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Crisis and non-crisis short selling and bank enforcement actions

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ABSTRACT

Employing standard informed trading intuition, we develop testable hypotheses regarding short selling before and after bank enforcement action (EA) initiations. For U.S.-listed bank firm data for 2007 to 2012, we find strong support for differentiated short seller activity and skill in crisis versus non-crisis periods. In financial crises, short sellers predominantly position prior to EAs. The EA initiations then act as information-homogenizing and profit-taking events reducing incentives to remain positioned. In contrast, EAs in non-crisis periods appear to serve as wake-up calls that attract additional short selling. Our findings offer potentially important insights for regulators considering short sellers' reactions to EA announcements in general, during financial crises, and when not experiencing a broad financial crisis.

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1. Introduction

Enforcement actions (EAs) initiated by bank regulators can remain in effect for years. The most serious actions can restrict a bank's growth, halt shareholder distributions, and mandate capital raises. Some banks fail while operating under an EA. A regulator's public disclosure of EA initiation informs not only the bank's depositors but also its equity investors. Our research investigates whether short sellers establish positions in anticipation of EA initiations, and whether those positions are modified in response to the initiations. Additionally, during financial crises, bank firm short selling may be elevated, even in firms never receiving an EA. Accordingly, we are particularly interested in analyzing the nature of period-specific EA-related short selling.

Prior theoretical considerations of information acquisition and related trading asymmetries motivate our framework for hypotheses development.¹ Conceptually, the potential for informed-trading profits incentivizes short sellers to undertake costly investments to acquire and process value-relevant information. For banking firms, short sellers' investments could include the legal acquisition of call report data, proposed changes in regulation of the industry,

and regional economic data as well as its time-consuming processing, analysis, and synthesis.² Our monthly aggregate short interest observations do not permit us to address the microstructural and broader welfare impacts of short seller positioning and adjustments around the time of EAs. They do, however, allow us to document predictable patterns likely of interest to banks, their investors and regulators, and to future researchers who have access to transaction-level data.

A banking regulator's EA initiation typically follows months of deliberations informed not only by public call report information and financial filings, but also by non-public information obtained from periodic on-site examinations and discussions with bank management. Accordingly, the months leading up to a regulator's ultimate decision to initiate an EA offer a potentially opportunistic time for short sellers to invest in information acquisition and its processing. In this vein, we expect short sellers to establish positions months prior to EA initiations and for the cross-sectional allocation of short positioning to reflect short seller skill. Data from our sample of 628 bank firms and 180 EAs initiated during 2007 to 2012 confirm these expectations. Driven heavily by exposure in firms that eventually delist (due to bank failure or inability to maintain exchange requirements), short selling is abnormally high during the 12 months leading up to an EA initiation. Additionally,

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¹ Grossman and Stiglitz (1980) provide the earliest equilibrium of this nature.

² We are not suggesting that such activities extend beyond that permitted by law. An assumption of illegal insider trading is not necessary to motivate our hypotheses.

and even more broadly, short seller allocation skill is evident. We document significant negative relationships in the cross-section of positions and subsequent returns.³

An EA announcement diminishes important informational asymmetry regarding the bank's distress and its position with bank regulators.⁴ We hypothesize that EA-related restrictions along with additional monitoring, higher public scrutiny, and likely diminished market capitalization limit future opportunities for short sellers to generate trading profits from additional investments in information asymmetry. Consistent with a hypothesis that after an initiation short sellers are more likely to shift resources to prospecting for opportunities in other bank firms, we find *on average* less short selling in firms operating with an EA than in comparable firms that never receive one. For *some* banks operating with an EA, however, profitable informed trading opportunities still exist. For such banks, short sellers likely have an incentive to maintain, or even increase, positioning in response to their ongoing information collection and analysis related to predicting extreme negative outcomes. About 40% (73) of the 180 EA firms in our sample appear to be likely candidates for sustained or increased short selling. These firms, while operating with an EA, ultimately delist when their bank(s) fail or when they are unable to maintain their U.S. exchange's minimum listing requirements (e.g., equity price of at least a dollar per share). Interestingly, however, delisting firms avoid EA-related profit taking's diminished positioning (on average) only when we restrict attention to firms having sufficiently high remaining post-announcement market cap. Even there, post-announcement positioning increases are insignificant. Overall, for our sample of 180 firms receiving an EA in 2007 to 2012, we find strong support for the hypothesis that EAs have a relevant information homogenization effect. In reducing short sellers' incentives to remain positioned, EAs serve as a significant opportunity for profit-taking. Still, subsequent to EAs, remaining abnormal short selling and subsequent returns generally perpetuate a skill-related negative relationship.

We next examine whether analyzing the 2007 to 2012 period overall masks differentiated short selling activity in crisis and non-crisis periods. During financial crises, more bank firms are likely to experience distress and extreme negative outcomes (e.g., bank failure and insolvency). We hypothesize that this creates more incentives for short sellers to identify and initiate short positions prior to EA initiations in a financial crisis than in a non-crisis period. It also creates greater incentives to take profits and reduce positions once an EA is initiated. The EAs' information homogenizing effect suggests that short sellers may be better off redeploying their human and financial capital towards prospecting for pre-EA firms. In contrast, in non-crisis times, we hypothesize that short sellers in general expend fewer resources analyzing banking firms. Rather than inducing profit-taking, EA initiations may then act as a wake-up call (i.e., impose a "fear of missing out"). If so, EAs may attract additional short sellers' financial and human capital (compared to similar firms not operating with an EA) to ferret out those firms that are over-valued and might experience extreme outcomes.

For our crisis versus non-crisis analyses, we define 2007 to 2009 as the crisis period and 2010 to 2012 as the non-crisis

³ Consistent with others (e.g., Karpoff and Lou, 2010), we proxy for short seller skill as a negative relationship between monthly short interest and subsequent month return.

⁴ As we discuss in the Internet Appendix, the regulator "announces" (publishes on its website) the initiation of the EA almost immediately. Given the periodicity of our monthly short interest data, we treat EA initiation and EA announcement as the same date and use EA initiation and EA announcement interchangeably throughout the paper.

period.⁵ Our results provide strong support for our hypotheses of crisis versus non-crisis differentiation in short selling behavior around EAs. Prior to EA initiations, short selling is abnormally high (low) in the crisis (non-crisis) period. Following EA initiations, short selling positions decrease during the crisis but increase in the non-crisis period. EA initiations incent divestment (profit-taking) during a crisis but incent investment (increased short positioning) during non-crisis times. We conclude that analyzing the 2007 to 2012 period as a whole without controlling for differentiation in the crisis and non-crisis periods, can lead to misleading inferences.

We also develop and test hypotheses of differentiated short selling skill in crisis versus non-crisis periods. Given our conceptual framework where informed-trading profits arise from prior costly investments in information and analysis, we maintain a focus on short sellers' skill in deriving profit from the expertise thereby acquired, i.e., cross-sectional allocation skill. For pre-EA positioning, we find robust evidence of short seller skill in both the crisis and non-crisis periods, but at a significantly attenuated level during a crisis. For positioning in firms operating with an EA that eventually survive the EA (i.e., do not fail or delist), we find evidence of significant cross-sectional allocation skill in the non-crisis period but much less in the crisis.

For non-crisis post-announcement *delister* positioning, however, in contrast to the usual skill-related negative relationship, we observe some incidence of positive (negatively skilled) relationships between positioning and subsequent return. Given the potential for inverted realized skill in non-crisis times, it need not follow that a crisis would be expected to result in even larger magnitudes for an inverted skill-related relationship. Indeed, our crisis post-announcement delister sample exhibits the usual negative relationship. The notable departure in non-crisis times coincides, likely not coincidentally, with the aforementioned influx of "awakened" additional post-announcement short seller positioning in non-crisis delisters. Some of that post-announcement positioning appears to be spectacularly wrongly allocated in the cross-section of delisters. Such a finding suggests that while post-announcement bank short sellers "awakened" by EAs in non-crisis times may benefit on average as prices decline on the road to delisting, a long-short hedge fund across non-crisis "known" delisters could invite spectacular failure.

Our findings have potential import for regulators concerned about differential reactions of short sellers to EA announcements in general, during financial crises, and when not experiencing a broad financial crisis. A growing literature concludes that short sellers are informed traders. During the financial crisis, short sellers detected firms with exposure to risky assets (Hasan et al., 2015), prior to write-downs (Liu et al., 2012), and earlier than accountants or analysts (Desai et al., 2016). Balasubramnian and Palvia (2018) analyze OCC-regulated firms and propriety supervisory ratings (CAMELS) for 2004 to 2012 and conclude short sellers provide early signals of financial distress.

Perhaps most relevant to our work, Berger et al. (2021) find that EAs are effective in reducing systemic risk (impacting bank leverage and portfolio risk) and have greater impact during financial crises than in normal times. Our finding that EAs correlate with a reduction in crisis-era short selling adds another reason why crisis-era EAs may attenuate, rather than exacerbate, systemic risk. To our knowledge, our investigation is the first to analyze the relationship between EAs and short sellers' positioning and potential profits in crisis and non-crisis periods.

The paper proceeds as follows. Section 2 describes the EA event timeline and partition of crisis and non-crisis pe-

⁵ We use the end of 2009 as the break between periods as in Berger and Bouwman (2013).

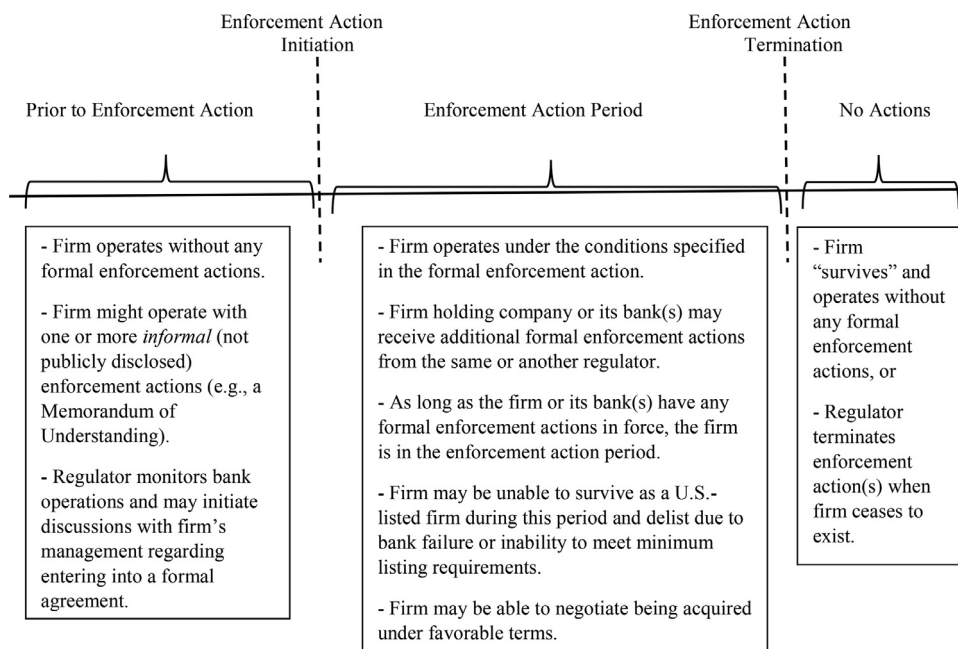


Fig. 1. Timeline of the enforcement action (EA) event. As shown in the timeline, some firms receive multiple formal EAs. As discussed in Section 2.1, we use the initiation of the *first* formal EA the firm receives as the "EA initiation event".

riods. Section 3 provides the related hypotheses development. Section 4 describes our banking firm sample and empirical findings. Section 5 concludes.

