



Auctions of failed banks: an analysis of losing bidders

Tim M. Zhou¹

Accepted: 3 March 2023 / Published online: 20 March 2023
© The Author(s) 2023

Abstract

Between 2007 and 2013, the Federal Deposit Insurance Corporation (FDIC) used purchase and assumption (P&A) as a resolution method to auction 492 failed institutions to healthy banks. While existing studies reveal positive value effects on winning bidders of these auctions, this study finds that losing bidders experience negative abnormal stock returns. Furthermore, the losing bidders' stockholders react negatively to a worsening market condition and an increased probability of failure. The returns, nevertheless, are related to the market power gains and distorted competitive condition post-auction. These results raise concerns that this type of intervention potentially gives rise to anticompetitive behavior among participating banks of FDIC auctions.

Keywords FDIC · Banks · Resolution · Auction

JEL Classification D44 · G14 · G21 · G28

1 Introduction

During the last global financial crisis, the Federal Deposit Insurance Corporation (FDIC) used purchase and assumption (P&A) as a resolution method to auction 492 failed institutions to healthy banks. The auctions of failed banks result in substantial costs to the FDIC (James 1991; Granja 2013). Nevertheless, compared to other resolution options such as liquidation, successful auctions tend to be less costly (James 1991). Despite the significance of these auctions during various financial crises, the literature has mainly tested the auctions' effects on the winning bidders (e.g., James and Wier 1987; Cochran et al. 1995; Cowan and Salotti 2015). However, it is unlikely to fully understand the implications of these auctions without examining other participants. To address this issue, this paper studies the unsuccessful bidders' stock abnormal returns realized after the auctions of failed banks.

The main event study of this paper shows that the announcements of the FDIC P&A outcomes generate overall significantly negative abnormal returns for the stockholders of

✉ Tim M. Zhou
t.zhou@swansea.ac.uk

¹ Hawkes Centre for Empirical Finance, School of Management, Bay Campus, Swansea University, Swansea SA1 8EN, Wales, UK

the unsuccessful bidding banks. A cross-sectional analysis further reveals that the losses are related to the fact that losing bidders' shareholders perceive a greater probability of failure, as far as their own banks are concerned, due to a worsening market condition. The losing bidders' stockholders, however, react positively to the potential anticompetitive effects.

Our study advances the literature regarding FDIC auctions of failed banks. It does so along three dimensions. First, with the exceptions of Granja et al. (2017), Cowan and Salotti (2015), Molyneux and Zhou (2022) and Cowan et al. (2022), the literature has mainly focused on the savings and loan crisis of the 1980s and 1990s. The financial crisis between 2007 and 2009, however, also witnessed an increased number of commercial bank and savings and loan failures. Only a total of 29 institutions failed during the seven years prior to 2007, whereas 492 deposit-taking FDIC insured institutions failed in the USA during the period between 2007 and 2013. Approximately 94% of these failed institutions were subsequently auctioned by the FDIC to healthy banks.¹ Moreover, compared to previous failure waves dealt with by the FDIC, the regulatory environment in which these auctions took place was very different (Granja et al. 2017; Cowan and Salotti 2015). These transactions, therefore, provide a timely case study to examine the effectiveness and wider implications of the design of the bank resolution process. Second, we hand collect a unique sample of 176 P&A transactions that took place from September 2007 to December 2013, of which losing bidders were publicly traded. As far as we are aware, our study is the only one to examine the post-auction returns of losing bidders in FDIC auctions, as the majority of the literature has examined acquiring banks (e.g., Croson et al. 2004; Cowan and Salotti 2015; James and Wier 1987). Third, our study is related to Molyneux and Zhou (2022), which examine non-merger rival banks of failed banks within the same market (i.e. at the level of Metropolitan Statistical Area). Their study, however, does not differentiate non-merger rival banks that bid less (than winning bidders) from those that are not allowed to or choose not to participate in the bidding process. We, however, focus specifically on the FDIC auction participants (excluding winners), that do not necessarily share the same market with failed banks as well as satisfy auction eligibility criteria imposed by the FDIC and are willing to participate the auctions. In so doing, we further scrutinize the design of this resolution approach and its potential policy implications within and beyond relevant banking markets. Fourth, our study also contributes to the literature on bank mergers and acquisitions (M&As). For example, we find that the losing bidders' stockholders react positively to the market power gains. This result is consistent with one of the common M&A motives (e.g. Berger 1995; Hannan and Berger 1991; Degryse and Ongena 2008; Hankir et al. 2011). Also our results suggest that FDIC auctions of failed banks impose externalities (both positive and negative) on the losing bidders, which are consistent with the existing studies on the external effects of M&As (e.g. Croson et al. 2004).

The remainder of our paper is organized as follows: Sect. 2 provides the relevant institutional background. Section 3 presents the literature review and develops the research hypotheses. Section 4 describes the dataset and the methodology. We present our results and discussions in Sect. 5. The robustness test results are presented in Sect. 6. Finally, we offer concluding remarks in Sect. 7.

¹ See Appendix I for a list of P&A transactions at the state level and in-state transactions (i.e., a failed bank was auctioned to a banking firm within the same state).

2 Institutional background

The FDIC provides deposit insurance to bank and thrift institution depositors and acts as the primary federal regulator of banks. As an insurer, it also deals with bank failures in the least costly manner that is consistent with its regulatory function to preserve and promote public confidence in the US financial system (FDIC 2014). To fulfill this role, the FDIC has two basic resolution methods to dispose of an insured commercial bank or thrift institution.² In a purchase and assumption (P&A) transaction, the FDIC auctions a package of failed bank's assets and an obligation to assume the bank's liabilities including all insured deposits.³ In some cases, the potential acquirers are required to assume all the assets and/or deposits (including uninsured deposits) of the failed bank. A deposit payoff is made when the FDIC is unable to find an assuming institution in a P&A transaction. In this case, the FDIC pays all of the failed institution's depositors up to the limit of insurance coverage.

P&A transactions are sealed-bid, first-price auctions.⁴ The FDIC first invites all known qualified and interested potential bidders prior to an auction. After signing confidentiality agreements, the bidding banks receive information packages, which contain details on the failing institution, the due diligence process and the bidding procedures. Once they have completed their due diligence 6–15 days prior to the scheduled closure deadlines, the bidding banks submit their (sealed) bids to the FDIC. In addition to indicating in their bids how much the premium bidding banks are prepared to pay for the target firms, the bidders also indicate whether the FDIC needs to enter into a loss-share agreement (LSA), which requires the FDIC to absorb a portion of the loss on a specified pool of assets. In the absence of any extenuating circumstances, the FDIC will award the failed bank to the highest bidder if the total amount of the FDIC's expected deposit insurance fund expenditures is the least costly of all possible methods for resolving the situation created by the failed institution. Subsequently, the chartering authority closes the failed institution and appoints the FDIC as receiver. On the same day, usually on a Friday, the FDIC issues a press release about the closure of the institution and the outcomes of the P&A transaction (i.e., the name of the bank that acquires the failed bank).⁵ The press release does not contain information related to the auction procedure (e.g. losing bidders' identities and their bids), however, it is reasonable to assume that these losing bidders can be identified by the market participants as the competitors of the winning bidders pre-auction.⁶ This conjecture is made based on how the FDIC selects bidders for each auction. To qualify as a bidder in a FDIC auction, insured depository institutions first contact the FDIC to express interests in acquiring financial institutions and indicate the size range of institutions and geographic areas that are of interest to them. These institutions are then reviewed by the financial regulatory authorities concerned, including the Office of the Comptroller of the Currency (OCC), the Federal Reserve Board (FRB), the Office of Thrift Supervision (OTS), and the appropriate state

² The FDIC has also used a third method—open bank assistance (OBA), which allows the FDIC to make loans to, purchase the assets of, or place deposits in a failing bank. This resolution method is no longer used due to restrictions imposed under the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 and under The Resolution Trust Corporation Completion Act of 1993.

³ Appendix II illustrates the timeline of a P&A transaction.

⁴ Klemperer (1999) provides a detailed non-technical survey of auction theory.

⁵ See Appendix III for a sample press release.

