

## Private Equity Investment in U.S. Banks

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### *Preliminary draft*

This version: June 16, 2017

**Abstract:** We document and analyze the performance of 81 private equity investments in U.S. commercial banking companies between 2004 and 2016. Abnormal announcement returns were strong and positive; standard industry metrics indicate that PE firms earned return premiums on these deals; and both market-based and accounting-based measures indicate increases in risk-taking at PE-targeted banks. Based on our (preliminary) results, we conclude that (a) PE firms were able to earn acceptable returns on these deals, despite having to operate under regulatory constraints, and (b) as historically feared by bank regulators, private equity investment makes commercial banking companies riskier.

**Keywords:** banking, private equity, regulatory policy

**JEL codes:** G21, G28, G31.

\* The views expressed herein are those of the authors and do not necessarily represent those of the Federal Reserve Bank of Boston or the Federal Reserve System.

## 1. Introduction

Banks have long supplied equity and debt finance in U.S. private equity (PE) deals. Between 1983 and 2009, 30% of all PE deals in the U.S. included equity and/or debt investments from the private equity arm of a large commercial or investment banking company (Fang, Ivashina and Lerner 2013; Capital IQ). But the reverse pattern of investment—that is, private equity investment in U.S. banking companies—has been rare. There are at least three reasons for this historical asymmetry. First, the heavily regulated environment in which banks operate can interfere with the ability of PE investors to make sharp and swift operational and financial changes. Second, the relatively short-run time investment horizons of PE investors are antithetical to the preferences of commercial bank regulators for stable, long-term equity investors. And third, both commercial and investment banks already operate with high financial leverage, which eliminates a primary financial strategy used by PE funds for increasing shareholder value.

This asymmetry broke down in the aftermath of the global financial crisis, when many U.S. banking companies found themselves both capital-constrained and under increased regulatory scrutiny to strengthen their balance sheets. On the asset side, banks reduced their risky investments across the board, including though not limited to paring back their equity and debt positions in private equity deals.<sup>1</sup> This resulted in a disintermediation of sorts, with increased private equity investment by non-bank institutional investors offsetting much of the reduction in private equity investment by banks (Fang, Ivashina and Lerner 2015). On the funding side, federal bank regulators permitted PE funds greater opportunities to invest in commercial banks. The Federal Reserve relaxed its rules governing private equity investments in bank holding companies in September 2008, and the Federal Deposit Insurance Corporation (FDIC) clarified its position on private equity investments in banks in September 2009.<sup>2</sup> Private equity firms, flush with un-

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<sup>1</sup> The so-called Volcker Rule (part of the Dodd-Frank Act of 2010) also played a role by restricting banks' exposures to private equity and hedge funds. Although this rule was not finalized until 2014 and full compliance was delayed until 2015, it was highly anticipated and likely influenced bank investment behavior earlier in the process.

<sup>2</sup> The Federal Reserve (2008) issued guidelines to clarify under what conditions an investment group must become a regulated bank holding company. These guidelines were generally interpreted as expanding the ability of PE funds to invest in banks while avoiding being subject themselves to banking regulations. The FDIC (2009), while not standing in the way of PE investment, made clear that it would not relax its rules for any investors in failed banks, and reserved the right to hold PE investors to stricter-than-normal standards regarding. This included, for example, the duration of

deployed capital raised during the pre-crisis years (Piper Jaffray 2008) took advantage of these new opportunities. In 2008, PE investment in U.S. banking companies totaled only about \$400 million; by 2012, PE investment in U.S. banking companies had increased to more than \$7 billion.

In this study, we document and assess the impact of 81 private equity investments in U.S. commercial banking companies between 2004 and 2016. Our research focuses on two interrelated questions. First, were these private equity investors able to earn acceptable returns on their investments in U.S. commercial banking companies, despite the operating and financial constraints placed upon them by bank regulations? Second, did these private equity investments result in greater amounts of business and/or financial risk at commercial banks, as historically feared by U.S. bank regulators?

We begin the analysis by measuring the reaction of stock market investors to the announcements of these deals. Unlike in most previous studies of private equity deals, the majority (78 of 81) of the targeted investments in our sample were publicly traded stock corporations. Announcement effects averaged between +3% and +5% across a variety of market models and announcement windows. Thus, the market clearly believed that PE firms could make value-enhancing interventions in heavily regulated commercial banking firms. These beliefs were borne out in the longer run, on average, for both passive shareholders and PE investors. Buy-and-hold returns measured over five years (the average duration of the deals in our data) imply average annual shareholder returns of 12.9% to 13.8%, while the annual internal rate of return earned by private equity investors averaged 12.7%. These rates of returns represent real-time premiums over returns to market indices that are similar to those found in previous studies of non-bank PE deals. So in general, the answer to our first question is yes: Private equity investors were able to earn acceptable returns on their investments in U.S. commercial banking companies, even while operating under the strict operational constraints imposed by U.S. bank regulations.

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PE equity investments (a minimum of three years), the size of PE equity investments (at least ten percent of total bank assets, maintained for at least three years), and the disclosure of detailed financial information beyond which a PE fund typically discloses.

In the next part of the analysis we apply panel estimation techniques to a propensity-matched data sample to test whether and how private equity investment influenced bank financial risks and returns. On average, PE investment in banks is associated with higher levels of insolvency risk, earnings volatility, return volatility, and idiosyncratic risk. Whether or not this increased risk-taking translates into increased bank value is ambiguous—Tobin’s Q increases, but an accounting-based Sharpe ratio decreases, with PE investment—but this tradeoff between risk and return is immaterial to bank regulators who care only about downside risk. So in general, the answer to our second question is also yes: Consistent with the historical reservations held by U.S. bank regulators, private equity investments in commercial banking companies appear to increase the risk profiles of these firms.

Finally, we search the detailed quarterly financial statements filed by commercial banks for evidence of post-investment changes in business activities. In the large majority of the deals in our data (74 of 81), private equity investors were blockholders—the PE firms held a 19% stake in the targeted banks on average—giving them the control rights necessary to make non-trivial strategic and operational changes. Target bank balance sheets shifted away from traditional intermediation activities such as loans and core deposits after PE investment, and toward less traditional activities such as trading assets and liabilities. On-the-one-hand, this reallocation could be the key driver of the increased risk levels that we observe at PE-targeted banks. On-the-other-hand, the data suggest that these changes merely moved the business mixes at targeted banks in the direction of the balance sheets at otherwise similar non-targeted banks.

Our findings, while still preliminary at this stage of our investigation, have implications for both research and policy. We expand the literature on private equity investment by analyzing the performance of PE targeted firms in a heavily regulated industry, and more specifically in the commercial banking industry. We provide a first analysis of recent policy changes that expanded the opportunities for private equity investment in U.S. commercial banking companies. Our empirical findings help inform the tradeoff between bank regulators’ historical concerns that the short-run objectives of PE investors will make banks riskier, versus the potential benefits of increasing commercial banks’ access to capital as well as increasing their exposure to investor discipline.

The remainder of the paper is organized as follows: In Section 2 we describe our data sample. In Section 3 we perform univariate analysis of the data, followed by multivariate analysis of the data in Section 4. Section 5 concludes.

## **2. Private equity investments in U.S. commercial banks**

Our study focuses on private equity investments in U.S. commercial banking companies made between 2004:Q1 and 2016:Q1. We hand-collected the private equity investment data from the SNL and S&P Capital IQ databases, and complemented these data with additional information from banks' press releases, transaction documents and SEC filings. We then merged these data with quarterly financial statement information from the Federal Reserve Y-9C commercial bank holding company database. (We use the terms *banks*, *banking companies*, and *bank holding companies* interchangeably throughout the rest of the paper.)

For many of these investment deals, the PE firm made stock purchases on more than one date. We identified 270 distinct stock purchase dates by PE investors in 121 unique banking companies. For a given banking company, we define the beginning of the PE investment (PE Entry) as the quarter in which the first investment was made in the target bank, and the end of the PE investment (PE Exit) as the quarter in which the total accumulated investment in the target bank was liquidated. We were able to assemble full information for 81 of these 121 bank-specific private equity investments.

The core pieces of information in our data set are the identities of the PE investment firms and the target banks, the PE Entry dates on which the initial investments were made, the number of shares purchased and the total dollar amount of those investments, the PE Exit dates on which the investments were fully sold, and the total dollar values of those sales. The distributions of these deal characteristics across the target banks in our sample are summarized in Table 1. We observe a total of 81 private equity investments in banking companies, 78 of which were in publicly traded targets, and 74 of which involved (at least at some point during the life of the investment) a blockholding investment of more than 5%. The average PE investor share across all 81 deals was 16.39% (median 9.99%), while the average PE investor share across

the 74 blockholding deals was 19.44% (median 14.58%). Private equity investment in these deals ranged from about \$1 million to about \$1 billion, with an average deal value of \$73 million (median \$15 million).

