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Abstract

We measure the negative externalities experienced by non-winning bidders and examine the determinants of these externalities in the Federal Deposit Insurance Corporation (FDIC) failed bank auctions. We show that unsuccessful bidders experience significantly negative cumulative abnormal returns when winning bidders enter non-winning bidders' key markets as a new entrant by acquiring relatively larger targets and when infrequent bidders are involved.

Key words: *FDIC, Banks, Auction, Externality*

JEL Classifications: *D44, D62, G14, G21, G28*

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1. Introduction

The Federal Deposit Insurance Corporation (FDIC) provides deposit insurance to bank and thrift institution depositors as well as 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 assignment to preserve and promote public confidence in the US financial system. To fulfil this role, purchase and assumption transactions (P&As) are arranged by the FDIC to auction failed banks and thrift institutions to healthy banking firms.

In this paper, we examine the externality effects associated with the auctions of failed banks. In this study, externalities are measured by bidding banks' cumulative abnormal returns after the auction outcomes are announced. The negative externality hypothesis generally states that bidders' willingness to pay in an auction reflects not only their private valuations of the object (e.g. the franchise value of the failed institution's deposits and the value of some of its assets in a FDIC P&A transaction) but also preemptive incentives stemming from the desire to reduce negative externalities (Jehiel et al., 1996; Jehiel et al., 1999). Support for the existence of negative externalities in auctions has been reported primarily from laboratory experiments (e.g. Bagchi and Shor, 2006; Hu et al., 2013). To the best of our knowledge, we are the first to test auction externalities with market data.

Our study updates and makes a contribution to the literature regarding FDIC failed bank auctions. First, the literature mainly focuses 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. In total, 492 deposit-taking FDIC insured institutions failed in the USA during the period 2007-2013 compared to 29 institutions during the previous seven years (see Figure 1). Around 94 percent of these failed institutions were subsequently auctioned to healthy banks by the FDIC. These transactions, therefore, provide a timely case study to examine these significant economic events as successful auctions tend to reduce the cost to taxpayers compared to liquidation (James, 1991). Second, the majority of the literature examines acquiring banks. For example, James and Wier (1987), Cochran et al. (1995) and Cowan and Salotti (2015) find that winning bidders enjoy significant

and positive abnormal returns. The results therefore support the wealth transfer hypothesis. Zhang (1997) also finds that winning bidders record positive abnormal returns, which are positively driven by their past bidding experience in FDIC auctions. Giliberto and Varaiya (1989), on the other hand, examine whether winning bidders in FDIC auctions suffer from the winner's curse (i.e. overpaying for failed banks). The results show that winning bids as well as bid levels of all bidders tend to increase with increased competition. As far as we are aware, our study is the only one to examine non-winning bidders in FDIC auctions.

[Insert Figure 1 here]

Our results show that non-winning banks experience significantly negative cumulative abnormal returns of -0.75% surrounding the announcement dates while winning banks record significant and positive cumulative abnormal returns, which suggest that the announcements of the FDIC P&A outcomes generate negative externalities for the unsuccessful bidding banks. Moreover, we find that non-winning banks experience negative externalities when winning bidders enter unsuccessful bidder's key markets as a new entrant by winning relatively larger failed banks, which confirm that negative externalities are identity dependent as predicted by theory (e.g. Jehiel et al., 1996). While the results remain consistent overall, our further tests also show that failed bank auctions generate more significant negative returns when infrequent bidders are involved in the auctions.

Our results carry important policy implications as understanding auction externalities helps banking regulators examine potential anticompetitive effects of selecting a particular bidder on the relevant competitors within a banking market. Negative externalities experienced by non-winning bidders may also suggest an adverse impact on their performance and in turn the soundness of the banking system, in particular during and after a financial turmoil. Moreover, our research also suggests that the negative externalities generated by the FDIC failed bank auctions may be much greater since not all related competitors participate in the auctions or are publically listed. Thus, our research results deserve further investigations from the policy-makers and market participants.

The remainder of our paper is organized as follows: Section 2 presents the research background and develops our hypotheses. Section 3 describes the dataset and methodology. We present our results and robustness tests in Section 4. We offer concluding remarks in Section 5.

2. Research Background and Hypotheses

Protecting insured deposits in the event of a bank failure is one of the FDIC's most important roles (FDIC, 2014). The FDIC has two basic resolution methods to dispose of an insured commercial bank[1]. In a purchase and assumption (P&A) transaction, the FDIC auctions a package of the failed banks assets and the obligation to assume the bank's liabilities including all insured deposits. 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[2]. All aspects of the P&A transactions and all information concerning the failing bank are held in strict confidence as the marketed institution is still an open and operating entity and may find a solution to improve its troubled condition and prevent failure on its own at any time before the P&A transaction is completed. The FDIC first invites all known qualified and interested potential bidders prior to an auction[3]. After signing confidentiality agreements, bidding banks receive copies of the information package, which contains details on the failing institution, the legal documents, the due diligence process and the bidding procedures. Bidding banks submit their (sealed) bids to the FDIC once they have completed their due diligence 6-15 days prior to the scheduled closing. In the absence

[1] The FDIC has also used the 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.

[2] Klemperer (1999) provides a detailed non-technical survey of auction theory.