⁶ The FDIC publishes a bid summary few weeks after the closure of the bank that contains information related to the auction procedure. See Appendix IV for a sample bid summary.

banking authority to ensure these banks satisfy the regulatory requirements as a potential healthy acquirer. Given the information the FDIC holds about each potential bidder, when the FDIC is appointed to auction a failed bank, it will select and invite all relevant banks to participate, which is essential to generate sufficient competition in the forthcoming auction. These contacted bidders presumably all have common interests in the failed bank and its markets and also perceive that their competitors may also have been invited at the same time to bid for the failed bank (Jehiel and Moldovanu 1996).

Finally, the winning bidder reopens the bank usually on the next business day, and customers of the failed institution automatically become customers of the assuming institution and gain access to their insured funds.

3 Literature review and research hypotheses

3.1 Literature review

The early research on resolutions of failed banks mostly studies the savings and loan crisis.⁷ For example, Barth et al. (1989) draw empirical distinctions between the economic insolvency of a financial institution and the closure decision of regulators. Barth et al. (1997), on the other hand, assess the cost savings obtained by selling insolvent thrifts through assisted acquisitions rather than liquidating them. The research on FDIC auctions of failed banks mostly applies event study methodology to examine the effects of P&A announcements on the FDIC auction winners' stockholder value. These studies generally find that in response to acquisition announcements, there is a significant and positive average stock-price reaction, which is associated with wealth transfers from the government agency resolving the failed banks.⁸ For example, James and Wier (1987) analyze a sample of 19 FDIC auctions between 1973 and 1983 and report a 2.36% two-day cumulative abnormal returns (CAR), which is significantly larger than the CAR for a sample of bank acquisitions unassisted by any bank regulators. They also find that the restrictions on bidder participation reduce auction competition (i.e., less competitive pressure on the price of the failed banks) and enable winners to obtain wealth transfers. Bertin et al., (1989) and Cochran et al. (1995) both report similar results by using updated samples in the 1980s and conclude that relaxing bidding restrictions could help reduce the excessive subsidies to winning bidders. Zhang (1997) examines a sample of 128 FDIC auctions between 1980 and 1990 and finds that the positive CAR experienced by acquirers in FDIC auctions is driven by their bidding experience. Using a logit model, the author suggests that compared to less experienced acquirers, experienced acquirers are more likely to reduce the amount of the winning bids and the number of bids. In a recent study, Cowan and Salotti (2015) find that FDIC auction announcements also generated substantial positive abnormal returns for winning bidders during the global financial crisis between 2008 and 2013. They, however, argue that the wealth transfers observed in the previous crises may no longer be caused by FDIC bidder-eligibility rules (e.g. James and Wier 1987) but consistent with the cash-in-the-market pricing model by Acharya and Yorulmazer (2008), which predicts

⁷ Gupta and Misra (1999) survey academic and regulatory studies on thrift and bank resolutions in the US between the 1980s and 1990s.

⁸ Appendix V provides a summary of extant studies on FDIC auctions by using the event study approach.

that regulators optimally subsidize healthy banks to purchase failed banks in a systemic crisis. Molyneux and Zhou (2022), as the only recent study that examines external effects of FDIC auctions, find substantial negative abnormal stock returns for non-merger rival banks of failed banks from 2008 to 2013. They find evidence that these negative abnormal returns are related to contagion effects and distorted market competition due to regulatory interventions.

A few other empirical studies use different approaches to examine the FDIC auction process. For example, James (1991) focuses on losses realized in bank failures in the 1980s. The author finds that these losses appear to vary with the resolution methods used by the FDIC. More specifically, there is a significant going-concern value that is preserved when a failed bank is auctioned but that is lost if the bank is liquidated. Granja (2013), on the other hand, finds that when failed banks are subject to more comprehensive disclosure requirements, regulators incur lower costs of closing the bank and retain a lower portion of its assets. Granja et al. (2017) examine the allocation process of failed bank sales between 2007 and 2013. They find that failed banks tend to be sold to bidders within the same market and with similar business lines, when these bidders are well capitalized. With the liquidity/budget constraint experienced by most banks in a systemic financial crisis, the allocation process of failed bank assets, nevertheless, may be inefficient, which partially explains the FDIC losses from failed bank sales in recent years.

3.2 Research hypotheses

First, auction theory (e.g., Jehiel and Moldovanu 1996) generally states that in an auction, the bidders' willingness to pay reflects not only their private valuation of the object but also the pre-emptive incentives stemming from their desire to reduce negative externalities. In a FDIC P&A transaction, the failed banks' assets tend to be discounted to attract bidders, particularly during the crisis period (Acharya and Yorulmazer 2008). Effectively, a winner receives a substantial subsidy from the FDIC to obtain an established branch network/customer base and to enter a banking market quickly at a relatively low cost. Strong evidence shows that the winners of FDIC auctions experience a positive average stock-price reaction to acquisition announcements associated with the wealth transfers from the government agency resolving the failure (e.g., James and Wier 1987; Bertin et al. 1989; Cochran et al. 1995; Zhang 1997; Cowan and Salotti 2015). The potential negative externalities generated by the wealth transfers may, therefore, predict why unsuccessful bidders experience negative abnormal stock returns. In this study, we first hypothesize this as follows:

H1 Wealth Transfer Externality Hypothesis: The average stock-price reaction for losing bidders is negative, as they miss out on FDIC subsidies.

Our *H1* hypothesizes a negative relationship between the losing bidder's abnormal returns and a variable measuring the subsidies missed out on by the losing bidders.

Second, Song and Walking (2000) and Othchere and Ip (2006) test the Acquisition Probability Hypothesis and conclude that the positive abnormal returns of peer firms are driven by an increased takeover probability within the market. By the same token, during a financial crisis, an unexpected announcement of a FDIC P&A auction signals an increased number of bank failures and a worsening market condition. Therefore, each FDIC P&A announcement may be perceived to increase the probability of insolvency for the remaining

peer banks and their shareholders will react negatively to these announcements. We next hypothesize this as follows:

H2 Failure Probability Hypothesis: Losing bidders experience adverse stockholder value changes due to an increased probability of bank failure.

H2 assumes that shareholders of losing bidders do not react to the specifics of an auction announcement but rather to the increased probability of their bank being involved in a future bank failure, which suggests a negative relationship between their abnormal returns and a variable that gauges an overall deteriorating market condition.

Third, existing studies find that prior to bidding in the P&As, winning bidders tend to be better performing than their rivals (e.g., Granja et al. 2017). Consequently, winning these auctions may further improve their competitive positions because, for instance, after the acquisitions they are able to implement a more cost-efficient production strategy (Steiner 1975; Eckbo 1983). Under this hypothesis, while these competitive effects benefit the acquirers, we anticipate that losing bidders will exhibit negative cumulative abnormal returns as their future performance as well as competitive position will worsen. To test the effects of competition on losing bidders, we summarize our next hypothesis as follows:

H3 Competition Hypothesis: Due to the worsening competitive position, losing bidders lose shareholder value.

H3 hypothesizes that FDIC auctions negatively affect losing bidders' future performance, which implies a negative relationship between the losing bidder's abnormal returns and the winning bidder's competitiveness.

We also acknowledge an alternative hypothesis that may predict positive stockholder wealth effects for losing bidders. A P&A transaction is distinct from a regular takeover as it is characterized by the transfer of assets and deposit liabilities from one failed institution to another without the two institutions legally combining into a single entity. Such transactions, nevertheless, can still lead to higher market concentration and hence increased individual market power and are subject to the same regulation as regular takeovers due to potential anticompetitive effects.⁹ According to Croson et al. (2004), positive externalities can occur in takeovers with market power, which will result in a lessening of competition and increased market prices. All market participants, therefore, profit from takeovers because a lower number of players decreases competition and boosts future profits (Degryse and Ongena 2008; Hankir et al. 2011). As winning bidder of a FDIC auction and their competitors (i.e. losing bidders) may be able to demand higher prices and maximize their profits post-auction, we summarize our next hypothesis as follows:

H4 Market Power Hypothesis: Positive abnormal returns for losing bidders are the consequence of anticompetitive effects.

⁹ Section 18(c)(5) of the Federal Deposit Insurance Act prohibits the FDIC from approving any merger (including P&A transactions) whose effect in any section of the country may be to substantially lessen competition, or tend to create a monopoly, or in any manner restrain trade.

H4 hypothesizes that FDIC auctions create positive externalities for losing bidders, which implies a positive relationship between the losing bidder's abnormal returns and increased market concentration.

