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COMPETITIVE EFFECTS OF IPOS: EVIDENCE FROM CHINESE LISTING SUSPENSIONS

FRANK PACKER AND MARK M. SPIEGEL

Abstract. Theory suggests that initial public offerings (IPOs) can adversely impact listed firms, both directly by increasing intra-industry competition, and indirectly by completing related asset market spaces. However, the endogeneity of individual IPO activity hinders testing these channels. This paper examines listing suspensions in China in a panel specification that accounts for macroeconomic and financial conditions, isolating the firm-level IPO impact. We measure the competitive impact of listing suspensions through the value share of postponed firms in the IPO queue in their industry, and asset-space competition by firms' historical covariance with a synthetic portfolio of listed firms with the IPO queue industry mix at the time of suspension. Our results support the predicted IPO effects through both channels. We also document heterogeneity in IPO effects. Stronger firms–measured through a variety of proxies–benefit less from the suspension news. These results are robust to a battery of sensitivity tests.

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I. Introduction

Do IPOs have competitive effects on other firms? At least two channels have been cited in the literature. In one, firms going public threaten listed firms profits in the same industry, either by posing a direct competitive threat to other firms operating in their industry (e.g. Akhigbe et al. (2003) and Hsu et al. (2010)), or by changing the strategic dynamics of the industry more generally (Spiegel and Tookes (2020)). Alternatively, the assets generated by initial public offerings may provide a valuable alternative to investors, and thus reduce demand for listed firm assets with similar risk characteristics (Braun and Larrain (2009)).

One challenge encountered in testing the importance of these channels is that individual firm listing decisions are endogenous. For example, it has been shown that waves of IPO activity may signal overvaluation in an industry or covariance group (Ritter (1991), Henderson et al. (2006)).

In this paper, we make use of the market implications of blanket suspensions of IPO activity by the China Securities Regulatory Commission (CSRC) to examine the importance of IPO competitive effects. In particular, we evaluate the equity valuation impact of announcements of blanket suspensions in IPO activity. These suspensions were largely unanticipated, and have been shown to have measurable implications for overall market valuations (e.g. Shi et al. (2018)).

Our analysis utilizes a panel sample to examine the implications of CSRC suspensions on individual listed firms. We examine the implications of the 3 blanket IPO suspension episodes in China that have been imposed since 2008. These suspensions were unanticipated, and initially of unknown duration. Our panel specification allows us to condition for macroeconomic and market conditions at the time of the suspension announcements. Combined with knowledge of the composition of the queue of firms about to go public ahead of each suspension, our investigation allows us to identify disparities in listed firm exposure to the direct or asset space competition posed by queue firms at the time of the IPO suspension announcements. This knowledge allows us to measure the market's assessment of the importance of these channels based on the impact of the announcements on firm equity valuations.

Our results indicate that anticipated competition from new IPOs is evident through both channels. IPO suspensions in China benefit those listed firms in industries heavily represented in the queue of firms approved to go public, consistent with the expectation that the IPO suspension would mitigate competition in product markets. Asset supply effects also matter. Listed firm shares with greater covariance in returns with a synthetic portfolio that replicates the industry composition of suspended IPOs earn higher returns on suspension announcement dates. This suggests that these firms are expected to benefit from a restriction in the supply of assets by firms with similar asset return characteristics.

Our analysis also documents significant heterogeneity by firm health in the exposure of firms to these competitive effects: we find that more profitable and productive firms are significantly less sensitive to the competitive challenges presented by IPOs. In particular, we find that equity changes in response to the suspension announcements among more profitable and productive firms – measured through a variety of alternative metrics – are less sensitive to the representation of their industry in the IPO queue at the time of the announcement than less profitable and productive firms. Our findings therefore complement those of Hsu, Reed and Rocholl (2010), who find increased sensitivity to the competitive effects of IPOs among more leveraged and less research intensive firms. We also find a similar pattern through the asset space channel, as healthier firms benefit less from the reduced supply of correlated assets resulting the IPO suspension. However, this latter channel is not as strong or robust in terms of statistical significance as the direct competition channel.