2. Event timelines

2.1. Enforcement action (EA) events

Fig. 1 displays the timeline for EA events. Prior studies of banks and bank regulators conclude that regulators may use the most severe types of EAs (prompt corrective actions, cease and desist orders, formal agreements and written agreements) as a last resort. As a result, the firm's financial condition can deteriorate substantially prior to the initiation (Delis et al., 2017). As described in Section 4.1, our analysis examines these most severe types of EAs. While operating under an EA, the firm or its bank(s) may receive additional EAs. Many firms "survive" the EAs, which we define as regulators' termination of all EAs while the firm's equity remains listed. Other firms are acquired while operating with at least one EA, delist concurrent with bank failure(s), or delist for other reasons (such as the inability to continue to meet minimum listing requirements) while still operating under at least one EA.

As shown in Fig. 1, firms can receive multiple EAs. We define the *earliest* initiation as the *EA initiation* event. For example, on Sept. 15, 2009, Tamalpais Bancorp, a bank holding company, received its *earliest* initiation, which was an FDIC cease & desist order for its bank. Subsequent events (while the firm operated with the FDIC C&D order) were a Jan. 2010 FRB written agreement initiation with the holding company and a Feb. 2010 FDIC escalation action (prompt corrective action proscriptions on the bank). The bank failed and the holding company delisted in Apr. 2010. We define Sept. 15, 2009, as the *EA initiation* event for our analyses.

2.2. Crisis and non-crisis periods

Fig. 2 (upper panel) shows our sample of 180 unique firms partitioned by EA initiation event for each calendar quarter in the crisis (2007 – 2009) and non-crisis (2010 – 2012) periods. We break

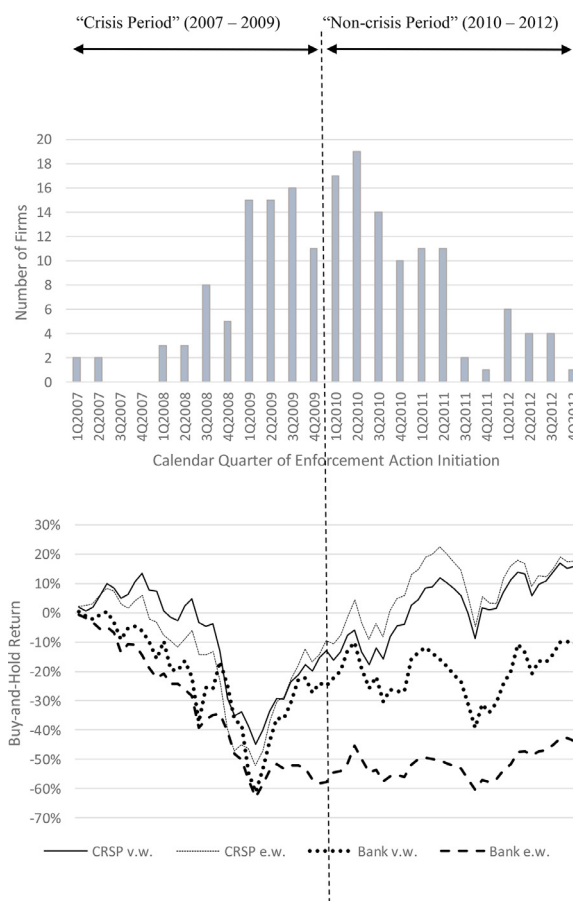


Fig. 2. Calendar time of enforcement action (EA) initiation events and return indices. The upper panel shows the number of firms that receive an EA initiation per calendar quarter in the crisis and non-crisis periods. The lower panel reports the buy-and-hold return for each of four equity indices purchased at the end of 2006. The indices are constructed from CRSP value-weighted (v.w.), and equal-weighted (e.w.) returns and value-weighted and equal-weighted returns for the 628 bank-firm sample (Bank v.w. and Bank e.w.).

crisis and non-crisis at the end of 2009 as in Berger and Bowman (2013), who note that by the first quarter of 2010, many financial institutions had repaid TARP money. The lower panel of Fig. 2 shows buy-and-hold returns for CRSP and bank firm value-weighted and equal-weighted indices. We construct the bank indices using our 628 bank-firm sample described in Section 4.1 that includes the 180 firms that receive an EA and all other publicly-traded bank firms that do not. Both CRSP indices and the bank value-weighted index recover sharply starting in second quarter 2009.

3. Hypotheses development

In this section, we develop testable hypotheses regarding bank equity short selling prior to, and following, enforcement action (EA) initiations in general, and for differentiations related to crisis and non-crisis periods.

3.1. Short selling prior to EA initiations

Supervisory ratings downgrades frequently precede EAs (e.g., Brunmeier and Willardson, 2006). Combined with Balasubramnian and Palvia's (2018) finding of increased short selling around downgrades, there is significant support for the premise that short sellers frequently establish positions prior to EA initiations. We carry that premise forward into our inquiry.

H1: In the months prior to the EA, a banking firm's short interest is abnormally high.

Some firms experience negative price momentum prior to EA initiations.⁶ Thus, one would expect skilled short seller positions established prior to EA initiations to precede subsequent negative returns. Such a finding, however, could merely reflect look-ahead bias created by requiring the subsample of banking firms to experience a future EA. A broader literature, not specific to banks, but similarly exposed to look-ahead bias, documents profitable pre-negative-event short selling. Regarding short seller skill, however, that literature suggests that at least some short sellers are skilled fundamental analysts who detect mispriced firms more generally than just preceding a subsequently-identifiable negative event (like an EA).⁷ We adopt a more demanding notion that short seller skill be exhibited through cross-sectional selectivity in the subset of firms that subsequently experience EAs.⁸ That is, it is reasonable to conjecture that skilled short sellers tilt their positioning toward (i.e., establish larger positions in) banks that will subsequently experience more negative price revisions by the dates of their EA initiations.

H2: In the months prior to an EA, a banking firm's abnormal short interest is negatively related to subsequent returns.

3.2. Short selling after EA initiations

To a great extent, we merely inherited **H1** and **H2** from prior empirical research on short selling in other contexts. That said,

⁶ For example, see Jordan et al., (2000).

⁷ Examples, not specific to banking, include Akbas et al., (2017), Henry et al., (2015), and Karpoff and Lou (2010).

⁸ Framing selectivity and/or market timing skill as a beneficial covariance between asset allocation weights and subsequent returns appears in many contexts, including its early motivation in Grinblatt and Titman (1989). We do not observe a short-seller's total portfolio returns, nor the costs related to that portfolio. Here we consider only the distribution of the magnitudes of short positions in EA banks, thus the characterization of this hypothesis as "selectivity" across banks rather than "timing" for a given bank.

general theoretical notions regarding informed traders who invest in information, analysis and expertise to subsequently gain from trading motivate **H1** and **H2**. They also motivate an inquiry into the nature of short seller positioning and skill after EA announcements.⁹ Once an EA is initiated, equity price adjusts to reflect public expectations for the bank's future operations under the publicly-announced EA.¹⁰ Even though its main objective is influencing the firm's available actions, the EA's announcement typically leads to more homogenized information. When the EA is perceived as negative news, the result is lower equity trading prices and therefore market cap. Accordingly, short sellers' incentives to invest additional financial and human capital to create additional post-announcement information or analytic advantage can be significantly diminished by EA announcements. This, in turn, leads to EA-related profit-taking and de-positioning. A possible exception is for banks having sufficient remaining market cap after the announcement but eventually failing. For contexts including such banks, additional short seller investment in asymmetric information or analysis to differentiate amongst banks operating with an EA could provide an opportunity for additional short seller trading profits. Following EA announcements, we considered outcome-contingent differentiations:

H3_{Survives}: For banking firms that survive subsequent to operating under an EA, abnormal short interest decreases from its pre-EA level.

H3_{Delists}: For banking firms that delist while operating under an EA, abnormal short interest may increase, decrease or not change depending on the context.

The EA-induced repricing and diminished asymmetry may eliminate many of short sellers' opportunities to invest in, and benefit from, the creation of new trading advantages. For those short sellers who do invest, however, we would expect cross-sectional allocation skill to continue to exhibit itself analogously to the pre-EA period.

H4: For banking firms operating under an EA, abnormal short interest following an EA is negatively related to subsequent returns.

3.3. Short selling in financial crisis versus non-crisis periods

Returning to our theoretical motivation for costly short seller investment in creating information or analytic skill trading advantages, during financial crises banks on average may be more likely to experience extreme negative outcomes (e.g., bank failure) than in non-crisis periods. The potential for bank failures could therefore offer a higher-than-normal aggregate profit opportunity for short sellers active in a financial crisis. Accordingly, other things being equal (including the supply of capital for short selling), short sellers might be expected to invest more heavily in producing asymmetry from which to profit during the crisis. This leads us to

⁹ In a Grossman and Stiglitz (1980) style competitive information acquisition equilibrium, everyone has access to the same information technology and makes only enough profits to offset the cost of their individual investment. We do not need that competitive equilibrium assumption to motivate the basic idea that trading profits will likely be high when short sellers can spend to become asymmetrically informed or talented in analysis. Indeed, we would arrive at the same negative relationship between abnormal short selling and future abnormal returns with a single trader having a monopolistic right to spend to become asymmetrically informed or advantaged in analysis.

¹⁰ Studies by Brous and Leggett (1996), Slovin et al. (1999), and Jordan et al. (2000) document a negative market reaction to EA initiations. Gilbert and Vaughan (2001) conclude depositors do not react negatively to EA disclosures. Roman (2020) finds stock price declines for the bank's relationship corporate borrowers.

conjecture that several of our previously hypothesized short positioning relationships may be even more pronounced during a market-wide financial crisis.

H1_{Crisis}: Abnormal short interest in EA firms prior to their EAs is higher in financial crises than in non-crisis periods.

If as **H1_{Crisis}** suggests, average pre-EA short-selling in EA banks is higher in a financial crisis, and there are more extreme negative outcomes (almost defining a “financial crisis”), there is almost certainly more capital at work seeking pre-EA positioning. What does a crisis-related increase in aggregate capital seeking pre-EA positions suggest for **H2**'s hypothesized negative correlation between on-average larger crisis-period pre-EA positions and their related subsequent crisis-era returns? We expect crisis-era competition with its more informative pre-EA prices, potential influx of marginally less talented short selling, and greater bunching of returns in the neighborhood of a binding lower bound of -100% all to result in *attenuated* aggregate pre-EA short seller skill.