4 Data and methodology

4.1 Data

To examine the performance of losing bidders in FDIC P&A auctions, data on insured commercial bank and saving institutions' failures are obtained from the FDIC.¹⁰ There were 492 bank failures during the period 2007–2013. Out of the initial sample, we eliminate 26 cases that are labeled as 'no acquirer' (i.e., all deposit payoff transactions are excluded). To conduct our event study, we then retain the P&A transactions where the losing bidders are publicly listed. Our final sample consists of 176 P&A transactions that took place from September 2007 to December 2013. To calculate the abnormal returns around the P&A announcements, the stock market data for publicly listed banks are collected from the Center for Research in Security Prices (CRSP). The data on the (winning and losing) bidders' as well as failed banks' financial characteristics are derived from the Federal Financial Institutions Examination Council's (FFIEC) call reports, which are quarterly and cover for the period between 2007 and 2013. The Pro Forma (Herfindahl–Hirschman Index) Reports published by the FDIC offer information on the before and after effects of a merger or acquisition on market concentration within a specified geographic market. The FDIC's Summary of Deposits (SOD) database provides information on the geographical distribution of banks' branch network and market shares in various markets.

4.2 Event study measuring the losing bidders' abnormal returns

To capture any stockholder value change associated with bidding outcomes, we use an event study to compute the abnormal returns to the losing bidding banks. The expected returns are first estimated by using the Carhart (1997) four-factor model (Fama–French (1993) three-factor model augmented by the momentum factor). In banking literature, the most common event study methodology is based on the market model (e.g., Cybo-Ottone and Mugria, 2000, Houston et al. 2001, DeLong 2001, Goddard et al. 2012, etc.). The basic one-factor market model, however, has attracted criticism for misspecification problems in studies of security performance (e.g., Kothari and Warner 2007). The Carhart (1997) four-factor model, on the other hand, has been applied in a number of recent banking studies to address these issues (e.g., Schuermann and Stiroh 2006; Jones et al. 2012). The main advantage of the Carhart (1997) four-factor model is that it takes into account 3 additional known determinants of security price performance (size, book-to-market and momentum), which are common to all securities, not just to those of the sample of firms experiencing the event (e.g., a FDIC auction). As a result, it allows for better isolation of the price performance associated with the event itself and results in more accurate inferences about the value effects of the event (Kothari and Warner 2007). The model is specified as follows:

¹⁰ Note that the data on bidders who are invited to participate in the auctions but decline to bid are unavailable.

$$R_{jt} = \alpha_j + \beta_j MKT_t + s_j SMB_t + h_j HML_t + u_j UMD_t + \varepsilon_{jt} \quad (1)$$

where R_{jt} is the rate of return of the common stock of the j th bank on day t , MKT_t is the rate of return of daily equal-weighted CRSP index on day t , SMB_t is the average return on small market-capitalization portfolios minus the average return on three large market-capitalization portfolios. HML_t is the average return on two high-book-to-market equity portfolios minus the average return on two low-book-to-market equity portfolios, and UMD_t is the average return on two high prior return portfolios minus the average return on two low prior return portfolios. ε_{jt} is a random variable.

Abnormal returns are prediction errors from the Carhart four-factor model. We estimate the abnormal returns (AR) for the common stock of the j th bank on day t as follows:

$$AR_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j MKT_t + \hat{s}_j SMB_t + \hat{h}_j HML_t + \hat{u}_j UMD_t) \quad (2)$$

where the coefficients $\hat{\alpha}_j$, $\hat{\beta}_j$, \hat{s}_j , \hat{h}_j and \hat{u}_j are ordinary least squares estimates of α_j , β_j , s_j , h_j and u_j , respectively.

Consistent with previous work (e.g., Cowan and Salotti 2015), the estimation period for the Carhart four-factor model coefficients and standard errors is 255 trading days long. To avoid contaminating the estimates with stock-price reactions to earlier events, the estimation period ends 91 trading days before the P&A announcement. We then compute the corresponding cumulative abnormal returns (CAR), which are the sums of the abnormal returns across selected consecutive trading days (i.e., event windows) as follows:

$$CAR_{jt} = \sum_{t=1}^{t2} AR_{jt} \quad (3)$$

The event window of interest in this study is defined as the announcement date plus one and up to four trading days after the announcement. Note that using a relatively short event window avoids the possibility of overlapping event windows since some frequent bidders participate in consecutive Friday P&A auctions. To test whether a mean CAR is different from zero, we use the standardized cross-sectional test of Boehmer et al. (1991).

4.3 Cross-sectional analysis

For the second stage of our analysis, to examine the determinants of the losing bidders' abnormal returns, we run OLS regressions of the CAR on a vector of bank-level and deal-specific characteristics. The model we use is as follows:

$$CAR_i = \alpha + \beta_1 SUBD_i + \beta_2 FLPR_i + \beta_3 COMP_i + \beta_4 MKPW_i + \beta_5 CONT_i + \varepsilon_i \quad (4)$$

The dependent variable of Eq. (4)—CAR, denotes the losing bidders' abnormal returns. *SUBD* tests our *Wealth Transfer Externality Hypothesis*, that is, whether missing out on the FDIC subsidies has a negative effect on the losing bidders' shareholders. As suggested by Cowan and Salotti (2015), we include two alternative variables to measure the subsidies missed out by the losing bidders. The first is the FDIC's estimated resolution costs (*FDIC costs*) reflected in the financial impact to its deposit insurance fund (DIF) and scaled by the failed bank's total deposits at assumption. Published by the FDIC on the P&A announcement date, this estimated cost is based on the estimate of immediate and discounted future costs. The second proxy is the ratio of the dollar bid (submitted by the winning bidder) to

the failed bank's total deposits (*Bid amount*). In our sample, except for 3 P&A transactions, the bid amount is in the form of the dollar discounts paid to the winners. Therefore, the greater estimated costs incurred or discounts the winners obtain to acquire the targets indicate a greater amount of subsidies.

FLPR tests our *Failure Probability Hypothesis*, that is, on average, FDIC announcements of bank failures change the losing bidders' perceptions of the probability of their own failures. We collect the data on the total number of bank failures (in natural logarithm) in the US during the previous 20 business days prior to each P&A auction (*Failures*) to gauge the overall market health. We assume that a greater number of banking failures (i.e. a worsening market condition) prior to the announcement of a P&A deal negatively affects the share-price reactions for the losing bidders as the perceived probability of their insolvency increases.

COMP, on the other hand, tests the *Competition Hypothesis*, i.e., the competitive effects of these transactions on the losing bidders. Jehiel and Moldovanu (1996) state that a losing bidder cares about the identity of the winner, as it may indicate to what extent the competitive conditions will be altered post-auction. To establish the linkage between the losing bidder shareholder reactions to the auction's results and a winner's identity, we directly measure a winner's pre-auction competitiveness (*Boone indicator*).¹¹ The Boone (2008) indicator is based on the efficient structure hypothesis that in terms of higher profits, more efficient banks achieve superior performance at the expense of their less efficient counterparts (Boone et al. 2005).¹² Overall, we hypothesize that the possibility of increased competition due to the acquirer's pre-auction competitiveness can adversely impact its rivals.

MKPW tests our *Market Power Hypothesis*, that is, FDIC auctions of failed banks to healthy banks result in anticompetitive behavior in the market—the setting of prices that are unfavorable to consumers (e.g. lower deposit rates and/or higher loan rates), and restrictions on the quantity or quality of banking services that are made available to the public. To avoid any potential exploitation of the market power, the FDIC examines the increase of deposit concentration (measured by the Herfindahl–Hirschman Index) caused by a merger (including P&A transactions) and may disapprove any transactions whose increased deposit market concentration exceeds a threshold, in other words, that tend to substantially increase market power.¹³ We therefore use the FDIC's own estimations of the increased deposit concentration (ΔHHI) within the metropolitan statistical area (MSA) or county where the failed bank is headquartered from the FDIC's The Pro Forma (Herfindahl–Hirschman Index) Report for each P&A transaction. In addition, geographically focused mergers may increase local market concentration significantly and have a positive measured effect on the profits of the other firms in the affected markets (Berger and Humphrey 1993). In this study, whether an acquisition is geographically focused or not is measured by the proportion of the winner's deposits (in percentage) held in the state where the target bank is chartered pre-auction (*Geographic focus*). Likewise, we examine the product focus of a P&A transaction that may increase the acquirer's product market

¹¹ We also include a number of control variables to indicate the pre-auction performance of bidders.

