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The effectiveness of government stock purchase during market crash: Evidence from China

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内容摘要：During the Chinese stock market crash in 2015, the Chinese government formed a “national team” to directly purchase stocks of more than 1000 firms. We find that the national team’s interventions lower the stock price crash risk for these firms; however, they also increase stock price synchronicity, transaction cost and decrease idiosyncratic information. The stabilizing role of the “national team” disappears in the long run after the crisis period. Firms with more noise traders and a lower level of investor confidence benefit more from the national team ownership,consistent with the conjecture that the national team improves market liquidity and investor confidence.

一、Introduction

We have witnessed several major market crises in the last few decades. The collapse of a technology bubble in March 2000 and the stock market downturn in October 2002 was followed by the financial crisis in 2008, the flash crash in May 2010, and the Covid-19 crash in early 2020. With the more frequent market crises, we see more and more government interventions in financial markets. For example, the Bank of Japan bought a record high of 120 billion yen in ETFs in March 2020 to combat the market crash. During the Asian financial crisis of 1997 and the global financial crisis of 2008, many governments and stock exchanges implemented a series of regulatory and monetary policies to stabilize the market. Indirect interventions, such as liquidity boosts through central banks and direct interventions, such as short sale restrictions and government preferred equity infusion in the financial industry, are commonly observed. The debates about government interference in public companies have been revived, and its pros and cons are carefully studied. On April 6, 2020, Former Federal Reserve Chairperson Janet Yellen argued that, in addition to U.S. Treasuries and corporate bonds, the central bank should be allowed to buy individual stocks to rescue the market. However, probably due to concerns over potential moral hazard problems and public aversion to government ownership in the private sector, we still do not see many cases where governments directly purchase individual stocks.

Interestingly, one of China’s key measures to battle the 2015–2016 market crash was the direct purchase of a wide range of individual company stocks and component shares of the market index. In particular, the China Securities Finance Corporation Limited (CSF) and China Central Huijin Investment Limited (CCH) lent money to 21 brokerages and formed a “national team” to directly buy more than 1000 stocks starting from July 6, 2015.2 These government-backed institutional investors directly purchase a wide range of stocks to inject liquidity in the market and minimize the spillover effects from the stock market to the real economy. As many listed companies in China collateralize their stock to secure bank loans, the government bailout needs to ensure that individual firms do not sustain a drastic price

decline, leading to a reduction in collateral value and widespread loan defaults. Furthermore, many margin investors experienced a short squeeze (Bian et al., 2018), and the fire sales resulted in more panicking behavior that further jeopar dized market stability. However, such an intervention might have unintended externalities if other market participants trade with or against the government, causing price efficiency to deteriorate (Brunnermeier et al., 2009).

This paper investigates the effect of market intervention by the national team on the stock market. In particular, in the main body of the paper, we examine if the Chinese national team achieves the goal of preventing stock price crashes through direct stock purchases? In our additional test, we identify the mechanism through which the national team achieves its goal of stabilizing the market. We also explore if there are any unintended consequences of the ownership by the national team.

Using quarterly data from the third quarter (Q3) of 2015 to the last quarter (Q4) of 2018, we construct a sample of firms purchased by the national team as the treatment group and those not held by the national team as the control group. We find that from July 2015 to the end of 2016, the national team’s direct purchase of stocks improves price stability.3 The positive effect of national team ownership on price stability is robust under a series of alternative empirical designs, such as propensity score matching, difference-in difference specification, or dividing the sample into constituent stocks and non-constituent stocks. National team ownership’s positive effect appears mostly in firms with more noise traders and firms with lower investor confidence. The finding is consistent with the notion that the national team stabilizes stock prices by trading against noise traders (the liquidity supplement effect) and restoring investor confidence (the confidence-boosting effect). However, national team ownership is associated with higher stock returns synchronicity, lower idiosyncratic volatility, and higher spread, indicating that national team ownership has many unintended effects on market quality. Furthermore, when we analyze the post-crisis sample between 2017 and 2018, the national team’s positive role disappears in the long run.

Our paper contributes to the literature in several ways. First, we provide an

in-depth analysis of direct government intervention in the stock market. Although a large body of literature has examined the consequence of government interventions in times of crisis, most of these studies focus on developed markets and the effect of bailout programs. The direct purchase of shares in many listed companies by the Chinese government is different from government bailout programs in other countries during times of crisis. Our findings suggest that the national team's direct purchase of shares has positive and negative impacts on the market. It provides an example of government intervention when regulatory agencies worldwide consider if the government's purchase of company stocks is a viable alternative to rescue the market. Our findings also provide direct evidence for the theoretical model proposed by Brunnermeier et al. (2020). They suggest that direct government involvement in the secondary market during the liquidity crisis can be beneficial since it might infuse additional liquidity into the market and prevent the looming market crash. However, it might result in price distortion and moral hazard problems. Koijen and Yogo (2019) suggest a demand system approach to asset pricing and match institutional and household holdings. They use the U.S. data and show that the price impact of average institutions has decreased recently, and they argue that stock returns are mostly explained by demand shocks unrelated to changes in observed characteristics. The large purchase of company stock by the national team would be an example of a demand shock, and our study provides an interesting setting to apply their model and understand how government bailout might affect the overall market return.

Furthermore, our findings bear some critical policy implications. The national team achieves the goal of stabilizing stock prices during the crisis period. However, after the crisis period, such an effect subdued. The negative impacts of the national team on price informativeness suggest that direct government purchase of stock is not a sustainable strategy in the long run. An orderly exiting strategy by the national team needs to be part of the overall rescuing plan.

The remainder of the paper is organized as follows. Section 2 describes the Chinese stock market crisis in 2015. Section 3 discusses the sample and methodology. Section 4 reports the empirical findings and robustness tests. Section 5 conducts

additional tests. Section 6 concludes the paper.

二、Background of the Chinese Stock Market Crisis

From mid-June 2015 to early January 2016, the Chinese A-share market experienced three major market crashes. The first occurred from mid-June to early July of 2015. The China Securities Regulatory Commission (CSRC) prohibited all security companies from shadow margin lending. As a result, many arbitrage positions were forced to be closed out at a loss, causing a further decline in the market. The crash was fueled by leverage-induced fire sales and heavy selling by margin investors (Bian et al., 2018). The Shanghai and Shen zhen Stock Exchange Composite Indexes plunged by 32% and 39%, respectively, wiping out more than RMB 26 trillion in share value from their June 12 peaks. After a short period of stability, another collapse took place in mid-August 2015, when the Chinese government unexpectedly lowered the RMB official exchange rate by about 2%. The stock index fell by nearly 26%, wiping out more than RMB 16.5 trillion in share value till late August 2015.4 The market gradually rebounded after the second collapse. However, on January 4, 2016, the stock market experienced another drop when the Shanghai and Shen zhen exchanges introduced the Circuit Breaker.5 The Shanghai Composite Index dropped from 3539 points to 2638 points, erasing about RMB 15.5 trillion in market value. During the stock market crash, the loss in market value accounted for about 52% of China’s Gross National Product in 2015. In essence, this crisis is a liquidity crisis caused by a decline in the number of market participants or difficulties in trading financial assets rather than a crisis caused by changes in the economic environment, corporate debt, or operational problems (Huang et al., 2016). The sharp decline of stock prices came from the liquidity spiral described in Brunnermeier and Pedersen (2009) when the ban from off-market margin lending came into force.

The stock price crash triggered a market-wide panic that destroyed investor confidence. To prevent further decline in stock prices and the outbreak of more serious systemic financial risk (Liang et al., 2020), the Chinese government implemented a series of rescue policies during the crash period. In addition to lowering interest rates, suspending IPOs, investigating rule-breaking trades, cracking

down market rumors, and restricting share sales by large shareholders, the Chinese government also formed a national team to buy company stocks traded on the exchanges directly. State-linked funds, including China Securities Finance Corporation Limited (CSF) and China Central Huijin Investment Limited (CCH), initiate stock purchases directly from the secondary market. Also, the CSF lent money to 21 brokerages to buy stocks in the stock market. These brokerages include affiliates of the State Administration of Foreign Exchange, CSF customized asset management plans, and CSF customized funds. They are different from other government institutions, such as the State-owned Asset Supervision and Administration Commission that holds state-owned enterprise (SOE) shares. The national team was driven purely by the incentive to promptly stabilize the stock price rather than rescuing companies from routine operational issues. The national team holding information is released to the market via company announcements, information shared by company insiders,6 or the quarterly earnings reports that include the disclosure of top-10 shareholders. According to the Wind database, the national team has directly bought stocks of more than 1000 firms since July 6, 2015.