[3] Insured depository institutions contact the FDIC to express interest in acquiring financial institutions and indicate the size range of institutions and geographic area(s) that interests them. The list of potential bidders is reviewed by the financial regulatory authorities concerned, including the Office of the Comptroller of the Currency, the Federal Reserve Board, the Office of Thrift Supervision, and the appropriate state banking authority.

of any extenuating circumstances, the FDIC will award the failed bank to the highest bidder if the total amount of the FDIC's expected expenditures is the least costly to the deposit insurance fund of all possible methods for resolving the failed institution[4].

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). The press release, however, does not contain information related to the auction procedure (e.g. non-winning bidders' names and their bids). A Bid Summary that contains publicly releasable bid information in accordance with the FDIC's Bid Disclosure Policy is subsequently made public by the FDIC at least 10 working days after the closure of the bank[5]. The winning bidder reopens the bank usually by the next business day, and the customers of the failed institution automatically become customers of the assuming institution with access to their insured funds.

Several economic arguments suggest that outcomes of the FDIC failed bank auctions create negative externalities for non-winning bidders. First of all, the process of selling a failed bank to other banks by the FDIC establishes vertical contractual relationships between a monopolistic dealer (i.e. the FDIC as the only agency that markets failed banks in the USA) selling inputs (e.g. the failed bank's deposits/customer base) and several downstream heterogeneous competing buyers (i.e. bidding banks in a P&A transaction)[6]. As pointed out in Jehiel et al. (1996), the result of such a sale may affect the nature of the ensuing interaction between auction participants. In this study, after the announcement of the P&A transaction, the ownership of the failed bank is transferred to the winning bidder, which subsequently may change the competitive conditions within a geographic market. For example, the winning bidder may be a new entrant in the market and able to establish their market presence rapidly by acquiring the existing customer base of the failed bank. This may pose a potential threat to the incumbent players in the market. Moreover, as James and Wier (1987) demonstrate,

[4] The FDIC Act (Title 12 USA 1823 Section 13) directs the agency to weigh the benefits to the insurance fund of selecting a particular bidder against possible anticompetitive effects or adverse effects on the soundness of the banking system.

[5] There is no official guideline when the Bid Summaries need to be made public by the FDIC.

[6] Katz (1989) offers a survey of vertical contractual relations.

positive cumulative abnormal returns to winning bidders in the FDIC auction procedures suggest wealth transfers from the FDIC to the acquiring banks, which in turn give these banks a competitive advantage and affect expected profits in future interaction with unsuccessful bidders. The negative externality hypothesis in our study, therefore, implies that non-winning bidders experience negative externalities in the FDIC failed bank auctions. Negative cumulative abnormal returns to unsuccessful bidders' stock as well as positive (or non-negative) cumulative abnormal returns to winning bidders when auction results are announced are therefore consistent with the hypothesis.

Despite these arguments that support the negative externality hypothesis, we also acknowledge an alternative hypothesis that may predict positive shareholder wealth effects for non-winning bidders. The point of departure for this view is that the winner of a sealed-bid auction may suffer from 'winner's curse' by failing to estimate the true value of the auctioned object and paying more for the object than its true worth (Roll, 1986; Varaiya, 1988). As a result, negative cumulative abnormal returns accrue to the winning banks, which are also negatively associated with the level of the competition of the auction (indicated by the number of bidders). The winning banks' competitors (e.g. other unsuccessful bidders in the auction), as a result, may experience positive externalities. The literature, nevertheless, tends to only test 'winner's curse' hypothesis and overlook the possible positive externality effects P&A transactions generate. While the majority of the studies apply event study methodology and find positive and significant cumulative abnormal returns to winning bidders, which is inconsistent with the 'winner's curse' hypothesis (e.g. Cochran et al., 1995; Zhang, 1997 etc.), Giliberto and Varaiya (1989) examine the value of bids using a sample of 322 FDIC auctions during the period 1965-1985 and find that winning bids as well as bid levels of all bidders tend to increase with increased competition, which may suggest bidders' failing to adjust for the 'winner's curse'[7].

Further, beyond developing an understanding of what externality effects non-winning bidders may experience, it seems necessary and relevant from a policy perspective to

[7] The inconsistent findings may be due to different sampling approaches. Ciliberto and Varaiya (1989) examine a relatively longer period and include both publicly listed and non-listed acquiring banks.

investigate what explains the magnitude of externality effects as such analysis enables regulators to better anticipate how the bidders are likely to respond to the bidding outcomes. First, the negative externality hypothesis states that when bidders do not obtain the object of the auction, they are no longer indifferent about the identity of the winner of the auction (Jehiel et al., 1996). Therefore, bank-specific characteristics that indicate a winning bidder's market competitive position (such as its size, market share etc.) may be significantly related to non-winning bidders' negative cumulative abnormal returns. On the other hand, if the overall externality effects are positive for non-winning bidders due to 'winner's curse', the relationship between the cumulative abnormal returns to each non-winning bank and the level of bidding competition indicated by the number of bidders should remain positive (James and Wier, 1987).