A little more than half of the 81 deals were fully completed by the end of our sample period. For these completed bank deals, the median average duration of investment was 20 quarters, approximately one year longer than the average duration of the completed nonbank deals in previous studies of nonbank PE deals. Guo, Hotchkiss and Song (2011) report an average 3.86 year duration for buyout deals between 1990 and 2006, while Fang, Ivashina and Lerner (2013) report an average 3.92 years (47 months) for private equity deals between 1993 and 2008. The longer average duration of the bank PE deals in our sample may reflect regulatory pressure for investors to provide stability at capital-deficient or otherwise troubled banking companies.

As shown in Figure 1, the number and the dollar value of private equity investments in banks increased after the Federal Reserve's September 2008 guidelines and the FDIC's September 2009 clarifications. As shown in Figure 2, the PE exits following this bulge in new deals appear as a four-year echo. This suggests that the average tenure of the large number of deals made in the later portion of our sample period were much closer to the average tenure of 3.9 years found in the earlier literature.

### **3. Univariate Analysis**

We begin with a standard univariate analysis of the data. First, we measure the abnormal announcement returns associated with 78 deals in which the targeted bank is publicly traded, as well as the longer run buy-and-hold returns for these deals. Second, we measure the returns on investment earned by private equity investors for the 47 deals from which the PE firms had fully exited before the end of our sample period. Third, we compare the pre-PE investment and post-PE investment attributes of the targeted banking companies, including measures of market returns and risk, accounting-based returns and risk, balance sheet composition, and income statement composition. This section closes with a summary of these various univariate findings.

#### ***3.1. Market returns to passive equity investors***

We measure the financial returns to private equity investment in U.S. commercial banks three different ways: The abnormal returns to bank equity shareholdings in response to the announcement of the PE deal, the long-run abnormal returns to the equity shares of banks that experienced PE investment, and the earnings multiple that accrued to PE investors over the life of their investment in these banks.

Table 2 presents the event study results for the 78 publicly traded commercial bank holding companies in our sample. The event windows correspond with the announcement of the initial investment in each bank by a private equity firm. The results indicate that, on average, market investors believed that private equity investment would add value. Standard CAPM-based and Fama-French-based models (in columns 1 and 2, respectively) indicate positive and statistically significant announcement returns, ranging from 3.3% and 5.5%. The market clearly expected private equity firms to make value-enhancing operational and/or strategic changes at these banks.

In column 3 we re-estimate the CAPM model after replacing the market equity index (CRSP) with a banking industry equity index (the Keefe Bruyette Woods (KBW) index for regional banks).<sup>3</sup> While this approach is somewhat unorthodox, it sheds light on a related important valuation question: Did banks receiving private equity investment—a clear break from historical regulatory policy—experience a positive valuation increment relative to the rest of the banking industry, which did not receive private equity investment? The data indicate an affirmative answer to this question, with banks receiving PE investment enjoying statistically positive ‘within-industry’ abnormal returns.

The market’s short-run expectation that banks receiving private equity investment would experience increased future earnings is largely borne out in the long-run pricing data. Table 3 presents the buy-and-hold abnormal returns for the same 78 commercial banks, for holding periods of up to four years. (Recall that the average entry-to-exit lifespan of a PE investment in our data is 22 quarters, or five-and-a-half years, for the 40 deals in which PE investors had fully exited by the end of our sample period.)

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<sup>3</sup> We use the KBW index for regional banks because it comports well with the 81 target banks in our sample, which averaged \$3.9 billion in assets. The Table 3 results are based on models using equally-weighted market return indices; as shown in the Appendix, the results are virtually identical when we use value-weighted market return indices.

Cumulative abnormal returns over five years (the average duration of the completed deals in our data) range between 83.7% and 90.7%. These compounded five-year returns imply average annual rates of return of 12.9% and 13.8%, respectively.<sup>4</sup>

### 3.2. *Returns to private equity investors*

In a survey of 79 different private equity groups, Gompers, Kaplan, and Mukharlyamov (2015) found that PE firms rely predominantly on two measurement tools to evaluate their own financial performance: The multiple on invested capital (MOIC) and the gross internal rate of return (IRR). On average, these firms used MOIC to evaluate 94.8% of their investments, and used IRR to evaluate 92.7% of their investments. We use these two tools to measure the performance of the PE bank deals in our data.

MOIC captures the accumulated percent return to invested capital over the life of the investment. We use the following formula to calculate MOIC:

$$MOIC = \frac{\sum_{t=0}^{T_2} \text{payments to capital}_t + \sum_{T_1}^{T_2} p_t \cdot \text{shares sold}_t}{\sum_{t=0}^{T_1} p_t \cdot \text{shares purchased}_t} \quad (1)$$

The summation terms allow for stock share purchases (PE entry) and stock share sales (PE exit) to occur on multiple trading days. The subscript  $t$  denotes time and  $p_t$  is the share price at time  $t$ . We denote 0 through  $T_1$  as the time span over which the PE investor purchases equity shares, we denote  $T_1$  through  $T_2$  as the time span over which the PE investor sells off the equity shares ( $0 < T_1 < T_2$ ), and *payments to capital* consist of any dividend payments received by PE investor during the lifetime of the deal. Gross IRR is the annualized percentage return before netting out management fees, carried interest, and other transactions costs. Gross IRR is calculated by solving the following formula for  $R$ :

$$0 = \sum_{t=0}^{T_2} \frac{p_t \cdot \text{shares sold}_t + \text{payments to capital} - p_t \cdot \text{shares purchased}_t}{(1+R)^t} \quad (2)$$

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<sup>4</sup> The calculations are  $0.129 = (1.8367^{0.2}) - 1$  and  $0.138 = (1.9073^{0.2}) - 1$ .

Table 4 displays the distributions of both measures for the 47 bank deals in our sample for which PE investors had completed their exit. As a real-time benchmark, the table also shows the distributions of MOIC and IRR calculated for investments in the S&P 500 over the entry-to-exit dates of each of the 47 completed deals. Because the values of MOIC and IRR for our bank PE deals exhibit substantial variation, we will focus mainly on the median averages.

The median average MOIC for the bank PE deals is 1.2619, an approximate 26% total return on invested capital over the life of the investment. This is nearly identical to the median 1.2514 multiple for simultaneous investments in the S&P 500, and only slightly lower than the average investment multiple of 1.3 reported by Gompers, Kaplan, and Mukharlyamov (2015) from their 2012 survey of PE firms investing in nonfinancial firms. These investment multiples, based largely on data from post-crisis PE investments, are substantially smaller than the investment multiples found for earlier PE deals. Guo, Hotchkiss and Song (2011) found a median investment multiple of 64.5% for 70 completed leveraged buyouts between 1990 and 2006. Harris, Jenkinson and Kaplan (2014) found the median *fund*-level multiples of 81% and 73%, respectively, for leveraged buyout firms and venture capital firms between 1984 and 2008. However, the latter study also finds that average returns earned by venture capital firms declined substantially after 2000. Given that our data is comprised exclusively of post-2000 bank private equity investments, our findings are not necessarily inconsistent with the existing literature on private equity investment in non-financial firms.

The median IRR for the bank PE deals is 12.67%.<sup>5</sup> This is comparable to the median fund-level IRRs of 13.0% for leveraged buyout firms, and 11.1% for venture capital firms, found by Harris, Jenkinson and Kaplan (2014) between 1984 and 2008. Our 12.67% figure represents a 3.32% premium over median 9.35% return on simultaneous investments in the S&P 500, which is similar to the IRR premiums found in non-bank studies. Harris, Jenkinson and Kaplan (2014) report a 3.7% annual return premium for PE

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<sup>5</sup> When compounded over the five year average duration of the deals in our sample, an annual return of 12.67% would result in a  $(1.1267)^5 - 1 = 82\%$  accumulated return. This figure is inconsistent with the accumulated return of 26% suggested by our 1.26 median MOIC. This seeming inconsistency occurs because our calculations of IRR discount future cash flows, while our calculations of MOIC sum-up cash flows regardless of when they occur.

investments over returns to investing in the S&P 500, while Gompers, Kaplan, and Mukharlyamov (2015) report a 2.7% annual return premium for PE firms over an industry benchmark provided by Prequin, a private provider of data on alternative asset investments.

### ***3.3. Financial and operating performance of target banks***

In Table 5 we compare the pre-PE investment and post-PE investment means for a variety of bank performance ratios. We limit these comparisons to the set of 74 private equity deals in which PE investors held a blockholding stake (at least 5% of outstanding shares) in the target bank and hence had some ability to affect changes at the target. The pre-PE investment period begins in 2004:Q1 for all banks and ends in the quarter before the blockholding investment was made. The post-PE investment period begins with the quarter in which the blockholding investment was made and ends with the quarter in which the blockholding investment was sold (for completed deals) or in 2016:Q1 (for uncompleted deals).