H2_{Crisis}: The negative relationship between abnormal short interest in EA firms prior to their EAs and subsequent returns is weaker during a financial crisis.

A broad financial crisis also likely reflects conditions where short sellers can benefit by taking profits at the EA and redirecting capital towards prospecting for pre-EA banking firms which are (temporarily) in relatively greater aggregate supply.

H3_{Crisis}: In a financial crisis, abnormal short interest decreases more from its pre-EA level.

A crisis-related de-emphasis on post-announcement banks operating under EAs suggests attenuated investment and related post-announcement skill in the cross-section of those banks.

H4_{Crisis}: In a financial crisis, abnormal short interest following an EA announcement is less negatively related to subsequent returns.

4. Sample description and analyses

4.1. The bank firm universe and EA sample

As discussed in Section 2, 180 firms within our 628 bank-firm dataset receive at least one EA initiation during 2007–2012. We analyze only those EAs that impose constraints on growth, distributions, and capital raises as described in Delis et al. (2017) as Class 1 actions. For firms that receive multiple Class 1 EA initiations, we use the earliest EA.¹¹ We assign each EA firm one of five outcomes: “survives EA” (i.e., all EAs are terminated by the regulator while the firm remains listed), “acquired” without regulator assistance by another firm while operating with at least one EA, “delists when bank fails”, “other delisting” while operating with at least one EA (e.g., the firm can no longer maintain exchange requirements such as price of at least \$1/share), or “still listed with EA” as of the end of 2015.

Table 1 Panel A shows that about a third of firms (63 firms) survive EAs. They operate under one or more EAs for almost 3 years (duration mean is 35.1 months). Firms that have the shortest time operating under EAs on average are those that delist concurrent with bank failure (duration mean of just 7.4 months) followed by firms that delist for other reasons (15.1 months measured from EA

initiation to delisting date).¹² Fourteen firms that receive initial EAs in 2007–2012 continue to operate under at least one EA continuously as of the end of 2015.

As an indication of the impact for the firm's shareholders (and opportunity for short sellers), we calculate buy-and-hold returns, measured from the day of initiation of the first EA until the firm recovers, delists, is acquired, or the end of 2015 (for firms still listed with an EA). Table 1 Panel A reports these raw returns as well as “excess return” (versus CRSP value-weighted return). Firms with the worst returns are those that delist due to bank failure or other reason (a mean raw return of -93.2% and -74.7%, respectively). Buy-and-hold returns for firms that survive EAs are not much different from the CRSP value-weighted index with a mean of -0.5% and median of 8.2% versus the index over the 3-year average duration under an EA.

Additional information in Table 1 Panel A describes the outcomes by year the first EA is initiated.¹³ The years with the highest number of first EAs are 2009 and 2010.¹⁴ For the 73 firms that delist (due to bank failure or other reasons), first EA initiations occur most frequently in 2009. Only four of the firms that receive initiations in 2011 or 2012 delist.

4.2. Abnormal short interest, returns, and other variables

We use raw short interest ratio and abnormal short interest ratio as measures of short selling. Raw short interest ratio equals the shares short at month end (Compustat) divided by shares outstanding (CRSP).¹⁵ As in Desai et al. (2016), we use the Karpoff and Lou (2010) abnormal short interest ratio regression model that incorporates five factors: size, book-to-market, momentum, turnover, and institutional ownership. Abnormal short interest (ABSI) equals the firm's raw short interest ratio minus that predicted by the model.

Monthly return data are from CRSP. Additional analysis variables are bank capital ratios, non-performing loans, bank Z-scores, and bank liquidity as defined in Deli et al. (2019) using Compustat data at the firm level. Other control variables are size, book-to-market, momentum, institutional ownership, and turnover. Size is market capitalization (CRSP). Book-to-market is book value (Compustat) divided by market capitalization. Momentum is 12-month cumulative return. Institutional ownership is shares owned by institutions (Thomson-Reuters Institutional Holdings (13F) Database) scaled by shares outstanding (CRSP). Turnover is the monthly share volume divided by shares outstanding (CRSP). Table 1 Panel B presents summary statistics for firm-month observations for the 628 firms.

Fig. 3 shows (for the 180 EA firms) buy-and-hold abnormal returns, ABSI, and the number of firms that delist in EA event time “t” for 12 months before and after the initiation, where initiation is event month “t” equals 0. The upper panel shows means of abnormal buy-and-hold returns BHAR[-12,t]. Abnormal return equals the EA firm's return minus the CRSP value-weighted return. BHAR trends negatively on average and more so in the crisis. The middle panel shows ABSI[t]. ABSI is higher on average for firms with EA initiations in the crisis. The bottom panel shows by event month the number of firms that delist during the first 12 months the firm

¹² All except one of the firms that delist due to bank failure operate with an EA for at least a month prior to and at the time of failure. The exception is Washington Mutual, which failed in September 2008.

¹³ Outcomes by regulator are provided in the internet appendix.

¹⁴ Four firms receive initiations during the time the 2008 short sale ban is in effect (i.e., Sept. 19 through Oct. 7). One of the firms fails 8 months later. The other three survive for at least two and a half years.

¹⁵ Short interest reporting frequency is twice per month during our sample period. We use short interest measured closet to month end. For dual share class firms, we use the common share class with the highest trading volume.

¹¹ An internet appendix provides a detailed description of how we constructed the 628-firm dataset.

Table 1
Summary statistics.

Panel	Obs.	Duration (months)		Buy and hold return		Excess return	
		Mean	Median	Mean	Median	Mean	Median
A							
All Firms	180	24.7	21.3	-13.6%	-45.8%	-44.5%	-70.4%
By Outcome							
Survives EA	63	35.1	32.0	46.2%	36.1%	-0.5%	8.2%
Acquired	30	15.8	11.8	16.2%	-5.8%	-1.3%	-27.9%
Delists when bank fails	30	7.4	6.7	-93.2%	-95.6%	-105.6%	-106.6%
Other delisting	43	15.1	12.8	-74.7%	-82.4%	-92.1%	-95.0%
Still listed with EA	14	63.0	63.7	11.0%	-25.7%	-58.2%	-82.1%
Outcomes by year initiated	2007	2008	2009	2010	2011	2012	Total
Survives EA	1	2	14	28	10	8	63
Acquired	2	4	4	9	7	4	30
Delists when bank fails	0	7	18	4	1	0	30
Other delisting	1	6	20	13	2	1	43
Still listed with EA	0	0	1	6	5	2	14
All	4	19	57	60	25	15	180
Panel B	Monthly Obs.	Mean	Median	Std. dev.		25th %-tile	75th %-tile
Short interest ratio (%)	31,187	3.235	1.509	4.305		0.062	4.892
ABSI (%)	31,187	0.152	-0.107	2.891		-1.190	0.782
Return (%)	31,187	-0.401	-0.147	12.314		-5.677	4.912
Size (in million \$)	31,187	1180.6	144.2	4181.1		48.3	499.5
Book-to-market	31,187	1.284	0.993	0.958		0.733	1.453
Momentum	31,187	-0.038	0.018	0.402		-0.210	0.194
Turnover	31,187	0.081	0.039	0.112		0.014	0.100
Inst. ownership	31,187	0.337	0.285	0.245		0.124	0.528
Bank capital	31,187	0.146	0.138	0.040		0.121	0.161
Non-perform loans	31,187	0.032	0.022	0.032		0.010	0.043
Bank Z-score	31,187	31.78	23.20	29.46		10.11	42.88
Bank liquidity	31,187	0.053	0.039	0.044		0.023	0.067

Panel A reports summary statistics by outcome for the 180 firms that receive EAs during 2007–2012. Duration is the time the firm operates with EAs (or from initiation to delisting). Buy-and-hold return and return minus CRSP value-weighted return (excess return) are from the initiation of the EA until the firm survives, delists, or is acquired. Firms still listed with at least one EA are as of the end of 2015. Lower rows report number of observations by outcome for year of initiation. Panel B reports summary statistics for the variables used for benchmarking and analysis. Firm-month observations are for all firms with (180 firms) or without (448 firms) an EA during the 2007–2012 sample period. *Short interest ratio* is common shares short (Compustat) divided by common shares outstanding (CRSP). *ABSI* is abnormal short interest ratio obtained using the Karpoff and Lou (2010) five-factor model. *Return* is buy-and-hold return (CRSP). *Size* is market capitalization (closing price multiplied by shares outstanding, CRSP). *Inst. ownership* is shares owned by institutions scaled by shares outstanding. *Book-to-market* is book value (Compustat) divided by market capitalization. *Momentum* is 12-month cumulative return. *Turnover* is the monthly share volume divided by shares outstanding (CRSP). *Bank capital* is the total of Tier 1 and 2 capital divided by risk-weighted assets. *Non-perform loans* is non-performing loans divided by total loans. *Bank Z-score* is the sum of return on bank assets and bank capital, divided by the standard deviation of return on firm assets for the prior 5 years of quarterly data. Return on bank assets is the firm’s before-tax profit divided by total assets. *Bank liquidity* is cash and due from banks plus federal funds sold and securities purchased under agreements to resell divided by total assets. Bank variables are at the firm level for most recent quarter (Compustat).

operates with the EA. It is worth noting that ABSI in Fig. 3 benchmarks “abnormal” short selling using the 5-factor model but does not control for short selling that would be “normal” for bank firms with similar fundamentals (e.g., bank capital ratios) that never receive an EA.