3. Data Description and Empirical Methodology

3.1 Data Description

To examine the FDIC P&A auctions' external effects, data on insured commercial bank failures are obtained from the FDIC. There are 492 bank failures in the acquired data during the period 2007-2013. Out of the initial sample, we eliminate twenty six cases which are labeled as no acquirer (i.e. all deposit payoff transactions are excluded). We then retain the P&A transactions where at least winner or one non-winning bidding bank is publically listed. Our final sample consists of 206 P&A transactions taking place from September 2007 to December 2013. Note that data on bidders who are invited to participate in the auctions but who decline to bid are unavailable[8]. Also, since bidders are allowed to submit more than one bid in FDIC auctions, we only count the number of the winners/non-winning bidders to avoid double counting. In total, 77 (79) publically listed banks submit 176 (333) non-repeating winning (non-winning) bids in these 206 auctions. Stock market data for publically listed banks from September 2006 to December 2013 are collected from DataStream to calculate cumulative abnormal returns around the P&A announcements. Data on bank characteristics are derived

[8] Jehiel and Moldovanu (1996) find that the best strategy of some agents is simply not to participate in the auction, although they cannot in this way avoid the negative external effects.

from both Call Reports of the Federal Financial Institutions Examination Council (FFIEC) and the FDIC's Summary of Deposits (SOD) database.

Table 1 and 2 provide a summary of the number of failed banks, (publicly listed) winners and non-winning bidders in each state and year in the FDIC P&A auctions. The tables show that more than half of the P&A transactions involve failed banks in Georgia, Florida, California and Illinois while around 30% of all bidding banks are headquartered in these four states. Also the number of the failed banks increases significantly between 2009 and 2011.

[Insert Table 1 here]

[Insert Table 2 here]

3.2 Empirical Methodology

We first compute the cumulative abnormal returns (CAR) to the winning as well as non-winning bidding banks to capture any externality effects associated with bidding outcomes. We estimate the expected returns using the Fama-French (1993) three-factor model, augmented by the momentum factor as suggested by Carhart (1997). The model is:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + s_j SMB_t + h_j HML_t + u_j UMD_t + \epsilon_{jt} \quad [1]$$

where R_{jt} is the rate of return of the common stock of the j^{th} bank on day t; R_{mt} is the rate of return of daily equal-weighted CRSP index on day t [9]; SMB_t is the average return of small market-capitalization portfolios minus the average return on three large market-capitalization

[9] As noted in Jones et al. (2012), an equal-weighted market index is preferred over a value-weighted index as the banking industry has become an increasingly larger part of the market index in recent years.

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; 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.

We estimate the abnormal returns (AR) for the common stock of the j^{th} bank on day t as:

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

[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.

Consistent with previous work (e.g. Bruno et al., 2015), we estimate a separate estimate window of 250 trading days [-269, -20] for the Fama-French-Momentum four-factor model. We then compute the corresponding cumulative abnormal returns (CAR) for the five-day event window [0, 4]. A standard cross-sectional standard deviation t-test is applied to test the significance of the CAR (see Brown and Warner, 1985).

$$CAR_{jt} = \sum_{t=t1}^{t2} AR_{jt}$$

[3]

The event window is defined by the announcement date plus 4 trading days after the announcement since it can be reasonably assumed that the market cannot make an *ex ante*

prediction about the bidding outcomes owing to the FDIC's strict confidentiality policy agreed by all FDIC approved bidders[10]. When a bidding bank submits more than one bid in different FDIC auctions on the same date, all on a Friday in our sample, its cumulative abnormal returns estimated for this event window are evenly distributed across various announcements. It is worth noting that using a 5-day event window in this study avoids the possibility of overlapping event windows since some frequent bidders participate in consecutive Fridays.

For the second stage of our analysis, we run regressions of the CAR on a vector of bank-level and deal-specific characteristics to examine the determinants of the externalities captured by non-winning banks' cumulative abnormal returns:

$$CAR_{jt} = \alpha_j + \beta_j WINNER_{jt} + \gamma_j BIDDER_{jt} + \delta_j TARGET_{jt} + \theta_j BID_{jt} + \varepsilon_{jt} \quad [4]$$

where CAR_{jt} is a non-winning bidder's cumulative abnormal returns around the P&A announcements; $WINNER_{jt}$ is a vector of variables that captures different aspects of a winner's characteristics that may be relevant to other bidders in a failed bank auction. We use three indicators to represent $WINNER_{jt}$ interchangeably in the estimations. First of all, different sizes of banks may affect market competitive conditions differently (Berger et al., 2004). The size of the winner in relation to the non-winning bidder is therefore included in our model as a relatively larger winner may be more likely to change the competitive conditions of the market. *RSIZE* is the ratio of the winning bank's total deposits divided by the non-winning bidder's deposit size in the year preceding the auction ranges. Second, *WINFOC* attempts to capture the winning bank's market focus. Since the FDIC permits out-of-state banks bidding for failed banks, we use the ratio of the amount of deposits the winning bank holds in the state where the failed bank is chartered to its total deposits in the year prior to the P&A transaction. This variable measures the extent to which the winning bank is focused on the failed bank's

[10] This assumption is testable by examining whether significant CAR can be observed prior to the announcements, for example within an event window [-4,-1] of four working days before the announcement date.

home market or in other words whether it is relatively an incumbent bank or new entrant[11]. *WINMS*, on the other hand, measures the winner's market share prior to the auction, which is its deposit market share in percentage terms in the state where the failed bank is based.