Within each of these sub-periods, we calculate quarterly mean averages for each of the 74 banks and then report the cross sectional means and standard deviations from those bank-specific means. Column [3] displays the raw differences between the sub-period means. In column [4] we re-calculate the difference in sub-period means after adjusting all bank-quarter ratio values by their cross sectional means. This adjustment controls for changes in financial, economic, and banking conditions during our sample period, and is especially important because the calendar quarters that define pre-PE and post-PE differ across banks.

These difference-in-means results are informative. PE investment is associated with reduced bank growth, more efficient use of bank assets and liabilities, and increased bank value. But PE investment is also associated with increased financial and banking risks—the very outcomes that bank supervisors have historically feared with private equity investments in banking companies.

On average, target banks' Z-scores decreased by an industry-adjusted 13.9% relative to their pre-PE levels.<sup>6</sup> The Z-score measures the decline in equity capital, measured in standard deviations of ROA, that is necessary for a bank to become insolvent. The -4.6853 industry-adjusted decline reduces the

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<sup>6</sup> We derive this result by dividing the industry-adjusted change in Z-score (-4.6853) by the pre-PE mean Z-score (33.7674). See Table 5.

quarterly Z-score from about 33 standard deviations of ROA to about 29 standard deviations of ROA. By itself, this result indicates an economically meaningless increase in the quarterly probability of insolvency; but if this result is being driven by a permanent increase in the standard deviation of ROA, the cumulative equity-reducing effects of consecutive quarters of negative ROA can become material. Indeed, the result is driven by an increase in income volatility rather than an increase in financial leverage. PE investment is associated a 23% industry-adjusted increase in SD(ROA), while Equity/Assets is statistically unchanged. Market-based indicators of shareholder risk also increased with PE investment: Total stock return volatility increased by 6.1%, implied stock return volatility increased by 14.8%, and idiosyncratic risk increased by 7.8%. And although systematic risk declined by 5.2%, this is of no solace to the bank regulator whose portfolio is far from diversified.

The heightened risk profiles of these banks did not necessarily preclude an increase in their values. As measured by Tobin's Q, the value of bank assets increased on average by an industry-adjusted 187 basis. But quarterly returns to the owners of those assets did not keep up with their increased riskiness, as the Sharpe ratio declined by an industry-adjusted 10.7%. Evidence from the operations and income statements of these banks reinforce this ambiguity. On-the-one-hand, target banks under PE investor management grew more slowly and increased the efficiency of their assets and liabilities. Asset growth declined by 6.11 percentage points, growth in full-time equivalent employees declined by 5.97 percentage points, and the rate of bank branch expansion declined by 3.42% (all industry-adjusted changes). By slowing the growth of the balance sheet, these banks were able to reallocate toward a more productive mix: On average, 3.77 percentage points more assets were funded by core deposits. These balance sheet efficiencies show up on the income statement as approximately 30 basis point increases in both net interest income and operating income, driven mainly by a 18 basis point increase in interest income.<sup>7</sup>

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<sup>7</sup> Operating income = net interest income + noninterest income. The income statements of commercial banks differ from those of non-financial firms. The most important difference is the absence of EBIT (earnings before interest and taxes). Commercial banks are very highly levered, but nearly all of that financial leverage takes the form of bank deposits. Because deposit issuance is an important part of banks' business model—depositors are willing to accept below-market interest rates, and in some cases pay fees, in exchange for transactions and safekeeping services—banks report interest expenses as part of net interest income (i.e., net interest income = interest income – interest expense).

On-the-other hand, these banks' net incomes did not increase on average with PE investment. Improvement in the (accounting) bottom line appears to have been constrained by reductions in loan quality and increases in noninterest expenses. The percentages of consumer loans and business loans that were nonperforming both increased. This reduction in loan quality may indicate that PE investors decided to take on more credit risk—which would also be consistent with the increase in interest income—or conversely, this may indicate that PE investors took steps to more accurately assess the condition of the loans already in place at the time of investment. In either case, the high-quality labor inputs necessary to properly manage a larger and perhaps increasingly risky loan portfolio would be consistent with the industry-adjusted 4.1% increase in noninterest expenses.

### ***3.4. Summary of univariate findings***

The univariate tests in Tables 2 through 5 provide initial answers to our two main research questions. First, were private equity investors able to earn acceptable returns on their investments in U.S. commercial banking companies, despite the operating and financial constraints placed upon them by bank regulations? Our buy-and-hold calculations (Table 3) indicate that large accumulations of abnormal shareholder wealth followed PE investment for the 78 publicly traded target banks in our sample. For the 47 completed PE bank deals in our sample, we find internal rates of return at least comparable to those reported in studies of PE investments in non-financial firms, once benchmarked to stock market conditions. However, despite having above-average investment durations that should (holding annual returns constant) result in larger multi-year accumulations, the investment multiples for the 47 completed bank deals in our sample fall short of those reported in some (though not all) non-financial firm PE investment studies.

Second, did these private equity investments result in greater amounts of operational or financial risk at commercial banks, as historically feared by U.S. bank regulators? Indeed, the raw data indicate that PE banking deals are associated with nontrivial increases in standard measures of credit risk, insolvency risk, and shareholder return risk. While this is unwelcome news for bank regulators—who do not benefit from the upside of this increased risk-taking—we also find evidence of increased allocative efficiencies that could in the longer run compensate for the increase in downside risk. Positive abnormal announcement

returns (Table 2) indicate that market investors expect that PE investment will enhance bank value, and sustained higher levels of Tobin's Q in the years after the initial PE investment indicate that market investors do not reverse their expectations as information on post-PE bank performance becomes available.

#### **4. Multivariate tests**

We now investigate our two questions at a higher level of statistical rigor. Using propensity score techniques, we construct a benchmark sample that matches the PE target banks in our sample to otherwise similar commercial banking companies that did not receive PE investment during our sample period. We then use fixed effects panel regression techniques to compare the relative financial performances of the two matched sets of banks.

##### ***4.1. Propensity matched data sample***

We begin with the population of U.S. commercial bank holding companies with complete information for each quarter of our 2004:Q1 through 2016:Q1 sample period. This full data sample contains 53,769 bank-quarter observations from 2,775 different banks. We use these data to estimate a pooled probit (time fixed effects only) model of the latent propensity for banks to be targeted by PE investors. The dependent variable is a dummy equal to one for banks that had non-zero private equity investment during any quarter during the sample period; we refer to these as PE-targeted banks. The estimated parameters of this model are displayed in Table 6.<sup>8</sup>

Following Rosenbaum and Rubin (1983), we use the estimated model from Table 6 to generate a fitted-value propensity score for every bank-quarter observation in the data, both PE-targeted banks and banks that never received private equity investments. For each bank-quarter observation of a PE-targeted bank, we select the five non-targeted banks from that quarter with propensity scores absolutely closest to the PE-targeted bank's propensity score. We sample from the non-targeted bank population each quarter with replacement; hence, a bank in our control group can be matched more than once with a bank in our

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<sup>8</sup> Definitions for each of the regressor variables in the pooled probit model are provided in Table 7.

treatment group.<sup>9</sup> This procedure yields a matched data sample of 12,074 bank-quarter observations (2,775 PE-targeted bank-quarter observations and 9,299 non-targeted bank-quarter observations) from 1,634 different banks (81 PE-targeted banks and 1,553 non-targeted banks). Summary statistics for the variables in the matched data sample are displayed in Table 7.

In the first-stage probit model, predictive power is more important than statistical inference. Indeed, the pseudo-R-squared of 0.2090 is reasonably high for what is essentially a cross-sectional model. Still, it is interesting to consider which right-hand side determinant variables had statistically significant coefficients, and hence were most important for delivering this strong statistical fit. Some of these results are economically sensible. Private equity investment is more likely at banks with low profitability (ROA); are more likely at publicly traded banks (Public) for which both the initial investment and (perhaps more crucially) the deal exit are not confounded by market liquidity issues; and are less likely at multi-bank holding companies (MBHC) for which costly and time-consuming legal organizational changes may be necessary to unlock efficiency gains. The combined positive effect of Deposits and negative effect of Interest Expense suggests that PE investors are attracted to banks with strong deposit franchises, i.e., bank assets are funded with large amounts of low-cost core deposits such as transactions accounts. The combined positive effect of Loans, positive effect of Business Loan Growth, and negative effect of Consumer Loan Growth suggests that PE investors are attracted to banks with strong commercial lending (as opposed to retail lending) franchises.