The national team's direct purchase resembles the Hong Kong government's response to the 1997 Asian financial crisis. During the Asian financial crisis in 1997, the Hong Kong government purchased shares of the 33 stocks that constitute the Hang Seng Index (HS) to fight against speculators targeting the Hong Kong dollar and the stock market. Su et al. (2002) find that the government's action reversed the stock market decline and reduced its volatility. Unlike the Hong Kong government bailout, which focused on the Hang Seng stocks, the Chinese government bought a very large number of shares in addition to firms on the major index. The national team bought 1389 stocks in our sample, almost half of the total A-share listed companies.

One might also compare the Chinese government intervention with the bailout effort in Japan. Since 2013, the Bank of Japan (BoJ) has been engaging in what the government has named the Quantitative and Qualitative Easing (QQE) program to fight against deflation. As part of its broader QQE agenda, the BoJ has vigorously increased its domestic equity holdings through purchases of index linked ETFs. By

the end of March 2020, the BoJ owned approximately ¥28.9 trillion worth of the Tokyo Stock Price Index (Topix) and Nikkei ETFs, corresponding to approximately 80% of the Japanese ETFs.8 Instead of investing passively in index funds, the Chinese national team buys a wide range of shares and manages its positions through active trading. Such direct intervention in the stock market turns out to be quite effective in quickly restoring investors' confidence. However, it might also introduce noise among market participants, which may induce moral hazards and affect price efficiency. If investors expect a government bailout during the market crash, they will rationally trade more aggressively and take on risky positions that are not aligned with their normal level of risk tolerance, leading to price distortion in the market.

三、Research design

（一）Sample and data source

We use non-financial companies listed on the Shanghai and Shenzhen exchanges between the third quarter (Q3) of 2015 and the last quarter (Q4) of 2016 as the initial sample to explore the effect of national team ownership.9 For the post-crisis period, we use data from 2017 to 2018. We exclude firms placed under special treatment (ST firms) and firms delisted during the sample period because they have unusual poor market performance.10 Following Jin and Myers (2006), we remove stocks traded for less than 30 days during a particular quarter.11 After excluding firms with insufficient data, we have 14,129 firm-quarter observations. We winsorize all variables at the 1st and 99th percentile to mitigate the impact of outliers. The stock market trading data, corporate financial data, and stock market derivative data come from the China Stock Market and Accounting Research (CSMAR) database, a leading Chinese financial database provider. National team ownership and other institutional ownership are drawn from the WIND database, another leading Chinese financial database.

（二）Measure of stock price stability

Following Chang et al. (2017), we use stock price crash risk to measure stock price stability. As described in the institutional background, the national team was formed to prevent further decline in stock prices when the crisis appeared. Hence we take stock price crash risk as the proxies for stock price stability and examine whether

the national team achieved its goal of stabilizing the stock price.

To calculate other measures for stock price stability, we follow Chen et al. (2001), Hutton et al. (2009), and Kim et al. (2011a, 2011b) and estimate firm-specific daily returns for each firm and quarter. The expanded market model is estimated to calculate the abnormal daily return during the sample period.

$$R_{i,t} = \alpha_i + \beta_{1,i}R_{m,t-2} + \beta_{2,i}R_{m,t-1} + \beta_{3,i}R_{m,t} + \beta_{4,i}R_{m,t+1} + \beta_{5,i}R_{m,t+2} + \varepsilon_{i,t} \quad (1)$$

where Ri, t is the dividend-inclusive daily return of stock i on day t and Rm, t is the return of the dividend-inclusive value-weighted market index on day t. The lead and lag terms for the market index return are included to allow for nonsynchronous trading (Dimson,1979). The residual returns from Model (1) are the firm-specific daily returns that market returns cannot explain. The firm-specific daily return for firm i on day t, Wi,t, is defined as the natural log of one plus the residual return in Eq. (1), that is, Wi,t = ln (1+ $\varepsilon_{i,t}$). We construct the following four price stability indicators based on Wi,t.

1.The price crash event

We define crash days in a given fiscal quarter for a given firm as those days during which the firm experiences firm-specific daily returns of more than 3.39 standard deviations (i.e., the frequency of 0.1% in the normal distribution) below the mean firm-specific daily returns over the entire fiscal quarter, that is, Wi,t < W − 3.39 σ (Wi,t). Our first measure of the crash likelihood for each firm in each quarter, denoted by CRASH, is an indicator variable that equals one for a firm-quarter that features one or more crash days (as defined above) during the fiscal quarter period and zero otherwise.

2.The difference in downside and upside frequencies

Following Callen and Fang (2013), we define jump days in a given fiscal quarter for a given firm as those days during which the firm experiences firm-specific daily returns of more than 3.39 standard deviations above the mean firm-specific daily returns over the entire fiscal quarter, that is, Wi,t > W + 3.39σ (Wi,t) . We define the second measure of the crash likelihood for each firm in each quarter, denoted by COUNT, as the downside frequencies minus the upside frequencies. A higher value of

COUNT corresponds to a higher frequency of crashes.

3.The negative conditional return skewness

The third measure of crash risk used in the literature (Chen et al., 2001; Hutton et al., 2009; Kim et al., 2011a, 2011b) is the negative conditional return skewness (NCSKEW). Specifically, NCSKEW for a given firm in a fiscal quarter is calculated by taking the negative of the third moment of firm-specific daily returns for each sample quarter and dividing it by the standard deviation of firm specific daily returns raised to the third power. Specifically, for each firm i in quarter q, we compute NCSKEW as

$$NCSKEW_{i,q} = -\left[n(n-1)^{\frac{3}{2}}\sum W_{i,t}^{3}\right] \Big/ \left[(n-1)(n-2)\left(\sum W_{i,t}^{2}\right)^{\frac{3}{2}}\right] \quad (2)$$

where n is the number of trading days for firm i in quarter q. An increase in NCSKEW corresponds to a stock having a more left-skewed distribution, i.e., being more “crash-prone.”

4.The down-to-up volatility

Following the literature (Chen et al., 2001; Hutton et al., 2009; Kim et al., 2011a, 2011b), we use the down-to-up volatility (DUVOL) as the last measure of crash risk. For each firm i over a fiscal-quarter period q, we separate all the days with firm-specific daily returns below the quarterly mean (“down” days) from those with firm-specific returns above the quarterly mean (“up” days) and separately calculate the standard deviation for each of these subsamples. The DUVOL measure is then the log of the ratio of the standard deviation on the down days to the standard deviation on the up days. Specifically, for each firm i in quarter q, we compute DUVOL as

$$DUVOL_{i,q} = log\left\{\left[(n_u-1)\sum_{Down} W_{i,t}^{2}\right] \Big/ \left[(n_d-1)\sum_{Up} W_{i,t}^{2}\right]\right\} \quad (3)$$

where nu and nd are the number of up and down days over the fiscal quarter q, respectively. DUVOL measures the difference in price volatility between the down days and up days for firm i in quarter q. A higher value for DUVOL corresponds to a stock being more “crash-prone.”

（三）Measuring national team ownership and other institutional ownership

According to the statistics of the WIND database, the national team mainly is represented by five groups: CSF (China Securities Finance Corporation Limited), CCH (China Central Huijin Investment Limited), affiliates of the State Administration of Foreign Ex change, CSF customized asset management plans, and CSF customized funds. These five groups had clear government affiliation and explicit policy goals of stabilizing the market during the crisis period.

We collect all information about national team ownership of Chinese stocks from the WIND database and then add up the shares held by the five different groups at each quarter-end in the sample period. We define the independent variable GOV as the number of shares held by the five groups at the end of the quarter, divided by the total number of shares outstanding at the end of the quarter.

To compare the national team's role with other institutional shareholders, we create another independent variable, INST, to measure other institutional investors' ownership. INST is measured as the total number of shares held by other institutional investors at the end of the quarter, divided by the total number of shares outstanding at the end of the quarter.