4.3. Two-stage regression specification and results

Our panel includes the observations for all banking firms during 2007 to 2013 irrespective of whether the firms experience an EA. In order to investigate potentially different structural relationships between endogenous short seller positioning before and after EAs and the subsequent returns, we adopt the following two-stage regression specification for the endogenous metric Abnormal Short Interest (ABSI) for firm *i* at calendar month *t* from the beginning of our sample and subsequent return:

$$\begin{aligned}
 ABSI_{i,t} = & \beta_0 + \beta_1 Befe_{i,t} + \beta_2 Befe_{i,t} \times delists + \beta_3 Aftea_{i,t} \\
 & + \beta_4 Aftea_{i,t} \times delists + \beta_5 Bank\ capital_{i,t-1} + \beta_6 Non \\
 & - performing\ loans_{i,t-1} + \beta_7 Bank\ Z - score_{i,t-1} \\
 & + \beta_8 Bank\ liquidity_{i,t-1} + \beta_9 Log(Size)_{i,t-1} \\
 & + \beta_{10} Book - to - market_{i,t-1} + \beta_{11} Momentu_{i,t-1} \\
 & + \beta_{12} Turnover_{i,t-1} + \mu_{i,t}
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 Return_{i,t} = & \beta_0 + \beta_1 ABSI_{i,t-1} + \beta_2 Befe_{i,t-1} \times ABSI_{i,t-1} \\
 & + \beta_3 Befe_{i,t} \times delists \times ABSI_{i,t-1} \\
 & + \beta_4 Aftea_{i,t-1} \times ABSI_{i,t-1} \\
 & + \beta_5 Aftea_{i,t} \times delists \times ABSI_{i,t-1} + \beta_6 Befe_{i,t-1} \\
 & + \beta_7 Befe_{i,t} \times delists + \beta_8 Aftea_{i,t-1} \\
 & + \beta_9 Aftea_{i,t} \times delists + \beta_{10} Log(Size)_{i,t-1} \\
 & + \beta_{11} Book - to - market_{i,t-1} \\
 & + \beta_{12} Momentum_{i,t-1} + m_{i,t}
 \end{aligned} \tag{2}$$

where $ABSI_{i,t-1}$ is the fitted (without the first-stage error term $\mu_{i,t}$) abnormal short interest from the first stage. Consistent with the short selling literature for non-bank specific analyses (e.g., Karpoff and Lou, 2010; Desai et al., 2016), the benchmark metric abnormal short interest (ABSI) compares each firm’s short interest to that of other firms each month where firms are matched with high, medium and low partitions of firms by employing five matching factors (size, book-to-market, momentum, turnover, and institutional ownership). Prior studies have confirmed that these five factors are associated with short sellers’ positioning. For the first stage’s fitting of ABSI, however, the regression specification also includes four of those matching factors (size, book-to-market,

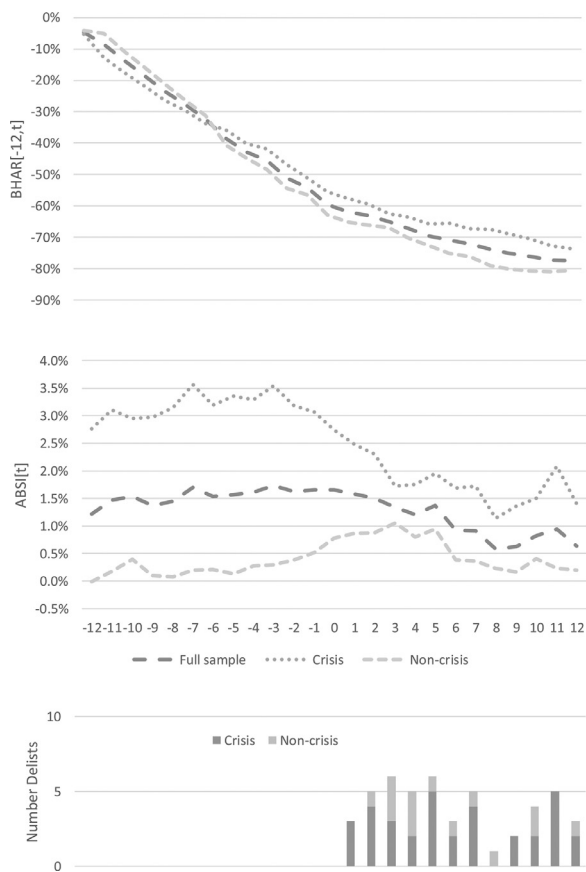


Fig. 3. Event time of EAs and buy-and-hold returns. This figure shows means of abnormal buy-and-hold returns $BHAR[-12,t]$ (upper panel) and short interest ratio $ABSI[t]$ (middle panel) versus event month “t” where EA initiation is event month “0”. Means are for the full sample of firms and whether initiation is in the crisis or non-crisis period. The bottom panel shows by event month the number of firms that delist during the first 12 months the firm operates with the EA.

momentum and turnover) as continuous control variables due to their possible explanatory power for ABSI over time. Institutional ownership, however, is excluded as a continuous control variable in both stages due to its high correlation with $\text{Log}(\text{Size})$.

Importantly for our analyses, the matching-partition-oriented metric ABSI is not structured to reflect important ancillary public fundamental bank information, such as found in quarterly financial filings that may also predict short seller positioning. For example, weak bank fundamental information – specifically, low bank capital ratios, high non-performing loan ratios, low bank Z-scores, and low bank liquidity – are associated with a higher likelihood of the distress that leads to receiving an EA (Deli et al., 2019). Our first-stage fitting of ABSI adds these observables as control variables because banking firm short selling is expected to be associated with these variables even when a firm never receives an EA. The second stage regression is a traditional asset pricing examination that seeks to relate returns to the usual factors of size, book-to-market and momentum, but also to expected ABSI.

In order to investigate the hypothesized structural breaks, both stages of the regression specification employ indicator variables to distinguish observation months: (i) in the 12 months preceding an EA ($Befea_{i,t}$); (ii) in the 12 months (inclusive of initiation month) of an EA ($Aftea_{i,t}$); and for firms that eventually delist while operating with an EA (delists).¹⁶ The structure of the indicator vari-

¹⁶ That is, $Befea$ equals 1 only when the firm receives an EA in one of the following 12 months and zero otherwise. $Aftea$ equals 1 only when a firm is in one of its

ables therefore creates “baseline” estimations for non-EA firm ABSI (i.e., firms that do not have a Befea period or an Aftea period¹⁷). All interpretations can therefore be compared to contemporaneous baseline (non-EA) ABSIs and related subsequent returns. Note that the first stage uses the indicator variable and interactions to enable an investigation of hypothesized structural differences in ABSI levels (intercept fixed effects) in the linear fitting of observed ABSI. The second stage, however, uses those same indicator variables not only to enable an investigation of hypothesized structural differences in return levels (intercept fixed effects), but also of hypothesized structural differences in return correlations (slopes in expected ABSI) in the linear fitting of observed returns before and after EA announcements.

Table 2 presents OLS estimates for the first stage regression in column (A). For comparison column (B) reports results estimation of the model when indicator variables are excluded. It is worth noting that for both estimations the coefficient estimates for bank capital, non-performing loans, and bank liquidity are significant at conventional levels, and that the signs are as expected if the ABSI metric is systematically higher for firms with weak bank fundamental information. These results confirm that heightened short positions are associated with weak bank fundamental information regardless whether the firm ever receives or operates with an EA. The exception is for bank Z-score, whose coefficient estimate has the opposite sign from expected. Table 2 Columns (C) and (D) presents OLS estimates for the second stage regression with and without the indicator variables and interactions.¹⁸ We now turn to hypothesis tests.

4.3.1. Is pre-EA short positioning abnormally high (H1)?

Table 3 Panel A uses estimates from Table 2 Column (A) to test H1’s conjecture of abnormally high pre-EA short positioning. The first-stage estimation provides two related estimations of differences from non-EA firms’ baseline ABSI. As shown in the “Full sample” Column, we find an insignificantly lower ABSI (than baseline non-EA firms) for survivors (-0.130) and a significantly higher ABSI for eventual delisters (0.382***). The ABSI for delisters equals the sum of estimates for Befea and Befea x delists, with significance determined by Wald tests. As borrowing shares to short is not uniformly frictionless, Table 3’s other columns consider subsamples likely varying in their appeal to short sellers due to those frictions. “Price \geq \$1/share” excludes so-called “penny stock” observations when the month’s stock price is less than one dollar per share. “Average daily volume \geq \$5000” excludes firms with very low average daily trading volume (ADV) that could prove difficult to short.¹⁹ “Size \geq \$50 M” focuses on firms above the 25th percentile of our sample’s market caps (at \$48.3 million) presumed to have sufficient market cap to represent (for short sellers) large potential dollar profit opportunities rather than just large negative returns on small dollar positions. Employing Balasubramnian and Palvia’s (2018) cutoff, firms having “Assets < \$50 B” are likely not “To Big To Fail” (TBTF). They are therefore likely to be free of damp-

first 12 months of operating with an EA, including the initiation month. At the earlier of the firm’s delisting or the completion of that 12 months following the EA, the firm no longer contributes observations. As we will be considering crisis and non-crisis subsamples, we include 2013 because it is clearly a non-crisis year and this allows us to follow firms with EA initiations during 2012. We exclude 2006 because it is unclear whether this is a crisis or non-crisis year. Desai et al., (2016) find that short sellers may have forecast financial distress by 2006. Given that some firms were “treated” in all of their contributed observations, we have omitted firm fixed effects which would confound identifying treatment effects.

¹⁷ Some non-EA firms delist during 2007 – 2013, but they never operate with an EA. We include them in the sample until they delist.

¹⁸ Modifying returns to be measured in excess of market returns leads to all of the same basic inferences.

¹⁹ We thank an anonymous referee for this suggestion.

Table 2
OLS estimates for the first and second stage regressions for 2007 to 2013.

Row	Dependent Variable:	(A)	(B)	(C)	(D)
		First Stage (Fitting ABSI)	ABSI	Second Stage (Allocation Skill)	Return
	Independent Variable				
(1)	ABSIh			-0.416 (0.000) ***	-0.780 (0.000) ***
(2)	Befea	-0.130 (0.179)		-3.742 (0.000) ***	
(3)	Befea x delists	0.512 *** (0.002)		-6.463 (0.000) ***	
(4)	Befea x ABSIh			-0.836 (0.055) *	
(5)	Befea x delists x ABSIh			0.583 (0.425)	
(6)	Aftea x ABSIh			-0.224 (0.505)	
(7)	Aftea x delists x ABSIh			0.239 (0.689)	
(8)	Aftea	-0.488 (0.000) ***		-1.536 (0.003) ***	
(9)	Aftea x delists	-0.314 (0.118)		-6.091 (0.000) ***	
(10)	Bank capital	-4.233 (0.000) ***	-3.813 (0.000) ***		
(11)	Non-performing loans	17.641 (0.000) ***	15.867 (0.000) ***		
(12)	Bank Z-score	0.007 (0.000) ***	0.007 (0.000) ***		
(13)	Bank liquidity	-5.419 (0.000) ***	-5.744 (0.000) ***		
(14)	Log(Size)	-0.555 (0.000) ***	-0.55 (0.000) ***	0.082 (0.099) *	0.132 (0.010) ***
(15)	Book-to-market	-0.492 (0.000) ***	-0.485 (0.000) ***	1.976 (0.000) ***	1.369 (0.000) ***
(16)	Momentum	0.079 (0.155)	0.079 (0.148)	2.358 (0.000) ***	3.164 (0.000) ***
(17)	Turnover	10.284 (0.000) ***	10.211 (0.000) ***		
(18)	Constant	2.948 (0.000) ***	2.914 (0.000) ***	-2.617 (0.000) ***	-2.602 (0.000) ***
(19)	N	31,187	31,187	31,187	31,187
(20)	R-squared	0.143	0.143	0.036	0.016

Table 2 presents OLS estimates for the first stage regression (Eq. 1) in column (A) and second stage regression (Eq. 2) in column (C) as given in Section 4.3. Firm-month observations are for all 628 banking firms during 2007 to 2013 irrespective of whether the firms experience an EA. Independent variable *ABSIh* in the second stage is the fitted (without the first-stage error term) abnormal short interest from the first stage. Indicator variables and cross terms in rows (2) through (9) distinguish event observation months for 180 firms that experience an EA in the 12 months preceding an EA (*Befea*) and in the first 12 months (inclusive of initiation month) operating with an EA (*Aftea*), and for firms that eventually delist while operating with an EA (*delists*). Control variables in rows (10) through (17) are as defined in Table 1 panel (B). Section 4.3 provides the model's further details. For comparison columns (B) and (D) report results for estimation of the model when indicator variables are excluded. Robust p-values are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively, for two-sided t-tests of coefficient estimates.