$BIDDER_{jt}$ is a vector of variables that indicates the non-winning bidder's own market position in the failed bank's home market. Jehiel et al. (1999) broaden the assumption of the model developed in Jehiel et al. (1996) which states that negative externalities do not depend on the 'sufferer's' identity. This relaxation of the assumption homes in on the fact that a non-winning bank may suffer from negative externalities if the market is vital to the bank and its identity in the market, therefore, needs to be controlled for. We use *BIDFOC* and *BIDMS* as representations of $BIDDER_{jt}$ interchangeably in the estimations. *BIDFOC* is defined as non-winning bidder's volume of deposits in the state where the failed bank is headquartered to its total deposits in the year prior to the auction. *BIDMS* indicates the non-winning bank's market share of the total deposits in the failed bank's market. We also control for the failed bank's size. *TARSIZE* is the logarithm of the target bank's total deposits in an FDIC auction which indicates the size of the customer base the winning bank acquires and the size of the transaction to some extent. The variable *BID* controls for the level of bidding competition, which may induce 'winner's curse' effects for the winners and explain potential positive CAR to unsuccessful bidders. *BID* is the number of bidders submitting bids in an auction (in logarithms) that captures the interest the auction generates[12]. Table 3 presents summary statistics of key variables in *Equation [4]*. It shows that winning banks tend to be larger than non-winning banks and are more committed in the failed banks' home markets prior to the auctions.

[Insert Table 3 here]

[11] Out of total 198 P&A transactions in our sample, 85 failed banks were acquired by a bank that is chartered in a different state.

[12] Note that the number of bidders submitting bids may not necessarily be the same as the total number of bidders as bidders may participate in the auctions but do not submit bids, the date on which, nevertheless, is not available.

4. Results

Table 4 illustrates the FDIC auction externality effects captured by winning and non-winning banks' CAR (expressed as percentages) around the P&A auction announcements over the entire sample period and various sub-periods. Across all events, the average CAR to winning bidders is 3.76%, which is significantly positive at the 1% level. This result is consistent with previous findings in the literature (e.g. James and Wier, 1987; Cochran et al., 1995; Zhang, 1997; Cowan and Salotti, 2015) and does not support 'winner's curse' hypothesis. Unsuccessful bidders, on the other hand, experience a five-day mean CAR of -0.75%, which is significantly different from zero at the 5% level[13]. The magnitudes of externalities vary with time. Generally, auction externalities seem to be primarily driven by the beginning and end of the sample period. Overall, the results suggest that the announcements of the FDIC P&A outcomes generate negative externalities for unsuccessful bidders.

[Insert Table 4 here]

Having shown that the FDIC auctions create negative externalities, we now examine what the determinants of these externality effects are. The results reported are all winsorized using 1% and 99% levels of the CAR at each auction announcement. Table 5 reports our regression results for the whole sample. A significant and positive coefficient on *WINFOC* indicates that unsuccessful bidders experience negative externalities when winning bidders enter a relatively new market by acquiring the failed banks. A significantly negative coefficient on *BIDFOC* in contrary suggests that there is a higher level of negative externality effects if the winners enter the key markets of the unsuccessful bidders. The independent variable TARSIZE is also consistently significant in all regression estimations, which shows that non-winning banks suffer more auction externalities if the target banks are larger. The variable that measures the

[13] We also estimate the CAR for winning and non-winning banks within an event window that is prior to the announcement date (i.e. [-4,-1]). On average, the mean CAR is 0.02 and 0.062 percent respectively and both statistically indifferent from zero. These results, therefore, suggest that market cannot make an *ex ante* prediction about the bidding results and the choice of the event window in this study is appropriate.

level of bidding competition - BID, however, remains insignificant in all estimations, which again shows no support for the positive externality hypothesis.

[Insert Table 5 here]

To further explore our dataset, we first split our sample into two sub-samples based on how frequently unsuccessful bidders participate in the FDIC auctions. The underlying reason why we choose this approach is that a frequent non-winning bidder may react differently to the 'bad' news that the failed bank is acquired by another bidder compared to infrequent non-winning bidders. If a bidder takes part in the FDIC auctions frequently (within the medium term), it may be relatively more aggressive in terms of expanding its market share. Therefore, this bidder may be less sensitive to certain failures of acquiring the targets, which therefore may not generate significant negative externalities since it can potentially bid for other targets again to make up its losses. It may also be possible that, on the other hand, an infrequent non-winning bidder participates in the auctions because it anticipates that some of its competitors will also bid for a specific failed bank. Therefore, infrequently non-winning bidders may be more sensitive to the undesirable auction outcomes and experience more significant negative externalities. On average, non-winning bidders submit four bids in various failed bank auctions between 2007 and 2003 in our sample. We therefore split our sample into one subsample that includes transactions that involve frequent non-winning bidders, who bid more than four times in total; and a second subsample that includes infrequent non-winning bidders, who bid no more than four times. Table 6 and 7 report the regression results for two subsamples – frequent non-winning bidders and infrequent non-winning bidders respectively. While the results remain consistent overall, it can be observed that failed bank auctions generate more significant negative externalities when infrequent non-winning bidders are involved. All three variables that indicate the winners' competitive position *RSIZE, WINMS* as well as *WINFOC* are significant in all regression estimations. More specifically, these results further demonstrate that infrequent non-winning bidders experience more negative externalities when the winners are relatively larger and have larger national market share (beyond targets' home markets). As far as the frequent unsuccessful bidders are concerned, the negative externality effects are

greater when the winning bidders have a relatively smaller market share in targets' home markets.