（四）The model

To examine the impact of national team ownership on stock price stability, we estimate the following regression that links our measures of stock price stability in quarter q to our proxies for national team ownership and a set of control variables in quarter q-1

$$Price\ Stability_{i,q} = \alpha + \beta_1 GOV_{i,q-1} + \beta_2 INST_{i,q-1} + \sum_k \beta_k Control_{i,q-1}$$

$$+ \sum_j \beta_j Industry\ dummy + \sum_l \beta_l Year - quarter\ dummy + \varepsilon_{i,q} \quad (4)$$

where Price Stabilityi, q is one of the four measures for stock price stability (CRARH, COUNT, NCSKEW, and DUVOL) for firm i in quarter q defined in Section 3.2. GOVi, q− 1 is national team ownership for firm i in quarter q-1.15 INSTi, q− 1 is the ownership of other insti tutional investors for firm i in quarter q-1. Eq. (4) is estimated using logistic regressions when the dependent variable is CRASHi, q. For other price stability measures as the dependent variables, Eq. (4) is estimated using ordinary least-square (OLS) regressions. We expect a negative coefficient for GOVi,

q− 1. It implies a negative influence on stock price crash risk and thus a positive impact on price stability.

Following Chen et al. (2001), Hutton et al. (2009), and Kim et al. (2011a, 2011b), we include a set of control variables. The first set is the market indicators. Returni, q− 1 is the arithmetic average of firm-specific daily returns over the fiscal quarter. Chen et al. (2001) find that firms with high past returns are more likely to experience stock price crashes. $TURN_{i, q-1}$ is the average firm-specific daily turnover ratio in a quarter. Hong and Stein (2003) find that stocks with higher turnover rates are more prone to crash risk. $VOL_{i, q-1}$ is the quarterly standard deviation of firm-specific daily returns. Kim et al. (2011a) show that stocks with higher price volatility are more prone to crash risk. $SKEW_{i,q-1}$ and $KURT_{i,q-1}$ denote the skewness and kurtosis of firm-specific daily returns over a fiscal quarter. Jin and Myers (2006) and Hutton et al. (2009) find that former return skewness and kurtosis positively relate to future crash risk.

We also control for the financial indicators, $SIZE_{i,q-1}$, $BM_{i, q-1}$, $ROE_{i, q-1}$ and $LEV_{i, q-1}$ in Eq. (4). $SIZE_{i, q-1}$ is the natural logarithm of stock market capitalization at the end of quarter q-1. $BM_{i, q-1}$ is the book value of equity divided by the market value of equity at the end of quarter q-1. Research shows that stock market capitalization is positively associated with stock price crash risk, while the book to-market ratio is negatively associated with stock price crash risk (Chen et al., 2001; Hutton et al., 2009; Callen and Fang, 2013). $ROE_{i, q-1}$ is defined as net income divided by net assets at the end of quarter q-1. $LEV_{i, q-1}$ is the total debt divided by total assets at the end of quarter q-1. Hutton et al. (2009) show that operating performance and financial leverage are negatively related to crash risk. Finally, industry and year-quarter dummies are included in Eq. (4) to control industry and time-fixed effects.

Table 1
The distribution of national team holdings.

Panel A. The distribution of national team holdings in different sectors		
	Number of firms that the national team once held	Number of firms in the overall sample
The overall sample	1389 (50.86%)	2731
Shanghai and Shenzhen 300 constituent stocks	242 (96.03%)	252
Main board stocks	773 (54.17%)	1427
Small board stocks	380 (48.97%)	776
Growing enterprise stocks	236 (44.70%)	528

	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4
Panel B. The size of national team holdings over the sample period						
Total market value (billion RMB)	1164.23	1317.65	1330.44	1409.40	1330.74	1269.39
Number of firms	1081	1311	1244	1238	1176	1178
Average ownership per stock	4.12%	3.29%	3.18%	3.11%	3.05%	2.94%
Panel C. The number (percentage) of stocks held by the national team in different sectors overtime						
Main board stocks	813(53%)	722(47%)	686(44%)	682(43%)	643(40%)	652(39%)
Small board stocks	173(23%)	363(46%)	345(44%)	348(44%)	331(41%)	335(40%)
Growing enterprise stocks	95(20%)	226(46%)	213(43%)	208(40%)	202(37%)	191(32%)
Panel D. The change of national team holdings over the sample period						
$Chg<-0.75$		44	4	8	3	11
$-0.75\leq Chg<-0.5$		167	37	25	17	23
$-0.5\leq Chg<-0.25$		122	99	62	59	41
$-0.25\leq Chg<0$		103	332	348	399	300
$Chg=0$		78	584	319	559	347
$0.25\geq Chg>0$		118	101	331	62	283
$0.5\geq Chg>0.25$		136	17	39	7	42
$0.75\geq Chg>0.5$		69	6	19	3	16
$Chg>0.75$	1081	448	53	64	61	93

This table reports the distribution and changing patterns of the national team holdings. Panel A presents national team ownership distribution across the Shanghai and Shenzhen 300 constituent stocks, mainboard stocks, small board stocks, and growing enterprise stocks. Panel B displays the change of national team holdings in terms of total market value, the number of stocks investing, and average ownership in each stock. Panel C reports the number and percentage of stocks held by the national team across different sectors over time. Panel D shows the distribution of stocks based on the change of national team ownership in each quarter. The change of national team ownership (Chg) is measured as the difference of national team ownership between quarter q and q-1, divided by the national team ownership in quarter q-1.

（五）The distribution of nation team ownership

Table 1 presents the distribution of national team ownership across firms. Panel A compares national team ownership distribution among the Shanghai and Shenzhen 300 constituent stocks (CSI 300 stocks), mainboard stocks, smallboard stocks, and growing en terprise stocks. Because we removed financial firms from the initial sample, our sample contains only 252 CSI 300 stocks. During the sample period, 242 (96.03%) of these 252 stocks were held by the national team, while the national team held 773 (54.17%) of 1427 mainboard stocks, 380 (48.91%) of 776 small board stocks, and 236 (44.70%) of 528 growing enterprise stocks. It appears that the national team is actively buying both the CSI 300 stocks and non-constituent stocks from across boards.

Panel B shows the change of national team ownership over time. In terms of total market value, the national team holdings went up from 1164.23 billion RMB in Q3 of 2015 to 1409.4 billion RMB in Q2 of 2016. The number of firms held by the national team increased from 1081 to 1311 during Q3-Q4 of 2015 and then decreased slowly to 1178 in Q4 of 2016.

Panel C reports changes in national team holdings in different sectors over time. In Q3 of 2015, the national team mainly bought stocks on the mainboard. In Q4 of 2015, the national team lowered its holdings in the mainboard and bought in more smallboard and growing enterprise stocks. The number of smallboard and growing enterprise stocks held by the national team increased to 363 and 226 in Q4 2015 (accounting for 46% of total shares in those sectors). Gradually, the national team's ownership percentage decreased in each sector after Q4 of 2015, implying that the national team did not merely use the buy-and-hold strategy to stabilize the price.

Although it is not our primary interest, we explore the national team's trading pattern to see if they are simply holding the shares passively or are actively participating in the market intervention. We compute the change in national team ownership (Chg) in each quarter and display the distribution of Chg in Panel D of Table 1. Chg is measured as the national team ownership difference between quarter q and q-1, divided by the national team ownership in quarter q-1. Panel D shows that after the national team entered the market in Q3 of 2015, it continued to trade. Taking Q4 of 2015 as an example, the national team reduced its ownership in 436 stocks, among which 44 were reduced by more than 75%, 167 were reduced by 50%–75%, 122 were reduced by 25%–50%, and 103 were reduced by less than 25%. Simultaneously, the national team increased its ownership in 771 stocks, among which 448 went over 75%, 69 were between 50%–75%, 136 were between 25%–50%, and 118 were less than 25%. The distribution of Chg suggests that the national team stabilizes stock price through active buying and selling rather than using the buy-and-hold strategy. After Q1 of 2016, when prices for most stocks became stable, the number of stocks sold by the national team is generally more than the number of stocks acquired,implying that the national team is withdrawing from the market once the market crash risk subdues.

Table 2
Descriptive statistics and univariate analysis.