#### **4.2. Panel regressions**

Tables 8 through 11 display the results of fixed effects panel regressions using the matched sample data set. Each regression takes the following form:

$$Y_{it} = a + b \cdot PE_{it} + c \cdot Controls_{it} + B_i + T_t + \varepsilon_{it} \quad (3)$$

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<sup>9</sup> As a robustness check, we constructed a second matched data sample using a one-to-one matching procedure without replacement. Our results and ultimate findings were qualitatively unchanged.

where  $i$  indexes banks,  $t$  indexes time in quarters,  $B$  represents fixed bank effects,  $T$  represents fixed time effects, and  $\varepsilon$  is a symmetric error term. The dependent variable  $Y$  takes the value of any of the bank performance variables examined in Table 5. We specify the treatment variable  $PE$  two different ways:  $PE\ Share$  is the percentage of outstanding bank  $i$  shares owned by private equity investors in quarter  $t$ , while  $PE\ Blockholder$  is a dummy equal to one if  $PE\ Share$  is 5% or greater. The vector of *Controls* is parsimoniously specified and includes just three elements: Bank age in years ( $Age$ ), bank asset size expressed in natural logs ( $lnAssets$ ), and a dummy equal to one for banks that are publicly traded ( $Public$ ).

We estimate (3) using ordinary least squares, and standard errors are clustered at the bank level. The number of target banks varies across regressions. When  $Y$  is an accounting-based variable and the treatment variable is  $PE\ Shares$ , the regressions include all 81 target banks; this declines to 74 target banks when the treatment variable is  $PE\ Blockholder$ , because in these regressions we exclude target banks with  $PE\ Share$  less than 5%. When  $Y$  is a market-based variable, the regressions include 72 target banks when the treatment variable is  $PE\ Share$ , and 65 target banks when the treatment variable is  $PE\ Blockholder$ .

In Table 8 the dependent variables are accounting-based measures of risk and returns.  $Z\text{-Score}$  is an inverse measure of insolvency risk (Boyd and Graham 1988).  $ROA$ ,  $std(ROA)$ , and  $Equity/Assets$  are the three component parts of  $Z\text{-Score}$ .  $Sharpe$  is the standard Sharpe ratio, constructed using accounting ROE and its standard deviation. The results show that a marginal increase in PE shareholdings ( $PE\ Share$ , columns 1-5) is a less consistent indicator of changes in target bank risk and return than having a blockholding share ( $PE\ Blockholder$ , columns 6-10). Nevertheless, the coefficients on  $Z\text{-score}$  and  $Sharpe$  are negative, and the coefficient on  $Std(ROA)$  is positive, in both halves of the table, an indication that bank riskiness increases following private equity investment. A blockholding PE investment is associated with an increase in bank insolvency risk, as measured by the  $Z\text{-Score}$ : On average, the target bank  $Z\text{-Score}$  by 7.36 standard deviations of ROA, a substantial decline from the sample average of 33.77 standard deviations of ROA to just 26.41. While these numbers indicate an extremely low probability of insolvency for the average bank, approximately one-in-twelve of the bank-year observations for the targeted banks in our sample have  $Z\text{-Score}$  values less than 7.36. This increase in insolvency risk is driven by an increase in

bank income variation ( $Std(ROA)$ ) that more than offsets increases in bank income ( $ROA$ ) and bank equity ( $Equity/Assets$ ). A blockholding private equity investment is also associated with a worsening of the ROE risk-return tradeoff, as measured by the accounting Sharpe ratio: On average, *Sharpe* declines by 45% with private equity investment, another indication of large post-PE increases in (accounting) income variability relative to post-PE increases in (accounting) income.<sup>10</sup>

In Table 9 the dependent variables are market-based measures of risk and firm value. *Return Volatility*, *Systematic Risk*, and *Idiosyncratic Risk* are the risk decompositions of daily stock returns from a one-factor market model estimated quarterly for each bank. *Implied Volatility* is derived from a Black-Scholes-Merton option pricing model calculated quarterly for each bank. *Tobin's Q* is the market value of bank assets divided by the book value of bank assets. For these data—which exclude privately held banks—a marginal increase in shareholdings matters more often than having or not having a blockholding share. Market prices linked increased private equity investment in banks with increased bank riskiness: On average, a one-standard deviation increase in *PE Share* is associated with a 4.5% increase in *Return Volatility*, a 5.0% increase in *Idiosyncratic Risk*, and a 22.2% increase in *Implied Volatility*.<sup>11</sup> But market prices also linked private equity investment with increased bank value: On average, a one-standard deviation increase in *PE Share* is associated with a 4.2% increase in *Tobin's Q*.

The regression results in Table 8 and 9 are broadly consistent with our short-run event study results (Table 2), with the longer run market valuation results (Tables 3 and 4), and with the difference-in-means tests (Table 5). Banks tended to become more risky after private equity investments, and while accounting returns may not have increased commensurately with these risks, market investors found increased bank value associated with those risks. In our next set of regression tests, we seek to identify the internal operational changes that drove banks' post-PE risk and return profiles.

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<sup>10</sup> Calculation is  $0.4485 = 0.3569/0.7957$ , where 0.7957 is the mean value of *Sharpe* for PE target banks (Table 7).

<sup>11</sup> Calculations based on sample standard deviation of *PE Shares* = 0.1185, the coefficients on *PE Shares* from Table 9, and the mean values of the dependent variables from Table 7.

In Table 10 the dependent variables are derived from bank balance sheets. *Asset Growth*, *FTE Growth*, and *Branch Growth* are, respectively, the quarterly growth rates of bank assets, bank full-time employment, and the stock of physical bank branches. *Trading Exposures*, *Loans*, *Core Deposits* and *NPL* are, respectively, assets and liabilities in banks' trading portfolios, assets invested in loans, assets funded by core deposits, and nonperforming loans, each expressed as a percentage of total assets.<sup>12</sup> In these multivariate tests, loan quality (*NPL*) and bank growth rates (*Assets*, *FTEs*, *Branches*) are no longer statistically impacted by private equity investment, as was indicated in the simple differences-in-means tests in Table 5.<sup>13</sup> However, the regression tests indicate that banks shift away from more traditional bank lending and deposit-taking activities, and shift toward (assumedly riskier) trading activities, after private equity investments. On average, a blockholding PE investment is associated with 4.1% and 2.9% reductions in *Loans* and *Core Deposits*, and with a 186% increase in *Trading Exposures* (0.00093/0.0005). Interestingly, all three of these shifts in business mix move the target banks back toward the industry averages, a seemingly expedient decision given that target bank ROA was well below the industry average prior to the PE investments (see Table 7).

In Table 11 the dependent variables are the major items from bank income statements—interest income, interest expense, net interest income, noninterest income, operating income, noninterest income, loan loss provisions, and net income—divided by bank assets. Because both interest-bearing loans and interest-paying deposits declined on average with PE investment (see Table 10), we also include regressions in which interest income and net interest income are normalized by interest-bearing assets, and interest expense is normalized by interest-paying liabilities. *Interest Income/Assets* declines with PE investment but *Interest Income/Interest-bearing Assets* does not; this pattern is consistent with a reduction in loan quantity while preserving the returns on existing loans. Reinforcing this interpretation, *Provisions* expenses decline by an amount similar to the decline in *Loans*. We fail to find any statistically significant

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<sup>12</sup> The market risk-based capital rules of January 1, 1998 require bank holding companies to report the quarterly average value of their trading portfolios, defined as the sum of trading assets plus trading liabilities. This item appears as a memorandum item in the Y-9C reports.

<sup>13</sup> Removing the control variable *lnAssets* from the right-hand sides of these regressions does not affect this finding.

performance improvements in any of the remaining individual interest or expense items. Nevertheless, in response to PE blockholding investments, the combined effect of these items accumulate to statistically significant and economically non-trivial increases in both *Operating Income* (net interest income plus noninterest income) and *Net Income* (this repeats the *ROA* regression from Table 8). We note that the positive or negative income from increased *Trading Exposures* is included in the *Noninterest Expense* measure.

## 5. Conclusions

As financial losses mounted at U.S. commercial banking companies during the global financial crisis, federal bank regulators took a more relaxed stance concerning private equity investment in U.S. banking companies. Private equity firms took advantage of this expanded field of opportunities, and approximately \$7 billion in new equity capital flowed into the commercial banking system from PE firms between 2008 and 2012. In this study, we document 81 separate private equity investments in U.S. commercial banks between 2004 and 2016, and assess the outcomes of those deals. We focus on two interrelated questions. First, were these private equity investors able to earn acceptable returns on their investments in U.S. commercial banking companies, despite the operating and financial constraints placed upon them by bank regulations? Second, did these private equity investments result in greater amounts of business and/or financial risk at commercial banks, as historically feared by U.S. bank regulators? Our analysis, while still preliminary, provides affirmative answers to both of these questions.