The roadmap to the rest of the paper is as follows. In part 2, we review the literature; and in part 3, we discuss institutional details with regard to the practice of suspensions in China. In part 4, we provide an overview of the data and variable construction. We present the methodology of the empirical tests in more detail in part 5. After reporting the empirical results and a battery of robustness checks in parts 6 and 7, respectively, we summarise our conclusions and policy implications in part 8.

II. Literature review

A large literature exists examining how the IPO event—characterised by a discrete change in scale of operations, capital structure and public visibility—affects firm performance, valuation, and innovation. Of more recent vintage is the research that has examined how the firm IPO affects other firms.

There are at least two channels through which IPOs have been shown to influence already public companies. First, there is the increased competition that newly listed firms bring to their industry, which adversely affects direct competitors. While Akhigbe et al. (2003) had tested for such an effect for more than 2000 IPOs between 1989-2000 and not uncovered evidence for it, Hsu et al. (2010)—by focusing on large

IPOs and allowing for anticipation of events before the event date—found that seasoned industry competitors experience a negative share price reaction around the time of the IPO, and post-IPO their operating performance declines as well. Hsu et al also show the negative impact to be greater the more leveraged and less R&D intensive the listed firm; they further show the impact goes in reverse for withdrawn IPOs.[1] More recently, Spiegel and Tookes (2020) have demonstrated that rival firms incur losses upon IPOs, but more because IPOs are an indicator of increased competition in the industry, rather than the newly listed firms becoming stronger after the IPO.

The second channel through which IPOs have been documented to affect seasoned firms is through a financial asset supply effect. Hong et al. (2008) show that local jurisdictions' relative asset supply can affect the relative valuations of listed firms; Baschieri et al. (2015) also document that local IPOs diminish the value of neighboring listed firms. Increases in traded assets generated by an IPO may also adversely affect the valuation of firms with similar financial characteristics. In their examination of more than 250 IPOs in 22 emerging markets, Braun and Larrain (2009) document that highly covarying listed securities experience a price decline upon IPOs in emerging market economies (EMEs), and the effect is larger the bigger the IPO and the less integrated the EME market is globally. Li et al. (2018) examine IPO approval announcements in China. They find a negative (though transitory) impact on listed share prices which is more prominent the higher the correlation with the industry of the IPO firms, consistent with the asset supply hypothesis.

The empirical literature on the market timing of equity issuance poses a challenge to research on the competitive effects of IPOs. Ritter (1991) documents long-term under-performance of IPOs accounted for by poorly performing companies going public in high-volume years, which is consistent with firms taking advantage of windows of opportunity to issue when investors are "irrationally overoptimistic about the future potential of certain industries." Pagano et al. (1998) finds that private firms are more likely to go public when industry market-to-book are unusually high. Boeh and

[1]Chemmanur and He (2011) also document that IPOs in an industry are associated with market share decline of competing firms in the same industry. Similarly, in their study of Australian firms, McGuilvery et al. (2012) show listed companies to be negatively affected by the completion of an IPO in their industry. Chod and Lyandres (2011) present a model of the decision to go public in the presence of product market competition whereby firms going public not only increase their market share, but adversely affect the market value of industry rivals. Nguyen et al. (2014) document that in reaction to perceived overreaction of the market to the competitive challenges posed by competing firm IPOs, listed firms in the same industry increase their share repurchases.

Dunbar (2014) document higher IPO issuance when average priori IPO returns have been high. Baker and Wurgler (2000) document downward adjustment in the prices of shares related to firms issuing new shares, as firms issue just before periods of low market returns.[2]

Market timing of IPOs by opportunistic issuers means that a negative relationship between the announcement of the IPO and the valuation of similar, already listed firms, cannot necessarily be taken as evidence of competitive effects. Since firm management are more informed about the firm's industry more generally, announced IPOs can reflect overly generous valuations of similar firms. IPO announcements could then trigger a price reversal among existing firms in the industry even without any competitive effects. Problems of the same nature can emerge when IPOs are withdrawn in response to perceived excess doldrums of market conditions.

It follows that a shock to activity is needed for identification of competitive IPO effects. However, individual IPOs (or withdrawn IPOs) can generally not be observed on that basis. Nevertheless, over the past few decades the regulators of mainland China, one of the world's largest IPO markets, have implemented blanket IPO suspensions of IPO activity. Though these events are are often launched in response to macroeconomic and/or market conditions, their blanket nature creates an identifiable exogenous and unanticipated shock to IPO activity in the cross section for a large number of identifiable firms.