Variable	mean	sd	max	min	p25	p50	p75
Panel A. Observations of firms once held by the national team over the sample period ($N = 7708$)							
$CRASH_q$	0.170	0.376	1.000	0.000	0.000	0.000	0.000
$COUNT_q$	−0.258	0.762	3.000	−3.000	−1.000	0.000	0.000
$NCSKEW_q$	−0.295	2.065	7.128	−5.335	−1.053	−0.318	0.400
$DUVOL_q$	−0.236	0.987	3.328	−2.256	−0.806	−0.281	0.256
GOV_{q-1}	0.021	0.024	0.088	0.000	0.000	0.012	0.032
$INST_{q-1}$	0.400	0.237	0.841	0.000	0.197	0.422	0.595
$Size_{q-1}$	22.800	1.026	25.520	20.200	22.080	22.750	23.480
BM_{q-1}	0.835	0.946	7.413	0.067	0.268	0.490	0.988
ROE_{q-1}	0.047	0.065	0.273	−0.305	0.012	0.038	0.077
LEV_{q-1}	0.427	0.209	0.941	0.051	0.250	0.417	0.596
$Return_{q-1}$	0.055	0.664	4.217	−1.433	−0.328	−0.002	0.338
$TURN_{q-1}$	0.039	0.032	0.173	0.002	0.016	0.030	0.051
VOL_{q-1}	0.042	0.019	0.089	0.010	0.027	0.041	0.055
$Skew_{q-1}$	−0.395	1.189	1.792	−5.762	−0.526	−0.136	0.075
$Kurt_{q-1}$	5.343	6.750	41.090	1.554	2.636	3.451	4.678
Panel B. Observations of firms never held by the national team over the sample period ($N = 6421$)							
$CRASH_q$	0.182	0.386	1.000	0.000	0.000	0.000	0.000
$COUNT_q$	−0.186	0.743	2.000	−4.000	−1.000	0.000	0.000
$NCSKEW_q$	−0.148	2.147	7.128	−5.335	−0.918	−0.210	0.493
$DUVOL_q$	−0.147	1.015	3.328	−2.256	−0.709	−0.201	0.306
GOV_{q-1}	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$INST_{q-1}$	0.336	0.216	0.841	0.000	0.151	0.335	0.502
$Size_{q-1}$	22.330	0.666	25.320	19.990	21.930	22.330	22.760
BM_{q-1}	0.530	0.641	7.413	0.067	0.205	0.351	0.598
ROE_{q-1}	0.038	0.068	0.273	−0.305	0.009	0.032	0.066
LEV_{q-1}	0.405	0.208	0.941	0.051	0.241	0.388	0.549
$Return_{q-1}$	0.144	0.855	4.217	−1.433	−0.334	0.029	0.500
$TURN_{q-1}$	0.049	0.036	0.173	0.002	0.024	0.039	0.062
VOL_{q-1}	0.046	0.019	0.089	0.010	0.031	0.044	0.058
$Skew_{q-1}$	−0.422	1.236	1.792	−5.762	−0.482	−0.133	0.089
$Kurt_{q-1}$	5.334	7.128	41.090	1.554	2.474	3.252	4.589

Panel C. Univariate analysis

	$CRASH_q$	$COUNT_q$	$NCSKEW_q$	$DUVOL_q$
Once held	0.170	−0.258	−0.295	−0.236
Never held	0.182	−0.186	−0.148	−0.147
Difference	−0.012*	−0.072***	−0.147***	−0.089***
T-value	−1.866	−5.656	−4.138	−5.268

This table presents descriptive statistics for our sample variables. Panel A (B) displays results for the 7708 (6421) observations of firms once (never) held by the national team over the sample period. Panel C displays the results of the univariate analysis. Variable definitions can be found in the Appendix.

四、Empirical results

（一）Descriptive statistics and univariate analysis

To explore whether there is any difference between stocks held by the national team and those that are not, we divide the overall sample into two subsamples based on the stock ownership at the end of each quarter. Table 2 presents descriptive statistics on the subsamples of firms that were once held (Panel A) or were never held (Panel B) by the national team over the sample period. Panel C presents the results of univariate tests for the major variables of interest.

We can see that the variables measuring stock price crash risk tend to be lower for firms in Panel A than for firms in Panel B. Specifically, the average proportion of observations that suffered crash days during the sample period (CRASH) is 0.170 in Panel A, while the number is 0.182 in Panel B. Panel C shows that the difference is significant at the 10% level. The average difference of downside and upside frequencies (COUNT) in Panel A is − 0.258, also lower than the mean of − 0.186 in

Panel B, significant at the 1% level (Panel C). The mean and median of NCSKEW are − 0.295 and − 0.318 for firms in Panel A, lower than those in Panel B (− 0.148 and − 0.210), significant at the 1% level. The same pattern can be found for the variable DUVOL. Overall, the two subsamples display considerable variation in terms of market capitalization value (Size), growth opportunities (BM), and economic performance (Return and ROE).

Table 3
Impact of national team ownership on stock price stability.

	(2) CRASH $_q$	(3) COUNT $_q$	(4) NCSKEW $_q$	(5) DUVOL $_q$
GOV_{q-1}	−4.591***	−1.797***	−3.704***	−1.954***
	(−3.537)	(−5.107)	(−5.155)	(−5.383)
$INST_{q-1}$	−0.139	−0.023	0.151*	0.056
	(−1.091)	(−0.626)	(1.761)	(1.338)
$Size_{q-1}$	0.043	−0.038***	0.012	−0.041***
	(1.207)	(−3.960)	(0.524)	(−3.709)
BM_{q-1}	0.013	−0.024**	−0.034	−0.034***
	(0.339)	(−2.022)	(−1.586)	(−2.833)
$Return_{q-1}$	0.143***	0.045***	0.210***	0.101***
	(3.512)	(5.243)	(8.090)	(8.059)
$TURN_{q-1}$	2.072*	0.704***	5.373***	2.155***
	(1.930)	(2.933)	(7.515)	(6.428)
VOL_{q-1}	−24.726***	−2.407***	−6.903***	−3.502***
	(−8.243)	(−3.591)	(−3.819)	(−3.957)
$Skew_{q-1}$	0.003	0.005	0.051*	0.024*
	(0.080)	(0.362)	(1.840)	(1.769)
$Kurt_{q-1}$	0.002	−0.002	−0.009*	−0.004
	(0.248)	(−1.093)	(−1.697)	(−1.403)
ROE_{q-1}	1.018**	0.293***	1.097***	0.470***
	(2.533)	(3.185)	(5.680)	(4.393)
LEV_{q-1}	−0.543***	−0.154***	−0.193**	−0.178***
	(−3.897)	(−3.999)	(−2.228)	(−3.970)
Constant	−1.140	1.210***	0.333	0.890***
	(−1.368)	(5.684)	(0.571)	(3.357)
Cluster	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
N	14,125	14,129	14,129	14,129
R^2	0.078	0.128	0.224	0.236

This table presents the results of the impact of national team ownership on extreme stock price crash events and average stock price crash risk. Logistic regression is used, and Pseudo R^2 is reported when the dependent variable is $CRASH_q$; otherwise, ordinary least-square (OLS) regressions are used, and adjusted R^2 is reported. All variables are defined in the Appendix. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

（二）Impact of national team ownership on stock price stability

Table 3 shows the OLS results regressing the price stability measure on national team ownership. Column (1) shows that $GOV_{i,\ q-1}$ is negatively associated with $CRASH_{i,\ q}$, significant at the 1% level, suggesting that national team ownership lowers the probability of extremely negative firm-specific daily returns. However, the coefficient of $INST_{i,\ q-1}$ is not significant. It seems that the national team plays a dominant role in preventing future extreme outcomes and stabilizing the market. Similarly, Column (2) indicates that the correlation between $GOV_{i,\ q-1}$ and $COUNT_{i,\ q}$ is negative, significant at the 1% level, while the coefficient on other institutional ownership $INST_{i,\ q-1}$ is insignificant. It suggests that the national team reduces the difference between the number of crash days and jump days, which results in better

price stability.

