent, private equity fund, the fund manager (also known as the general partner, or GP) raises capital from institutional investors such as pension funds, insurance companies, endowments (also known as limited partners, or LPs) when raising a new fund, which typically occurs every 7 to 10 years.[1] LPs commit capital to the fund, and the GP draws this down over time by investing in portfolio companies during the fund's investment period.

Where bank-affiliated funds are concerned, the fund manager is a division of a bank. As such, the fund structure differs from that of standard, independent private equity funds.

[1] They may also raise funds from high net worth individuals and family offices.

Bank-affiliated investors often do not raise funds, but instead receive evergreen funding from their parent banks, and so do not follow the typical private equity fund life cycle. However, unlike capital commitments to an independent private equity fund, this funding is not ring-fenced and the amount set aside can be adjusted. In instances where they do raise funds, the parent bank is often the only contributor of capital (Andrieu and Groh, 2012). According to Fang et al. (2013) and Hardymon et al. (2004), the parent bank often acts as an anchor LP to the fund, contributing as much as 50% of the fund's equity.[2] As such, the parent bank can simply pull the funding, and there is no legal restriction on them doing so, given that the bank is the ultimate owner of its private equity division.[3] Consequently, if a shock hits the parent bank, there can be repercussions for its private equity arm, as the bank may reduce the amount of funding available for private equity activities. This begs the question of how parent banks respond to exogenous shocks with respect to financing their PE arms.

In this paper, we shed light on the question by exploiting the European Banking Authority (EBA) 2011 capital exercise, where selected banks had to increase their core tier 1 capital (CT1) ratios to 9% of their risk-weighted assets by June 2012. The regulatory exercise was unexpected, not only in its magnitude (Financial Times, 2011), but also in its timing.[4] We study whether after the capital exercise, portfolio companies' real outcomes of the private equity arms of exposed banks are negatively affected relative to portfolio companies of unexposed banks. Additionally, we argue that the effect might differ across

[2]Although the literature provides some scant evidence regarding the capital contribution of the parent bank to the bank-affiliated PE fund, our own discussions with senior bank-affiliated PE practitioners indicate that the bank is the sole or main provider of capital to the fund.

[3]An institutional LP (such as a pension fund or insurance company) in a standard, independent, private equity fund cannot typically do this, as they commit a fixed amount of capital to the fund, which the fund manager has a legal right to call down for investment purposes. This committed capital is typically called down gradually over the course of the fund's investment period.

[4]The EBA carried out stress tests across European banks fewer than five months prior to the EBA capital exercise.

the sample of companies under PE ownership. That is, we investigate whether financially constrained firms, for whom access to external financing may be difficult or prohibitively expensive, experience stronger effects after the capital exercise compared to their unconstrained counterparts. Finally, we examine the extent to which portfolio companies of more experienced investors are likely to weather the negative impact of the policy intervention.

Our analysis is based on a sample of over 300 companies backed by the private equity arms of European banks prior to the EBA capital exercise in 2011. The dataset offers a symmetric window around the 2011 EBA capital exercise, from 2008 to 2014. In a difference-in-differences setting, we examine how the growth and investment of these companies changes after the EBA policy change. We divide firms into two groups: treated and control. The former group includes firms that receive private equity investment from a bank-affiliated investor of an affected bank. The latter group includes firms that receive funding from a bank that is unaffected by the EBA capital exercise. The identifying assumption for the research design is that treated and control firm groups behave similarly in the absence of the capital exercise. Our subsamples of affected and unaffected portfolio companies have similar profitability, sizes, investment, and leverage prior to the EBA capital exercise, and they exhibit similar pre-shock growth trends. As such, the dataset provides an ideal setting for a difference-in-differences analysis.

Our work contributes to the literature in three ways. First, we add to the body of literature examining how bank-affiliated private equity activity affects deal outcomes and firm performance (Fang et al., 2013; Wang, 2017). Our findings extend these studies with regards to bank-affiliated PE investment by showing that a shock to the parent bank of the PE investor weakens the financial positions of its portfolio companies.[5] We show that

[5]Although we are interested in the role of banks as GPs, Lerner et al. (2007) examine the role of banks as LPs investing in private equity funds and find that banks' selection of private equity funds is poorer relative to other types of LPs (such as endowments, pension funds) and they invest in poorer-performing funds. They show that banks under-perform other classes of LPs across both buyout and VC investments.

companies connected to affected banks reduce their investment by 5% to 8% relative to companies receiving investment from private equity arms of unaffected banks; this result is strongly significant when controlling for various fixed effects and firm-level covariates. We then consider the post-shock growth of portfolio companies by studying the growth in firms' assets and employment after the EBA capital exercise. We show that asset growth is 5% to 9% lower for companies linked to affected banks, while growth in employment is around 4% lower.

The second main contribution is that we uncover significant heterogeneity in firms' financial positions. An extensive literature on firm heterogeneity posits that firms facing constraints in some financial markets are more likely to have a higher degree of information asymmetry, and may therefore find it difficult to access external financing. Previous empirical studies on PE investment emphasize the importance of financing constraints. 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. Boucly et al. (2011) also observe stronger growth in companies that are ex-ante more likely to be constrained pre-buyout. We build on this line of work by showing that the negative impact of the shock on affected banks' portfolio companies' performance is stronger for companies that were ex-ante more likely to be financially constrained prior to the shock. This is consistent for different measures of financial constraints, including leverage, profitability, and location in countries more exposed to the European sovereign debt crisis, which was ongoing at the time of the EBA exercise.

Finally, we exploit heterogeneity at the private equity investor level. Hotchkiss et al. (2014) find that portfolio companies of more experienced investors are associated with a higher likelihood of survival, implying they are less likely to fall into distress relative to

portfolio companies of inexperienced investors. This implies that portfolio companies of PE investors with more reputational capital are less likely to fall into distress and more likely to perform better than those backed by less experienced investors. Furthermore, Tykvová and Borell (2012) show that more experienced PE investors are better able to manage distress risks than their less experienced counterparts, and their portfolio companies exhibit lower bankruptcy rates. In the context of the EBA capital exercise, we expect the shock to have a stronger effect on portfolio companies with less experienced investors. Those with greater experience are better able to engage their portfolio and help them maintain their level of performance. We therefore anticipate that the EBA exercise has a stronger impact on the portfolio companies of less experienced private equity investors. We find that the negative effect on the performance of portfolio companies is muted for companies with more experienced private equity investors.

The remainder of the paper proceeds as follows. Section 2 overviews the EBA capital exercise and develops the testable hypotheses. Sections 3 and 4 describe our dataset and empirical methodology, respectively. Section 5 presents the empirical results along with robustness tests. Section 6 concludes.

2 Background and hypotheses

2.1 2011 EBA capital exercise

In October 2011, in a bid to restore confidence in the European banking sector, the EBA required certain banks to set aside additional, temporary capital buffers but left requirements unchanged for all other banks. Specifically, selected banks with large exposures to sovereign debt were required to increase their core tier one (CT1) ratios to 9% of their risk-weighted assets by the end of June 2012 in order to mitigate risks related to sovereign

bond exposure and to increase confidence across the banking sector. In order to meet the new regulatory requirement, banks could increase their CT1 ratios by either issuing more capital, or reducing their risk-weighted assets.

Just as the magnitude of the shock was unexpected (Financial Times, 2011), so was the timing. Fewer than five months earlier, the EBA carried out stress tests across European banks. As a result, the new capital requirements plausibly surprised the participating banks. The previous stress tests, however, were not without criticism. The integrity of these tests was questioned after the Belgian bank, Dexia, failed only a few months later. The tests indicated that Dexia was one of the healthiest banks in Europe. Furthermore, the difference in magnitude of the shortfall that each of these regulatory actions reported was striking. The stress tests in June 2011 revealed banks had a €2.5 billion deficit, and the capital exercise of October 2011 documented a shortfall of €215 billion Euros.