We find positive and nontrivial abnormal stock returns at PE-targeted banks upon the announcement of these deals, a clear signal that intervention by PE firms was expected to be value-enhancing. These expectations were largely confirmed in the longer run, as both passive investors and the PE firms themselves earning above-market return premiums. So clearly, private equity investors were able to earn acceptable returns on these investments, despite having to operate under regulatory constraints. We also find plentiful evidence of heightened risk at PE-targeted banks, including increases in earnings volatility, stock return volatility, idiosyncratic risk, and indicators of bank insolvency. So, as historically

feared by bank regulators, private equity investment increases the risk profiles of commercial banking companies. Perhaps surprising, we find no evidence that this increased riskiness is not the result higher financial leverage, faster rates of growth, or increased credit risk. Rather, the data suggests it is caused by a shift away from traditional loan-making and deposit-taking, and toward increased reliance on gains from trading assets and trading liabilities.

For private investors in bank shares, an increase in bank-specific riskiness matters only to the extent that it may not be offset by an increase in expected returns and/or portfolio diversification effects. As such, our results show that private equity investors benefited from the private equity deals. But bank regulators benefit little from the upside risk of increased earnings or stock returns—in this way, they resemble bondholders. Nor do they benefit from portfolio diversification effects—indeed, because bank failures tend to occur in waves, any diversification effects tend to be negative for bank regulators. For a bank regulator, the clear benefit from allowing private equity investments in banks is increasing in the likelihood of a bank failure wave, because private market capital injections can in the short run help prevent those failures. In the longer run, the increased bank riskiness (as revealed in our tests) associated with PE investment will likely cause bank regulators to revert to their historical position opposing PE investments during normal times, regardless of the private market value created by those investments (as revealed in our tests).

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**Table 1: Characteristics of PE target banks**

This table shows the characteristics of (non-zero) private equity investments associated with 81 U.S. commercial banking companies between 2004:Q1 and 2016:Q1. The data for PE equity share, Investment value and Duration are within-bank averages across the quarters during which there was a private equity investment at that bank.

	<b>number</b>	<b>mean</b>	<b>min</b>	<b>25<sup>th</sup></b>	<b>50<sup>th</sup></b>	<b>75<sup>th</sup></b>	<b>max</b>
Total deals	81						
PE equity share	81	16.39%	0.87%	4.96%	9.99%	19.92%	89.00%
Investment value (\$ millions)	81	\$73.64	\$1.03	\$6.45	\$15.31	\$72.32	\$1,004.69
Deals with a publicly traded target bank	78						
PE equity share	78	15.62%	0.87%	4.49%	9.98%	19.22%	75.94%
Investment value (\$ millions)	78	\$80.81	\$2.29	\$6.57	\$15.88	\$87.30	\$1,004.69
Deals with a PE blockholder investment (>5%)	74						
PE equity share	74	19.44%	5.13%	7.38%	14.58%	23.31%	75.94%
Investment value (\$ millions)	74	\$92.16	\$1.92	\$10.27	\$21.06	\$96.00	\$1,004.69
Deals completed prior to end of sample	47						
Duration (quarters)	47	21.06	2	10.5	20	31.5	48

**Table 2: Announcement Returns**

This table shows the stock market reaction to 78 public announcements of regulatory approval of private equity investments in U.S. bank holding companies between 2004:Q1 and 2016:Q1. The market model is either the CAPM with equally-weighted CRSP market index (column 1), the CAPM with equally weighted KBW regional bank index (column 3), or the Fama-French 3 Factor plus Momentum (column 2). Because the KBW regional banking index is available only after July 2005, the sample size declines from 78 to 65 in column 3. \*\*\*, \*\* and \* indicate difference from zero at the 1%, 5% and 10% levels of statistical significance.

Event Window (Days)	CAPM (CRSP index)		Fama-French 3 Factor + Momentum		CAPM (KBW index)	
	CAR	t-value	CAR	t-value	CAR	t-value
(-1,0)	0.0070	0.97	0.0067	0.944	-0.0072	-1.54
(0,0)	-0.0033	0.82	-0.0023	-0.460	-0.0097	-1.27
(0,+1)	0.0337	3.76***	0.0332	4.68***	0.0057	2.11**
(-1,+1)	0.0369	4.50***	0.0355	7.08***	0.0188	3.51***
(-1,+1)	0.0439	3.79***	0.0422	4.86***	0.0081	3.19***
(-2,+2)	0.0549	4.25***	0.0503	4.48***	0.0222	3.67***

**Table 3: Buy-and-Hold Returns**

This table shows the long-run buy-and-hold abnormal returns on 78 private equity investments in U.S. bank holding companies between 2004:Q1 and 2016:Q1. The market model is either the CAPM with equally-weighted CRSP market index (column 1), the CAPM with equally weighted KBW regional bank index (column 3), or the Fama-French 3 Factor plus Momentum (column 2). Because the KBW regional banking index is available only after July 2005, the sample size declines from 78 to 65 in column 3. \*\*\*, \*\* and \* indicate difference from zero at the 1%, 5% and 10% levels of statistical significance.

Holding Period	CAPM (CRSP index)		Fama-French 3 Factor + Momentum		CAPM (KBW index)	
	BHAR	t-value	BHAR	t-value	BHAR	t-value
(0,+1 year)	<b>0.1350</b>	2.014**	<b>0.1323</b>	2.155**	<b>0.1661</b>	2.50***
(0,+2 year)	<b>0.2694</b>	2.898***	<b>0.2637</b>	3.099***	<b>0.2888</b>	1.94**
(0,+3 year)	<b>0.3483</b>	3.080***	<b>0.3618</b>	3.495***	<b>0.5171</b>	2.49***
(0,+4 year)	<b>0.4739</b>	3.641***	<b>0.5263</b>	4.418***	<b>0.7781</b>	4.509***
(0,+5 year)	<b>0.8367</b>	3.035***	<b>0.8512</b>	4.012***	<b>0.9073</b>	4.510***

**Table 4: Private Equity Performance Metrics**

This table uses two performance metrics to evaluate the returns to private equity firms on 47 investments in U.S. bank holding companies between 2004:Q1 and 2016:Q1 for which PE investors had completed their exit. *MOIC* is the multiple on invested capital and *IRR* is the gross annualized internal rate of return. Last two columns display the distribution of *MOIC* and *IRR* for the S&P 500 index over the entry-to-exit dates of each of the 47 completed deals.

	<i>MOIC</i>	<i>MOIC-S&amp;P</i>	<i>IRR</i>	<i>IRR-S&amp;P</i>
Mean	1.3025	1.2110	0.2987	0.0806
Standard Deviation	0.6375	0.2582	0.8392	0.2533
Maximum	3.9159	1.6761	5.0000	0.5994
75 <sup>th</sup> percentile	1.5569	1.3418	0.2693	0.1223
50 <sup>th</sup> percentile	1.2619	1.2514	0.1267	0.0935
25 <sup>th</sup> percentile	0.9569	1.0720	0.0283	0.0461
Minimum	0.1563	0.1986	-0.3595	-1.3125

**Table 5: Pre-entry and Post-entry Target Bank Performance**

This table displays annualized average values of performance indicators for 74 private equity target banks that received blockholding (more than 5% of total outstanding shares) investments. The pre-PE investment subsample includes all quarters in our sample prior to the quarter in which the blockholding investment was made. The post-PE investment subsample begins with the first blockholding quarter and ends with the final blockholding quarter, and excludes all quarters after which the private equity position was sold. \*\*\*, \*\* and \* indicate a difference in means at the 1%, 5% and 10% levels of statistical significance.