Columns (3) and (4) further provide results using indicators of average crash risk as the dependent variables. Column (3) shows that GOVi, q− 1 are negatively correlated with NCSKEWi, q, significant at the 1% level, suggesting that stock price crash risk declines when national team ownership increases. In contrast, the coefficients of INSTi, q− 1 are positive, significant at the 10% level. One possible explanation is that institutional investors may simply sell off their stock in response to unfavorable performance in crisis times, as monitoring is time-consuming (Coffee, 1991). Hence liquidity can dry up, increasing price crash risk (Callen and Fang, 2013). Another possible explanation is that some institutional investors pursue short-term benefits that lead managers to hide bad news and increase the occurrence of price crashes (Callen and Fang, 2013; Chang et al., 2017). When DUVOLi, q is used as the dependent variable in Column (4), the results remain similar. In general, the results in Table 3 confirm that national team ownership plays an active role in enhancing stock price stability.

Consistent with Chen et al. (2001), Kim et al. (2011a, 2011b), and Chang et al. (2017), we find that the coefficients of TURNi, q− 1 are significantly positive, suggesting that past information asymmetry and price volatility increase future crash risk. We also find that past returns (Returni, q− 1) is positively related, and BM and Size are negatively related to price crash risk, implying that stock-price bubbles increase future crash risk while growing firms and larger Chinese firms tend to have lower crash risk (Xu et al., 2013; Li and Cai, 2016).

Table 4
Robustness test: using a sample of firms once held by the national team.

	$CRASH_q$	$COUNT_q$	$NCSKEW_q$	$DUVOL_q$
Panel A. Subsample regressions using only firms ever held by the national team				
GOV_{q-1}	−3.762**	−1.459***	−2.912***	−1.691***
	(−2.465)	(−3.445)	(−3.352)	(−3.860)
Controls	Yes	Yes	Yes	Yes
N	7702	7708	7708	7708
R^2	0.081	0.128	0.233	0.243
Panel B. Taking national team purchases as a shock for the national team subsample				
$GovBuy_{q-1}$	−0.114	−0.156***	−0.275***	−0.134***
	(−0.869)	(−5.104)	(−3.366)	(−3.420)
Controls	Yes	Yes	Yes	Yes
N	7010	7022	7022	7022
R^2	0.088	0.141	0.252	0.260
Panel C. Taking national team exits as a shock for the national team subsample				
$GovExit_{q-1}$	0.277**	0.007	0.362***	0.094**
	(2.531)	(0.199)	(3.665)	(1.989)
Controls	Yes	Yes	Yes	Yes
N	5697	5717	5717	5717
R^2	0.086	0.100	0.234	0.226

This table presents the effects of changes in national team ownership on stock price stability. Panel A constrains the sample to firms that were once held by the national team. In Panel B, $GovBuy_{q-1}$ is a dummy variable that equals one in and after the quarter when the national team bought a stock for the first time and zero otherwise. Observations are dropped if the national team sold out their shares in the sample period after buying the company shares. In Panel C, $GovExit_{q-1}$ is a dummy variable that equals one in and after the quarter when the national team exit and zero when the national team holds the stocks. The observations before the national team enters are deleted. The definition of other variables is provided in the Appendix. Logit regression is used, and Pseudo R^2 is reported when the dependent variable is $CRASH_q$, otherwise ordinary least-square (*OLS*) regressions are used, and adjusted R^2 are reported. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

（三）Robustness checks

We have conducted several robustness checks to ensure our findings continue to hold under different model specifications. First, we conduct a placebo test following Liu and Lu (2015) and confirm that our results are likely not biased by potential unobservable factors.

We have shown that national team ownership improves stock price stability after the crash. However, it is possible to have a reverse causality; the national team tends to hold less crash-prone stocks. Endogeneity concerns may also arise because of omitted unob servable firm characteristics. Omitted variables affecting both national team ownership and future stock price stability could lead to spurious correlations. To alleviate these concerns, we perform a series of robustness checks on our findings.

1.Subsample examination using only firms once held by the national team

First, we perform the analysis using only firms once held by the national team in the sample period. Using this subsample allows us to mitigate the biases due to the different characteristics between firms with and without national team ownership. Panel A of Table 4 reports the findings,18 and we see that the increase of national team ownership lowers stock price crash risk.

Further, we take national team purchases as a shock and generate a dummy variable, GovBuy, that equals 1 in and after the quarter when the national team bought a stock for the first time and zero otherwise. We replace GOV q-1 with GovBuyq-1

and re-estimate the above regressions.19 The results are presented in Panel B of Table 4. They are robust and consistent with those in the previous section.

To examine the effect of the national team's exit, we similarly take the national team's exit as another shock and generate a dummy variable, GovExit, which equals one in and after the quarter when the national team exit and zero otherwise. We replace GOV_{q-1} with $GovExit_{q-1}$ and re-estimate the regressions.20 Panel C of Table 4 shows that $GovExit_{q-1}$ is positively correlated with $CRASH_q$, $NCSKEW_q$, and $DUVOL_q$, suggesting that the national team's exit is associated with an increased stock price crash risk.

2.Results using propensity-score matching

Given that endogenous selections of government interventions may drive the relationship between national team ownership and stock price stability, we use propensity-score matching (PSM) to form two similar subsamples and re-examine the role of national team ownership. First, we define the treatment firms as those in which the national team appears as shareholders in quarter q-1, but not in quarter q-2. The control firms are defined as those without the national team as shareholders in both quarters q-2 and q-1.21 Second, we use the logit regression to estimate the probability that the national team might invest in a company and take the probability as the propensity score. In the logit regression, the dependent variable is a dummy variable that equals one if the observation is a treatment firm and zeroes otherwise. The independent variables include the control variables in Eq. (4) with the lagged value. One treatment firm is matched to one control firm with replacement, and we have 4442 pairs of observations as the PSM subsample.

Panel A of Table 5 compares firm-level characteristics between the treatment and control samples. It shows that the matching process effectively eliminates the differences in these characteristics between the treatment and control samples. Panel B of Table 5 reports the treatment effects on our measures for stock price stability. The stock price crash risk is lower for the treatment sample, suggesting that our prior results are robust.

3.Results using the difference-in-difference (DID) approach

We further use a DID approach to ensure that their cross-sectional heterogeneity does not drive the difference in stock price crash risk between firms held and not held by the national team. Because firms were bought in by the national team at different times, we use the DID model for multiple-period shocks, following Chan et al. (2012). Specifically, our empirical models are defined as follows:

$$Price\ Stability_{i,q} = \alpha + \beta_1 PostTreat_{i,q-1} + \beta_2 Treat_{i,q-1} + \sum_k \beta_k Control_{i,q-1} + \sum_j \beta_j Industry\ dummy + \sum_l \beta_l Year - quarter\ dummy + \varepsilon_{i,q} \quad (5)$$

where $PostTreat_{i,\,q-1}$ is our variable of interest, and it equals one for a company i held by the national team in quarter t-1 and equals zero for firms not held by the national team and firms before the national team bought their shares. The coefficient on the $PostTrest_{i,\,q-1}$ dummy (β1) represents the changes in price crash risk for firms before and after the national team's purchase compared to the changes for the control group in the same period. The coefficient on the $Treat_{i,\,q-1}$ dummy (β2) captures the baseline difference between the firms before the initialization of the event. Definitions of other variables are the same as those in the baseline analysis.

Table 6 reports the results. Columns (1) to (4) show that the coefficient on the Treati, q− 1 dummy is insignificant, suggesting no pronounced difference between the firms before the initialization of the event. However, the coefficients on the PostTresti, q− 1 dummy is negative and significant, suggesting that compared to firms not held by the national team, firms bought in by the national team experienced a decrease in price crash risk after the purchase by the national team. The results suggest that firms bought by the national team experienced a significant increase in stock price stability.

Table 6
Robustness test: the difference-in-difference (DID) approach.