Banks were selected based on their total assets as of year-end 2010, ensuring that selection was not based on bank-specific events in the months prior to the capital exercise. In each country, the EBA sorted banks in descending order of market share (by total assets), such that the exercise covered at least 50% of the national banking sector. The June 2011 stress tests followed a similar selection criteria. The country-specific selection threshold led to a considerable size overlap between selected and unselected banks. For example, the smallest bank included in the exercise, Slovenian bank Nova Kreditna Banka Maribor, reported €6 billion in total assets in 2010, while the largest bank not included, Credit Mutuel, had €591 billion in total assets in the same year (Gropp et al., 2018). We take advantage of this exogenous banking sector policy change to study the portfolio companies of affected and unaffected banks' private equity arms.

2.2 Hypotheses

2.2.1 Real effects of the capital exercise

In a recent study, Gropp et al. (2018) provide evidence that European banks achieved the target set by the EBA by reducing their risk-weighted assets rather than by issuing new equity in response to the requirements.[6] The upshot is that affected banks tighten lending and transmit liquidity shocks onto firms. De Jonghe et al. (2019), Blattner et al. (2019), and Fraisse et al. (2020) report a decline in corporate lending with respect to the EBA capital exercise. Hence, firms that obtain most of their bank credit from affected banks suffer a reduction in asset and investment growth (Gropp et al., 2018), lower firm-level productivity (Blattner et al., 2019), lower employment growth (Juelsrud and Wold, 2020), and higher failure rates (Farinha et al., 2019).

Banks play a prominent role in private equity by making private equity buyouts through their PE arms. Meuleman et al. (2020) reveal that bank-affiliated investors are more effective in resolving financial distress as they are better aligned with their creditors to resolve distress. However, to the extent that the capital exercise affects banks, the shock can move from the PE arm to its portfolio companies. We anticipate shock transmission from PE-affected banks to the real sector. Based on this discussion, our first hypothesis is as follows.

Hypothesis 1: Following the capital exercise, portfolio companies of the private equity arms of EBA-affected banks suffer from weaker investment, and weaker growth in assets and employment.

[6] Juelsrud and Wold (2020) find that Norwegian banks responded in a similar manner to a 2013 Norwegian policy reform, reducing their risk-weighted assets to achieve the new capital requirement.

2.2.2 Financial constraints

Prior literature shows that financially constrained companies are more vulnerable to credit market downturns and shocks to the availability of bank financing (Bottero et al., 2020). Firm-level heterogeneity, measured by financial constraints, is a key contributor to PE portfolio companies' performance. Boucly et al. (2011) provide evidence that private equity buyouts create value by relaxing credit constraints and allowing firms to grow and expand. Similarly, Cohn et al. (2020) document that PE investors acquire companies that have growth potential but are highly leveraged and dependent upon external financing. Finally, Bernstein et al. (2019) note that smaller firms, more leveraged firms, or target firms in more financially dependent industries outperformed buyout target firms less likely to be ex-ante constrained during the global financial crisis.

An implication of the mechanism described in the previous subsection is that companies connected to affected banks are likely affected in a disproportionate manner. Although the literature indicates that PE investors alleviate financing constraints of portfolio companies, bank-affiliated PE arms that are negatively affected by the EBA exercise may reduce funding to their portfolio companies. Motivated by this consideration, we expect firms that are financially constrained to experience stronger effects compared to their less constrained counterparts.

Hypothesis 2: The effect of the capital exercise is stronger on portfolio companies that are more likely to be financially constrained.

2.2.3 Investor experience

Other important sources of heterogeneity likely matter in the context of PE investment. Specifically, the benefits of experience and investor reputation are well known. From a theoretical perspective, a more reputable investor may support a portfolio in times of

distress, as they are able to obtain external financing at more favourable rates (Demiroglu and James, 2010; Ivashina and Kovner, 2011). Prior empirical literature finds investor reputation important in a multitude of settings, such as fundraising (Barber and Yasuda, 2017), deal sourcing (Hsu, 2004), exit (Jenkinson and Sousa, 2015), investment outcomes (Sørensen, 2007; Nahata, 2008; Krishnan et al., 2011), and financial distress (Tykvová and Borell, 2012; Hotchkiss et al., 2014). Particularly pertinent to our analysis, Hotchkiss et al. (2014) find that portfolio companies of more experienced investors are more likely to survive, implying they are less likely to fall into distress relative to portfolio companies of less experienced investors. This implies that portfolio companies of PE investors with more reputational capital are less likely to fall into distress and more likely to perform better than those backed by less experienced investors. Furthermore, Tykvová and Borell (2012) show that more experienced PE investors are better able to manage distress risks than their less experienced counterparts, and that their portfolio companies exhibit lower bankruptcy rates. Our third hypothesis is as follows.

Hypothesis 3: Following the capital exercise, the real outcomes of portfolio companies attached to EBA-affected banks are likely to suffer, but less so for companies of more experienced private equity investors.

3 Data and descriptive statistics

3.1 Data

Our data set of European private equity buyouts by bank-affiliated PE investors comes from Capital IQ and covers 2008-2014.[7] We focus on bank-affiliated private equity investors attached to European banks because we are interested in the 2011 EBA capital exercise

[7] This database is widely used for firm-level analysis on private equity buyouts (see for example, Bernstein et al., 2019; Jenkinson and Sousa, 2015; Bernstein and Sheen, 2016; Fang et al., 2013; Davis et al., 2014; Faccio and Hsu, 2017).

as an external shock to the banking sector. Specifically, we consider deals where the target company is located in Europe, as European companies are required to disclose annual accounting information in the public domain.[8] Our sample, which encompasses 16 European countries, is therefore representative of the European market for bank-affiliated private equity buyouts.[9] We extract all private equity buyout transactions, excluding venture capital deals, where investors typically acquire a minority stake and use little or no leverage to finance the deal.

We select transactions based on the following criteria: the target company is headquartered in Europe at the time of the transaction, the company received private equity investment by the end of 2010, the bank-affiliated investor had not exited by the end of 2011. Where club deals are concerned, where two or more PE firms jointly sponsor a deal, we drop all cases (55) that involve both the PE arm of an EBA-affected bank and an unaffected bank. Finally, we exclude deals of sponsors involved in any merger or acquisition during the sample period. We extract all relevant transaction information, such as the entry date, the private equity sponsor(s), the location of the target company and of the acquirer, the number of investors, and the transaction value.

We collect accounting data from the Amadeus database, which is distributed by Bureau van Dijk. Following prior literature, we apply more filters to our sample. First, we include only companies whose full accounts are available in Amadeus. In doing so, we exclude companies who file abbreviated accounts. Second, we exclude companies in the financial and utility sectors (Michaely and Roberts, 2011; Bernstein et al., 2019). To control for the

[8] There is no reason to believe that restricting our sample to all-European deals (ie both the investor and the target being based in Europe) should bias our results in any way. Indeed, from 1990 to 2016, 95% of all private equity investments made by European bank-affiliated private equity investors were in European companies.

[9] Our sample includes transactions executed in the following countries: Austria, Belgium, Denmark, France, Germany, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and the UK.

potential influence of outliers, we winsorize the regression variables at the 5th and 95th percentiles. To identify exits, we use Capital IQ and relevant news article to search for corporate events related to the target firm in each transaction, such as bankruptcies, trade sales, secondary buyouts, and IPOs. This allows us to note the date and type of exit for each deal, where an exit occurs.

Information on the bank-affiliated private equity investors is from Capital IQ and Thomson Reuters Eikon. Specifically, we gather investor-level information, such as the private equity firm's year of incorporation, its location, and the number and dates of all individual investments it has made. Following Jenkinson and Sousa (2015), where more than one private equity firm participates in the same transaction, if one led the transaction (received a higher percentage of shares), we only use the information about the leader. If none of the private equity firms receive more shares than the other(s) or no information on this is available, we obtain information on all private equity firms and average the data on investor-level characteristics. Finally, in line with previous research, if the private equity firm is founded before 1970, we use 1970 as the founding year, as there is very little activity in European private equity markets prior to that date (Jenkinson and Sousa, 2015; Krishnan et al., 2011).