¹² The Boone indicator is used in this study due to its appealing features compared to those of other commonly used proxies for competition (i.e. H-Statistic and Lerner index). See Schaeck and Cihák (2014) for a detailed comparison among these banking competition measures.

¹³ The FDIC may deny a proposed merger transaction on competitive grounds when the post-merger Herfindahl–Hirschman Index (HHI) in each relevant geographic market is more than 1800, reflects an increase of more than 200 points from the pre-merger HHI.

Table 1 Definitions of explanatory variables

Explanatory variable	Definition
<i>Assets sold</i>	Ratio of the assets sold in the P&A to the total assets of the failed bank
<i>Bid amount</i>	Ratio between the dollar bid to the deposits assumed
<i>Boone indicator</i>	A measure of the degree of competition in the banking market and calculated as the elasticity of profits to marginal costs
<i>Deposits assumed</i>	Ratio of the deposits assumed in the P&A to the total deposits of the failed bank
<i>Failures</i>	Number of bank failures nationally during the previous 20 business days in natural logarithm
<i>FDIC costs</i>	Ratio of the failed bank's resolution costs estimated by the FDIC to the failed bank's total deposits
<i>Geographic focus</i>	Ratio of the dollar amount of the deposits that the acquiring bank holds in the state where the failed bank is chartered to the acquiring bank's total deposits
<i>GDPpc</i>	GDP per capita (in natural logarithm) of the previous quarter in the state where the failed bank is chartered
ΔHHI	Increase in market concentration (at the MSA/county level) measured by a Herfindahl–Hirschman index (HHI)
<i>Liquidity ratio</i>	Ratio of liquid assets to total assets
<i>LSA</i>	Dummy variable equal to 1 if a loss-share agreement is included in the P&A
<i>Nonperforming loans</i>	Ratio of nonperforming loans (non-accrual) and 90 days or more past due loans to total loans
<i>Product focus</i>	Differences in asset composition between the winner and the target banks by using a Herfindahl–Hirschman index (HHI) calculated as the sum of the squared differences across the four asset categories
<i>Size</i>	Total assets of the bank (in thousands USD)
<i>Tier1 capital ratio</i>	Ratio of Tier 1 capital to the total risk-weighted assets
<i>Unemployment</i>	Average unemployment rate of the previous quarter in the state where the failed bank is chartered

power. As proposed by Jones et al. (2012), *Product focus* is determined by the differences in asset composition between the winner and target. A Herfindahl–Hirschman index (i.e., the sum of the squared differences in asset composition between winner and target) is used as a proxy.

Our tests also include a number of control variables (*CONT*). First, since not all assets and deposits are auctioned by the FDIC, we include two variables that measure, scaled by the failed bank's total assets and deposits upon the closure, the amount of winner-acquired failed bank's assets and deposits (*Assets sold* and *Deposits assumed*, respectively).¹⁴ *Assets sold* may serve as a proxy for the financial condition of the failed bank: the relatively greater the quality of the assets on the failed bank's balance sheet is, the greater the amount of assets auctioned by the FDIC. *Deposits assumed*, on the other hand, may indicate the amount of the failed bank's preserved franchise value, which the acquirer has incentives to assume (James 1991, Cowan and Salotti 2015). In recent years, to encourage bids when substantial assets are sold, a loss-share agreement (*LSA*) has often been included by the FDIC. The aim is to prevent the FDIC from keeping large amounts of failed bank assets that it would then attempt to sell under

¹⁴ The details of the retained assets and deposits are not disclosed by the FDIC.

Table 2 Descriptive statistics

	N	Mean	Median	St. Dev	Min	Max
<i>Panel A: winners</i>						
Boone indicator	303	-0.0058	-0.0051	0.0420	-0.1403	0.4767
Geographic focus	323	0.5433	0.7856	0.4584	0	1
Liquidity ratio	292	0.2627	0.2424	0.1165	0.0776	0.6759
Nonperforming loans	292	0.0499	0.0401	0.1165	0	0.3218
Product focus	264	0.0798	0.0501	0.0839	0.0007	0.4711
Size (\$000)	292	34,623,404	2,546,677	79,906,497	20,876	330,461,262
Tier 1 capital ratio	292	0.1726	0.1371	0.1060	0.0669	0.6585
<i>Panel B: losers</i>						
Liquidity ratio	307	0.2244	0.2081	0.1004	0.0626	0.6655
Nonperforming loans	307	0.0427	0.0362	0.0309	0.0013	0.1800
Size (\$000)	307	13,595,388	3,828,180	39,676,031	381,818	277,519,011
Tier 1 capital ratio	307	0.1383	0.1369	0.0341	-0.1653	0.1400
<i>Panel C: targets</i>						
Liquidity ratio	258	0.1951	0.1859	0.0843	0.0015	0.4427
Nonperforming loans	258	0.1812	0.1593	0.1020	0.0023	0.4723
Size (\$000)	258	663,782	274,420	1,172,488	21,879	10,894,842
Tier 1 capital ratio	258	0.0131	0.0175	0.0340	-0.1653	0.1400
<i>Panel D: deal characteristics</i>						
Assets sold	176	0.9136	1	0.2234	0	1
Bid amount	176	0.48876	0	6.446	-0.1188	85.5
Deposits assumed	176	0.9865	1	0.0802	0.4652	1
Failures	176	8.2102	7.5	5.7774	0	26
FDIC costs	176	0.2434	0.2199	0.2743	0.0041	3.4113
Δ HHI	176	31.0517	0	1615.6111	0	1660.3530
LSA	176	0.6818	1	0.4670	0	1

unfavorable market conditions (FDIC 2003). We also control for the average unemployment rate (in percentage) and GDP per capita (in natural logarithm) of the previous quarter in the state where the target is based (*Unemployment* and *GDPpc*). Finally, we also include a number of variables denoting participating banks' pre-auction financial characteristics, which include their core capital (*Tier1 capital ratio*), size (*Size*), liquidity (*Liquidity ratio*) and nonperforming loans (*Nonperforming loans*).

All previously mentioned explanatory variables are defined in Table 1. Table 2 reports the descriptive statistics. On average, compared to the losing bidders, the winners of FDIC P&As tend to be better capitalized, two times bigger in size and have more liquid assets. Compared to the bidders, the targets, unsurprisingly, have the worst performance in every category. The acquirers also have significant business (measured by deposits) in the state where the targets are chartered. Over 90% of the failed banks' assets and nearly all their deposits are purchased and assumed by the winning bidders.

Table 3 FDIC auctions of failed banks: the losing bidders abnormal returns, 2007–2013

Full sample of losing bidders				
Event windows	N	Mean CAR (%)	Positive: negative	StdCesct Z
CAR[0, + 1]	283	-0.35	138:145	-0.523
CAR[0, + 2]	283	-0.31	136:147	0.276
CAR[0, + 3]	283	-0.61	133:150	-1.318**
CAR[0, + 4]	283	-0.90	135:148	-2.115**

This table summarizes the cumulative abnormal returns (CAR) of losing bidders surrounding the announcements of FDIC purchase and assumption auction results between 2007 and 2013. The return-generating model used to compute the abnormal returns utilizes the 3-factor Fama–French (1993) model with an additional factor for price momentum. The equal-weighted CRSP index is used as the market proxy. The standardized cross-sectional statistic (StdCesct, Boehmer et al. 1991) is adjusted for the cross-sectional correlation. ***, ** and * denote statistical significance at the 1%, 5% and 10% level respectively

5 Empirical results

Table 3 summarizes the losing bidders' CAR (expressed as percentages) around the time of the P&A auction announcements. The table shows that losers experience a four-day and five-day CAR with a mean of -0.6% and -0.9%, respectively, and that both are statistically significant. Overall, the results indicate that announcements of FDIC P&A outcomes negatively affect the unsuccessful bidders' stock market performance.