	(1) CRASH $_q$	(2) COUNT $_q$	(3) NCSKEW $_q$	(4) DUVOL $_q$
$TreatPost_{q-1}$	−0.178*	−0.094***	−0.184***	−0.077***
	(−1.790)	(−4.621)	(−3.317)	(−2.902)
$Treat_{q-1}$	0.001	0.020	−0.031	−0.005
	(0.014)	(1.173)	(−0.641)	(−0.204)
$INST_{q-1}$	−0.094	−0.007	0.207**	0.094**
	(−0.708)	(−0.188)	(2.413)	(2.220)
$Size_{q-1}$	0.043	−0.043***	0.017	−0.045***
	(1.185)	(−4.498)	(0.767)	(−3.979)
BM_{q-1}	0.003	−0.026**	−0.035	−0.038***
	(0.086)	(−2.163)	(−1.566)	(−3.145)
$Return_{q-1}$	0.146***	0.042***	0.208***	0.099***
	(3.485)	(4.878)	(7.983)	(7.862)
$TURN_{q-1}$	1.975*	0.661***	5.560***	2.281***
	(1.795)	(2.751)	(7.736)	(6.763)
VOL_{q-1}	−25.749***	−2.205***	−7.488***	−3.647***
	(−8.221)	(−3.242)	(−4.060)	(−4.039)
$Skew_{q-1}$	−0.002	0.004	0.051*	0.024*
	(−0.057)	(0.279)	(1.755)	(1.698)
$Kurt_{q-1}$	−0.002	−0.003	−0.008	−0.003
	(−0.225)	(−1.336)	(−1.508)	(−1.307)
ROE_{q-1}	0.900**	0.294***	1.065***	0.439***
	(2.191)	(3.132)	(5.354)	(3.964)
LEV_{q-1}	−0.534***	−0.153***	−0.198**	−0.169***
	(−3.690)	(−3.877)	(−2.262)	(−3.740)
Constant	−0.980	1.320***	1.421***	1.936***
	(−1.136)	(5.525)	(2.722)	(7.364)
Cluster	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
N	13,398	13,402	13,402	13,402
R^2	0.081	0.134	0.232	0.243

This table presents the impact of national team purchases on stock price stability using the DID design. $TreatPos_{q-1}$ equals one for firms held by the national team in quarter q-1; equals zero for both firms not held by the national team and firms before buying in by the national team. The coefficient of the $Treat_{q-1}$ dummy captures the baseline difference between the firms *before* the initialization of the event. All of the other variables are defined in the Appendix. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7
The effect of the national team on constituent and non-constituent stocks.

	CRASH $_q$	COUNT $_q$	NCSKEW $_q$	DUVOL $_q$
Panel A. The role of national team ownership for the SCI 300 stocks				
Gov_{q-1}	−3.649	−2.817***	−7.092***	−4.441***
	(−1.086)	(−2.963)	(−3.409)	(−4.255)
Controls	Yes	Yes	Yes	Yes
N	1383	1421	1421	1421
R^2	0.126	0.105	0.137	0.148
Panel B. The role of national team ownership for the non-CSI 300 stocks				
Gov_{q-1}	−4.504***	−1.643***	−3.550***	−1.652***
	(−3.123)	(−4.205)	(−4.448)	(−4.093)
Controls	Yes	Yes	Yes	Yes
N	12,683	12,708	12,708	12,708
R^2	0.081	0.131	0.236	0.245

This table reports the results of the impact of the national team on stock price stability using the Shanghai and Shenzhen 300 (CSI 300) constituent stocks (in Panel A) and non-CSI 300 constituent stocks (in Panel B). The definition of variables is provided in the Appendix. Logit regression is used, and Pseudo R^2 is reported when the dependent variable is $CRASH_q$, otherwise ordinary least-square (OLS) regressions are used, and adjusted R^2 are reported. The t-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

4.The effect of the national team on constituent and non-constituent stocks

The sample distribution in Table 2 suggests that the national team holds a large proportion of the CSI 300 stocks. One concern is whether the national team rescues the market mainly by saving constituent stocks. In this section, we separate the CSI 300 stock and non-constituent stock subsamples and re-examine our findings.

The results are presented in Table 7. Panel A reports results for the CSI 300 stock subsample. It shows that national team ownership increases stability by lowering the price crash risk for the CSI 300 stocks. The coefficients on GOVq-1 are negatively significant at the 1% level in the COUNTq-1, NCSKEWq-1, and DUVOLq-1 regressions. Panel B displays results for the non-constituent stock subsample. The

national team ownership (GOVq-1) has negative effects on price crash risk for the non-constituent stocks, suggesting that the national team ownership impact on stock price crash risk exists across all companies.

Table 8
The role of the national team in SOEs and non-SOEs.

	$CRASH_q$	$COUNT_q$	$NCSKEW_q$	$DUVOL_q$
Panel A. The role of the national team in SOEs				
Gov_{q-1}	−3.603*	−0.660	−2.394***	−0.820*
	(−1.843)	(−1.179)	(−2.642)	(−1.701)
Controls	Yes	Yes	Yes	Yes
N	4988	5062	5062	5062
R^2	0.047	0.078	0.104	0.143
Panel B. The role of the national team in non-SOEs				
Gov_{q-1}	−4.764***	−2.067***	−4.276***	−2.119***
	(−2.598)	(−4.449)	(−3.883)	(−3.972)
Controls	Yes	Yes	Yes	Yes
N	9031	9067	9067	9067
R2	0.109	0.163	0.291	0.289

This table differentiates the role of the national team from government ownership. Panel A and B report the results of the effect of Gov_{q-1} on stock price stability in SOEs and non-SOEs. Logistic regression is used, and Pseudo R^2 is reported when the dependent variable is $CRASH_q$; otherwise, ordinary least-square (OLS) regressions are used, and adjusted R^2 is reported. All variables are defined in the Appendix. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

5.Differentiating the role of the national team in SOEs and non-SOEs

In the previous examinations, we took the national team as the government-backed institution and compared their role with other institutional investors. One may wonder whether the national team plays the role of government shareholder in the crisis period. Extant studies show that the presence of government shareholders plays a role in a government bailout during a crisis. For example, Beuselinck et al. (2017) find that European companies with government ownership experienced a smaller decrease in firm value in the 2008 financial crisis, as government ownership implies explicit or implicit government guarantees, especially in countries where government expropriation is less severe and investor protection is more robust. We argue that the national team's purchase of company stocks is different from the commonly known government ownership. Theoretically, government ownership in a company aims to retain control of certain assets or business decisions strategically important to the national economy. As a large shareholder, the government is often long-term oriented and involved in routine company operations (Lu and Zhu, 2020). In this sense, government ownership can offer explicit or implicit government guarantees to an invested company. However, the Chinese national team's acquisition of company stocks was driven purely by the government's incentive to stabilize the company stock, and it only took place following the government bailout of the 2015 market crash. The national team does

not get involved with the company's operation. According to the findings in Section 5.2, they play their role in relaxing stock price crash risk by alleviating noise traders' negative impact and providing confidence to investors.

Empirically, if the national team plays the role of government shareholder in the crisis period, their effects on stock price stability should be observed only in non-SOEs. To test this conjecture, we separate our sample into SOEs and non-SOEs. Sample distribution shows that in the observations of firms once held by the national team, the number of SOEs and non-SOEs are almost half to half (41.6% versus 58.4%). This is contrary to our conjecture, as the national team has not shown greater interest in non-SOEs. We further re estimate Eq. (4) in the SOE and non-SOE subsample separately. The results are reported in Table 8. Panel A and B show that in both SOEs and non-SOEs, national team ownership plays an active role in reducing stock price crash risk.

五、Further analysis

（一）The mechanism of the national team to increase price stability

The Chinese national team has a clear policy goal, considerable capital resources, and quick access to information as a unique institutional investor. The main objective for the national team is to maintain stock price stability. The national team may fulfill the role of enhancing stock price stability in two ways.

Firstly, government intervention can play a role in reducing price volatility and mitigating the possibility of a market breakdown by trading against the noise traders responsible for increased noise trading volatility (Brunnermeier et al., 2020). The behavioral finance theory documents that an investor's irrational behavior causes the crash of the stock market. In reality, there is a limit to arbitrage, and arbitragers cannot force the stock price to converge to its intrinsic value. Myopia and heterogeneous belief of arbitrageurs may lead to a growing valuation bubble. When a small shock causes enough arbitrageurs to exit the market simultaneously, and there is no possible risk premium that can induce investors to trade, the market could crash (Delong et al., 1990; Shleifer and Vishny, 1997; Barberis and Thaler, 2003). In this situation, the national team can play an important role and supplement the liquidity by trading with

investors.The national team can effectively alleviate the crash risk due to the liquidity crisis by actively buying and selling in the market and providing liquidity for traders. We refer to this as the “liquidity supplement effect” of the national team.