Our combined panel has an unbalanced structure containing 2,039 annual observations (firm-years) on 308 portfolio companies. Of these firms, 251 are linked to the PE arm of an EBA-affected bank, and 57 are linked to the PE arm of an unaffected bank. Table 1 shows the industry distribution of the portfolio companies of both the affected (EBA) and unaffected (non-EBA) banks' private equity arms in the sample at the broad industry level (one-digit SIC). The two samples exhibit similar properties. The majority of the firms in each sub-sample are concentrated in manufacturing and, to a slightly lesser extent, services. The industry distribution is also comparable with other studies examining bank-affiliated

private equity transactions in Europe (Wang, 2017).

3.2 Descriptive statistics

In figure 1, we graph the deal activity of the European private equity market, focusing on independent and bank-affiliated PE buyouts. In terms of the number of deals executed, both deal types follow a similar pattern, rising considerably in the run up to the global financial crisis, before dropping thereafter. Around the time of the EBA capital exercise in 2011, independent private equity deal activity recovers, but the number of bank-affiliated deals drop slightly more after the capital exercise. Moving a step further, in figure 2 we document the difference in the three-year moving average of the annual number of deals by the PE arms of banks affected by the EBA capital exercise, as well as that of unaffected banks.[10] Although affected banks have more active PE arms in each year, after the EBA capital exercise in 2011, there is a decline in the difference between the number of buyouts by the PE arms of affected and unaffected banks. This suggests that in the post-capital exercise period, affected banks are involved in relatively fewer PE buyouts compared to unaffected banks, relative to the pre-capital exercise period.

To appreciate that our two sub-samples of EBA-affected bank-affiliated deals and unaffected bank-affiliated deals are similar in nature, tables 2 and 3 report some pre-shock characteristics and trends of the two sets of companies. Across both groups, firms are very similar in terms of profitability (ROA), sales, size, earnings, cash flow, leverage, and investment in the pre-shock period. The differences in these variables between the two sub-samples are small in magnitude and statistically insignificant. We enrich this analysis by examining companies' growth rates in the aforementioned characteristics in table 3.

[10] That is, the three-year moving average of the annual number of deals by the PE division of banks affected by the EBA capital exercise, minus the three-year moving average of the annual number of deals by the PE arm of unaffected banks

Once again, we find that the two sub-samples share similar pre-EBA shock trends in terms of their firm-level characteristics.

To provide a simple visual account of the evolution of firms' investment, asset growth, and employment growth around the EBA capital exercise, we present figure 3. Specifically, the graphs present the α_t of the following regression equation:

$$y_{i_t} = \alpha_t + \alpha_i + \varepsilon_{it} \tag{1}$$

where α_t captures year fixed effects and α_i denotes firm fixed effects. The year before the shock, 2010, is used as the base period and its corresponding coefficient is normalized to zero. We estimate the equation separately for both the EBA and non-EBA samples, with standard errors clustered at the firm level. We observe that the two groups of companies follow relatively similar paths before the shock in terms of their levels of investment, and their growth in assets and employment. This alleviates concerns that either group is substantially outperforming the other in the run up to the EBA capital exercise. Thereafter, at the onset of the EBA shock, a divergence appears between the two groups, with portfolio companies of affected banks' PE arms underperforming.

Overall, these analyses suggest that companies receiving PE investment from EBA-affected banks are similar in nature and characteristics in the pre-shock period to companies receiving investment from the PE arms of unaffected banks. They also share similar pre-shock growth rates and time-series trends in investment and in growth in assets and employment. This underlines that there is no reason to doubt there are any significant differences between the two subsamples in the run up to the EBA capital exercise. In the following sections, a formal regression analysis framework tests the role of the policy initiative in the performance of the two groups of portfolio companies.

4 Empirical specification

4.1 Baseline model

We estimate our regressions using a difference-in-differences method to identify how bank capital requirements affect the performance of portfolio companies of the PE divisions of affected and unaffected banks. The sample period offers a symmetrical window around the 2011 EBA capital exercise, from 2008 to 2014. Formally, we estimate the following equation:

$$y_{it} = \alpha_t + \alpha_i + \alpha_c + \beta_1(EBA_i * Post_t) + \beta_2 X_i * Post_t + \varepsilon_{it} \quad (2)$$

where y_{it} is investment, the one-year growth in total assets, or the one-year growth in employment for firm i at time t. We define investment as the change in fixed assets plus any depreciation for the year. *EBA* is a dummy variable that equals 1 if a firm receives private equity investment from a bank-affiliated investor of an affected bank, and zero if the bank is unaffected by the EBA capital exercise. *Post* is a dummy that equals 1 for observations in the post-EBA period of 2011–2014, and zero otherwise. The coefficient of interest in equation 1 is β_1, which measures the relative evolution of firm outcomes between firms receiving funding from an affected bank-affiliated investor and firms receiving funding from a non-affected investor around the EBA capital exercise. Obtaining a negative coefficient on the interaction term supports H1.

The models include additional controls as follows: firm fixed effects (α_i) to account for unobserved firm heterogeneity, bank*year fixed effects (α_t), and country fixed effects (α_c) to account for potential differences across counties. In addition, we augment our specifications with firm-level control variables, X_i, to account for heterogeneity across firms prior to the EBA capital exercise. In particular, we control for firm size, cash flow normalized by total

assets, profitability (ROA), and leverage, which is the ratio of total debt to total assets. To avoid concerns regarding the endogeneity of these variables, we measure them in the pre-shock period (2010) and then interact them with the *Post* dummy to allow a differential impact around the shock (Gormley and Matsa, 2013; Bernstein et al., 2019). Finally, to deal with serial correlation, we cluster standard errors at the firm level.

4.2 Accounting for financial constraints

In order to enrich our understanding of our baseline findings, we now exploit heterogeneity at the portfolio company-level. Specifically, we determine whether sponsorship by an EBA-affected bank has a stronger effect on portfolio companies that are more likely to be financially constrained in the pre-shock period. To do so, we estimate the following model:

$$y_{it} = \alpha_t + \alpha_i + \alpha_c + \beta_1(EBA_i * Post_t) + \beta_2(Constrained_i * Post_t) \\ +\beta_3(Constrained_i * EBA_i * Post_t) + \beta_4 X_i * Post_t + \varepsilon_{it} \tag{3}$$

where *Constrained* is a dummy variable that equals 1 for firm i if its leverage (profits) is in the top (bottom) quartile of the distribution in 2010, the last year prior to the EBA capital exercise. In addition, we define constrained firms as those located in Greece, Ireland, Italy, Portugal, and Spain (GIIPS) due to the EBA exercise occurring in parallel with the sovereign debt crisis, which led to severe credit shortages in the aforementioned countries. The main term is the triple-interaction coefficient on β_3, which measures whether financially constrained firms face greater performance reductions following the EBA capital exercise. Negative coefficients on both β_1 and β_3 support H2. The remaining control variables and fixed effects remain unchanged.

4.3 Private equity group reputation

In the final section, we turn our attention to heterogeneity at the private equity investor-level, where we consider the impact of the experience of the private equity investor. Formally, we estimate the following model:

$$y_{it} = \alpha_t + \alpha_i + \alpha_c + \beta_1(EBA_i * Post_t) + \beta_2(Reputation_i * Post_t) \\ +\beta_3(Reputation_i * EBA_i * Post_t) + \beta_4 X_i * Post_t + \varepsilon_{it} \tag{4}$$

where *Reputation* is a dummy variable that equals 1 if the PE investor is more likely to be experienced. It is worth noting that the scholarly literature has not settled on a universally accepted strategy to identify PE investor experience and reputation. However, given our sample contains deals by bank-affiliated PE investors, where often there is no formal fund structure in place, we focus on two measures of investor experience.[11] First, we consider the number of prior PE deals made by the investor at the time of each buyout. Investor reputation and experience are intrinsically linked to its level of activity, and in turn, the success of its investments (Sørensen, 2007; Nahata, 2008). By participating in more deals and engaging with more companies, investors can not only learn more about company selection and monitoring, but also expand their network of deal flow suppliers, customers, and other intermediaries. Second, we take PE investor age at the time of the deal, which indicates staying power in the market over time.[12]

To support H3 we should observe a negative coefficient on β_1 and a positive coefficient on β_3. This implies that firms' outcomes are adversely affected after the capital exercise,

[11] Prior research also uses the number and value of funds raised by investors as proxies of experience.