[Insert Table 6 here]

[Insert Table 7 here]

Furthermore, we divide the sample on the basis of whether the winning bidders win more frequently in the FDIC auctions or not as the non-winning bidders may react differently in each case to the auction outcomes. While a frequent winning bidder may adopt a more aggressive but less focused business expansion strategy, an infrequent winning bidder may tend to have a better identified target bank and be more determined to acquire it to gain competitive advantage. As a result, the identities of infrequent winning bidder may be more relevant to other non-winning bidders. In our sample, a winning bidder on average wins 2 different failed banks in the auctions. Therefore, the first subsample includes transactions that involve frequent winning bidders only, who win more than twice between 2007 and 2013; and the second subsample includes the infrequent winning bidders, who don't win more than twice. Table 8 and 9 show the estimation results of *Equation [4]* for the two subsamples respectively. The results generally suggest that non-winning bidders suffer from more substantial negative externalities if the winning bidders do not win often in the FDIC auctions, more specifically when the infrequent winning bidders are relatively new entrants in the target market. It is also worth noting that Table 9 shows a negative and consistently significant relation between non-winning banks' CAR and the number of participants submitting bids in an auction. This suggests that auctions involving infrequent winning bidders tend to generate greater interest and more negative externalities.

[Insert Table 8 here]

[Insert Table 9 here]

To test the robustness of our estimation, we conduct a 1-tail bootstrap of our (cross-sectional standard deviation) t-test based on 1000 replications of the randomly chosen actual 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 1% level, which suggests that our results are unlikely to be driven by pure fluke or data mining.

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 if a specific bank submits more than one bid in different FDIC auctions on the same date; or if the same bidder participates in consecutive Fridays; or if a bidder makes a public announcement or experiences an event within the event window that may also affect share prices[14]. We then replicate our event study and regressions from Table 5, the results remain unchanged. In addition, we reduce the length of our event window to two days [0, 1] and four days [0, 3] to reduce any potential confounding effects. The findings again remain consistent[15].

5. 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. This paper examines to what extent non-winning bidding banks experience negative externalities generated by the auction outcomes and what explains these externality effects.

[14] We follow Bruno et al. (2015) and screen these announcements and events via Lexix/Nexix.

[15] To preserve space, the results are not reported and available upon request.

We first compute the cumulative abnormal returns of the bidding banks to capture the externality effects associated with bidding outcomes. In total, we identify 206 P&A transactions taking place from September 2007 to December 2013. We find that non-winning banks record a significantly negative CAR around the auction outcome announcements while there are significantly positive CAR to the winning bidders.

We then use a multivariate regression model to test the determinants of negative externalities. The results show that non-winning banks experience significant and negative externalities when winning bidders enter a relatively new market by acquiring the failed banks. A number of further tests show consistent results and also suggest that negative externalities are more significant when infrequent non-winning and winning bidders are involved in the P&A transactions.

Our study contributes to the literature in two important ways. First, as far as we are aware, we are the first to test the existence of negative externalities in auctions using market data. Moreover, we extend and update the literature on the FDIC failed bank auctions by examining non-winning bidding banks during the recent financial crisis.

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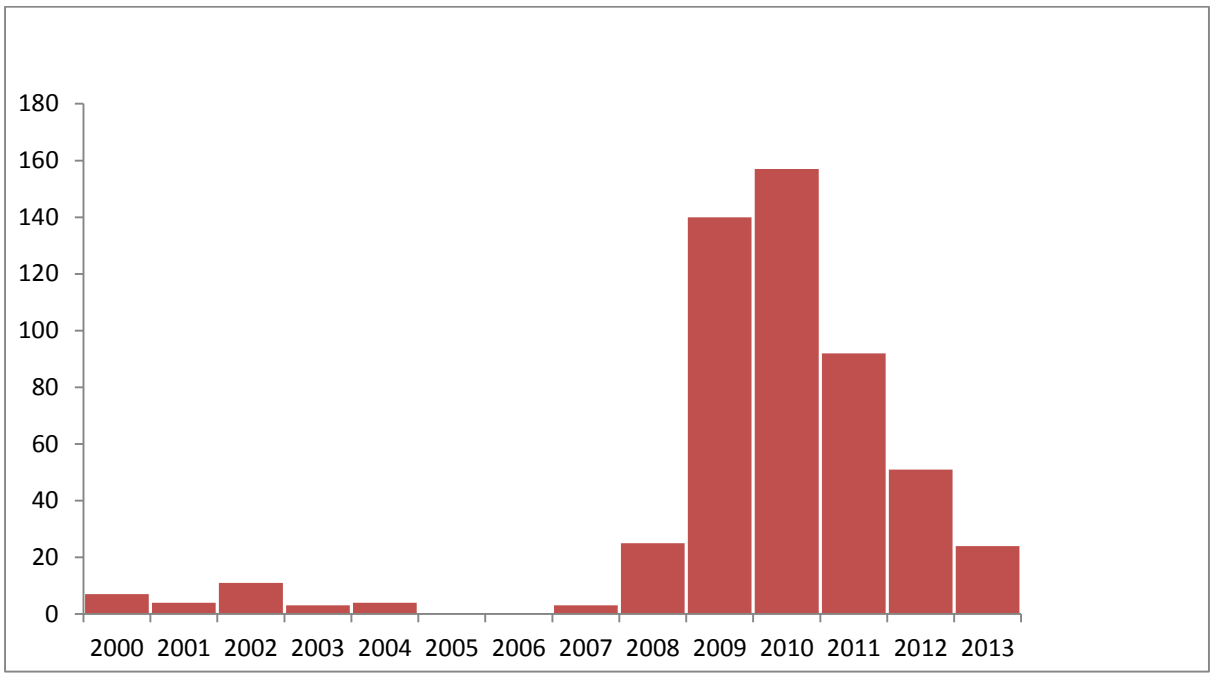
Figure 1: Number of Failed Banks and Savings and Loan Institutions 2000-2013