Secondly, the national team’s bailout would lead investors to believe that the government is committed to rescuing the stock market. It would enhance investor confidence and increase the demand for stocks, and hence alleviate stock price crash risk. The national team’s direct purchase of shares becomes a piece of good news that might counteract against bad news released to the market during the market crash (Jin and Myers, 2006; Hutton et al., 2009; Kim et al., 2011a, 2011b). We refer to this as the “confidence□boosting effect” of the national team.

We conduct several subsample cross-sectional analyses in this section to see how national team ownership improves stock price stability.

First, we examine whether the national team improves price stability through trading against noise traders. Brunnermeier and Pedersen (2009) suggest that if the government intervenes through direct trading against noise traders during the crisis period, the national team may play a more prominent role in improving firms’ price stability when there are more noise traders. We use the lack of institutional investor ownership as a measure of the level of noise traders. Institutional investors are more likely to be informed in vestors (e.g., Gompers and Metrick, 2001; Yan and Zhang, 2007), while individual investors are usually speculative and noise traders (e.g., Nofsinger and Sias, 1999). We first divide the whole sample into three groups based on the institutional investors’ ownership, and then we divide it into tertiles in quarter q-1, and compare the role of national team ownership on stock price crash risk between the high and low tertiles. Panel A of Table 9 reports the results. In the subsample with fewer institutional investors (i.e., more speculative noise traders), the coefficients of GOV_{q-1} in the stock price crash risk regressions are all negatively significant, while the coefficients are mostly insignificant in the subsample with high institutional ownership. It suggests that the national team plays a more prominent role for firms with more speculative noise traders, consistent with its liquidity supplement effect.

Next, we examine the role of the national team in firms with different levels of investor confidence. Bailout by the national team restores investor confidence and stabilizes stock price. Hence we expect the findings to be more significant for firms with higher investor pessimism in quarter q-1. We use the ratio of short selling as the proxy for investor pessimism. The short-selling ratio is measured as the short-selling amount divided by the number of tradable stocks. A higher short-selling ratio implies a higher level of investor pessimism. We classify the sample into three groups based on the tertiles of the short-selling ratio in quarter q-1.22 Panel B of Table 9 reports the results. In the subsample with a higher short-selling ratio in quarter q-1, the coefficients of GOV_{q-1} are all negative in the price crash risk regressions, significant at the 1% level. Simultaneously, the coefficients are insignificant in the subsample, with a lower short-selling ratio in quarter q-1. The coefficients of GOV_{q-1} are more pronounced for firms with a higher short-selling ratio in quarter q-1, suggesting that the national team plays a more critical role via boosting investor confidence in reducing the price crash risk. The result is consistent with the confidence-boosting effect of the national team.

In sum, we find that the national team ownership lowers stock price crash risk via trading against noise traders and restoring investor confidence.

Table 10
The effect of national team ownership in crisis and post-crisis period.

	$CRASH_q$	$COUNT_q$	$NCSKEW_q$	$DUVOL_q$
Panel A. The role of national team ownership in the crisis period (Q3, 2015 to Q1, 2016)				
GOV_{q-1}	−3.880*	−2.553***	−3.399***	−1.871***
	(−1.646)	(−5.788)	(−4.298)	(−4.013)
Controls	Yes	Yes	Yes	Yes
N	6667	6712	6712	6712
R^2	0.061	0.101	0.130	0.205
Panel B. The role of national team ownership in the near post-crisis period (Q2, 2016 to Q4, 2016)				
GOV_{q-1}	−4.019**	−1.153**	−4.156***	−2.178***
	(−2.495)	(−2.217)	(−3.228)	(−3.792)
Controls	Yes	Yes	Yes	Yes
N	7402	7417	7417	7417
R^2	0.059	0.113	0.237	0.225
Panel C. The role of national team ownership in a further post-crisis period (Q1, 2017 to Q4, 2018)				
GOV_{q-1}	−1.894*	−0.479	−0.157	−0.156
	(−1.862)	(−1.440)	(−0.430)	(−0.686)
Controls	Yes	Yes	Yes	Yes
N	22,571	22,581	22,581	22,581
R^2	0.016	0.031	0.054	0.069

This table reports the results of the impact of the national team on stock price stability in the crisis period (in Panel A), the near-term post-crisis period (in Panel B), and a long-term post-crisis period (in Panel C). The crisis period is from Q3 of 2015 to Q1 of 2016. The near-term post-crisis period is from Q2 of 2016 to Q4 of 2016, and the longer-term post-crisis period is from Q1 of 2017 to Q4 of 2018. Definitions of variables are provided in the Appendix. Logit regression is used, and Pseudo R^2 is reported when the dependent variable is $CRASH_q$, otherwise ordinary least-square (OLS) regressions are used, and adjusted R^2 are reported. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

（二）The effect of the national team during the post-crisis period

The Chinese market experienced several crashes between Q3 of 2015 and Q1 of

2016 and rebounded slowly from Q2 of 2016. One might wonder about the role of the national team during the post-crisis period. Moreover, the national team continues to own company shares after the crisis by the end of Q4 of 2016. This section explores if the national team ownership continues to affect the price crash risk during the post-crisis period. We divide our sample into the crisis period (Q3 of 2015 to Q1 of 2016) and the post-crisis period (Q2 of 2016 to Q4 of 2016) and re-estimate Eq. (4). Further, we collect data from Q1 of 2017 to Q4 of 2018 to examine national team ownership's role in a longer-term post-crisis period.

Table 10 presents the results. Panel A reports the national team's role in the crisis period, Panel B displays the results in the near term post-crisis period, and Panel C presents the results in the long-term post-crisis period. Panel A and B show that the national team ownership plays similar roles in easing stock price crash risk in both the crisis and the near-term post-crisis period. However, Panel C shows that the national team no longer plays an active role in stabilizing stock prices in the long run.

（三）The effect of national team ownership on stock pricing efficiency

To understand the overall impact of national team ownership, we also explore if there might be any unintended consequences associated with direct market intervention by the government. We examine the impact of national team ownership on several pricing efficiency measures, including stock price synchronicity, idiosyncratic volatility, and transaction cost.

We conjecture that government intervention via direct stock purchase might reduce stock pricing efficiency. The Chinese stock market is characterized by retail traders' dominance and a large amount of noise trading (Pan et al., 2016). Retail investors account for over 90% of the trading volume and hold more than 50% of the tradable shares (Brunnermeier et al., 2020). In addition, many of the traders in China are "fast-trading mom-and-pop investors" who are vulnerable to behavioral biases and tend to trade excessively (Seasholes and Wu, 2007; Mei et al., 2009; Xiong and Yu, 2011). Given China's stock market's speculative nature, investors are likely to speculate on trades made by the national team, resulting in lower stock price efficiency. Chi and Li (2019) show that stock price mispricing is more severe due to

government intervention. Specifically, retail investors initially underreact to the bailout news but eventually overreact. Brunnermeier et al. (2020) suggest that the noise of government interventions can become an additional asset pricing factor. When noise trading is sufficiently large, investors focus on collecting information about government interventions rather than company fundamentals. Hence, the widely adopted objective of government interventions to reduce price crash risk may exacerbate stock prices' information efficiency. We refer to this as the "information distortion effect" of the national team.

Table 11
The side effect of national team ownership.