Table 3
Tests of hypotheses H1, H2, H3, and H4 for 2007 to 2013.

Row		Full sample	Price ≥ \$1/share	ADV ≥ \$5000	Size ≥ \$50 M	Assets < \$50 B	"Sweet spot"
Panel A: Examination of H1 (Abnormal Short Positioning Preceding EAs)							
(1)	Befea	-0.130	-0.092	-0.143	-0.436 ***	0.205 *	0.029
(2)	Befea x delists	0.512 ***	0.513 ***	0.693 ***	2.415 ***	0.114	1.673 ***
(3)	Befea + Befea x delists	0.382 **	0.421 ***	0.550 ***	1.979 ***	0.319 **	1.702 ***
Panel B: Examination of H2 (Cross-Sectional Allocation Skill Prior to EAs)							
(4)	ABSIh	-0.416 ***	-0.398 ***	-0.373 ***	-0.321 ***	-0.407 ***	-0.354 ***
(5)	Befea x ABSIh	-0.836 *	-1.280 ***	-0.687 *	-1.069 ***	-0.449	-0.736
(6)	ABSIh + Befea x ABSIh	-1.252 ***	-1.678 ***	-1.060 ***	-1.390 ***	-0.856 *	-1.090 ***
(7)	Befea x ABSIh + Befea x delists x ABSIh	-0.253	-0.272	-0.224	-1.131	-0.333	-0.924
(8)	ABSIh + Befea x ABSIh + Befea x delists x ABSIh	-0.669	-0.670	-0.597	-1.452 *	-0.740	-1.278 **
Panel C: Examination of H3 (Abnormal Short Positioning Following EA Announcements)							
(9)	Aftea	-0.488 ***	-0.561 ***	-0.531 ***	-1.237 ***	-0.196 *	-0.991 ***
(10)	Aftea x delists	-0.314	0.252	-0.028	3.591 ***	-0.423 **	3.210 ***
(11)	Aftea + Aftea x delists	-0.802 ***	-0.308	-0.559 **	2.354 ***	-0.619 ***	2.220 ***
(12)	Aftea - Befea	-0.358 ***	-0.468 ***	-0.388	-0.801 ***	-0.401 ***	-1.020 ***
(13)	Aftea + Aftea x delists - (Befea + Befea x delists)	-1.184 ***	-0.729 ***	-1.109 ***	0.375	-0.938 ***	0.517
(14)	Difference	-0.826 ***	-0.261	-0.721 **	1.176	-0.537 **	1.537 **
Panel D: Examination of H4 (Cross-Sectional Allocation Skill Following EA Announcements)							
(15)	Aftea x ABSIh	-0.224	-0.368	-0.148	-0.732 *	-0.324	-0.970 *
(16)	ABSIh + Aftea x ABSIh	-0.640 *	-0.766 **	-0.512 *	-1.053 ***	-0.731 *	-1.324 **
(17)	Aftea x ABSIh + Aftea x delists x ABSIh	0.015	-0.811	-0.045	-2.193 *	-0.258	-2.247 **
(18)	ABSIh + Aftea x ABSIh + Aftea x delists x ABSIh	-0.401	-1.209 **	-0.418	-2.514 **	-0.665	-2.601 **

Panels A through D report relevant comparisons of coefficient estimates using the OLS regressions (as in Table 2) for 2007 to 2013 for testing hypotheses H1, H2, H3, and H4. Section 4.3 provides a discussion of each hypothesis and connections to table rows. Columns report estimates for the full sample (as in Table 2) as well as for the following subsamples: stock price of at least \$1/share, average daily trading volume ("ADV") of at least \$5000, market cap ("Size") of at least \$50 million, and total assets of at least \$50 billion. The "Sweet spot" subsample consists of firms with market cap of at least \$50 million and with total assets of at least \$50 billion. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively, for two-sided Wald tests.

ened short seller interest due to anticipation of government intervention forestalling future losses in TBTF banks.²⁰ Finally, we use the combination "Assets < \$50 B & Size > \$50 M" as a likely short seller "Sweet spot" of banking firms offering short sellers sufficient

dollar profit opportunities while not being TBTF. Subsample restrictions are applied to all firms regardless of whether they ever receive an EA.

Table 3 Row (1) displays subsample coefficient estimates for Befea for firms that survive EAs (survivors) and Table 4 Row (3) displays the analogous subsample coefficient estimate sums for firms that delist while operating under an EA (delisters). Accordingly,

²⁰ While just one of our TBTF banking firms (Wachovia) operated with EAs in the crisis period, seven received EAs in the non-crisis period.

Table 4
Seemingly Unrelated Regression estimates for the crisis and non-crisis periods.

Row	Dependent Variable: Independent Variable	(A)	(B)	(C)	(D)	(E)	(F)
		First Stage (Fitting ABSI)			Second Stage (Allocation Skill)		
		ABSI Crisis	ABSI Non-crisis	ABSI Crisis – Non-crisis	Return Crisis	Return Non-crisis	Return Crisis – Non-crisis
(1)	ABSIh				-0.107 (0.353)	-0.669 (0.000) ***	0.562 (0.001) ***
(2)	Befea	0.193 (0.181)	-0.451 (0.001) ***	0.644 (0.001) ***	-2.913 (0.002) ***	-4.728 (0.000) ***	1.815 (0.115)
(3)	Befea x delists	0.608 (0.004) ***	-0.887 (0.000) ***	1.495 (0.000) ***	-7.264 (0.000) ***	-7.656 (0.000) ***	0.392 (0.869)
(4)	Befea x ABSIh				-1.172 (0.101)	-0.957 (0.096) *	-0.215 (0.815)
(5)	Befea x delists x ABSIh				1.164 (0.204)	-2.393 (0.067) *	3.557 (0.026) **
(6)	Aftea	-0.860 (0.001) ***	-0.448 (0.000) ***	-0.412 (0.150)	-1.418 (0.406)	-2.615 (0.000) ***	1.197 (0.503)
(7)	Aftea x delists	0.536 (0.125)	-1.023 (0.000) ***	1.559 (0.000) ***	-6.032 (0.012) **	-5.651 (0.002) ***	-0.381 (0.900)
(8)	Aftea x ABSIh				0.041 (0.966)	-0.346 (0.382)	0.387 (0.707)
(9)	Aftea x delists x ABSIh				-0.513 (0.654)	0.496 (0.585)	-1.009 (0.490)
(10)	Bank capital	-3.731 (0.000) ***	-7.95 (0.000) ***	4.219 (0.000) ***			
(11)	Non-performing loans	20.025 (0.000) ***	17.254 (0.000) ***	2.771 (0.123)			
(12)	Bank Z-score	0.006 (0.000) ***	0.011 (0.000) ***	-0.005 (0.001) ***			
(13)	Bank liquidity	-9.09 (0.000) ***	-3.163 (0.000) ***	-5.927 (0.000) ***			
(14)	Log(Size)	-0.713 (0.000) ***	-0.447 (0.000) ***	-0.266 (0.000) ***	0.149 (0.051) *	-0.083 (0.184)	0.232 (0.019)**
(15)	Book-to-market	-0.504 (0.000) ***	-0.598 (0.000) ***	0.094 (0.156)	1.742 (0.000) ***	1.309 (0.000) ***	0.433 (0.197)
(16)	Momentum	0.478 (0.000) ***	-0.213 -0.007 ***	0.691 (0.000) ***	0.9 (0.098) *	-0.298 (0.471)	1.198 (0.079) *
(17)	Turnover	12.284 (0.000) ***	7.974 (0.000) ***	4.31 (0.000) ***			
(18)	Constant	3.65 (0.000) ***	3.187 (0.000) ***	0.463 (0.039) **	-4.163 (0.000) ***	0.569 (0.305)	-4.732 (0.000) ***
(19)	N	14,792	16,395		14,792	16,395	
(20)	R-squared	0.181	0.123		0.027	0.036	

Table 4 presents estimates for the first stage regression (Eq. 1) in columns (A) and (B) and second stage regression (Eq. 2) in columns (D) and (E) using a Seemingly Unrelated Regressions (SUR) approach for estimating the two-stage regression model in the crisis (2007 – 2009) and non-crisis (2010 – 2013) periods. Variables are as described in Table 2. Columns (C) and (F) report the difference in estimates (Crisis – Non-crisis). Section 4.4 provides further discussion. Robust p-values are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively, for two-sided t-tests of coefficient estimates in columns (A), (B), (D), and (E), and for two-sided Wald tests in columns (C) and (F).

Row (2) presents the increase from survivor to delister. Not surprisingly given that they survive, Row (1)'s estimates indicate that truly abnormal (beyond comparable non-EA firms) pre-EA short positioning in eventual *survivors* is mixed across subsamples and indicates a level generally insignificantly different from positioning in comparable non-EA firms. However, Row (3)'s estimates indicate pre-EA short positioning in eventual *delisters* while operating with an EA that is robustly and uniformly higher than the baseline for comparable non-EA firms, and particularly so for firms with sufficient market cap to offer significant dollar profit opportunities (1.979***). Row (2) confirms that the increased positioning in delisters compared to survivors is robustly significant. We conclude that **H1**'s general conjecture of abnormally high pre-EA positioning by short sellers is strongly supported although it is generally driven by positioning in delisters rather than survivors.

4.3.2. Does pre-EA short positioning reflect cross-sectional allocation skill (H2)?

Hypothesis **H2** suggests that in the months preceding EA initiations, the firm's abnormal short interest is negatively related to subsequent returns. The general notion of short seller expertise suggests that abnormal short selling and subsequent returns should be negatively related even for firms that never receive an EA (non-EA firms).²¹ Skill in short selling should not only exhibit as picking firms that subsequently struggle beyond the level priced into the stock, but also should exhibit as taking larger (smaller) positions in firms that experience larger (smaller) subsequent negative, or even positive, returns. Short seller expertise leads to our anticipation that the second-stage coefficient estimate for *ABSIh* should generally be negative (the larger the position the more negative the subsequent return). The coefficient estimate of interest for testing **H2** as stated is the sum of that base coefficient for

ABSIh and the coefficient for the interaction effect specific to the pre-EA period: *Befea x ABSIh*. The sum of the two provides the total estimated negative (slope) relationship between fitted *ABSI* and subsequent return for EA firms in their pre-EA periods while taking into account other observable explanatory factors. Although not directly hypothesized in **H2**, the second-stage specification also allows us to consider the coefficient for *Befea x ABSIh* in isolation to examine if short sellers appear even more skilled in emphasizing big losers and/or deemphasizing others in the subset of firms that subsequently experience an EA.