Data source: FDIC, 2014

Table 1: FDIC Purchase and Assumption (P&A) Transactions in States, 2007-2013

State	Targets	Winners	Non-winners
Alabama		1	
Arkansas	1	3	3
Arizona	5		
California	27	10	9
Delaware		1	2
Florida	30	2	4
Georgia	32	8	6
Iowa	2		1
Idaho	1		
Illinois	18	4	4
Indiana	3	3	4
Kansas	4		
Kentucky	2	1	2
Louisiana	3	2	1
Maryland	1		
Michigan	2	1	1
Minnesota	3	3	1
Missouri	7	2	5
Mississippi		2	2
North Carolina	8	4	5
Nebraska	2		
New Jersey	2	2	2
New Mexico	3		1
Nevada	2	1	2
New York	3	4	2
Ohio	5	6	5
Oklahoma	3	1	
Oregon	2	1	2
Pennsylvania	2	2	2
Puerto Rico	2	2	2
South Carolina	6	1	2
South Dakota			1
Tennessee	4	1	1
Texas	7	2	3
Utah			1
Virginia	3	4	
Washington	9	3	3
Wisconsin	1		
Wyoming	1		
In Total	206	77	79

Table 2: FDIC Purchase and Assumption (P&A) Transactions, 2007-2013

Year	Targets	Winner's bids	Non-winners' bids
2007	1	1	3
2008	12	12	15
2009	53	51	60
2010	56	54	93
2011	41	34	84
2012	31	19	57
2013	12	5	21
In Total	206	176	333

Table 3: Summary Statistics

This table reports the summary statistics for data used in our regressions. Data on winners, non-winners and failed banks' deposits are from the FDIC's Summary of Deposits (SOD) database. Winner's (non-winning bidder's) business focus in target-state shows the percentage of the amount of the deposits the winning (non-winning) bank holds in the state where the failed bank is chartered to its total deposits in the year prior to the purchase and assumption transaction. Winner's (non-winning bidder's) market share in target-state is its deposit market share in percentage in the state where the failed bank is based. Data on total bidders, which is the total number of bidders submitting bids in the auction, are from the FDIC.

	Mean	Std. Dev.	Min.	Max.	Observations
Winner's total deposits US$ Mil.	17788.122	41024.254	16.246	198407.561	333
Winner's Business Focus in target-state %	53.6021	45.5734	0	100	333
Winner's market share in target-state %	0.9130	2.3740	0	27.4	333
Non-winning bidder's total deposits US$ Mil.	7992.943	20345.953	268.174	151902.585	333
Non-winning bidder's Business focus in target-state %	37.1379	41.2765	0	100	333
Non-winning bidder's market share in target-state %	0.7721	2.0227	0	27.4	333
Failed bank's total deposits US$ Mil.	778.1225	1606.906	26.617	12300	333
Total Bidders	4.2985	1.6196	2	10	333

Table 4: Failed Bank Auction Externalities, 2007-2013

This table summarizes the externalities of the FDIC purchase and assumption auctions between 2007 and 2013. The return generating model used to compute abnormal returns utilizes the 3-factor Fama-French (1992) model with an additional factor for price momentum for each winning and non-winning bidder in the sample and subsamples. The equal-weighted CRSP index is used as the market proxy. The event window is 5 trading days [0, +4] around the auction outcome announcement date. The cumulative abnormal returns (CAR) for the winning and non-winning bank are computed as the sum of the daily abnormal returns over the 5-day event window and presented in Panel A and B respectively. ***, **,* denotes statistical significance at the 1%, 5% and 10% levels respectively based on a cross-sectional standard deviation *t-test* (see Brown and Warner, 1985) for differences in means and a Wilcoxon test for differences in medians.

Panel A

	Winner's bids	CAR [0,+4]		
		Mean	Median	Standard deviation
Total sample	176	3.76%***	1.84%***	8.96
September 2007-December 2009	64	6.78%***	4.09%***	12.83
January 2010-December 2010	54	1.47%**	1.43%**	5.52
January 2011-December 2013	58	2.55%***	1.77%***	4.41

Panel B

	Non-winner's bids	CAR [0,+4]		
		Mean	Median	Standard deviation
Total sample	333	-0.75%**	-0.11%**	6.11
September 2007-December 2009	81	-2.28%**	-1.30%**	8.42
January 2010-December 2010	92	-0.36%	0.58%	7.27
January 2011-December 2011	81	0.16%	0.47%	3.86
January 2012-December 2013	79	-0.73%*	-1.10%*	3.33

Table 5: Determinants of Failed Bank Auction Externalities

This table examines what determines the magnitude of failed bank auction externality effects using ordinary least square (OLS) regressions of non-winning bank cumulative abnormal return surrounding auction outcome announcements between 2007 and 2013. RSIZE is the ratio of the winning bank's deposits divided by the non-winning bidder's deposit size in the year preceding the auction. WINFOC (BIDFOC) is a ratio of the amount of the deposits the winning (non-winning) bank holds in the state where the failed bank is chartered to its total deposits in the year prior to the P&A transaction. WINMS (BIDMS) measures the winner (non-winner)'s market power prior to the auction, which is its deposit market share in percentage in the state where the failed bank is based. TARSIZE is the logarithms of failed bank's total deposits in a FDIC auction. BID controls for the total number of bidders submitting bids in an auction (in logarithms). T-statistics are reported in parentheses. ***, **,* denotes statistical significance at the 1%, 5% and 10% levels respectively.