Table 4 reports our OLS regression results for the whole sample by using CAR[0, + 1] as the dependent variable. The coefficients of our proxy for FDIC wealth transfer (*FDIC costs* and *Bid amount*), are statistically insignificant in all six estimations. The results do not appear to support our *Wealth Transfer Externality Hypothesis* that while winning bidders receive subsidies/discounts from the FDIC, losing bidders experience negative effects, as they miss out on such subsidies. Our *Failure Probability Hypothesis*, on the other hand, is supported in five estimations. The findings suggest that a worsening market condition, measured by *Failures*, negatively affects the share-price reactions for the losing bidders as these banks face an increased probability of insolvency. This result is consistent with Molyneux and Zhou (2022) that each P&A announcement is perceived by shareholders of surviving banks as having an increased probability of failure in the future. In this study, the variable to measure the winner's competitiveness (*Boone indicator*) is negatively significant in all estimations. Since lower values of the Boone (2008) indicator signify more competitiveness, the findings in Table 4 do not support our *Competition Hypothesis*. This instead suggests, interestingly, that the losing bidders' shareholders react negatively to the announcements that less competitive banks become the winners. Two independent variables measuring the potential market power gains as a result of the FDIC P&A transactions (*Geographic focus* and *Product focus*) have no significant effects on the losing bidders' shareholder value, whereas there is strong evidence that increased market concentration is associated with positive losing bidder CAR, the coefficients of ΔHHI are significant in all the estimations. The results, therefore, support our *Market Power Hypothesis*, that is, the FDIC's selling of failed banks results in anticompetitive behavior in the market. Moreover, one explanatory variable of the acquiring bank's financial characteristics has also significant coefficients (i.e., *wSize*). The results show that rival losing bidders react positively when a winner

Table 4 Determinants of the losing bidders' abnormal returns in the FDIC auctions of failed banks

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]
<i>FDIC costs</i>	0.0033 (0.0054)		-0.0011 (0.0059)		0.0026 (0.0076)	
<i>Bid amount</i>		0.0001 (0.0003)		0.0005 (0.0003)		0.0006 (0.0004)
<i>Failures</i>	-0.0058* (0.0034)	-0.0060* (0.0035)	-0.0068 (0.0042)	-0.0072* (0.0042)	-0.0091* (0.0048)	-0.0100** (0.0049)
<i>Boone indicator</i>	-0.1031** (0.0468)	-0.1031** (0.0469)	-0.0960** (0.0464)	-0.0919** (0.0463)	-0.1097** (0.0506)	-0.1042** (0.0503)
ΔHHI	0.0017* (0.0010)	0.0018* (0.0010)	0.0019** (0.0009)	0.0019** (0.0009)	0.0023* (0.0012)	0.0024** (0.0012)
<i>Geographic focus</i>	0.0090* (0.0054)	0.0090 (0.0055)	0.0075 (0.0054)	0.0091* (0.0054)	0.0077 (0.0068)	0.0084 (0.0068)
<i>Product focus</i>	0.0399 (0.0371)	0.0402 (0.0372)	0.0252 (0.0374)	0.0283 (0.0372)	0.0558 (0.0435)	0.0556 (0.0429)
<i>wTier1 capital ratio</i>	0.0177 (0.0331)	0.0192 (0.0331)	0.0348 (0.0335)	0.0352 (0.0331)	0.0060 (0.0372)	0.0058 (0.0369)
<i>wSize</i>	0.0037** (0.0017)	0.0042*** (0.0015)	0.0049*** (0.0017)	0.0049*** (0.0015)	0.0044* (0.0023)	0.0048** (0.0020)
<i>wLiquidity ratio</i>	0.0105 (0.0318)	0.0081 (0.0320)	0.0236 (0.0321)	0.0187 (0.0322)	0.0098 (0.0364)	0.0091 (0.0360)
<i>wNonperforming loans</i>	-0.0829 (0.0551)	-0.0849 (0.0551)	-0.1105* (0.0564)	-0.1093* (0.0556)	-0.0857 (0.0654)	-0.0938 (0.0650)
<i>iTier1 capital ratio</i>	0.0739 (0.0747)	0.0700 (0.0750)	0.0679 (0.0793)	0.0596 (0.0791)	-0.0436 (0.0872)	-0.0465 (0.0858)
<i>iSize</i>	-0.0001 (0.0025)	-0.0001 (0.0025)	0.0003 (0.0025)	-0.0000 (0.0025)	0.0001 (0.0028)	0.0001 (0.0027)
<i>iLiquidity ratio</i>	-0.0492** (0.0224)	-0.0524** (0.0232)	-0.0429* (0.0222)	-0.0500** (0.0228)	-0.0387 (0.0267)	-0.0432 (0.0267)
<i>iNonperforming loans</i>	-0.0415 (0.0771)	-0.0496 (0.0766)	-0.0637 (0.0794)	-0.0693 (0.0789)	-0.0152 (0.0849)	-0.0302 (0.0830)
<i>tTier1 capital ratio</i>	0.0320 (0.0655)	0.0274 (0.0651)	0.0502 (0.0655)	0.0563 (0.0650)	-0.0221 (0.0860)	-0.0192 (0.0833)
<i>tSize</i>	-0.0067** (0.0028)	-0.0075*** (0.0024)	-0.0084*** (0.0029)	-0.0078*** (0.0024)	-0.0093*** (0.0035)	-0.0099*** (0.0027)
<i>tLiquidity ratio</i>	0.0172 (0.0274)	0.0209 (0.0271)	0.0167 (0.0285)	0.0170 (0.0275)	0.0320 (0.0346)	0.0400 (0.0350)
<i>tNonperforming loans</i>	-0.0256 (0.0264)	-0.0170 (0.0226)	-0.0096 (0.0270)	-0.0069 (0.0239)	-0.0373 (0.0325)	-0.0251 (0.0274)
<i>Assets sold</i>	-0.0105 (0.0171)	-0.0117 (0.0170)	-0.0391* (0.0212)	-0.0448** (0.0216)	-0.0339 (0.0239)	-0.0448* (0.0249)
<i>Deposits assumed</i>	-0.0271	-0.0220	-0.0104	0.0297	-0.0345	0.0237

Table 4 (continued)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]	CAR[0, + 1]
	(0.0397)	(0.0469)	(0.0404)	(0.0501)	(0.0499)	(0.0662)
<i>LSA</i>	0.0064	0.0065	0.0101*	0.0091*	0.0176**	0.0168**
	(0.0051)	(0.0051)	(0.0053)	(0.0053)	(0.0070)	(0.0069)
<i>Unemployment</i>	0.5156	0.5787	0.1748	0.1048	0.3131	0.3042
	(0.3595)	(0.3644)	(0.5546)	(0.5349)	(0.6075)	(0.5846)
<i>GDPpc</i>	-0.0011	-0.0001	-0.0112	-0.0103	0.1944	0.1919
	(0.0163)	(0.0163)	(0.0164)	(0.0164)	(0.1481)	(0.1473)
<i>Year dummy</i>	No	No	Yes	Yes	Yes	Yes
<i>State dummy</i>	No	No	No	No	Yes	Yes
Observations	219	219	219	219	219	219
R-squared	0.194	0.193	0.244	0.251	0.372	0.379

This table examines the determinants of the magnitude of the losing bidders' abnormal returns by using the ordinary least square (OLS) regressions of the losing bidders' cumulative abnormal returns (CAR[0, + 1]) surrounding auction outcome announcements between 2007 and 2013. All variables are defined in Table 1. The letters w, l and t denote winner, loser and target, respectively. Standard errors are in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively

has greater size. These findings seem to suggest that losing bidders welcome the entry of a large player to potentially enhance the market power.

The abovementioned findings have significant policy and business implications. While the overall negative abnormal returns of losing bidders appear to be driven by worsening market and economic conditions, these losing bidders benefit from distorted competition and increased market power. Our study, therefore, offers a fresh insight into the fact that these interventions potentially give rise to anticompetitive behavior among participating banks of FDIC auctions. As a result, our study would not only enable regulators to better anticipate how the banking system is likely to respond to bidding outcomes, particularly during and after a major financial turmoil, but also remain relevant to merger regulation and antitrust policy. Understanding the effects on losing bidders helps banking regulators scrutinize the design of the auction process and the trade-off between the stability of a banking market and long-term competitive conditions, which are important to all market participants as well as the general public. Our findings may also contribute to the broad debates related to the role of market discipline as well as to regulatory interventions in a changing regulatory environment.