[12] Following previous research, where the year of incorporation of the investor is before 1970, we set the year to 1970.

but less so for portfolio companies of experienced investors.

5 Results

5.1 Real effects

We start by considering whether companies backed by PE groups affiliated with EBA-affected banks perform worse after the EBA capital exercise, relative to companies backed by the PE arms of unaffected banks. Table 4 shows the results of estimating equation 2 with and without firm controls. We report coefficient estimates with standard errors clustered by firm. In column 1 we find that firms receiving investment from PE firms affiliated with EBA shock-affected banks reduce their levels of investment relative to those receiving investment from unaffected banks. The effect is strong in statistical significance and in economic magnitude. Specifically, firms attached to affected banks lower their investment by 5% after the shock relative to unaffected banks' portfolio companies. Moreover, in column 2, the effect remains significant and actually strengthens in magnitude when we control for a host of firm-level covariates. Moving to the following columns of the table, we show that the effect persists for firms' growth in assets and employment. Specifically, we find that EBA-affected companies' asset growth falls by 6%-9% relative to non-EBA bank-backed companies. In addition, portfolio companies of EBA-affected banks suffer around 4%-5% weaker employment growth relative to portfolio companies of unaffected banks.

Our results are relevant to the general literature studying the real impact of bank capital regulation (see for example, Hanson et al., 2011; Aiyar et al., 2014; De Marco and Wieladek, 2015; De Jonghe et al., 2019; Fraisse et al., 2020; Gropp et al., 2018; Juelsrud and Wold, 2020), which shows that increasing banks' capital requirements may come at a cost to the real economy and, specifically, may hamper companies connected to affected

banks. Unlike this literature, which studies the real effect on companies through banks' commercial lending arms, we examine the effect through banks' PE investment arms. We also relate to studies that shed light on bank-affiliated PE investors. Fang et al. (2013) find that bank-affiliated PE deals are associated with poorer financing terms and ex-post outcomes, while Wang (2017) concludes that bank-affiliated PE buyouts, on average, fail to create operating performance gains. Similarly, Bottazzi et al. (2008) show that banks are less active investors and spend less time supporting their portfolio companies relative to independent investors. We find evidence that the PE portfolio companies of banks are not immune to exogenous shocks affecting their parent banks. An exogenous shock to the parent bank may have negative consequences for a bank's PE arm and the companies in which it invests, relative to the portfolio companies of unaffected banks' PE arms.

5.2 Robustness

Several exercises ensure the robustness of our main findings.

5.2.1 Other sources of external financing

One potential concern regarding the main results documented so far is that companies may access the syndicated loans market as a source of additional capital. This could allow firms to weather the effects of the EBA capital exercise. Hellmann et al. (2007) show that companies receiving investment from bank-affiliated investors are significantly more likely to receive a future loan from the lending arm of the parent bank. Along similar lines, Fang et al. (2013) present evidence that banks' involvement in private equity generates significant cross-selling opportunities, as it significantly increases the bank's chance of winning future investment banking business (as a future lender, M&A advisor, or equity underwriter) from the target firm.

We use LPC DealScan, a leading database of syndicated loans, and search for each of the companies in our sample to check whether they receive any loans over the sample period. In total, there are 87 loans to 53 sample companies. The majority of these loans are for acquisitions, debt repayment, restructuring, and corporate purposes. Of the 87 loans, 65 are to portfolio companies whose parent bank was affected by the EBA exercise, and 22 are to unaffected companies. To control for this additional source of financing, we include in our baseline specification an interaction term between the variables *Loan* and *Post*, where the former is a dummy variable equal to 1 if a company obtains a loan. Accordingly, our regression model is as follows:

$$y_{ict} = \alpha_t + \alpha_i + \alpha_c + \beta_1(EBA_i * Post_t) + \beta_2(Loan_i * Post_t) + \beta_3 X_i * Post_t + \varepsilon_{it} \quad (5)$$

We present the results in table 5. We find that the $Loan * Post$ variable has little statistical impact on companies' growth, despite being positively signed. However, of more importance in our interpretation of the results is that its inclusion does not have a material impact on our estimates of the interaction between the EBA and $Post$ variables. In other words, we find that it does not diminish the effect of the exogenous EBA shock on portfolio company growth.

5.2.2 Matching firms

Although tables 1, 2, 3, and figure 3 show that the samples of PE portfolio companies of affected and unaffected banks are similar in nature across several dimensions, including their operating industry, financial characteristics, and pre-EBA shock growth trends, we look to strengthen the identification strategy underpinning the difference-in-differences model. To do so, we run an algorithm to match firms between our two subsamples. We

include only firms that meet certain matching criteria, therefore ensuring both samples of firms are similar. In particular, we match each firm from our smaller sample of portfolio companies of unaffected banks, to companies linked to affected banks. Each matched company operates in the same two-digit SIC code and its size (number of employees) in the pre-EBA shock year (2010) is within a 50% bracket of the matched firm.[13] Using this procedure, we match up to three EBA-affected firms for as many unaffected firms as possible. Where an unaffected firm generates more than three matches, we retain the three closest matches as measured by the sum of the squares of the difference between the firm's total assets. The obvious downside is that this process further reduces our sample size to 111 EBA-affected firms alongside the 57 unaffected firms. However, it provides an important robustness measure to our identification strategy and to our difference-in-differences model, as it ensures similarity across our two samples of firms. The results of this exercise are in table 6. We continue to find that companies connected to the PE arms of affected banks suffered weaker investment and growth in the aftermath of the EBA shock. Moreover, the magnitude of the coefficients on the $EBA * Post$ interaction in table 6 are similar to those in our baseline specification.

5.2.3 Attrition bias

In order to account for any potential attrition bias from firms exiting via acquisition or bankruptcy, we restrict our sample to only 2010 to 2012. The results are presented in table 7. Despite the reduction in the time series element of our panel data, the significance of our results remains largely intact, and the magnitudes are not dissimilar from those in our baseline model. Hence, our main findings are not due to attrition bias.

[13] Given our sample size, we are restricted in our ability to add more matching variables, and narrow our matching bandwidths. There is a trade-off between doing so and obtaining more closely matched firms, as well as obtaining a sample large enough to pursue meaningful estimates.

5.3 The role of financial constraints

In this section we focus on the financial constraint dimension linked to firms' relative indebtedness, profitability, and country of operation compared to the whole distribution of firms in order to separate firms that are likely "constrained" from those that are not constrained. We present the results in table 8. In panel A, we identify firms located in the GIIPS countries, for whom the impact of the sovereign debt crisis, which occurred at the same time as the EBA capital exercise, was more potent. The coefficients on the triple-interaction term suggest that portfolio companies of EBA-affected banks, which are located in the GIIPS countries, are worse off relative to those located elsewhere in Europe. The coefficients are statistically significant for investment, asset growth, and employment growth. In particular, they suggest that portfolio companies of EBA-affected banks located in the GIIPS countries suffer a 16% greater decline in asset growth and an 11% greater decline in employment growth following the EBA shock, relative to those located in other European countries. Similarly, their investment fell by between 7%-10% more. The European sovereign debt crisis affected the GIIPS countries considerably the countries experienced a significant reduction in their supply of credit available to firms, and loan interest rates rose relative to other countries in Europe (Popov and Van Horen, 2014; De Marco, 2019). Prior research shows that firms borrowing from GIIPS banks suffer greater declines in investment and sales growth relative to other firms (Acharya et al., 2018). We complement this finding by showing that PE portfolio companies of the EBA shock-affected banks located in the GIIPS countries experience a greater reduction in both asset and employment growth following the shock, compared to those elsewhere in Europe.