Independent variables						
RSIZE	-0.0001	-0.0001				
	(-0.43)	(-0.62)				
WINFOC			0.0120**	0.0104*		
			(2.03)	(1.76)		
WINMS					-0.0013	-0.0013
					(-1.19)	(-1.15)
BIDFOC	-0.0137**		-0.0155**		-0.0139**	
	(-2.16)		(-2.44)		(-2.20)	
BIDMS		-0.0006		-0.0006		-0.0004
		(-0.44)		(-0.50)		(-0.29)
TARSIZE	-0.0068***	-0.0064***	-0.0057**	-0.0054**	-0.0061***	-0.0059**
	(-3.01)	(-2.75)	(-2.46)	(-2.26)	(-2.65)	(-2.47)
BID	-0.0080	-0.0071	-0.0072	-0.0064	-0.0083	-0.0075
	(-1.16)	(-1.02)	(-1.04)	(-0.92)	(-1.20)	(-1.08)
Constant	0.0959***	0.0853***	0.0744**	0.0657*	0.0892***	0.0797**
	(3.03)	(2.65)	(2.24)	(1.93)	(2.77)	(2.44)
R-square	0.0428	0.0294	0.0544	0.0375	0.0464	0.0326
No. of observations	325	325	325	325	325	325

Table 6: Determinants of Failed Bank Auction Externalities –Subsample: Frequent Non-winning Bidders

This table examines what determines the magnitude of failed bank auction externality effects using ordinary least square (OLS) regressions of frequent non-winning bank cumulative abnormal return surrounding auction outcome announcements. The subsample under study includes transactions that involve frequent non-winning bidders only, which bid more than four times between 2007 and 2013. RSIZE is the ratio of the winning bank's deposits divided by the non-winning bidder's deposit size in the year preceding the auction. WINFOC (BIDFOC) is a ratio of the amount of the deposits the winning (non-winning) bank holds in the state where the failed bank is chartered to its total deposits in the year prior to the P&A transaction. WINMS (BIDMS) measures the winner (non-winner)'s market power prior to the auction, which is its deposit market share in percentage in the state where the failed bank is based. TARSIZE is the logarithms of failed bank's total deposits in a FDIC auction. BID controls for the total number of bidders submitting bids in an auction (in logarithms). T-statistics are reported in parentheses. ***, **,* denotes statistical significance at the 1%, 5% and 10% levels respectively.

Independent variables						
RSIZE	0.0001	0.0001				
	(0.62)	(0.21)				
WINFOC			0.0071	0.0062		
			(1.29)	(1.12)		
WINMS					0.0032**	0.0034***
					(2.52)	(2.60)
BIDFOC	-0.0138**		-0.0136**		-0.0116*	
	(-2.11)		(-2.09)		(-1.80)	
BIDMS		-0.0036		-0.0035		-0.0032
		(-1.48)		(-1.44)		(-1.32)
TARSIZE	-0.0033	-0.0024	-0.0025	-0.0017	-0.0041*	-0.0034
	(-1.50)	(-1.08)	(-1.09)	(-0.75)	(-1.89)	(-1.54)
BID	-0.0068	-0.0061	-0.0056	-0.0052	-0.0073	-0.0069
	(-1.06)	(-0.94)	(-0.88)	(-0.80)	(-1.15)	(-1.08)
Constant	0.0478	0.0335	0.0323	0.0204	0.0562*	0.0445
	(1.56)	(1.10)	(0.99)	(0.62)	(1.85)	(1.46)
R-square	0.0302	0.0205	0.0358	0.0258	0.0557	0.0493
No. of observations	226	226	226	226	226	226

Table 7: Determinants of Failed Bank Auction Externalities – Subsample: Infrequent Non-winning Bidders

This table examines what determines the magnitude of failed bank auction externality effects using ordinary least square (OLS) regressions of infrequent non-winning bank cumulative abnormal return surrounding auction outcome announcements. The subsample under study includes transactions that involve infrequent non-winning bidders only, which bid no more than four times between 2007 and 2013. RSIZE is the ratio of the winning bank's deposits divided by the non-winning bidder's deposit size in the year preceding the auction. WINFOC (BIDFOC) is a ratio of the amount of the deposits the winning (non-winning) bank holds in the state where the failed bank is chartered to its total deposits in the year prior to the P&A transaction. WINMS (BIDMS) measures the winner (non-winner)'s market power prior to the auction, which is its deposit market share in percentage in the state where the failed bank is based. TARSIZE is the logarithms of failed bank's total deposits in a FDIC auction. BID controls for the total number of bidders submitting bids in an auction (in logarithms). T-statistics are reported in parentheses. **,* denotes statistical significance at the 5% and 10% levels respectively.