6 Robustness tests

As a robustness test, we adopt a Heckman (1979) sample-selectivity estimation procedure to correct for potential selection bias.

To acquire a failed bank through FDIC P&A transactions, banks need to initially apply to be listed as a qualified bidder. After the review of their applications and approvals by the FDIC as well as other relevant regulators, these potential bidders may express their interest in bidding for failed banks when the FDIC informs them about the forthcoming auctions. Empirical evidence shows that these qualified bidders tend to have better performance than

non-bidding banks and therefore a better chance to be selected by the FDIC to participate in the auctions (Granja et al. 2017). Moreover, the sampling approach in this study focuses on publicly listed losing bidders, which may also behave differently in a banking system than other non-listed losing bidders behave. Due to the nonrandom exclusion of some losing bidders, our study may risk sample selection bias. In other words, the post-auction value effects may be more related to who gets selected than the effects of losing an auction per se. It is, nevertheless, difficult to anticipate whether biased regression estimates overstate or understate the true causal effects, in particular in multivariate models, such as the one applied by this study (see Berk 1983). To correct the possible bias in selecting losers for our study, we use the Heckman (1979) procedure involving two sequential equations. The first equation presented as follows uses a probit model to identify which bank becomes the loser of a P&A auction. It is modeled as a bivariate discrete choice model where the event of becoming a losing bidder for a bank is a function of the bank's financial condition (i.e., a loser's tier 1 capital ratio, size, liquidity and nonperforming loans) as follows:

$$\begin{aligned} \text{Loser}(1,0)_i = & \alpha + \beta_1 \text{Tier1Capital ratio}_i + \beta_2 \text{Size}_i \\ & + \beta_3 \text{Liquidity ratio}_i + \beta_4 \text{Non performing loans}_i + \varepsilon_i \end{aligned} \quad (5)$$

The estimated probability of being a FDIC auction loser is measured through Lambda (i.e. the Mills ratio) from the first-stage results and included in the second stage OLS regression of our cross-sectional model (excluding 4 independent variables used in the first stage) to correct for a self-selection bias as follows:

$$\text{CAR}_i = \alpha + \beta_1 \text{SUBD}_i + \beta_2 \text{FLPR}_i + \beta_3 \text{COMP}_i + \beta_4 \text{MKPW}_i + \beta_5 \text{CONT}_i + \beta_6 \text{Lambda}_i + \varepsilon_i \quad (6)$$

The Heckman estimations are estimated over all FDIC-insured banks between 2007 and 2013. The results are reported in the Table 5, which show that the coefficient of Lambda is insignificant, suggesting no evidence of self-selection affecting our results.

To ascertain that bidding outcomes drive the changes of the losing bidders' stockholder value, we collect additional information on the winning bidders during the same sample period (2007–2013) and repeat our event study on a new sample of 171 winners.¹⁵ We then identify the bidders that appear in both samples, in other words, the banks that experience both winning and losing bidding outcomes between 2007 and 2013. Table 6 shows a list of these bidders and their mean CAR as a winner as well as a loser. In total, approximately 78% of these banks experience higher average CAR as a winning bidder. On the other hand, when they lose, over 60% of these banks have negative CAR, but when they win, only 17% of them have negative CAR. These results, therefore, suggest that bidding outcomes are positively associated with the bidders' CAR. To examine whether the auction results determine the bidders' stockholder value, we next conduct a more powerful robustness test by running OLS regressions of the CAR of all bidders (i.e., winners and losers) on a dummy variable taking a value of 1 as a winner and 0 otherwise as well as on a vector of control variables. Table 7 shows the results of this test. The coefficients of the dummy variable *Winner or Loser* are statistically positive, which confirms that losing (winning) a FDIC auction generates negative (positive) and significant abnormal returns for the bidders.

¹⁵ The event study results for the winning bidders of FDIC P&A transactions between 2007 and 2013 are not presented in the paper and are available upon request.

Table 5 Heckman selection model—losing bidders

Explanatory variable	Loser(1/0)
Panel A	
<i>lTier1 capital ratio</i>	0.3460 (0.8169)
<i>lSize</i>	0.0019 (0.0223)
<i>lLiquidity ratio</i>	-0.0225 (0.2237)
<i>lNonperforming loans</i>	-0.3897 (0.7386)
Lambda	-0.1704 (0.4154)
Panel B	
	CAR[0, + 1]
<i>FDIC costs</i>	0.0008 (0.0113)
<i>Failures</i>	-0.0118 (0.0081)
<i>Boone indicator</i>	-0.1062 (0.0697)
ΔHHI	0.0011 (0.0011)
<i>Geographic focus</i>	0.0068 (0.0104)
<i>Product focus</i>	0.0835 (0.0713)
<i>wTier1 capital ratio</i>	0.0403 (0.0586)
<i>wSize</i>	0.0024 (0.0027)
<i>wLiquidity ratio</i>	0.0039 (0.0549)
<i>wNonperforming loans</i>	-0.1557 (0.1080)
<i>tTier1 capital ratio</i>	0.0128 (0.1053)
<i>tSize</i>	-0.0048 (0.0046)
<i>tLiquidity ratio</i>	0.0292 (0.0499)
<i>tNonperforming loans</i>	-0.0538 (0.0468)
<i>Assets sold</i>	-0.0035 (0.0298)
<i>Deposits assumed</i>	-0.0437 (0.0631)
<i>LSA</i>	0.0164*

Table 5 (continued)

Explanatory variable	Loser(1/0)
	(0.0094)
<i>Unemployment</i>	0.3864 (0.6633)
<i>GDPpc</i>	0.1578 (0.2816)
Observations	1,011,493

This table examines whether selection bias affects our main results. A two-stage Heckman (1979) selection procedure is used. The first-stage probit model in Panel A predicts that the possibility of being a loser is determined by a number of the losers' characteristics. To correct for a self-selection bias, the Lambda (Mills ratio) is computed and then included in the second-stage OLS regression estimation (Panel B). Standard errors are in parentheses

It is widely recognized that abnormal returns are generally not normally distributed. This violation of the assumption of normality may lead to significant statistical inference problems (Brown and Warner 1980, 1985). For this reason, we follow Armstrong et al. (2010) and Bruno et al. (2018) to rely on bootstrap simulations to evaluate the significance of the cumulative effects of all auction announcements. We conduct a 1-tail bootstrap of our (cross-sectional standard deviation) t-test based on 1000 replications of randomly chosen placebo event dates (with a resampling ratio of 0.25) over the same sample period. The results show that the CAR remain significantly negative at the 5% level, which suggests that our results are unlikely to be driven by data mining.¹⁶

In addition, a possible limitation of an event study is that the estimation of the CAR may be affected by confounding events. To rule out such possibility, we first exclude all the transactions based on the following conditions: if a specific bank submits more than one bid in different FDIC auctions on the same date¹⁷; if the same bidder participates in consecutive Fridays¹⁸; or if a bidder makes a public announcement or experiences an event within the event window that may also affect share prices.¹⁹ We then replicate our event study and regressions from Table 4, and the results remain unchanged.

7 Conclusions

During and after the recent financial crisis, the FDIC conducted a large number of P&A transactions that involved auctioning failed commercial banks and savings and loan institutions to healthy banks. These auctions provide a timely case study to examine the

¹⁶ The robustness test results that are not presented in the paper are available upon request.

¹⁷ For example, the Bank of North Carolina (a subsidiary of BNC Bancorp) participated in two separate FDIC auctions (of CommunitySouth Bank and Trust and The Bank of Asheville respectively) on January 21, 2011.

¹⁸ For example, Bank of the Ozarks (a subsidiary of Bank OZK) participated in two FDIC auctions (of First National Bank of the South and Crescent Bank and Trust Company) in consecutive Fridays (on 16th July and 23rd July, 2010).

¹⁹ We follow Bruno et al. (2018) and screen these announcements and events via Lexis-Nexis.