Moving to panel B, we partition the sample on the basis of firms' leverage in the pre-shock period (2010). Again, we find that financially constrained firms suffer larger losses in asset and employment growth. The economic magnitude of the effect on firms' growth

is not dissimilar to the results in panel A. Employment growth falls by between 15% and 17% more, and asset growth falls by around 20% more, in EBA-sponsored firms that are more likely financially constrained, relative to firms less likely to be constrained. Lastly, in panel C, we split the sample on the basis of profitability in the pre-shock period, where profitability is defined as their earnings scaled by total assets. Consistent with the previous tests, we find that firms with the lowest profitability in the pre-shock period suffer the most in terms of their post-shock growth and investment. Investment is around 5% lower for less profitable firms, while asset growth is approximately 1%-4% lower. The coefficient on employment is negative, but statistically insignificant. Taken together, the results imply that although the portfolio companies of EBA-affected banks suffer after the shock relative to portfolio companies of unaffected banks, the effect is not standardized across all types of companies. Instead, we find that the negative effect on company performance is stronger for firms that are more likely financially constrained.

5.4 Private equity investor experience

We now turn our attention to the impact of private equity investor reputation and experience at the time the buyout occurs. Table 9 shows the results from the estimation of equation 4. We proxy for investor reputation by the number of previous investments (panel A) and the age of the PE investor (panel B). Our results are remarkably consistent across these two categories. The point estimates suggest that the negative effect of the EBA shock on firms' investment and growth is weaker for firms backed by more experienced investors. That is, we find that investors with more experience dampen the effects of the shock on their portfolio companies. Specifically, the coefficients in panel A imply that the investment levels of firms backed by more experienced investors increase by around 5% relative to companies sponsored by less experienced investors. Similarly, the negative

effect on asset growth is muted by around 10% when the investor is more experienced. The coefficients on employment growth are positive but insignificant. Together, the results imply that more experienced investors attenuate the negative implications of the banking shock. In panel B, where we partition the sample on the basis of the investor's age, the results parallel those in panel A. In each instance, the coefficient on the triple-interaction term is positive and significant.

In summary, the results reveal heterogeneity at the investor-level that the estimates for the full sample do not show. We document that portfolio companies of EBA-affected banks sponsored by less experienced investors are more susceptible to a drop in performance after the bank shock. Our results echo somewhat Hotchkiss et al. (2014), who find that companies backed by less experienced PE investors are more likely to default than those backed by experienced investors. We find evidence that PE investors with more experience and reputational capital help their portfolio companies sustain performance when external shocks hit their parent banks. Their portfolio companies suffer a smaller relative fall in investment and growth.

6 Conclusion

A number of recent studies show that increasing capital requirements for banks may come at a cost to the real economy. Researchers pay considerably less attention to the effects of an exogenous shock to a bank, and the consequent impact on its private equity arm and the portfolio companies in which it invests. This is somewhat surprising given how important banks are in private equity markets. Our paper builds on these foundations but examines how the growth and investment of bank-affiliated private equity-backed companies evolve after the European Banking Authority's 2011 increase in capital requirements for parent banks. We find that portfolio companies connected to affected banks reduce

their investment, asset growth, and employment growth following the shock.

At the next stage, we explore whether the effect of capital exercise on firm performance depends upon firm characteristics such as indebtness, profitability, and the location of the firm. When we split our firms according to those criteria, we uncover significant firm-level heterogeneity. In particular, the negative effect of the capital exercise is stronger for highly leveraged firms, less profitable firms, and firms in the periphery of Europe. This implies that bank shocks do not affect all firms equally, reflecting the higher risk characteristics associated with firms that are financially constrained and subject to greater information asymmetries. Finally, we consider whether investor experience potentially mitigates these negative effects. Our findings indicate that the negative effect of the capital exercise is muted when the private equity sponsor is more experienced.

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Figures

Figure 1: Bank-affiliated vs independent buyouts in Europe 1990-2019

The graph shows the number of bank-affiliated private equity buyouts in Europe (right axis) and the number of independent private equity buyouts in Europe (left axis) from 1990 to 2019. A bank-affiliated deal is a transaction in which the sponsor is a bank-affiliated private equity firm. An independent deal is one in which the equity sponsor is an independent limited partnership, unaffiliated with any other organization. Private equity transaction information is from S&P Capital IQ.

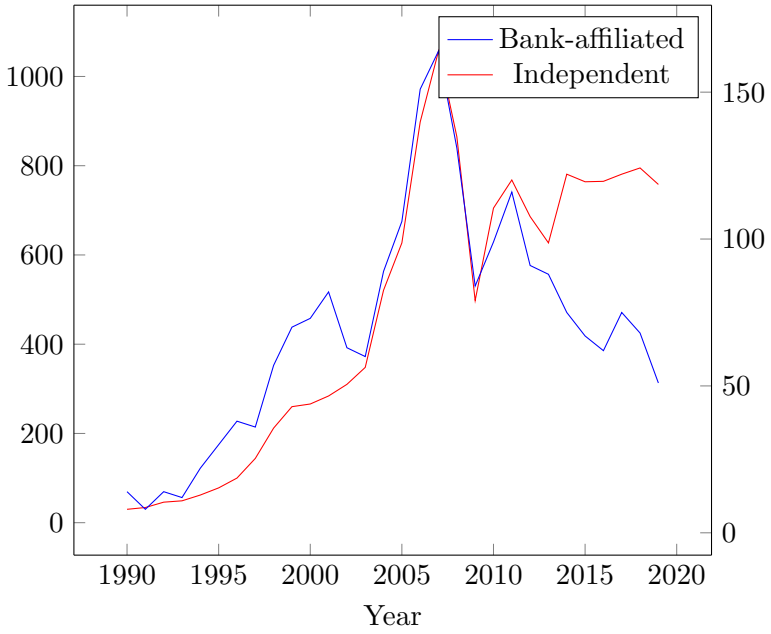


Figure 2: EBA vs non-EBA bank PE deals

The graph shows the three-year moving average of the annual number of deals by the PE division of a bank affected by the EBA capital exercise, minus the three-year moving average of the annual number of deals by the PE arm of an unaffected bank. The red line denotes the EBA capital exercise in 2011.

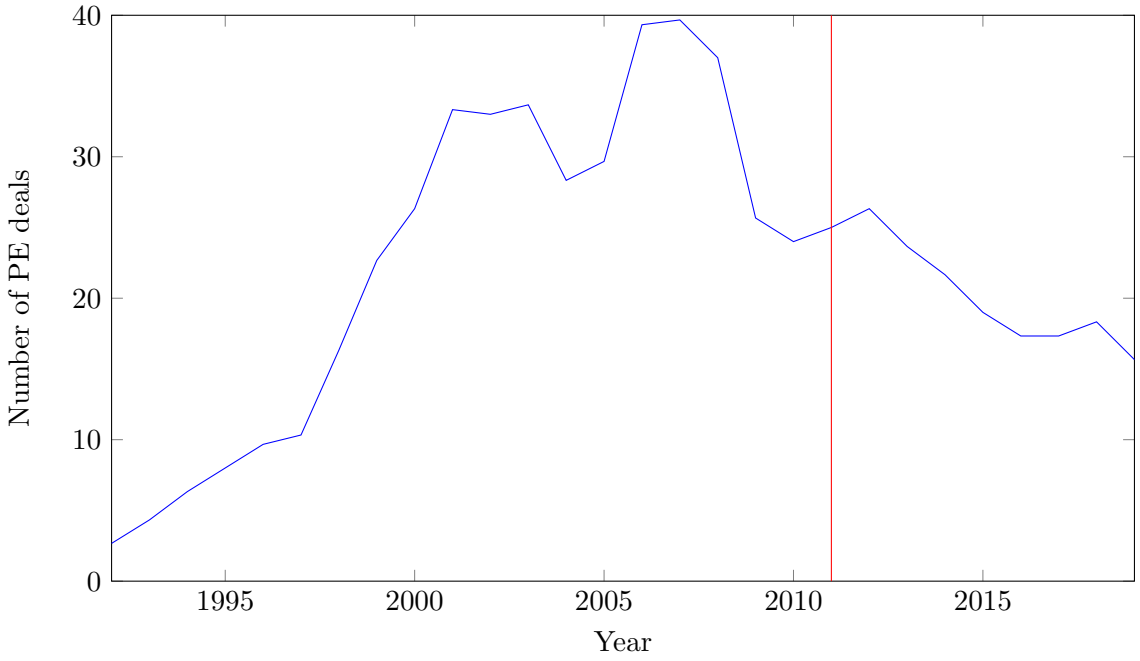
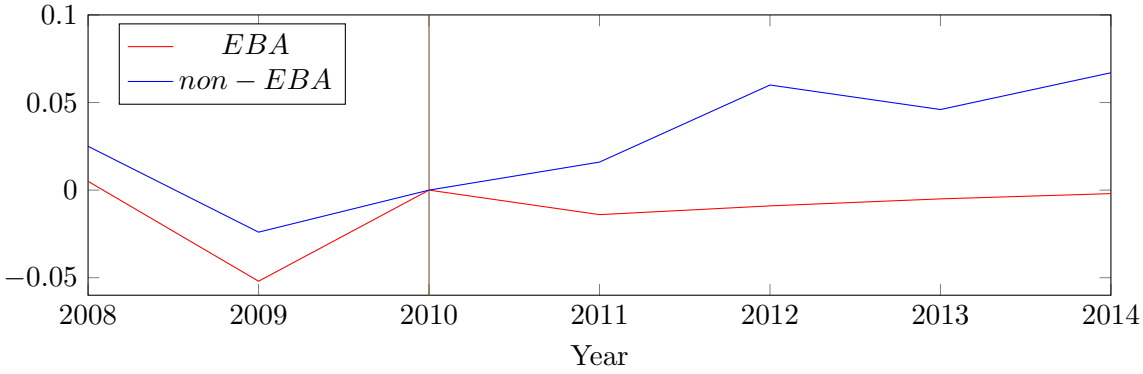