	(1) SYNCH $_q$	(2) IV $_q$	(3) SPREAD $_q$
GOV_{q-1}	4.974***	−1.555***	1.004***
	(6.344)	(−4.867)	(3.317)
$INST_{q-1}$	−0.307***	0.394***	−0.022
	(−3.244)	(9.855)	(−0.515)
$Size_{q-1}$	0.298***	−0.188***	0.044***
	(11.683)	(−18.810)	(3.970)
BM_{q-1}	0.298***	−0.105***	0.033***
	(9.657)	(−7.997)	(3.280)
$Return_{q-1}$	−0.242***	0.146***	−0.089***
	(−10.292)	(12.376)	(−5.462)
$TURN_{q-1}$	1.600**	1.951***	−1.814***
	(2.342)	(6.408)	(−4.833)
VOL_{q-1}	−5.119***	15.559***	−8.657***
	(−2.934)	(18.770)	(−8.912)
$Skew_{q-1}$	−0.073***	0.058***	−0.033***
	(−2.741)	(5.309)	(−3.399)
$Kurt_{q-1}$	−0.010*	−0.005**	0.008***
	(−1.879)	(−2.461)	(4.041)
ROE_{q-1}	−0.066	−0.612***	0.569***
	(−0.296)	(−5.591)	(4.820)
LEV_{q-1}	−0.441***	0.163***	0.028
	(−4.470)	(3.743)	(0.621)
Constant	−5.647***	5.926***	−1.487***
	(−6.104)	(15.664)	(−3.918)
Cluster	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Quarter	Yes	Yes	Yes
N	14,129	14,129	14,129
Adj. R^2	0.372	0.486	0.645

This table reports the results of the side effect of national team ownership. $SYNCH_q$ is the stock return synchronicity. IV_q is the idiosyncratic volatility, calculated as the standard deviation of residual of the Fama and French three-factor model. $Spread_q$ is the bid-ask spread. Definitions of other variables are provided in the Appendix. Ordinary least-square (OLS) regressions are used, and adjusted R^2 are reported. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

We calculate the three pricing efficiency measures (i.e., stock price synchronicity, idiosyncratic volatility, and transaction cost). Stock price synchronicity captures firm-specific information reflected in the stock price. If investors focus on collecting information about government interventions rather than company fundamentals, share prices reflect less of a company's idiosyncrasy information, rising and falling in line with the market. Also, the idiosyncratic volatility of firms owned by the national team will decrease as well. Transaction cost is another variable related to pricing efficiency. If the noise of government intervention has become an additional asset pricing factor,

the transaction cost is likely to increase, and the pricing of the stock will become less efficient.

Following Durnev et al. (2003), we first estimate the firm-specific price synchronicity using daily returns over each fiscal quarter during the sample period. For each firm-quarter observation, we regress the daily returns on the value-weighted market return and the value-weighted two-digit SIC industry return using the following equation:

$$R_{i,t} = \alpha + \beta_1 Ret_{m,t} + \beta_2 Ret_{m,t-1} + \beta_3 Ret_{ind,t} + \beta_4 Ret_{ind,t-1} + \varepsilon_{i,t} \quad (6)$$

Following the definition used in the literature (Piotroski and Roulstone, 2004; Hutton et al., 2009; Crawford et al., 2012), we define synchronicity as

$$SYNCH_{i,q} = ln\left(\frac{R^2_{i,q}}{1 - R^2_{i,q}}\right) \quad (7)$$

where $R_{i,q}$ is the coefficient of determination from the estimation of Eq. (6). The log transformation of $R_{i,q}$ creates an unbounded continuous variable out of a variable bounded initially by 0 and 1. By construction, high values of $SYNCH_{i,q}$ indicate firms whose stock returns are closely tied to and vary strongly with market and industry returns and whose returns reflect relatively less firm-specific information.

Next, we follow Ang et al. (2006) to define idiosyncratic volatility (IdiVol) with respect to the Fama-French model using the following regression:

$$r_{i,t} = \alpha_{i,t} + \beta_{i,t} MKT_t + s_{i,t} SMB_t + h_{i,t} HML_t + \varepsilon_{i,t} \quad (8)$$

where $r_{i,t}$ is the daily excess return of stock i. The market factor, MKT_t, is computed as the tradable market value-weighted excess return of the market portfolio over the daily risk-free interest rate (based on the China central bank's three-month deposit interest rate). The size value premium factor SMB_t is the return of the smallest one-third of firms less the return on the firms in the top third ranked by market capitalization. The value premium factor HML_t is the portfolio's return that longs the top third of firms with the highest book-to-market ratios and shorts the bottom third of firms with low book-to-market ratios. The idiosyncratic volatility for stock i in quarter q is measured as the standard deviation of the residuals εi, t after estimating Eq. (8) using daily excess returns over the quarter.

Finally, to measure a firm's stock transaction cost, we follow Corwin and Schultz (2012) to calculate the bid-ask spread estimator from daily high and low prices of firm i in quarter q. Assuming that there is a spread of S%, which is constant over the two-day estimation period, S can be estimated with the following two equations:

$$\mathrm{E}\left\{\sum_{j=0}^{1}\left[ln\left(\frac{H_{t+j}^{0}}{L_{t+j}^{0}}\right)\right]^{2}\right\}=2k_1{\sigma_{HL}}^{2}+4k_2\sigma_{HL}ln\left(\frac{2+S}{2-S}\right)+2\left[ln\left(\frac{2+S}{2-S}\right)\right]^{2} \tag{9}$$

$$\mathrm{E}\left\{\left[ln\left(\frac{H_{t,t+1}^{0}}{L_{t,t+1}^{0}}\right)\right]^{2}\right\}=2k_1{\sigma_{HL}}^{2}+2\sqrt{2}k_2\sigma_{HL}ln\left(\frac{2+S}{2-S}\right)+\left[ln\left(\frac{2+S}{2-S}\right)\right]^{2} \tag{10}$$

where $H_{t+j}{}^{0}$ ($L_{t+j}{}^{0}$) denotes the observed high (low) stock price for day t, and $H_{t,\,t+1}{}^{0}$ ($L_{t,\,t+1}{}^{0}$) is the high (low) price over the two days t and $t+1$. σ_{HL} denotes the high-low volatility. k_1 and k_2 are the coefficients. Setting $\alpha=\left[ln\left(\frac{2+S}{2-S}\right)\right]$, $\beta=\mathrm{E}\left\{\sum_{j=0}^{1}\left[ln\left(\frac{H_{t+j}^{0}}{L_{t+j}^{0}}\right)\right]^{2}\right\}$, $\gamma=\mathrm{E}\left\{\left[ln\left(\frac{H_{t,t+1}^{0}}{L_{t,t+1}^{0}}\right)\right]^{2}\right\}$, Eqs. (9) and (10) can be solved numerically to obtain

$$S=\frac{2(e^{\alpha}-1)}{1+e^{\alpha}} \tag{11}$$

where $\alpha=\frac{\sqrt{2\beta}-\sqrt{\beta}}{3-2\sqrt{2}}-\sqrt{\frac{\gamma}{3-2\sqrt{2}}}$.

Using the above measures, i.e. SYNCHi, q (the measure of stock price synchronicity), IVq (idiosyncratic volatility) and Spreadq (Bid ask spread of the stock), as the new dependent variable, we re-estimate Eq. (4) to find out the effects of the national team on pricing efficiency. We expect that the increase of national team ownership would decrease price informativeness (higher price synchronicity and lower idiosyncratic volatility) and increase transaction costs (higher spread).

Table 11 reports the impact of national team ownership on stock pricing efficiency. Column (1) shows that the coefficients of GOVi, q− 1 are positive and significant at the 1% level, implying that national team ownership increases stock return synchronicity and lessens the firm-specific information in stock prices.24 National team ownership reduces the ability of share prices to aggregate information about the fundamentals.

Column (2) shows a negative relationship between government ownership and firm return idiosyncratic volatility (IV). This suggests a decrease in firm-specific information due to government ownership. Also, in Column (3), government ownership increases transaction costs as it increases the spread. This is consistent with Brunnermeier et al. (2020), who document that the government's noise attracts investors' speculation, which plays a central role in driving market dynamics in

China’s financial markets. Transaction costs increase, and the information processing cost is more significant for firms with national team ownership.

Generally, we see that the information and pricing efficiency is lower with higher national team ownership.

六、Conclusion

Regulators, investors, and policyholders have long been debating government intervention’s pros and cons during times of market crashes. In recent years, it seems that governments are taking more active roles when faced with market crashes. To examine the impact of government intervention requires the study of both short-term effects and long-term consequences. The outcome is also highly dependent on institutional settings and market mechanisms. This paper examines government intervention through the na tional team during the Chinese stock market crisis from 2015 to 2016. We find that national team ownership lowered the probability of extreme stock price crashes and overall stock price crash risk. The national team plays its role by restoring investor confidence and trading against noise traders. However, the national team’s direct market intervention had an unintended consequence, as stock price synchronicity and transaction cost went up, and idiosyncratic volatility went down.

Government intervention in the stock market will continue to exist; however, the recent debate on whether the government should be allowed to invest in the stock market is becoming a matter of contention. Our study documents the pros and cons of government purchase of company shares, and our finding provides regulators with a complete picture of the effect of direct government inter vention. Future studies might explore how the national team unwinds its positions and facilitate a smooth transition during its exit.

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