	[1] Post-PE Investment			[2] Pre-PE Investment			[3]	[4]	
	N	Mean	Std.Dev.	N	Mean	Std.Dev.	difference	adjusted difference	
<b>Accounting Risk and Return</b>									
Z-Score	1591	33.0257	25.8350	970	33.7674	24.4634	-0.7418	-4.6853	***
ROA	1591	0.0022	0.0270	970	0.0016	0.0289	0.0006	0.0010	
Std(ROA)	1591	0.0251	0.0337	970	0.0199	0.0265	0.0052	0.0046	***
Equity	1591	0.0980	0.0270	970	0.0924	0.0324	0.0056	0.0004	
Sharpe	1591	1.6652	2.8881	970	1.9162	3.1073	-0.2510	-0.2044	**
<b>Market Risk and Value</b>									
Stock Return Volatility	1342	0.0305	0.0192	754	0.0296	0.0192	0.0009	0.0018	***
Idiosyncratic Risk	1342	0.0280	0.0187	754	0.0270	0.0176	0.0010	0.0021	***
Systematic Risk	1342	0.0091	0.0093	754	0.0096	0.0109	-0.0005	-0.0004	
Implied Volatility	1327	0.0028	0.0018	731	0.0027	0.0017	0.0001	0.0004	***
Tobin's Q	1342	1.0069	0.0515	754	1.0000	0.1137	0.0069	0.0187	***
<b>Balance Sheet</b>									
Asset Growth	1591	0.0783	0.2536	970	0.1578	0.5401	-0.0795	-0.0638	***
FTE Growth	1591	0.0463	0.3094	970	0.1080	0.4788	-0.0616	-0.0597	***
Branch Growth	1591	0.0549	0.3746	970	0.1129	0.5502	-0.0580	-0.0342	*
Trading Exposures/Assets	1591	0.0006	0.0065	970	0.0004	0.0021	0.0002	0.0013	
Loans/Assets	1591	0.7133	0.1059	970	0.7299	0.0824	-0.0166	-0.0014	
Core Deposits/Assets	1591	0.6677	0.0806	970	0.6152	0.0981	0.0525	0.0377	***
NPL	1591	0.0253	0.0281	970	0.0193	0.0284	0.0006	0.0033	***
Nonperforming Business Loans	1591	0.0020	0.0027	970	0.0018	0.0027	0.0002	0.0002	*
Nonperforming Real Estate Loans	1591	0.0148	0.0175	970	0.0113	0.0181	0.0035	0.0008	
Nonperforming Consumer Loans	1591	0.0003	0.0015	970	0.0001	0.0002	0.0002	0.0002	***
<b>Income Statement</b>									
Interest Income /Assets	1591	0.0352	0.0079	970	0.0347	0.0089	0.0005	0.0018	***
Interest Income/Interest-bearing Assets*	1591	0.0465	0.0115	970	0.0452	0.0115	0.0013	0.0034	***
Interest Expense /Assets	1591	0.0064	0.0061	970	0.0093	0.0063	-0.0028	-0.0001	
Interest Expense/Interest-paying Liabilities*	1591	0.0127	0.0105	970	0.0196	0.0094	-0.0069	-0.0006	***
Net Interest Income /Assets	1591	0.0180	0.0190	970	0.0111	0.0196	0.0068	0.0028	***
Net Interest Income/Interest-bearing Assets*	1591	0.0247	0.0249	970	0.0147	0.0254	0.0100	0.0036	**
Provisions/Assets	1591	0.0068	0.0143	970	0.0080	0.0153	-0.0012	-0.0009	*
Noninterest Income /Assets	1591	0.0088	0.0113	970	0.0090	0.0079	-0.0002	-0.0006	
Operating Income/Assets	1591	0.0199	0.0347	970	0.0121	0.0348	0.0078	0.0030	**
Noninterest Expense/Assets	1591	0.0338	0.0201	970	0.0317	0.0220	0.0021	0.0013	*
Net Income/Assets	1591	0.0022	0.0270	970	0.0016	0.0289	0.0006	0.0010	

\*Interest-bearing assets includes cash in interest-bearing accounts, loans, held-to-maturity securities, fed funds sold, and securities purchased to resell. Interest-paying liabilities includes deposits, fed funds purchased, securities sold to repurchase, and subordinated notes and debentures.

**Table 6: Propensity Score Model**

Logit regression. Unbalanced panel of quarterly observations of 2,775 U.S. bank holding companies between 2004:Q1 and 2016:Q1. Dependent variable is a dummy equal to one for banks that had non-zero private equity investment during any quarter during the sample period. Fitted values of the model are used to construct propensity scores for every bank holding company in each quarter of the data. Significance at the 10%, 5% and 1% levels is indicated by \*\*\*, \*\*, and \*.

<i>Age</i>	<b>-0.0161***</b> (0.0062)
<i>lnAssets</i>	0.0341 (0.0541)
<i>Loans</i>	<b>1.4879*</b> (0.8488)
<i>Deposits</i>	<b>1.7304**</b> (0.7653)
<i>Liquidity</i>	-0.2522 (0.8993)
<i>MBHC</i>	<b>-0.3451**</b> (0.1381)
<i>Public</i>	<b>1.1378***</b> (0.1205)
<i>Equity</i>	2.0702 (1.2755)
<i>ROA (Net Income)</i>	<b>-10.4013***</b> (3.4814)
<i>Noninterest Expense</i>	-0.6607 (2.7507)
<i>Interest Expense</i>	<b>-26.7770*</b> (14.6019)
<i>HHI Loans</i>	-0.5130 (0.3657)
<i>NPL</i>	0.4143 (1.3503)
<i>Wholesale Funds</i>	0.6334 (0.5169)
<i>Re Loan Gr</i>	0.0052 (0.0044)
<i>Bus Loan Gr</i>	<b>0.0010**</b> (0.0005)
<i>Con Loan Gr</i>	<b>-0.0023*</b> (0.0012)
<i>Constant</i>	<b>-4.7796***</b> (1.5007)
Clustered Standard Errors	Yes
Time Fixed Effects	Yes
Bank-Quarter Obs.	53,769
No. of Banks	2,775
No. of Target Banks	81
Pseudo R-squared	0.2090

**Table 7: Descriptive Statistics and Definitions for Variables in the Matched Data Sample**

Data for 12,074 bank-quarter observations on 1,614 different banks (81 unique PE target banks and 1,533 different matched banks). All quarterly flow variables are reported as annualized numbers. Post-exit bank-quarter observations are excluded. All of the variables listed here are used in the regression tests.

		PE Targets		Non-PE Targets	
		Mean	Std. Dev.	Mean	Std. Dev.
<b>Accounting Risk and Return</b>					
<i>Z-Score</i>	= [equity/assets + $\mu(\text{ROA})$ ] / $\sigma(\text{ROA})$ , where $\mu(\text{ROA})$ and $\sigma(\text{ROA})$ are the mean and standard deviation of ROA over the previous eight quarters.	33.7691	25.6204	36.4011	24.9287
<i>ROA</i>	= return on assets	0.0022	0.0271	0.0033	0.0289
<i>Std(ROA)</i>	= standard deviation of ROA.	0.0224	0.0303	0.0179	0.0225
<i>Equity</i>	= equity divided by assets.	0.0952	0.0291	0.0953	0.035
<i>Sharpe</i>	= ( $\mu(\text{ROE})$ -risk free rate)/ $\sigma(\text{ROE})$ , where $\mu(\text{ROE})$ and $\sigma(\text{ROE})$ are the mean and standard deviation of ROE over the previous eight quarters.	0.7957	1.1440	0.9777	4.4471
<b>Market Risk and Value</b>					
<i>Return Volatility</i>	= total stock price variation. Standard deviation of daily stock returns.	0.0299	0.0194	0.0271	0.0204
<i>Idiosyncratic Risk</i>	= idiosyncratic risk. Square root of idiosyncratic variance decomposed from total stock price variation using the single factor market model, $\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma^2(e_i)$ , where $\sigma^2(e_i)$ is the idiosyncratic variance.	0.0273	0.0185	0.0244	0.0197
<i>Systematic Risk</i>	= systematic risk. Square root of systematic variance decomposed from total stock price variation using the single factor market model, $\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma^2(e_i)$ , where $\beta_i^2 \sigma_m^2$ is the systematic variance.	0.0094	0.0097	0.0088	0.0093
<i>Implied Volatility</i>	= implied volatility derived from Black-Scholes-Merton option pricing theory.	0.0027	0.0017	0.0026	0.0018
<i>Tobin's Q</i>	= market value of bank's assets divided by book value of bank's assets.	1.0053	0.0777	1.0163	0.0702
<b>Balance Sheet</b>					
<i>Asset Growth</i>	= quarterly growth in total assets.	0.1104	0.3880	0.0788	0.3890
<i>FTE Growth</i>	= quarterly growth in full-time employees.	0.0749	0.4269	0.0476	0.4796
<i>Branch Growth</i>	= quarterly growth in number of bank branches.	0.0790	0.4562	0.0715	0.4645
<i>Trading Exposures</i>	= quarterly average of trading portfolio divided by assets.	0.0005	0.0050	0.0022	0.0140
<i>Loans</i>	= total loans divided by assets.	0.7184	0.1112	0.7034	0.1096
<i>Core Deposits</i>	= transactions deposits plus small time deposits, divided by assets	0.6413	0.1028	0.6377	0.1101
<i>Nonperforming Loans</i>	= loans 90 days delinquent plus non-accruing loans, divided by assets.	0.0237	0.0306	0.0228	0.0331

(continued)