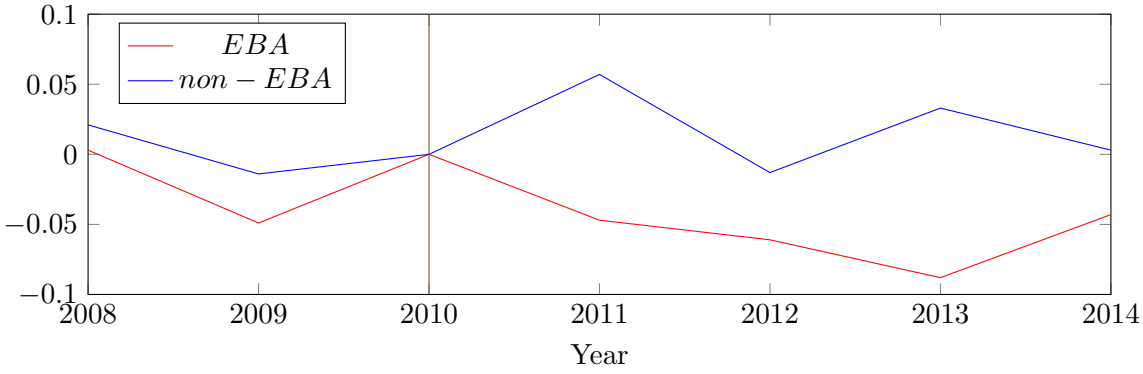
Figure 3: Effect of EBA-affected bank PE-backed companies on firm behaviour over time

The figure illustrates the change in investment, asset growth, and employment growth for both EBA and non-EBA companies in our sample. Investment is the change in fixed assets over the past year, plus depreciation, and is scaled by total assets. Asset growth is on the one-year growth in total assets, and employment growth is the one-year growth in employment. Specifically, the figure reports the α_t of the following equation: $(y_{it}) = \alpha_t + \alpha_i + \varepsilon_{it}$, where α_t captures year fixed effects and α_i captures company fixed effects. The year before the shock, 2010, is the base period and its corresponding coefficient is normalized to zero. The equation is estimated separately for both the EBA and non-EBA samples, with standard errors clustered at the company level.

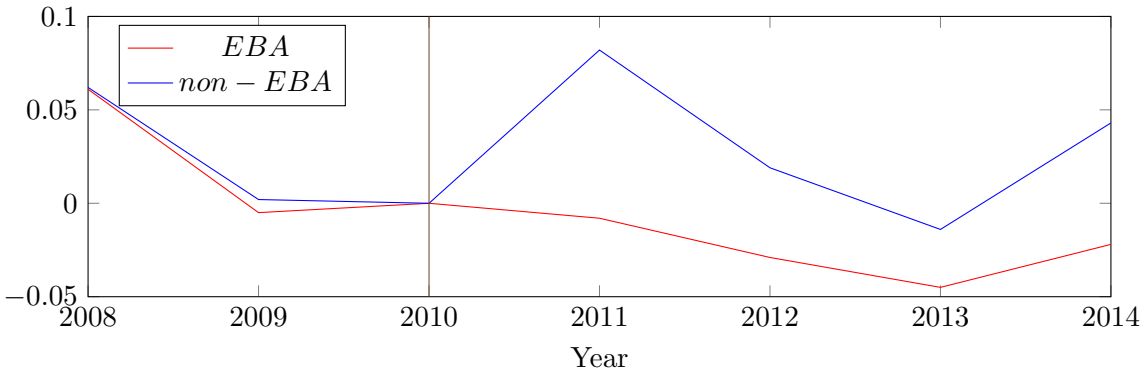
Investment



Asset growth



Employment growth



Tables

Table 1: Industry distribution

The table shows the industry distribution at the broad industry level (one-digit SIC) for the EBA and non-EBA sample of private equity-backed companies.

Industry distribution	EBA	non-EBA
Agriculture, Forestry & Fishing	1%	0%
Construction	5%	6%
Manufacturing	42%	36%
Retail Trade	4%	13%
Services	25%	19%
Transport, Communication, Electric & Gas	9%	9%
Wholesale Trade	12%	17%

Table 2: Portfolio company characteristics in 2010

The table reports descriptive statistics of sample firms in the last pre-shock year (2010) across treated (EBA companies) and untreated firms (non-EBA companies). *ROA* shows return on assets, as measured by net income over assets; *EBITDA* is earnings before interest, taxes, depreciation and amortization, scaled by assets; *Cash flow* is net profit (loss) for the period less minority interest plus depreciation and amortization, and is scaled by total assets; *Investment* is the change in fixed assets over the past year, plus depreciation, and is scaled by total assets. *Leverage* is total debt over total assets. The last column reports the mean difference across the two groups where ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. All ratios are winsorized at the 1%.

	EBA				non-EBA				
Variable	Firms	Mean	Median	SD	Firms	Mean	Median	SD	t-test
Total assets	248	116,740	27,234	306.129	56	98,844	25,472	212.272	17,896
Sales	246	87,355	31,064	207.492	56	65,430	14,295	115.077	21,925
Log(Employees)	181	5.15	5.22	1.64	37	4.56	4.21	1.62	0.59
EBITDA	231	0.10	0.10	0.23	53	0.11	0.09	0.11	-0.01
Cash flow	232	0.05	0.07	0.23	53	0.06	0.07	0.15	-0.01
Investment	235	-0.01	0.03	0.27	53	-0.02	0.02	0.31	0.01
ROA	243	0.02	0.04	0.25	55	0.03	0.05	0.15	-0.01
Leverage	247	0.66	0.67	0.36	56	0.62	0.63	0.23	0.04