Table 2 Column (D) reports the relevant second stage regression estimations in the absence of the indicators variables and interactions. As anticipated given prior findings regarding short seller skill, baseline coefficient estimates for *ABSIh* (in non-EA firms) are significantly negative (-0.780***). In Column (C)'s focal second-stage regressions (that include the indicators and interactions), they are as well (-0.416***). These baseline estimates strongly suggest that short sellers exhibit cross-sectional allocation talent as a norm even when considering only firms that never receive an EA.

Turning to Table 3 Panel B, we examine **H2**'s hypothesis of a negative relationship for firms subsequently experiencing an EA. The estimates suggest multiple insights. For eventual *survivors*, Table 3 Panel B Row (6) displays a consistently negative relationship in pre-EA periods (e.g., Full Sample -1.252***). Row (5) confirms a robust significantly negative incremental slope in the pre-EA (*Befea*) period (e.g., Full sample -0.836*). For delisting firms, Table 3 Panel B Row (8) displays a fairly consistent insignificantly negative total slope (e.g., Full sample -0.669). Row (7)'s coefficients suggest that these slopes appear to be more negative than the already significantly negative slope for the baseline non-EA firms (e.g., Full Sample -0.669 is more negative by -0.253 than -0.416***). However, covariation in the reduced sample size of delisting firms "robs" the apparently more negative coefficient of its significance. Additionally, we cannot reject that the slopes are the same across the non-EA baseline and delisting firms in the pre-EA period (e.g., in Full sample 0.253 is not significant). Summarizing Table 3 Panel B's pre-EA evidence on skill, in our sample, banking firm short sell-

²¹ Note, however, that conditioning the baseline skill level on lack of a future EA biases this baseline down since it eliminates firms that will receive an EA. That is, short seller skill in general is at least as high in general as it is in the sample of firms that never experience the generally-negative event of receiving an EA.

ers exhibit significant baseline (non-EA), and significant (insignificant) additional specific pre-EA expertise in survivors (delisters) through greater abnormal positioning in big losers and/or lesser abnormal positioning in firms that lose less or even gain. In contrast to the delister drivers for pre-EA positioning as hypothesized in **H1**, here we have survivor drivers for pre-EA skill as hypothesized in **H2**. Overall, our sample exhibits strong and subsample robust evidence of pre-EA short seller expertise as hypothesized in **H2**.

4.3.3. Is short positioning following EA announcements abnormally high (**H3**)?

H3's hypotheses deal with short seller positioning levels subsequent to the announcement of an EA under the notion that EA announcements act as information-homogenizing events that incent short seller profit taking. Table 3 Panel C indicates that short positioning following an EA is significantly less than baseline for survivors (e.g., Full sample -0.488^{***}) and delisters (e.g., Full sample -0.802^{***}). With respect to the specific hypothesis regarding positioning adjustments following EA announcements, consistent with **H3_{Survives}**, Table 3 Panel C Row (12) confirms the tendency for survivor firm short positioning to decrease in response to the EA (e.g., Full sample -0.358^{***}). Regarding **H3_{Delists}**, Row (13) displays an even greater tendency to decrease for delisters (e.g., Full sample -1.184^{***} representing an additional decrease at -0.826^{***}). This greater profit-taking decrease in short seller positioning for eventual delisters appears in all subsamples other than those containing sufficient market cap to represent significant remaining dollar profit opportunities for short sellers. For $\text{Size} \geq \$50 \text{ M}$, delisters who are already experiencing significantly higher positioning prior to the EA announcement (Table 3 Panel A Row (3)'s 1.979^{***}) experience a post-announcement increase (Table 3 Panel C Row (13)'s 0.375). The result is a continuation of, or possibly even increase in, the significantly higher-than-baseline positioning. (Panel C Row (11)'s $2.354^{***} = \text{Panel A Row (1)'s } 1.979^{***} + \text{Panel C Row (14)'s } 0.375$). Not surprisingly, this increase of 0.375 appears to differ from the post-announcement decrease experienced by survivors (Table 3 Panel C Row (12)). To recap, our sample confirms **H3**'s basic hypothesis about (lower than comparable non-EA) short positioning in EA firms following the announcement of EAs and confirms **H3_{Survives}**'s specific decrease in short positioning follow the announcement. It also verifies **H3_{Delists}**'s ambiguity regarding short positioning changes subsequent to EA announcements for delisters due to the subset of those that have sufficient post-announcement market cap to sustain existing, or even attract additional, short seller scrutiny and positioning. For that sufficient post-announcement market cap subset of delisters, the EA precedes, and may even appear to attract, additional abnormal short positioning that results in a level significantly exceeding that in comparable non-EA firms.

4.3.4. Does post-EA-announcement positioning reflect allocation skill (**H4**)?

The **H4** hypothesis addresses talent-related correlation between short seller positioning after EA announcements and subsequent returns. Table 3 Panel D verifies the presence of **H4**'s hypothesized short seller skill after EA announcements for survivors (e.g., Row (16)'s Full sample $-0.640^{**} = -0.416^{***} - 0.224$). Additionally, there is some suggestion, that for survivors, short sellers exhibit greater-than-baseline cross-sectional allocation skills after EA announcements (Row (15)), presumably from avoiding big survivor rebounds after EAs. For **H4** for delisters the conjectured skill appears in all subsamples (Row (18)), and is significant for those with sufficiently high price (Price $\geq \$1/\text{share}$ at 1.209^{**}) or market cap (e.g. $\text{Size} \geq \$50 \text{ M}$ at -2.514^{**}). Support for **H4** in delisters appears strongest in the short seller "Sweet spot" where a firm has

sufficient remaining market cap to attract additional short seller scrutiny, but is not TBTF (Row (18)'s 2.601^{**}). Regarding potential beyond-baseline skill, however, there is no significant evidence of greater-than-baseline skill in short seller post-announcement allocations across delisters other than for firms with sufficiently large remaining market cap (Row (17)'s $\text{Size} \geq \$50 \text{ M}$ at -2.193^{*}). As expected, the evidence is greatest when the firm is also TBTF (Row (17)'s $\text{Assets} < \$50 \text{ B} \ \& \ \text{Size} \geq \50 M at 2.247^{**}). On balance, other than for the $\text{Size} \geq \$50 \text{ M}$ and "Sweet spot" subsamples where additional short seller investment may be warranted, EA announcements appear to provide substantive information homogenization and incent profit taking. For delisters, the resulting diminished opportunities for profits places short sellers in a context fostering a similar level of cross-sectional allocation skill as that found for non-EA firms. Summarizing our post-announcement results, we find robust evidence of short seller skill for survivors regardless of subsample, but only for large remaining market cap delisters.

4.4. Investigating structural differences in a financial crisis

In order to examine whether prior full-sample results adequately describe both times of crisis and non-crisis, we engage a Seemingly Unrelated Regressions (SUR) approach for estimating the two-stage regression model in the crisis and non-crisis periods. Due to the proliferation of banking firm financial distress during a global financial crisis, we expect that short sellers will face increased pressure to take profits after an EA and reallocate their financial and human capital towards prospecting for more pre-EA firms. That is, we expect that the crisis will result in more pre-EA positioning and less following EAs. We would also expect that conditioning on a crisis decreases short seller profitability and may attenuate the usual negative relationship between positioning and subsequent return.

4.4.1. Is abnormal short interest higher during a financial crisis (**H1_{Crisis}**)?

Regarding background for **H1_{Crisis}**, Table 4 Column (C) Row (18)'s 0.463^{**} confirms that in our SUR estimation the crisis subsample reflects the expected positive crisis fixed effect, i.e., the regression line starts from a higher intercept level of ABSI. While a positive crisis fixed effect reflects **H1** in a general sense as a starting point for all firms, incremental EA-related positioning beyond contemporaneous comparable non-EA firm baselines is our main concern. Due to contemporaneous comparable firm baselining, a given level of positive (negative) ABSI would be less (more) likely to be flagged as "truly abnormal" – i.e., above (below) comparable firm levels in the same period – in crisis rather than non-crisis. In line with this tendency, Column (A) confirms for survivors the presence of insignificant above-higher-crisis-period-baseline pre-EA short positioning during Crisis (Row (2)'s 0.193). Column (B) confirms for survivors significantly less-than-lower-non-crisis-period-baseline pre-EA positioning during Non-crisis (Row (2)'s -0.451^{***}). Regarding a direct examination of baseline-adapted **H1**, the difference (Column (C) Row (2)'s $+0.644^{***}$) confirms **H1_{Crisis}** as applied to surviving firms, i.e., greater truly abnormal (i.e., expected ABSI) pre-EA positioning (beyond period-comparable baselines) in surviving firms in a financial crisis. Table 5 Panel A Row (3) displays subsample robustness for this difference characterization other than for penny and low volume stocks. (Those stocks drive the -0.113 for $\text{Assets} < \$50 \text{ B}$ because the difference characterization still holds for $\text{Price} \geq \$1/\text{share}$ and for $\text{ADV} \geq 5000$.)

Regarding background for **H1_{Crisis}** as applied to delisting firms, Table 5 Panel A Row (4) confirms significantly greater-than-baseline pre-EA short positioning (e.g., Full sample 0.801^{***}) in Crisis, but significantly less-than-baseline pre-EA short positioning (e.g., Full sample -1.338^{***}) in Non-crisis. More to the point, the

Table 5
Tests of hypotheses $H1_{Crisis}$ and $H2_{Crisis}$.