Table 6 Bidders' abnormal returns as both a winner and a loser, 2007–2013

Bank name	State	Mean CAR (%) as a winner	Mean CAR (%) as a loser
Ameris Bancorp	Georgia	7.32	-2.47
Bank of Marin Bancorp	California	4.89	-0.96
Bank of the Ozarks	Arkansas	1.31	-0.82
BNC Bancorp	North Carolina	13.11	-0.02
Branch Banking & Trust Company, (BB&T)	North Carolina	3.81	3.59
Centerstate Banks, Inc	Florida	1.63	0.00
Charter Financial Corp	Georgia	-1.64	-6.44
City National	California	5.96	0.61
Columbia Banking System, Inc	Washington	2.42	-11.81
East West Bancorp	California	29.13	-9.30
Enterprise Financial Services	Missouri	3.69	-1.18
Fidelity Southern	Georgia	3.35	2.66
Fifth Third Bancorp	Ohio	6.71	-16.11
First Bancorp	North Carolina	0.05	-0.02
First Citizens Bancshares	North Carolina	0.82	-0.02
First Community Bancshares	Virginia	4.33	-0.10
First Financial Bancorp	Ohio	13.32	7.09
First Horizon National Corporation	Tennessee	-0.13	-1.03
First Merchants	Indiana	8.22	4.12
First Midwest Bancorp	Illinois	2.92	0.01
First United Bancorp	Florida	1.12	-1.37
Firstmerit	Ohio	-1.43	-2.66
Great Southern Bancorp	Missouri	5.31	-1.00
Hancock Holding	Mississippi	4.11	0.78
Heartland Financial	Illinois	1.12	7.16
Heritage Financial Corp	Washington	0.94	1.52
Home Bancshares	Arkansas	0.30	-0.01
Iberiabank	Louisiana	5.20	-1.14
M & T Bank	New York	0.36	1.20
MB Financial	Illinois	4.07	-2.33
New York Community Bancorp	New York	5.89	1.59
Old National Bancorp	Indiana	11.32	2.77
Pacific Premier Bancorp	California	-0.14	-0.31
Pacwest Bancorp	California	8.61	-0.18
Prosperity Bancshares	Texas	13.00	-2.77
Renasant	Mississippi	4.75	1.71
Republic Bancorp of Kentucky	Kentucky	-0.69	-0.58
Simmons First National	Arkansas	1.86	-0.31
South State	South Carolina	13.52	-3.61
Southern Missouri Bancorp	Missouri	1.62	-5.64
Southern National Bancorp of Virginia	Virginia	6.18	1.17
State Bank Financial Corporation	Georgia	1.49	7.13
Synovus Financial	Georgia	-0.01	1.94

Table 6 (continued)

Bank name	State	Mean CAR (%) as a winner	Mean CAR (%) as a loser
Trico Bancshares	California	2.07	1.10
Trustmark	Mississippi	0.72	1.30
Umpqua Holdings	Oregon	-0.73	-0.63
United Community Banks	Georgia	-7.98	-2.88
United States Bancorp	Ohio	-1.46	-2.28
Valley National Bancorp	New Jersey	6.73	-6.36
Washington Federal	Washington	0.96	0.61
Westamerica Bancorporation	California	4.28	1.25
Western Alliance Bancorporation	Nevada	5.16	5.57
Zions Bancorporation	California	-6.81	-6.13

Table 7 The effects of bidding outcomes on the FDIC bidders' abnormal returns, 2007–2013

Variables	(1) CAR[0, + 1]	(2) CAR[0, + 1]	(3) CAR[0, + 1]
<i>Winner or Loser</i>	0.0452*** (0.0157)	0.0418*** (0.0159)	0.0407** (0.0164)
<i>Assets sold</i>	-0.0370 (0.0391)	-0.0382 (0.0504)	-0.0406 (0.0547)
<i>Deposits assumed</i>	0.0681 (0.1009)	0.0788 (0.1076)	-0.0052 (0.1138)
<i>LSA</i>	-0.0053 (0.0187)	-0.0104 (0.0211)	-0.0018 (0.0240)
<i>Unemployment</i>	-0.3720 (0.6103)	-0.5514 (0.7955)	-0.7302 (0.9944)
<i>GDPpc</i>	-0.0210 (0.0517)	-0.0329 (0.0529)	-0.6009 (0.4225)
<i>Year dummy</i>	No	Yes	Yes
<i>State dummy</i>	No	No	Yes
Observations	442	442	442
R-squared	0.028	0.036	0.124

This table examines whether bidding outcomes have an impact on the FDIC bidders' abnormal returns by using the ordinary least square (OLS) regressions of all bidders' cumulative abnormal returns (CAR[0, + 1]) surrounding auction outcome announcements between 2007 and 2013. *Winner or Loser* is a dummy variable taking 1 if the bidder is a winning bidder and 0 otherwise. All other explanatory variables are defined in Table 1. Standard errors are in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively

effectiveness and wider implications of the design for bank resolution process. This study examines 176 P&A transactions involving publicly listed losing bidders between 2007 and 2013. We use an event study approach to analyze these losing bidders' unexpected stockholder value change after the auction results were made public in the stock market. The results from the event study show that losing bidders in these auctions recorded significantly negative abnormal returns around the auction outcome announcements.

Cross-sectional regressions further show that the stockholders' returns of these bidders are inversely related to the proxy that indicates the market conditions, which supports the *Failure Probability Hypothesis*. On the other hand, we find no evidence to support the *Wealth Transfer Externality Hypothesis* and *Competition Hypothesis*. We, however, find that the stockholders react positively to the P&A transactions that may give rise to distorted competition and antitrust behavior in the market. In particular, losing bidders welcome the entry of a large player to potentially enhance the market power. This finding, therefore, confirms our *Market Power Hypothesis*. Overall, our results suggest that the adverse effects of losing in a P&A auction on losing bidders are largely driven by a worsening market condition. These bidders, nevertheless, benefit from increased market power as a result of the resolution process, which deserves further examination.

We conduct several more robustness tests. A Heckman (1979) sample-selectivity estimation procedure is used to correct for potential self-selection, and we find no evidence of such bias. We also find consistent results that losing (winning) a FDIC auction generates negative (positive) and significant abnormal returns for the bidders. Additional robustness tests similarly show that our overall results are consistent and driven by auction outcomes instead of data mining and confounding events.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11156-023-01146-3>.

Acknowledgements I would like to thank Jonathan James, Mike Buckle, Philip Molyneux, Dylan Thomas, Vineet Upreti, Wei Song, Philip Keeton, the referees and Cheng-Few Lee (editor) for helpful comments.

Declaration

Conflict of interest They authors declare that they have no conflict of interest.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Acharya VV, Yorulmazer T (2008) Cash-in-the-market pricing and optimal resolution of bank failures. *Rev Financ Stud* 21:2705–2742. <https://doi.org/10.1093/rfs/hhm078>
- Armstrong CS, Barth ME, Jagolinzer AD, Riedl EJ (2010) Market reaction to the adoption of IFRS in Europe. *Account Rev* 85(1):31–61. <https://doi.org/10.2308/accr.2010.85.1.31>
- Barth JR, Dan RB Jr., Daniel S, George HKW (1989) Thrift institution failures: estimating the regulator's closure rule. *research in financial services, a research annual*. In: George Kaufman, 1, JAI Press, Inc.