Table 3: Portfolio company growth rates in 2010

The table reports the one-, two-, and three-year growth rates of firm characteristics in 2010. *ROA* shows return on assets, as measured by net income over assets; *EBITDA* is earnings before interest, taxes, depreciation and amortization, scaled by assets; *Cash flow* is net profit (loss) for the period less minority interest plus depreciation and amortization, scaled by total assets; *Investment* is the change in fixed assets over the past year, plus depreciation, and is scaled by total assets; *Leverage* is total debt over total assets. The last column reports the mean difference across the two groups where ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	EBA				non-EBA				
Variable	Firms	Mean	Median	SD	Firms	Mean	Median	SD	t-test
1-year growth rate									
Total assets	248	0.11	0.05	0.28	56	0.02	0.00	0.18	0.09***
Sales	236	0.10	0.07	0.27	56	0.10	0.05	0.23	0.00
Employees	161	0.04	0.01	0.20	38	-0.03	0.00	0.11	0.07
EBITDA	225	0.00	-0.04	1.02	52	0.00	-0.04	0.81	0.00
Cash flow	205	-0.10	-0.08	1.24	47	-0.20	-0.10	0.86	0.10
Investment	230	-0.79	-0.60	3.75	50	-1.72	-0.45	5.53	0.91
ROA	240	-0.04	-0.15	1.87	55	-0.07	-0.09	1.83	0.03
Leverage	247	0.02	0.00	0.20	56	0.04	0.00	0.17	-0.02
2-year growth rate									
Total assets	247	0.35	0.03	1.07	56	0.38	-0.01	1.26	-0.03
Sales	226	0.26	-0.02	1.09	53	0.55	-0.02	1.53	-0.29
Employees	158	0.25	0.00	0.98	30	0.35	-0.09	1.41	-0.10
EBITDA	217	-0.14	-0.11	1.26	49	0.19	-0.10	1.38	-0.33
Cash flow	201	-0.21	-0.22	1.44	44	0.01	-0.09	1.59	-0.22
Investment	213	-0.57	-0.78	3.85	47	-0.86	-0.86	5.48	0.29
ROA	240	-0.06	-0.29	2.34	53	-0.10	-0.12	2.56	0.04
Leverage	246	0.04	-0.02	0.36	56	-0.01	-0.03	0.33	0.05
3-year growth rate									
Total assets	247	1.29	-0.02	2.91	56	1.32	-0.05	3.18	-0.03
Sales	236	1.37	-0.09	3.22	53	1.07	-0.10	3.13	0.30
Employees	150	0.99	0.00	2.31	31	1.25	-0.17	2.80	-0.26
EBITDA	215	-0.11	-0.10	1.96	50	0.11	-0.14	1.63	-0.22
Cash flow	192	-0.22	-0.34	1.85	44	0.06	-0.19	1.73	-0.28
Investment	218	-1.45	-0.97	4.60	51	-2.05	-1.11	6.58	0.54
ROA	237	-0.06	-0.55	2.97	54	-0.06	-0.23	2.95	0.00
Leverage	244	0.09	-0.01	0.55	56	-0.02	-0.09	0.43	0.11*

Table 4: Investment and growth

The table reports the estimates of a difference-in-differences fixed effects model. In columns 1 and 2 the dependent variable is investment scaled by assets; in columns 3 and 4 it is the one-year growth in assets; in columns 5 and 6 it is the one-year growth in employment. All specifications include firm, country and bank*year fixed effects. The main parameter of interest is the interaction between the $Post_t$ dummy, which equals 1 for years after 2011, and the EBA_i company dummy variable, which equals 1 if the PE arm of an EBA-affected bank backs the company. Even-numbered columns augment the baseline model with a set of firm-level controls measured before the EBA shock in 2010 and interacted with the $Post_t$ dummy. These variables include firm size (log of revenue), cash flow over assets, ROA, and leverage. Standard errors, reported in the parentheses, are clustered at the firm level. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Investment		Asset growth		Employment growth	
	(1)	(2)	(3)	(4)	(5)	(6)
EBA*Post	-0.051**	-0.085***	-0.058**	-0.097**	-0.049**	-0.054**
	(0.021)	(0.028)	(0.025)	(0.033)	(0.022)	(0.023)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Observations	1,750	1,750	2,039	2,039	1,323	1,323

Table 5: Robustness: Controlling for other sources of external financing

The table reports the estimates of a difference-in-differences fixed effects model, where we control for additional sources of external financing for firms. In columns 1 and 2 the dependent variable is investment scaled by assets; in columns 3 and 4 it is the one-year growth in assets; in columns 5 and 6 it is the one-year growth in employment. All specifications include firm, country and bank*year fixed effects. The main parameter of interest is the interaction between the $Post_t$ dummy, which equals 1 for years after 2011, and the EBA_i company dummy variable, which equals 1 if the PE arm of an EBA-affected bank backs the company. $Loan_i$ equals 1 if a company obtains a loan, and zero otherwise. Even-numbered columns augment the baseline model with a set of firm-level controls measured before the EBA shock in 2010 and interacted with the $Post_t$ dummy. These variables include firm size (log of revenue), cash flow over assets, ROA, and leverage. Standard errors, reported in the parentheses, are clustered at the firm level. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Investment		Asset growth		Employment growth	
	(1)	(2)	(3)	(4)	(5)	(6)
EBA*Post	-0.025*	-0.051**	-0.025*	-0.024*	-0.035*	-0.004
	(0.008)	(0.020)	(0.017)	(0.017)	(0.020)	(0.049)
Loan*Post	0.004	0.009	0.119	0.104*	0.027	0.003
	(0.017)	(0.019)	(0.139)	(0.042)	(0.042)	(0.045)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Observations	1,750	1,750	2,039	2,039	1,323	1,323

Table 6: Robustness: Matching firms

The table reports the estimates of a difference-in-differences fixed effects model, but on a reduced sample of matched firms. In columns 1 and 2, the dependent variable is investment scaled by assets; in columns 3 and 4 it is the one-year growth in assets; in columns 5 and 6 it is the one-year growth in employment. All specifications include firm, country and bank*year fixed effects. The main parameter of interest is the interaction between the $Post_t$ dummy, which equals 1 for years after 2011, and the EBA_i company dummy variable, which equals 1 if the PE arm of an EBA-affected bank backs the company. Even-numbered columns augment the baseline model with a set of firm-level controls measured before the EBA shock in 2010 and interacted with the $Post_t$ dummy. These variables include firm size (log of revenue), cash flow over assets, ROA, and leverage. Standard errors, reported in the parentheses, are clustered at the firm level. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Investment		Asset growth		Employment growth	
	(1)	(2)	(3)	(4)	(5)	(6)
EBA*Post	-0.049**	-0.059***	-0.059**	-0.046*	-0.035*	-0.012
	(0.010)	(0.020)	(0.026)	(0.031)	(0.022)	(0.055)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Observations	968	968	1,108	1,108	659	659

Table 7: Robustness: Controlling for attrition bias

The table reports the estimates of a difference-in-differences fixed effects model, where we narrow our time frame to only include years 2010 to 2012. In columns 1 and 2 the dependent variable is investment scaled by assets; in columns 3 and 4 it is the one-year growth in assets; in columns 5 and 6 it is the one-year growth in employment. All specifications include firm, country, and bank*year fixed effects. The main parameter of interest is the interaction between the $Post_t$ dummy, which equals 1 for years after 2011, and the EBA_i company dummy variable, which equals 1 if the PE arm of an EBA-affected bank backs the company. Even-numbered columns augment the baseline model with a set of firm-level controls measured before the EBA shock in 2010 and interacted with the $Post_t$ dummy. These variables include firm size (log of revenue), cash flow over assets, ROA, and leverage. Standard errors, reported in the parentheses, are clustered at the firm level. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Investment		Asset growth		Employment growth	
	(1)	(2)	(3)	(4)	(5)	(6)
EBA*Post	-0.026**	-0.041*	-0.056**	-0.044*	-0.021	-0.066**
	(0.011)	(0.023)	(0.019)	(0.032)	(0.017)	(0.033)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Observations	866	866	909	909	596	596