		Full sample	Price \geq \$1/share	ADV \geq \$5000	Size \geq \$50 M	Assets < \$50 B	"Sweet spot"
Row	Panel A: Examination of $H1_{Crisis}$ (Pre-EA Abnormal Short Positioning Higher During Crisis)						
(1)	Crisis: Befea	0.193	0.233	0.153	0.099	0.146	0.027
(2)	Non-crisis: Befea	-0.451 ***	-0.422 ***	-0.468 ***	-1.195 ***	0.259 **	-0.113
(3)	Crisis - Non-crisis	0.644 ***	0.655 ***	0.621 ***	1.294 ***	-0.113	0.140
(4)	Crisis: Befea + Befea x delists	0.801 ***	0.812 ***	0.918 ***	2.145 ***	0.615 ***	1.805 ***
(5)	Non-crisis: Befea + Befea x delists	-1.338 ***	-1.200 ***	-1.496 ***	-2.348 ***	-1.079 ***	-2.337 ***
(6)	Crisis - Non-crisis	2.139 ***	2.012 ***	2.414 ***	4.493 ***	1.693 ***	4.142 ***
Row	Panel B: Examination of $H2_{Crisis}$ (Pre-EA Cross-Sectional Allocation Skill Attenuates During Crisis)						
(7)	Crisis: ABSIh + Befea x ABSIh	-1.279 *	-1.736 **	-0.996	-1.484 **	-1.101	-1.166
(8)	Non-crisis: ABSIh + Befea x ABSIh	-1.626 ***	-1.932 ***	-1.447 ***	-1.447 **	-1.017	-1.186
(9)	Crisis - Non-crisis	0.347	0.196	0.451	-0.037	-0.084	0.020
(10)	Crisis: ABSIh + Befea x ABSIh + Befea x delists x ABSIh	-0.115	-0.284	-0.107	-1.159 *	-0.333	-1.010 *
(11)	Non-crisis: ABSIh + Befea x ABSIh + Befea x delists x ABSIh	-4.019 ***	-3.437 ***	-3.684 ***	-5.045 ***	-4.285 ***	-4.930 ***
(12)	Crisis - Non-crisis	3.904 ***	3.153 **	3.577 ***	3.886 **	3.952 ***	3.920 ***
(13)	Crisis: Befea x ABSIh	-1.172	-1.629 **	-0.928	-1.477 **	-0.976	-1.069
(14)	Non-crisis: Befea x ABSIh	-0.957 *	-1.259 **	-0.832	-0.994 *	-0.377	-0.772
(15)	Crisis - Non-crisis	-0.215	-0.370	-0.096	-0.483	-0.599	-0.297
(16)	Crisis: Befea x ABSIh + Befea x delists x ABSIh	-0.008	-0.177	-0.039	-1.152	-0.208	-0.913
(17)	Non-crisis: Befea x ABSIh + Befea x delists x ABSIh	-3.350 ***	-2.764 **	-3.069 ***	-4.592 ***	-3.645 ***	-4.516 ***
(18)	Crisis - Non-crisis	3.342 **	2.587 *	3.030 **	3.440 **	3.437 ***	3.603 ***

Panels A and B report relevant comparisons of coefficient estimates using the SUR regression results (as in Table 4) for the crisis (2007 – 2009) and non-crisis (2010 – 2013) periods for testing hypotheses $H1_{Crisis}$ and $H2_{Crisis}$. Section 4.4 provides a discussion of related hypotheses and connections to table rows. Columns report estimates for the full sample (as in Table 4) as well as for the following subsamples: stock price of at least \$1/share, average daily trading volume ("ADV") of at least \$5000, market cap ("Size") of at least \$50 million, and total assets of at least \$50 billion. The "Sweet spot" subsample consists of firms with market cap of at least \$50 million and with total assets of at least \$50 billion. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively, for two-sided Wald tests.

difference (2.139***) confirms $H1_{Crisis}$ as applied to delisting firms, i.e., greater truly abnormal pre-EA positioning in delisting firms in a financial crisis.

Table 5 Panel A Rows (3) and (6) provide strong evidence for $H1_{Crisis}$'s conjecture of higher truly abnormal pre-EA positioning in a crisis except for TBTF survivors. As in earlier estimations that did not separate the observations into crisis and non-crisis periods, there is clear evidence that the higher truly abnormal pre-EA positioning is driven by positioning in firms that delist following an EA more so than those that survive. We interpret this as evidence of the higher level of short seller activity prior to EAs during a crisis. Of course, the higher aggregate level could lead to more informative prices prior to the EA that then attenuate pre-EA short seller profits (e.g., if they all short at the same time in a windfall price decline).

4.4.2. Does pre-EA allocation skill dissipate during a financial crisis ($H2_{Crisis}$)?

Our negative slope measure of short seller cross-sectional allocation skill examines short sellers' abilities to emphasize (deemphasize) big losers (big winners) in the cross section of firms shorted. That type of skill (to help recover the costs of investment in expertise) should still be evident, albeit possibly at a reduced level, even when competition among short sellers induces on-average more informative pre-EA prices. $H2_{Crisis}$ hypothesizes that, due to increased competition and more informative pre-EA prices, the negative relationship between abnormal short interest in EA firms prior to their EAs and subsequent returns is weaker during a financial crisis.

Table 4 Column (D) Row (1) indicates that the sign of the non-EA baseline relationship is negative in both Crisis (-0.107) and Non-crisis (-0.669***) periods.²² The significant difference from Non-Crisis (0.562***) suggests that the crisis period attracts or induces

²² Note that the crisis and non-crisis intercepts are (as in the first stage) significantly different. In particular, Table 4 Row (18)'s significantly more negative intercept (-4.732***) reflects the expected more negative returns starting point (intercept) in a "crisis." Our hypotheses regarding differential position-return negative correlations – as proxied by differential slopes in ABSIh – are not directly affected by the lower returns crisis starting point (intercept).

a lower level of cross-sectional allocation talent. This is possibly due to: (i) increased crisis-era competition (or perhaps laziness given baseline returns significantly more negative in a crisis anyway); and potentially (ii) more informative prices at which short sellers position even when there is no subsequent EA. $H2_{Crisis}$, however, is a hypothesis specifically about lower relative pre-EA cross-sectional positioning skill during a crisis. For survivors, Table 5 Panel B Row (7) confirms an apparently lower level of pre-EA skill (Row (7)'s -1.279*) in Crisis than in Non-crisis (Row (8)'s -1.626***). The difference (Row (9)'s 0.347), although insignificant, is in the direction hypothesized in $H2_{Crisis}$ as applied to survivors. However, given that all previous results have pointed to pre-EA positioning in delisting firms as the driving force behind measured pre-EA short seller skill, the potentially more interesting comparison is for delisters. Table 5 Panel B Row (12) confirms a robustly lower level of pre-EA skill (e.g., Full sample 3.904***) for crisis delisters in the direction hypothesized in $H2_{Crisis}$. Note that, although there is variation across subsamples, for the period's Full sample, Crisis (Non-crisis) skill is insignificantly superior (significantly superior) to baseline non-EA firms for survivors (Full Sample -1.172 (Row 13) and -0.957* (Row 14)) and delisters (Full sample -0.008 (Row (16)) and -3.350*** (Row (17))). While there are pockets of significantly beyond-baseline non-EA pre-EA skill in survivors (e.g., Row (14)'s Price \geq \$1/share at 1.259** Size \geq \$50 M at -0.994*), once again the greatest beyond-baseline pre-EA skill, and crisis-related difference in pre-EA skill, appears in allocating amongst delisting firms (Rows (17) and (18)). Returning to $H2_{Crisis}$, however, the effect of a crisis in attenuating short sellers' pre-EA cross-sectional allocation talent is notable (Rows (9) and (12)) and driven heavily by diminished crisis-era skill in short sellers' cross-sectional allocation skill amongst delisters (Row (12)).

4.4.3. Is post-announcement profit-taking greater during a financial crisis ($H3_{Crisis}$)?

Moving on to short positioning following EA announcements, recall that the additional pressure for profit-taking in a crisis suggests reallocating financial and human capital towards prospecting for pre-EA firms. In line with that incentive, $H3_{Crisis}$ conjectures that crisis-era abnormal short interest decreases more from pre-EA levels. Regarding background for $H3_{Crisis}$ as applied to surviving

Table 6
Tests of hypotheses $H3_{Crisis}$ and $H4_{Crisis}$.

		Full sample	Price \geq \$1/share	ADV \geq \$5000	Size \geq \$50 M	Assets < \$50 B	"Sweet spot"
Row	Panel A: Examination of $H3_{Crisis}$ (Crisis Abnormal Short Positioning Decreases More Following EA Announcements)						
(1)	Crisis: Aftea - Befea	-1.053 ***	-1.367 ***	-1.108 ***	-2.008 ***	-0.862 ***	-1.564 ***
(2)	Non-crisis: Aftea - Befea	0.003	-0.032	-0.004	0.046	-0.303 *	-0.580 *
(3)	Crisis - Non-crisis	-1.056 ***	-1.335 ***	-1.105 ***	-2.054 ***	-0.560 *	-0.984
(4)	Crisis: Aftea + Aftea x delists - (Befea + Befea x delists)	-1.125 ***	-0.913 **	-1.196 ***	-0.116	-0.976 ***	-0.139
(5)	Non-crisis: Aftea + Aftea x delists - (Befea + Befea x delists)	-0.133	0.718**	0.417	4.075 ***	0.031	4.437 ***
(6)	Crisis - Non-crisis	-0.992 **	-1.631 ***	-1.613 ***	-4.192 ***	-1.007 **	-4.576 ***
(7)	Crisis: Aftea + Aftea x delists	-0.324	-0.101	-0.277	2.029 **	-0.361	1.666 **
(8)	Non-crisis: Aftea + Aftea x delists	-1.471 ***	-0.482 *	-1.079 ***	1.727 ***	-1.048 ***	2.100 ***
(9)	Crisis - Non-crisis	1.147 ***	0.381	0.802 *	0.301	0.687 **	-0.434
Row	Panel B: Examination of $H4_{Crisis}$ (Cross-Sectional Allocation Skill Following EA Announcements Attenuates in Crisis)						
(10)	Crisis: ABSIh + Aftea x ABSIh	-0.066	0.064	-0.078	0.443	-0.195	0.333
(11)	Non-crisis: ABSIh + Aftea x ABSIh	-1.015 ***	-1.054 **	-0.780 **	-1.504 ***	-1.122 **	-1.862 ***
(12)	Crisis - Non-crisis	0.949	1.118	0.702	1.947	0.927	2.195 **
(13)	Crisis: Aftea x ABSIh	0.041	0.171	-0.010	0.450	-0.070	0.430
(14)	Non-crisis: Aftea x ABSIh	-0.346	-0.381	-0.165	-1.051 **	-0.482	-1.448 **
(15)	Crisis - Non-crisis	0.387	0.552	0.155	1.501	0.412	1.878 *
(16)	Crisis: ABSIh + Aftea x ABSIh + Aftea x delists x ABSIh	-0.579	-2.174	-0.327	-1.247	-0.736	-1.134
(17)	Non-crisis: ABSIh + Aftea x ABSIh + Aftea x delists x ABSIh	-0.519	-1.178	-0.958	14.475	-0.780	20.498
(18)	Crisis - Non-crisis	-0.060	-0.996	0.631	-15.722	0.044	-21.632
(19)	Crisis: Aftea x ABSIh + Aftea x delists x ABSIh	-0.472	-2.067 ***	-0.259	-1.240	-0.611	-1.037
(20)	Non-crisis: Aftea x ABSIh + Aftea x delists x ABSIh	0.150	-0.505	-0.343	14.928	-0.140	20.912
(21)	Crisis - Non-crisis	-0.622	-1.562	0.084	-16.168	-0.471	-21.949

Panels A and B report relevant comparisons of coefficient estimates using the SUR regression results (as in Table 4) for the crisis (2007 – 2009) and non-crisis (2010 – 2013) periods for testing hypotheses $H3_{Crisis}$ and $H4_{Crisis}$. Section 4.4 provides a discussion of related hypotheses and connections to table rows. Columns report estimates for the full sample (as in Table 4) as well as for the following subsamples: stock price of at least \$1/share, average daily trading volume ("ADV") of at least \$5000, market cap ("Size") of at least \$50 million, and total assets of at least \$50 billion. The "Sweet spot" subsample consists of firms with market cap of at least \$50 million and with total assets of at least \$50 billion. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively, for two-sided Wald tests.

firms, Table 6 Panel A Row (1) confirms robustly significant declines in abnormal short positioning during a crisis. However, Row (2) indicates the absence of a similarly robust decline during non-crisis times for survivors. The significant additional decline during crisis (Row 3) confirms $H3_{Crisis}$ for surviving firms.