- Barth JR, Bartholomew PF, Elmer PJ (1997) The value of tax benefits and the cost of liquidating versus selling failed thrift institutions. *J Econ Finance* 21(2):3–11. <https://doi.org/10.1007/BF02920758>
- Berger AN (1995) The profit-structure relationship in banking - tests of market-power and efficient-structure hypotheses. *J Money, Credit, Bank* 27(2):404–431. <https://doi.org/10.2307/2077876>
- Berger AN, Humphrey DB (1993) Bank scale economies, mergers, concentration, and efficiency: the US experience. *Revue D'economies Financiere* 27:123–154
- Berk RA (1983) An introduction to sample selection bias in sociological data. *Am Sociol Rev* 48(3):386–398. <https://doi.org/10.2307/2095230>
- Bertin WJ, Ghazanfari F, Torabzadeh KM (1989) Failed bank acquisitions and successful bidders' returns. *Financ Manage* 18(2):93–100. <https://doi.org/10.2307/3665896>
- Boehmer E, Masumeci J, Poulsen AB (1991) Event-study methodology under conditions of event-induced variance. *J Financ Econ* 30(2):253–272. [https://doi.org/10.1016/0304-405X\(91\)90032-F](https://doi.org/10.1016/0304-405X(91)90032-F)
- Boone J (2008) A new way to measure competition. *Econ J* 118(531):1245–1261. <https://doi.org/10.1111/j.1468-0297.2008.02168.x>
- Boone, Jan., Rachel Griffith, and Rupert Harrison. (2005) Measuring Competition. AIM Research Working Paper 22.
- Brown SJ, Warner JB (1980) Measuring security price performance. *J Financ Econ* 8(3):205–258. [https://doi.org/10.1016/0304-405X\(80\)90002-1](https://doi.org/10.1016/0304-405X(80)90002-1)
- Brown SJ, Warner JB (1985) Using daily stock returns: the case of event studies. *J Financ Econ* 14:3–31. [https://doi.org/10.1016/0304-405X\(85\)90042-X](https://doi.org/10.1016/0304-405X(85)90042-X)
- Bruno B, Onali E, Schaeck K (2018) Market reaction to bank liquidity regulation. *J Financ Quant Anal* 53:899–935. <https://doi.org/10.1017/S0022109017001089>
- Carhart MM (1997) On persistence in mutual fund performance. *J Financ* 52(1):57–82. <https://doi.org/10.1111/j.1540-6261.1997.tb03808.x>
- Cochran B, Rose LC, Fraser DR (1995) A market evaluation of FDIC assisted transactions. *J Bank Finance* 19:261–279. [https://doi.org/10.1016/0378-4266\(94\)00052-5](https://doi.org/10.1016/0378-4266(94)00052-5)
- Cowan AR, Valentina S, Natalya AS (2022) The long-term impact of bank mergers on stock performance and default risk: the aftermath of the 2008 financial crisis. *Finance Res Lett* 48:102925. <https://doi.org/10.1016/j.frl.2022.102925>
- Cowan AR, Salotti V (2015) The resolution of failed banks during the crisis: acquirer performance and FDIC guarantees 2008–2013. *J Bank Finance* 54:222–238. <https://doi.org/10.1016/j.jbankfin.2014.12.016>
- Crosron RT, Gomes A, McGinn KL, Nöth M (2004) Mergers and acquisitions: an experimental analysis of synergies. *External Dyn Rev Finance* 8(4):481–514. <https://doi.org/10.1093/rof/8.4.481>
- Cybo-Ottone A, Murgia M (2000) Mergers and shareholder wealth in European banking. *J Bank Finance* 24:831–859. [https://doi.org/10.1016/S0378-4266\(99\)00109-0](https://doi.org/10.1016/S0378-4266(99)00109-0)
- Degryse H, Steven O (2008) Competition and regulation in the banking sector: a review of the empirical evidence on the sources of bank rents. *Handb Financ Intermed Bank*, 483–554
- DeLong GL (2001) Stockholder gains from focusing versus diversifying bank mergers. *J Financ Econ* 59(2):221–252. [https://doi.org/10.1016/S0304-405X\(00\)00086-6](https://doi.org/10.1016/S0304-405X(00)00086-6)
- Eckbo BE (1983) Horizontal mergers, collusion, and stockholder wealth. *J Financ Econ* 11(1–4):241–273. [https://doi.org/10.1016/0304-405X\(83\)90013-2](https://doi.org/10.1016/0304-405X(83)90013-2)
- Fama EF, French KR (1993) Common risk factors in the returns on stocks and bonds. *J Financ Econ* 33(1):3–56. [https://doi.org/10.1016/0304-405X\(93\)90023-5](https://doi.org/10.1016/0304-405X(93)90023-5)
- FDIC (2003) Managing the crisis: the FDIC and RTC experience, chronological overview. FDIC, Washington DC, USA.
- FDIC (2014) Federal deposit insurance corporation annual report 2013. FDIC, Washington DC, USA.
- Goddard J, Molyneux P, Zhou T (2012) Bank mergers and acquisitions in emerging markets: evidence from Asia and Latin America. *The European Journal of Finance* 18(5):419–438. <https://doi.org/10.1080/1351847X.2011.601668>
- Granja J (2013) The relation between bank resolutions and information environment: evidence from the auctions for failed banks. *J Account Res* 51(5):1031–1070. <https://doi.org/10.1111/1475-679X.12028>
- Granja J, Matvos G, Seru A (2017) Selling failed banks. *J Financ* 72(4):1723–1784. <https://doi.org/10.1111/jofi.12512>
- Gupta A, Misra L (1999) Failure and failure resolution in the US thrift and banking industries. *Financ Manage* 28(4):87–105. <https://doi.org/10.2307/3666305>
- Hankir Y, Rauch C, Umber MP (2011) Bank M&A: A market power story? *J Bank Finance* 35(9):2341–2354. <https://doi.org/10.1016/j.jbankfin.2011.01.030>

- Hannan TH, Berger AN (1991) The rigidity of prices: evidence from the banking industry. *Am Econ Rev* 81:938–945
- Heckman JJ (1979) Sample selection bias as a specification error. *Econometrica* 47:153–162. <https://doi.org/10.2307/1912352>
- Houston JF, James CM, Ryngaert MD (2001) Where do merger gains come from? Bank mergers from the perspective of insiders and outsiders. *J Financ Econ* 60(2–3):285–331. [https://doi.org/10.1016/S0304-405X\(01\)00046-0](https://doi.org/10.1016/S0304-405X(01)00046-0)
- James C (1991) The losses realized in bank failure. *J Financ* 46:1223–1242. <https://doi.org/10.1111/j.1540-6261.1991.tb04616.x>
- James C, Wier P (1987) An analysis of FDIC failed bank auctions. *J Monet Econ* 20:141–153. [https://doi.org/10.1016/0304-3932\(87\)90062-6](https://doi.org/10.1016/0304-3932(87)90062-6)
- Jehiel P, Moldovanu B (1996) Strategic nonparticipation. *Rand J Econ* 27(1):84–98. <https://doi.org/10.2307/2555793>
- Jones JS, Lee WY, Yeager TJ (2012) Opaque banks, price discovery, and financial instability. *J Financ Intermed* 21:383–408. <https://doi.org/10.1016/j.jfi.2012.01.004>
- Klemperer P (1999) Auction theory: a guide to the literature. *J Econ Surv* 13:227–286. <https://doi.org/10.1111/1467-6419.00083>
- Kothari SP, Jerold BW (2007) Econometrics of event studies. *Handbook of Empirical Corporate Finance*, Elsevier Ltd, 3–36.
- Molyneux P, Zhou TM (2022) Banking Market reaction to auctions of failed banks. *Int J Financ Econ* 27(1):518–534. <https://doi.org/10.1002/ijfe.2166>
- Otchere I, Ip E (2006) Intra-industry effects of completed and cancelled cross border acquisitions in australia: a test of the acquisition probability hypothesis. *Pac Basin Financ J* 14(2):209–230. <https://doi.org/10.1016/j.pacfin.2005.06.006>
- Pettway RH, Trifts JW (1985) Do banks overbid when acquiring failed banks? *Financ Manage* 14(2):5–15. <https://doi.org/10.2307/3665150>
- Philippe J, Moldovanu B, Stacchetti E (1996) How (not) to sell nuclear weapons. *Am Econ Rev* 86:814–829
- Philippe J, Moldovanu B, Stacchetti E (1999) Multidimensional mechanism design for auctions with externalities. *J Econ Theory* 85:258–293. <https://doi.org/10.1006/jeth.1998.2501>
- Schaeck K, Cihák M (2014) Competition, efficiency, and stability in banking. *Financ Manage* 43(1):215–241. <https://doi.org/10.1111/fima.12010>
- Schuermann T, Kevin JS (2006) Visible and hidden risk factors for banks. No. 252, Staff Report, Federal Reserve Bank of New York
- Song MH, Walkling RA (2000) Abnormal returns to rivals of acquisition targets: a test of the ‘acquisition probability hypothesis.’ *J Financ Econ* 55(2):143–171. [https://doi.org/10.1016/S0304-405X\(99\)00048-3](https://doi.org/10.1016/S0304-405X(99)00048-3)
- Steiner PO (1975) *Mergers: motives, effects*. University of Michigan Press, Policies
- Zhang H (1997) Repeated acquirers in FDIC assisted acquisitions. *J Bank Financ* 21:1419–1430. [https://doi.org/10.1016/S0378-4266\(97\)00025-3](https://doi.org/10.1016/S0378-4266(97)00025-3)

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.