Table 8: Portfolio companies & financial constraints

The table reports the estimates of a difference-in-differences fixed effects model. In columns 1 and 2 the dependent variable is investment scaled by assets; in columns 3 and 4 it is the one-year growth in assets; in columns 5 and 6 it is the one-year growth in employment. In panel A, we explore the impact of the sovereign debt crisis. Here, *Constrained* equals 1 if the target company is located in a GIIPS country (Greece, Ireland, Italy, Portugal and Spain). In panel B, *Constrained* equals 1 if the company is in the top quartile of firm leverage in 2010. In panel C, *Constrained* equals 1 if the company is in the bottom quartile of firm profitability (defined as EBITDA/total assets) in 2010. Even-numbered columns augment the baseline model with a set of firm-level controls measured before in 2010 and interacted with the $Post_t$ dummy. These variables are firm size (log of revenue), cash flow over assets, ROA, and leverage. Standard errors, reported in the parentheses, are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level

	Investment		Asset growth		Employment growth	
Panel A: GIIPS						
EBA*Post*GIIPS	-0.105**	-0.075**	-0.181**	-0.163*	-0.144*	-0.110*
	(0.043)	(0.049)	(0.084)	(0.095)	(0.080)	(0.079)
GIIPS*Post	0.025	-0.010	0.015	-0.032	0.065	0.049
	(0.034)	(0.041)	(0.060)	(0.073)	(0.057)	(0.061)
EBA*Post	-0.008	-0.040**	-0.036	-0.079**	-0.028	-0.029
	(0.008)	(0.019)	(0.024)	(0.037)	(0.023)	(0.021)
Observations	1,750	1,750	2,039	2,039	1,323	1,323
Panel B: Leverage						
EBA*Post*Constrained	-0.020	-0.049	-0.222***	-0.208**	-0.177*	-0.157*
	(0.043)	(0.046)	(0.078)	(0.082)	(0.095)	(0.108)
Constrained*Post	-0.015	-0.074*	-0.251**	-0.277**	-0.177**	-0.146*
	(0.038)	(0.044)	(0.067)	(0.078)	(0.085)	(0.104)
EBA*Post	-0.018**	-0.056***	-0.037*	-0.039	-0.048**	-0.034
	(0.009)	(0.020)	(0.019)	(0.040)	(0.021)	(0.054)
Observations	1,750	1,750	2,039	2,039	1,323	1,323
Panel C: Profitability						
EBA*Post*Constrained	-0.069**	-0.048*	-0.043**	-0.013*	-0.029	-0.059
	(0.033)	(0.039))	(0.004)	(0.009)	(0.098)	(0.108)
Constrained*Post	0.082**	072**	0.004	0.092	0.013	0.103
	(0.025)	(0.034)	(0.079)	(0.090)	(0.089)	(0.101)
EBA*Post	-0.019**	-0.041*	-0.053***	-0.010	-0.037*	0.025
	(0.009)	(0.022)	(0.018)	(0.041)	(0.022)	(0.056)
Observations	1,705	1,705	1,946	1,946	1,297	1,297
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes

Table 9: Private equity group experience

The table reports the estimates of a difference-in-differences fixed effects model. In columns 1 and 2 the dependent variable is investment scaled by assets; in columns 3 and 4 it is the one-year growth in assets; in columns 5 and 6 it is the one-year growth in employment. In panel A, *Experience* is the number of deals made by the investor prior to entry. It equals 1 if this is above the sample median and the PE firm is more likely to be more experienced and have more reputational capital. In panel B, *Experience* is the PE investor's age. It equals 1 if the investor's age is above the sample median. Even-numbered columns augment the baseline model with a set of firm-level controls measured before in 2010 and interacted with the $Post_t$ dummy. These variables are firm size (log of revenue), cash flow over assets, ROA, and leverage. Standard errors, reported in the parentheses, are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level

	Investment		Asset growth		Employment growth	
Panel A: Prior number of deals made						
EBA*Post*Experience	0.060*	0.055*	0.113**	0.108*	0.036	0.007
	(0.040)	(0.040)	(0.075)	(0.066)	(0.075)	(0.070)
Experience*Post	0.083	0.099	0.114	0.122	0.117	0.118
	(0.096)	(0.097)	(0.048)	(0.075)	(0.014)	(0.023)
EBA*Post	-0.056**	-0.073**	-0.117**	-0.049	-0.116**	0.339
	(0.028)	(0.019)	(0.048)	(0.464)	(0.045)	(0.337)
Observations	1,315	1,315	1,713	1,512	1,136	1,001
Panel B: PE investor age						
EBA*Post*Experience	0.012*	0.009	0.116**	0.105*	0.133*	0.071**
	(0.027)	(0.038)	(0.063)	(0.084)	(0.080)	(0.018)
Experience*Post	0.016	0.009	-0.061	0.043	-0.043	0.025
	(0.022)	(0.034)	(0.052)	(0.075)	(0.070)	(0.097)
EBA*Post	-0.020*	-0.049*	-0.068***	0.064	-0.092***	-0.039
	(0.010)	(0.027)	(0.023)	(0.061)	(0.027)	(0.075)
Observations	1,670	1,670	1,923	1,923	1,229	1,229
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes

Appendix

Definition of the variables

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

Data sample

Before preliminary analysis of our data, we introduce our sample distribution of transactions and banks. Panel A of table A2 presents the private equity transactions in our study by the year of the deal. As expected, given that the holding period of bank-affiliated buy-outs is typically five to seven years, most of the deals are concentrated in the seven years prior to 2011, the year of the shock. Unsurprisingly, the pre-crisis years of 2006 and 2007, when markets were buoyant, are the most active years for deal execution. Deal activity then drops significantly once the repercussions of the crisis take effect in 2009.

We then look at the country distribution of our deals, based on the location of the portfolio company receiving the investment. Panel B confirms that France and the UK have the most active PE markets in Europe. Incidentally, the largest bank by asset size in Europe unaffected by the EBA capital exercise is the French bank, Credit Mutuel. Finally, in panel C we consider the country distribution of the banks. In total, there are 39 banks in the sample. Consistent with expectations, the larger, more advanced economies have more active banks in private equity markets during our sample period. Germany, traditionally a bank-based economy, has the most banks (8).

Table A1: Variable definitions and sources

A. Dependent variables		
Investment	The change in fixed assets plus any depreciation	Amadeus
Asset growth	The one-year growth in total firm assets	Amadeus
Employment growth	The one-year growth in firm employment	Amadeus
B. Main explanatory variables		
EBA	Dummy variable equal to 1 for PE-backed firms of EBA-affected banks	Capital IQ
Post	Dummy variable equal to 1 for years 2011 to 2014 and 0 otherwise	Capital IQ
EBA*Post	Interaction term between the EBA and Post variables	Capital IQ
C. Control variables		
Sales	Total firm sales	Amadeus
Earnings	Earnings before interest, taxes, depreciation, and amortization (EBITDA) normalized by total assets	Amadeus
Cash flow	Net income plus depreciation divided by total assets	Amadeus
Leverage	Total debt divided by total assets	Amadeus
ROA	Net income divided by total assets	Amadeus

Table A2: Sample statistics

The table provides sample statistics on the buyouts in our study. Panel A displays the time series of the buyouts, panel B describes the location of the target companies, and panel C details the location of the banks and their PE arms.

	Number	Percentage
Panel A: Buyout year distribution		
pre-2000	8	2.8%
2000	3	1.0%
2001	8	2.7%
2002	4	1.4%
2003	13	4.5%
2004	20	6.8%
2005	19	6.5%
2006	47	16.1%
2007	61	20.9%
2008	53	18.2%
2009	27	9.2%
2010	29	9.9%
Panel B: Firm country distribution		
Austria	3	1.0%
Belgium	8	2.7%
Denmark	1	0.3%
France	125	42.6%
Germany	17	5.8%
Hungary	1	0.3%
Ireland	1	0.3%
Italy	22	7.5%
Netherlands	6	2.1%
Norway	1	0.3%
Poland	1	0.3%
Portugal	5	1.7%
Spain	9	3.1%
Sweden	2	0.7%
Switzerland	1	0.3%
UK	89	30.5%
Panel C: Bank country distribution		
Austria	1	2.6%
Belgium	1	2.6%
Denmark	1	0.6%
France	6	15.4%
Germany	8	20.5%
Italy	7	17.9%
Netherlands	3	7.7%
Norway	2	5.1%
Portugal	1	2.6%
Spain	4	10.3%
UK	3	7.7%