**Table 7: (continued)**

		<b>PE Targets</b>		<b>Non-PE Targets</b>	
		Mean	Std. Dev.	Mean	Std. Dev.
<b>Income Statement</b>					
<i>Interest Income</i>	= interest income divided by assets.	0.0349	0.0084	0.0340	0.0088
<i>Interest Income/Interest-bearing Assets*</i>	= interest income divided by interest-bearing assets.	0.0459	0.0118	0.0453	0.0127
<i>Interest Expense</i>	= interest expense divided by assets.	0.0076	0.0065	0.0077	0.0069
<i>Interest Expense/Interest-paying Liabilities*</i>	= interest expense divided by interest-paying assets.	0.0156	0.0110	0.0156	0.0111
<i>Net Interest Income</i>	= net interest income minus provisions, divided by assets.	0.0152	0.0196	0.0148	0.0222
<i>Net Interest Income/Interest-bearing Assets*</i>	= net interest income minus provisions, divided by interest-bearing assets	0.0204	0.0258	0.0203	0.0285
<i>Provisions</i>	= loan loss provisions, divided by assets.	0.0071	0.0145	0.0066	0.0164
<i>Noninterest Income</i>	= noninterest income divided by assets.	0.0088	0.0101	0.0104	0.0099
<i>Operating Income</i>	= net interest income plus noninterest income minus provisions, divided by assets	0.0168	0.0348	0.0186	0.0391
<i>Noninterest Expense</i>	= noninterest expense divided by assets.	0.0326	0.0202	0.0322	0.0226
<i>Net Income</i>	= net income divided by assets.	0.0022	0.0271	0.0033	0.0289
<b>Other variables</b>					
<i>Assets</i>	= total book value of assets in millions of dollars.	3,879	12,133	10,166	78,632
<i>Deposits</i>	= deposits divided by assets.	0.8151	0.0562	0.8126	0.0716
<i>Public</i>	= 1 if publicly held. Otherwise = 0.	0.8249	0.3802	0.7676	0.4224
<i>Age</i>	= age of bank in years.	16.2987	8.4603	17.2236	10.5651

\*Interest-bearing assets includes cash in interest-bearing accounts, loans, held-to-maturity securities, fed funds sold, and securities purchased to resell. Interest-paying liabilities includes deposits, fed funds purchased, securities sold to repurchase, and subordinated notes and debentures.

**Table 8: Accounting Risk and Return**

OLS estimations of equation (3). Data is a propensity matched sample of U.S. banks targeted (and not targeted) by private equity investors between 2004:Q1 and 2016:Q1. Post-exit bank-quarter observations are excluded. The dependent variables are accounting-based measures of bank performance. *PE Share* is the percent shareholdings of private equity investors in each quarter. *PE Blockholder* is a dummy equal to one if *PE Share* equals at least 5%. All variables are defined at Table 7. All regressions include bank fixed effects and time fixed effects. Standard errors are clustered by bank. Statistical significance at the 10%, 5% and 1% levels is indicated by \*\*\*, \*\*, and \*.

Dependent variable:	[1] <i>Z-Score</i>	[2] <i>ROA</i>	[3] <i>Std(ROA)</i>	[4] <i>Equity/Assets</i>	[5] <i>Sharpe</i>	[6] <i>Z-Score</i>	[7] <i>ROA</i>	[8] <i>Std(ROA)</i>	[9] <i>Equity/Assets</i>	[10] <i>Sharpe</i>
<i>PE Share</i>	<b>-35.2665***</b> (8.1113)	0.0076 (0.0081)	<b>0.0112***</b> (0.0027)	0.0137 (0.0142)	<b>-1.7810***</b> (0.3610)					
<i>PE Blockholder</i>						<b>-7.3613***</b> (2.8467)	<b>0.0037**</b> (0.0017)	<b>0.0027***</b> (0.0008)	<b>0.0068*</b> (0.0040)	<b>-0.3569***</b> (0.1288)
<i>Age</i>	-0.0371 (0.2571)	-0.0006*** (0.0002)	0.0002*** (0.0001)	0.0003 (0.0004)	-0.0267 (0.0200)	-0.0954 (0.2615)	-0.0006*** (0.0002)	0.0002*** (0.0001)	0.0002 (0.0004)	-0.0277 (0.0206)
<i>lnAssets</i>	3.3825 (2.2736)	-0.0009 (0.0018)	-0.0018*** (0.0005)	0.0069* (0.0041)	0.3139* (0.1709)	4.1957* (2.4031)	-0.0013 (0.0018)	-0.0020*** (0.0006)	0.0066 (0.0042)	0.3443* (0.1762)
<i>Public</i>	1.5926 (3.8768)	-0.0040** (0.0019)	-0.0001 (0.0008)	-0.0040 (0.0032)	-0.1115 (0.2406)	0.2356 (3.8386)	-0.0040** (0.0018)	0.0003 (0.0008)	-0.0041 (0.0032)	-0.1856 (0.2464)
<i>Constant</i>	-12.0958 (28.8069)	0.0340 (0.0232)	0.0253*** (0.0064)	-0.0042 (0.0520)	-2.6292 (2.1834)	-21.6358 (30.6866)	0.0404* (0.0234)	0.0279*** (0.0072)	0.0007 (0.0538)	-2.9907 (2.2483)
Bank-Quarter Obs.	12,074	12,074	12,074	12,074	12,074	11,860	11,860	11,860	11,860	11,860
No. of Banks	1,614	1,614	1,614	1,614	1,614	1,607	1,607	1,607	1,607	1,607
No. of Target Banks	81	81	81	81	81	74	74	74	74	74
R-square (within)	0.062	0.133	0.161	0.061	0.017	0.059	0.134	0.157	0.063	0.017

**Table 9: Market-based Risk and Value**

OLS estimations of equation (3) for publicly traded banks. Data is a propensity matched sample of U.S. banks targeted (and not targeted) by private equity investors between 2004:Q1 and 2016:Q1. Post-exit bank-quarter observations are excluded. The dependent variables are market-based measures of bank performance. *PE Share* is the percent shareholdings of private equity investors in each quarter. *PE Blockholder* is a dummy equal to one if *PE Share* equals at least 5%. All variables are defined at Table 7. All regressions include bank fixed effects and time fixed effects. Standard errors are clustered by bank. Statistical significance at the 10%, 5% and 1% levels is indicated by \*\*\*, \*\*, and \*.

Dependent Variable:	[1] <i>Return Volatility</i>	[2] <i>Idiosyncratic Risk</i>	[3] <i>Systematic Risk</i>	[4] <i>Implied Volatility</i>	[5] <i>Tobin's Q</i>	[6] <i>Return Volatility</i>	[7] <i>Idiosyncratic Risk</i>	[8] <i>Systematic Risk</i>	[9] <i>Implied Volatility</i>	[10] <i>Tobin's Q</i>
<i>PE Share</i>	<b>0.0114**</b> (0.0053)	<b>0.0116**</b> (0.0052)	0.0024 (0.0029)	<b>0.0050***</b> (0.0010)	<b>0.0356*</b> (0.0200)					
<i>PE Blockholder</i>						0.0004 (0.0017)	0.0001 (0.0018)	0.0011 (0.0008)	<b>0.0011***</b> (0.0003)	<b>0.0131*</b> (0.0077)
<i>Age</i>	0.0008*** (0.0002)	0.0008*** (0.0002)	0.0000 (0.0001)	-0.0001*** (0.0000)	-0.0045*** (0.0006)	0.0008*** (0.0002)	0.0008*** (0.0002)	0.0000 (0.0001)	-0.0001*** (0.0000)	-0.0043*** (0.0006)
<i>lnAssets</i>	-0.0064*** (0.0016)	-0.0076*** (0.0016)	0.0022*** (0.0006)	-0.0005*** (0.0002)	-0.0114** (0.0057)	-0.0065*** (0.0016)	-0.0076*** (0.0016)	0.0022*** (0.0006)	-0.0007*** (0.0002)	-0.0139** (0.0057)
<i>Constant</i>	0.0973*** (0.0199)	0.1126*** (0.0203)	-0.0273*** (0.0078)	0.0114*** (0.0021)	1.2920*** (0.0756)	0.0981*** (0.0198)	0.1134*** (0.0203)	-0.0268*** (0.0083)	0.0134*** (0.0025)	1.2614*** (0.0762)
Bank-Quarter Obs.	9,427	9,427	9,427	8,929	8,929	9,234	9,234	9,234	8,742	8,742
No. of Banks	673	673	673	640	640	666	666	666	633	633
No. of Target Banks	72	72	72	71	71	65	65	65	64	64
R-square (within)	0.642	0.587	0.504	0.121	0.460	0.644	0.589	0.501	0.102	0.455

**Table 10: Balance-sheet Items**

Partial results for OLS estimations of equation (3). Data is a propensity matched sample of U.S. banks targeted (and not targeted) by private equity investors between 2004:Q1 and 2016:Q1. Post-exit bank-quarter observations are excluded. The dependent variables are accounting-based measures of bank performance. *PE Share* is the percent shareholdings of private equity investors in each quarter. *PE Blockholder* is a dummy equal to one if *PE Share* equals at least 5%. All variables are defined at Table 7. All regressions include bank fixed effects and time fixed effects. Standard errors are clustered by bank. Statistical significance at the 10%, 5% and 1% levels is indicated by \*\*\*, \*\*, and \*.