Regarding $H3_{Crisis}$ as applied to delisting firms, Table 6 Panel A Row (4) confirms a robust significant decline in abnormal short positioning during a crisis. In stark contrast, Row (5) not only reflects an absence of a similar decline, but significantly increased post-announcement positioning in non-crisis delisting firms having sufficient remaining post-announcement market cap (e.g., Row (5)'s 4.075*** for Size \geq \$50 M). Regarding $H3_{Crisis}$'s specifically hypothesized difference, Row (6)'s significant additional declines during crisis (Full sample at -0.992** and negative and significant for all subsamples) confirm $H3_{Crisis}$ even for delisting firms. In summary, consistent with additional pressure for crisis-related profit taking to redeploy financial and human capital towards prospecting for pre-EA firms, both surviving and delisting firms in our sample experience (on average) $H3_{Crisis}$'s hypothesized greater decline in post-announcement short positioning during a financial crisis. Profit-taking is higher during a crisis.

Regarding potentially important EA announcement feedback effects, it is reasonable to conjecture that an EA announcement could act as a "wake up call" and thereby attract additional short seller capital and positioning, particularly in firms that subsequently delist. Table 6 Panel A Row (5)'s positive coefficient estimates (post-announcement increases) are consistent with such a "wake up call" or "fear of missing out" notion for non-crisis delisters. However, Table 6 Panel A Row (4)'s uniformly negative coefficient estimates (post-announcement decreases) clearly contradict the notion of similar average post-announcement attraction for crisis delisters – even when post-announcement positioning remains significantly high (Table 6 Panel A Row (7)'s 2.029** for Size \geq \$50 M and 1.666** for "Sweet spot"). Perhaps surprisingly, any on-average "piling on" in response to an EA appears to be a non-crisis, rather than crisis, concern, and only for delisters. In crisis, for both

delisters and survivors, EAs usually offer short selling pressure relief.

4.4.4. Does post-EA-announcement skill dissipate during a financial crisis ($H4_{Crisis}$)?

Regarding short sellers' skill variations during a crisis, $H4_{Crisis}$ hypothesizes that, due to greater competition during a crisis, there should be a less negative relationship between abnormal short interest following EA announcements and subsequent returns. As we highlighted in the discussion of $H2_{Crisis}$, Table 4 Columns (D) and (E) Row (1) indicates that the sign of the non-EA baseline relationship is negative in both Crisis (-0.107) and Non-crisis (-0.669***) periods.²³ The significant difference from Non-Crisis (0.562***) suggests that a crisis attracts, or induces, a lower level of cross-sectional allocation talent. Degradation in average skill is the expected result of increased crisis-era entry and competition, and of the more informative prices at which short sellers engage even when there is no subsequent EA. However, $H4_{Crisis}$ is a hypothesis specifically about lower relative positioning skill following EA announcements during crisis rather than non-crisis times. For survivors, Table 6 Panel B Row (10) suggests less skill following EA announcements (e.g., Full sample -0.066) in Crisis than in Non-crisis (e.g., Row (11)'s -1.015***), the difference in which (e.g., Row (12)'s 0.949) is consistently in the positive direction hypothesized in $H4_{Crisis}$. It is significant, however, only in the "Sweet spot" subsample (Row (12)'s 2.195**). In both crisis and non-crisis times, short seller cross-sectional allocation skill in survivors following an EA announcement tend to be comparable to that in firms that never receive an EA. (See Full Sample Row (13)'s 0.041 and Row (14)'s -0.346 which are both insignificantly different from zero.). A possible exception is Non-crisis beyond-baseline post-announcement skill in surviving firms having sufficiently enticing remaining post-

²³ We emphasize again that the baseline's forward-looking confinement to firms that never receive an EA biases the baseline negative measure of short seller talent up towards zero since EAs are generally considered negative events and firms that receive them in the future are excluded from this baseline.

announcement market cap (Table 6 Panel B Row (14)'s -1.051^{**} for Size \geq \$50 M and 1.879^{**} for "Sweet spot"). However, given that our previous results have highlighted that positioning in delisting firms is the driving force behind greater measured short seller skill, the potentially more interesting comparison is again for delisters. Table 6 Panel B Rows (16) and (17) display similar overall delister skill following EA announcements (e.g., Full sample -0.579) in crisis as that in non-crisis times (e.g., Full sample -0.519). Row (18)'s overall negative differences for crisis delisters (e.g., Full sample -0.060) are insignificant but also in the *opposite* of the direction hypothesized in $H4_{Crisis}$. We note that, similar to survivors, Rows (19) and (20) reflect no significant overall evidence of other-than-baseline skill in either crisis (Row (19)'s Full sample -0.472) or non-crisis times (Row (20)'s Full sample 0.150). In summary, regarding $H4_{Crisis}$'s conjecture of lower post-announcement cross-sectional allocation skill during crisis, Table 6 Panel B Row (12) presents consistently positive differences that align with $H4_{Crisis}$ applied to survivors, only one of which is significantly different from zero. Table 6 Panel B Row (18) provides no consistent support for, nor contradiction of, $H4_{Crisis}$ as applied to delisters. The only *significantly* beyond-baseline (truly abnormal) post-announcement skill is in Non-crisis surviving firms' with large remaining market cap (Table 6 Panel B Row 14's -1.051^{**} and -1.448^{**}), and for Crisis non-penny-stock delisting firms (Table 6 Panel B Row 19's -2.067^{***}). While all subsamples presented in these rows (14 and 19) suggest beyond-baseline post-announcement skill, verification of the significance of potentially beyond-baseline skill awaits future more powerful investigations.

5. Conclusions

Formal EAs are important bank supervisory tools. Due to their public nature, however, bank and security market regulators, along with bank management, are justified in expressing concern regarding whether publicly-traded bank EAs – through information revelation and imposed restrictions – influence public equity values in a manner that interacts with regulatory intent. As an example, EAs can coincide with increased short selling and lower bank equity values thereby exacerbating efforts to restore regulatory capital adequacy. During times of financial crisis, almost by definition we expect an unusually high number of EAs. Increased EA-related short selling across multiple banks could increase systemic risk. Given crisis conditions, to attenuate short seller feedback effects, bank regulators might favor non-public actions (e.g., MOUs) rather than publicly-announced EAs. However, Berger et al. (2021) find that use of formal EAs is important for *reducing* systemic risk, particularly during financial crises, and that "more severe EAs and EAs against banks are more effective in systemic risk reduction than those less severe" (p. 0).²⁴

Our findings indicate that EAs correlate with a *reduction* in crisis-era short selling. Such a reduction adds another reason why crisis-era EAs may attenuate, rather than exacerbate, systemic risk. During the 2007–2009 financial crisis, following EA initiations, we find *on average* less short selling in firms operating with an EA than in comparable firms that never receive one. Our findings support our hypotheses that in financial crises, short sellers predominantly position *prior* to EAs and that EA initiations then act as information-homogenizing and profit-taking events reducing in-

centives to remain positioned. Profit-taking puts upward pressure on bank stock prices, all else equal. Extending our investigational approach to the period following the crisis, we document our perhaps otherwise counterintuitive main contribution: EA initiations attract short selling in *non-crisis, rather than crisis*, periods. So, while the possibility that EAs interfere with regulatory intent is a valid one, the concern appears to be justified primarily due to the reaction during non-crisis times.

Supplementary materials

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CRediT authorship contribution statement

Leslie Boni: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing - original draft, Writing - review & editing. **J. Chris Leach:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing - original draft, Writing - review & editing. **Reilly S. White:** Conceptualization, Data curation, Investigation, Writing - review & editing.

References

- Akbas, F., Boehmer, E., Erturk, B., Sorescu, S., 2017. Short interest, returns, and unfavorable fundamental information. *Financial Manag.* 455–486 Summer.
- Balashubramanian, B., Palvia, A., 2018. Can short sellers inform bank supervision? *J. Financial Serv. Res.* 53, 69–98.
- Berger, A.N., Bouwman, C.H.S., 2013. How does capital affect bank performance during financial crises? *J. Financial Econ.* 109, 146–176.
- Berger, A.N., Cai, J., Roman, R.A., Sedunov, J., 2021. Supervisory enforcement actions against banks and systemic risk. *J. Bank. Finance* forthcoming.
- Brous, P.A., Leggett, K., 1996. Wealth effects of enforcement actions against financially distressed banks. *J. Financial Res.* 19, 561–577.
- Brunmeier, J., Willardson, M.D., 2006. Supervisory enforcement actions since FIRREA and FDICIA. *Region* 22–27 & 38–43.
- Desai, H., Rajgopal, S., Yu, J.J., 2016. Were information intermediaries sensitive to the financial statement-based leading indicators of bank distress prior to the financial crisis? *Contemp. Acc. Res.* 33, 576–606.
- Deli, Y.D., Delis, M.D., Hasan, I., Liu, L., 2019. Enforcement of banking regulation and the cost of borrowing. *J. Bank. Finance* 101, 147–160.
- Delis, M.D., Staikouras, P.K., Tsoumas, C., 2017. Formal enforcement actions and bank behavior. *Manage. Sci.* 63, 959–987.
- Gilbert, R.A., Vaughan, M.D., 2001. Do depositors care about enforcement actions? *J. Econ. Bus.* 53, 283–311.
- Grimblatt, M., Titman, S., 1989. Mutual fund performance: an analysis of quarterly portfolio holdings. *J. Bus.* 62, 393–416.
- Grossman, S.J., Stiglitz, J.E., 1980. On the impossibility of informationally efficient markets. *Am. Econ. Rev.* 70, 393–408.
- Hasan, I., Massoud, N., Saunders, A., Song, K., 2015. Which financial stocks did short sellers target in the subprime crisis? *J. Bank. Finance* 54, 87–103.
- Henry, T.R., Kisgen, D.J., Wu, J.(J.), 2015. Equity short selling and bond rating downgrades. *J. Financial Intermed.* 24, 89–111.
- Jordan, J.S., Peek, J., Rosengren, E.S., 2000. The market reaction to the disclosure of supervisory actions: implications for bank transparency. *J. Financial Intermed.* 9, 298–319.
- Karpoff, J.M., Lou, X., 2010. Short sellers and financial misconduct. *J. Finance* 65, 1879–1913.
- Liu, M., Ma, T., Zhang, Y., 2012. Are short sellers informed? Evidence from the 2007–2008 subprime mortgage crisis. *Financial Rev.* 47, 199–218.
- Roman, R.A., 2020. Winners and losers from supervisory enforcement actions against banks. *J. Corp. Finance* 60, 101516.
- Slovnik, M.B., Sushka, M.E., Polonchek, J.A., 1999. An analysis of contagion and competitive effects at commercial banks. *J. Financial Econ.* 54, 197–225.

²⁴ Berger et al. (2021) do not examine short selling.