Independent variables						
RSIZE	-0.0013*	-0.0011				
	(-1.75)	(-1.57)				
WINFOC			0.0270*	0.0198		
			(1.80)	(1.35)		
WINMS					-0.0045**	-0.0048**
					(-2.19)	(-2.30)
BIDFOC	-0.0196		-0.0247		-0.0153	
	(-1.33)		(-1.62)		(-1.05)	
BIDMS		0.0004		0.0004		0.0014
		(0.20)		(0.20)		(0.65)
TARSIZE	-0.0122**	-0.0129**	-0.0111**	-0.0123**	-0.0092*	-0.0102*
	(-2.36)	(-2.34)	(-2.12)	(-2.19)	(-1.70)	(-1.82)
BID	-0.0061	-0.0050	-0.0101	-0.0084	-0.0129	-0.0124
	(-0.36)	(-0.29)	(-0.60)	(-0.49)	(-0.77)	(-0.74)
Constant	0.1735**	0.1688**	0.1487*	0.1510*	0.1425*	0.1449*
	(2.38)	(2.22)	(1.97)	(1.89)	(1.91)	(1.90)
R-square	0.1066	0.0901	0.1085	0.084	0.1224	0.1160
No. of observations	99	99	99	99	99	99

Table 8: Determinants of Failed Bank Auction Externalities – Subsample: Frequent Winning Bidders

This table examines what determines the magnitude of failed bank auction externality effects using ordinary least square (OLS) regressions of non-winning bank cumulative abnormal return surrounding auction outcome announcements. The subsample under study includes transactions that involve frequent winning bidders only, which win more than twice between 2007 and 2013. RSIZE is the ratio of the winning bank's deposits divided by the non-winning bidder's deposit size in the year preceding the auction. WINFOC (BIDFOC) is a ratio of the amount of the deposits the winning (non-winning) bank holds in the state where the failed bank is chartered to its total deposits in the year prior to the P&A transaction. WINMS (BIDMS) measures the winner (non-winner)'s market power prior to the auction, which is its deposit market share in percentage in the state where the failed bank is based. TARSIZE is the logarithms of failed bank's total deposits in a FDIC auction. BID controls for the total number of bidders submitting bids in an auction (in logarithms). T-statistics are reported in parentheses. ***, **, * denotes statistical significance at the 1%, 5% and 1% levels respectively.

Independent variables						
RSIZE	-0.0001	-0.0001				
	(-0.43)	(-0.80)				
WINFOC			0.0056	0.0033		
			(0.69)	(0.39)		
WINMS					0.0006	0.0013
					(0.25)	(0.53)
BIDFOC	-0.0235**		-0.0244***		-0.0239***	
	(-2.60)		(-2.72)		(-2.67)	
BIDMS		-0.0024)		-0.0022		-0.0027
		(-0.92		(-0.84)		(-0.98)
TARSIZE	-0.0088***	-0.0078**	-0.0082**	-0.0074**	-0.0089***	-0.0079**
	(-2.61)	(-2.24)	(-2.30)	(-2.04)	(-2.62)	(-2.26)
BID	0.0074	0.0074	0.0075	0.0068	0.0071	0.0070
	(0.80)	(0.78)	(0.81)	(0.71)	(0.77)	(0.73)
Constant	0.1042**	0.0845*	0.0926*	0.0777	0.1044**	0.0840*
	(2.28)	(1.82)	(1.90)	(1.56)	(2.29)	(1.80)
R-square	0.0988	0.0559	0.1009	0.0522	0.0979	0.0531
No. of observations	128	128	128	128	128	128

Table 9: Determinants of Failed Bank Auction Externalities – Subsample: Infrequent Winning Bidders

This table examines what determines the magnitude of failed bank auction externality effects using ordinary least square (OLS) regressions of non-winning bank cumulative abnormal return surrounding auction outcome announcements. The subsample under study includes transactions that involve infrequent winning bidders only, which win no more than twice between 2007 and 2013. RSIZE is the ratio of the winning bank's deposits divided by the non-winning bidder's deposit size in the year preceding the auction. WINFOC (BIDFOC) is a ratio of the amount of the deposits the winning (non-winning) bank holds in the state where the failed bank is chartered to its total deposits in the year prior to the P&A transaction. WINMS (BIDMS) measures the winner (non-winner)'s market power prior to the auction, which is its deposit market share in percentage in the state where the failed bank is based. TARSIZE is the logarithms of failed bank's total deposits in a FDIC auction. BID controls for the total number of bidders submitting bids in an auction (in logarithms). T-statistics are reported in parentheses. **, * denotes statistical significance at the 5% and 10% levels respectively.

Independent variables						
RSIZE	-0.0003	-0.0003				
	(-0.36)	(-0.39)				
WINFOC			0.0165**	0.0150*		
			(1.96)	(1.79)		
WINMS					-0.0018	-0.0018
					(-1.35)	(-1.35)
BIDFOC	-0.0097		-0.0121		-0.0096	
	(-1.11)		(-1.39)		(-1.11)	
BIDMS		-0.0003		-0.0005		-0.0002
		(-0.22)		(-0.32)		(-0.12)
TARSIZE	-0.0063**	-0.0061*	-0.0051*	-0.0049	-0.0052*	-0.0050
	(-2.10)	(-1.94)	(-1.68)	(-1.55)	(-1.65)	(-1.56)
BID	-0.0176*	-0.0163*	-0.0165*	-0.0151	-0.0172*	-0.0160
	(-1.78)	(-1.66)	(-1.69)	(-1.55)	(-1.76)	(-1.64)
Constant	0.1022**	0.0942**	0.0755*	0.0679	0.0884**	0.0815*
	(2.35)	(2.12)	(1.67)	(1.46)	(1.98)	(1.80)
R-square	0.0389	0.0329	0.0571	0.0481	0.0473	0.0412
No. of observations	197	197	197	197	197	197