Dependent Variable:	[1] <i>Asset Growth</i>	[2] <i>FTE Growth</i>	[3] <i>Branch Growth</i>	[4] <i>Trading Exposures</i>	[5] <i>Loans</i>	[6] <i>Core Deposits</i>	[7] <i>NPL</i>
<b>Panel A: Treatment variable is <i>PE Share</i></b>							
<i>PE Share</i>	-0.02713 (0.09584)	-0.01907 (0.10462)	-0.08061 (0.04999)	<b>0.00210***</b> (0.00079)	<b>-0.0953***</b> (0.02637)	<b>-0.05330**</b> (0.02468)	-0.00268 (0.00707)
Bank-Quarter Obs.	12,074	12,074	12,074	12,074	12,074	12,074	12,074
No. of Banks	1,614	1,614	1,614	1,614	1,614	1,614	1,614
No. of Target Banks	81	81	81	81	81	81	81
R-squared (within)	0.026	0.023	0.090	0.019	0.212	0.301	0.356
<b>Panel B: Treatment variable is <i>PE Blockholder</i></b>							
<i>PE Blockholder</i>	0.00993 (0.03217)	-0.00900 (0.03247)	-0.01932 (0.02783)	<b>0.00093**</b> (0.00052)	<b>-0.0297***</b> (0.00411)	<b>-0.01834**</b> (0.00844)	-0.00143 (0.00150)
Bank-Quarter Obs.	11,860	11,860	11,860	11,860	11,860	11,860	11,860
No. of Banks	1,607	1,607	1,607	1,607	1,607	1,607	1,607
No. of Target Banks	74	74	74	74	74	74	74
R-squared (within)	0.026	0.023	0.090	0.020	0.236	0.297	0.359

**Table 11: Income Statement Items**

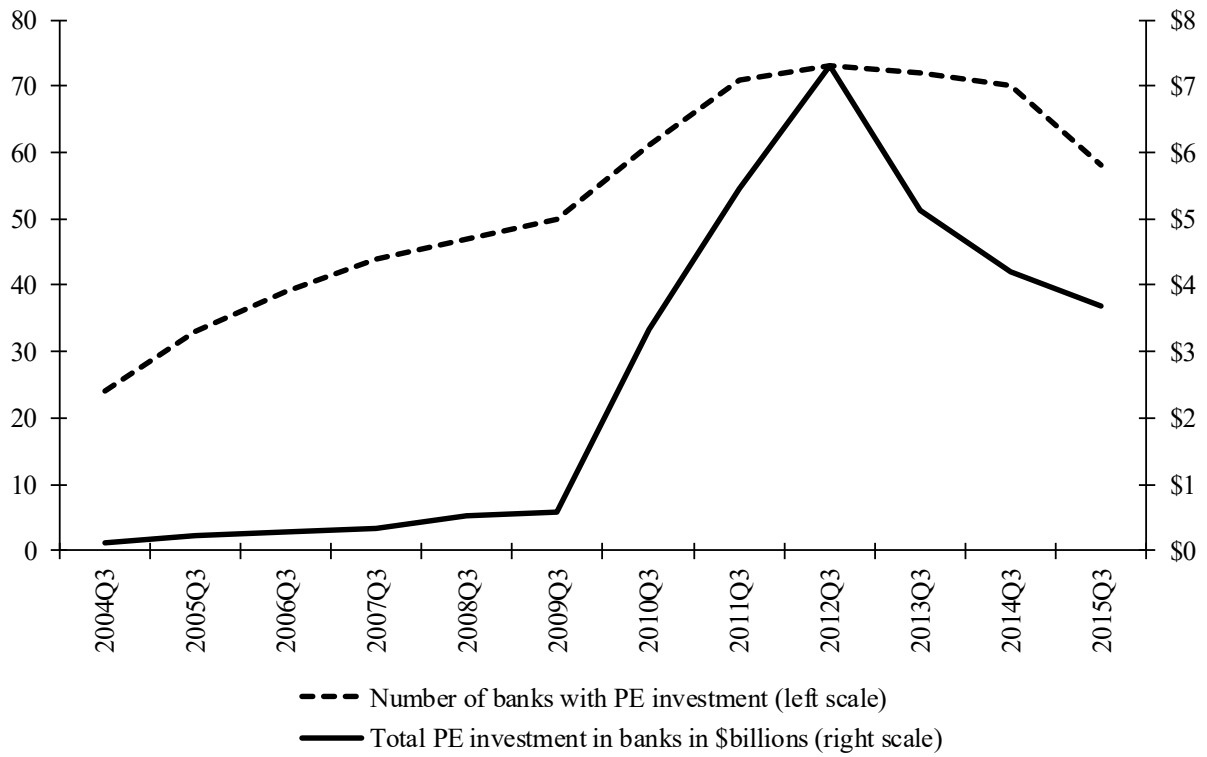
Partial results for OLS estimations of equation (3). Data is a propensity matched sample of U.S. banks targeted (and not targeted) by private equity investors between 2004:Q1 and 2016:Q1. Post-exit bank-quarter observations are excluded. The dependent variables are accounting-based measures of bank performance. *PE Share* is the percent shareholdings of private equity investors in each quarter. *PE Blockholder* is a dummy equal to one if *PE Share* equals at least 5%. All variables are defined at Table 7. All regressions include bank fixed effects and time fixed effects. Standard errors are clustered by bank. Statistical significance at the 10%, 5% and 1% levels is indicated by \*\*\*, \*\*, and \*.

Dependent Variable:	[1] <i>Interest Income</i>	[2] <i>Interest Income/Interest -bearing Assets</i>	[3] <i>Interest Expense</i>	[4] <i>Interest Expense/Interest- paying Liabilities</i>	[5] <i>Net Interest Income</i>	[6] <i>Net Interest Income/Interest -bearing Assets</i>
<b>Panel A: Treatment variable is <i>PE Share</i></b>						
<i>PE Share</i>	<b>-0.00630***</b> (0.00198)	-0.00235 (0.00237)	0.00064 (0.00084)	0.00186 (0.00153)	-0.00127 (0.00406)	0.00138 (0.00571)
Bank-Quarter Obs.	12,074	12,074	12,074	12,074	12,074	12,074
No. of Banks	1,614	1,614	1,614	1,614	1,614	1,614
No. of Target Banks	81	81	81	81	81	81
R-squared (within)	0.118	0.120	0.908	0.866	0.297	0.324
<b>Panel B: Treatment variable is <i>PE Blockholder</i></b>						
<i>PE Blockholder</i>	<b>-0.00140*</b> (0.00083)	0.00034 (0.00101)	-0.00010 (0.00023)	-0.00010 (0.00023)	-0.00010 (0.00045)	0.00254 (0.00165)
Bank-Quarter Obs.	11,860	11,860	11,860	11,860	11,860	11,860
No. of Banks	1,607	1,607	1,607	1,607	1,607	1,607
No. of Target Banks	74	74	74	74	74	74
R-squared (within)	0.122	0.130	0.909	0.869	0.297	0.323

Dependent Variable:	[7] <i>Noninterest Income</i>	[8] <i>Operating Income</i>	[9] <i>Noninterest Expense</i>	[10] <i>Provisions /Assets</i>	[11] <i>Net Income</i>
<b>Panel A: Treatment variable is <i>PE Share</i></b>					
<i>PE Share</i>	0.00098 (0.00255)	0.00631 (0.00776)	0.00253 (0.00397)	-0.00611 (0.00407)	0.00758 (0.00806)
Bank-Quarter Obs.	12,074	12,074	12,074	12,074	12,074
No. of Banks	1,614	1,614	1,614	1,614	1,614
No. of Target Banks	81	81	81	81	81
R-squared (within)	0.026	0.225	0.026	0.199	0.133
<b>Panel B: Treatment variable is <i>PE Blockholder</i></b>					
<i>PE Blockholder</i>	0.00074 (0.00068)	<b>0.00347*</b> (0.00204)	-0.00054 (0.00115)	<b>-0.00192**</b> (0.00091)	<b>0.00373**</b> (0.00166)
Bank-Quarter Obs.	11,860	11,860	11,860	11,860	11,860
No. of Banks	1,607	1,607	1,607	1,607	1,607
No. of Target Banks	74	74	74	74	74
R-squared (within)	0.026	0.227	0.027	0.134	0.134

**Figure 1**  
Private equity investment in U.S. commercial banking companies.



**Figure 2**

Number new and completed private equity investments in U.S. commercial banking companies.