We are not the first to recognize the research value of IPO suspensions in China. In related empirical work, Cong and Howell (2019) examine the impact of IPO suspensions in China on the firms whose IPOs were suspended. They document significant declines in growth and innovative activity as a result. However, they do not examine the impact on the currently listed competitors of suspended firms. In a related paper,

[2] In addition to IPOs, opportunistic issuance is evident in the case of seasoned equity offerings as well. Loughran and Ritter (1997) document systematic long-term underperformance of seasoned equity offerings, which they interpret as being due in large part to firms taking advantage of windows of opportunity to issue equity when they are overvalued. The above cited Baker and Wurgler (2000) paper considers seasoned as well as new equity issuance, and concludes that the evidence suggests that "... firms time the market component of their returns when issuing securities." Bradley and Yuan (2013) also document that rival firms can be affected by seasoned equity offerings – negatively so in the case of seasoned secondary share offerings. The theoretical model of Chemmanur and He (2011) predicts lower post-IPO profitability and productivity for firms going public during an IPO "wave".

Shi et al. (2018) examine whether large IPOs in China affect overall market conditions and document a negative impact which is larger the larger the IPO. By contrast, they do not find that IPO suspensions have been viewed as good news by the overall market. But Shi et al look at aggregate effects of IPOs, while our examination of the impact of the suspensions on individual shares allows us to condition for differences in firm characteristics at the time of suspension announcements.

III. IPO Suspensions in China: The Institutional Backdrop

III.1. **Chinese IPO suspensions.** As described above, China's securities regulator, the CSRC, is authorised to impose suspensions on new IPOs of indeterminate length, and has done so nine times since 1994 and five times since 2005. The motivation for the suspensions appears to have been concern over market stability, in particular that liquidity might be reduced, market prices depressed, or demand from existing stocks depressed by new IPOs (Tian (2011), Shi et al. (2018), Cong and Howell (2019)).[3]

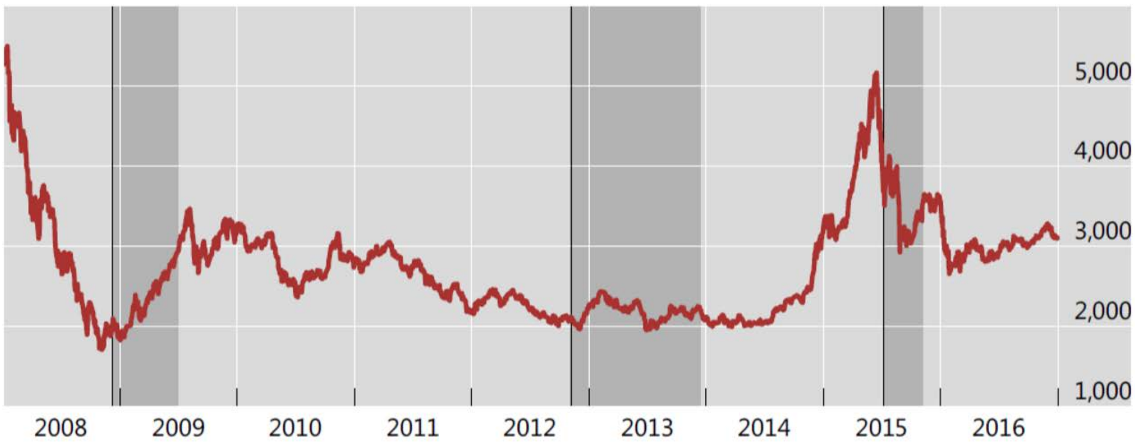
The length of the suspension is indeterminate at its launch; the lifting date is only announced later on. In fact, the length is quite variable: in the three most recent suspensions of 2008-09, 2012-14, and 2015 that are the focus of this study, the length of the suspensions were 214, 438 and 156 days, respectively.[4] Cong and Howell (2019) demonstrate that the suspensions were costly to firms that had been approved and were in the queue for listing, likely due to increased market uncertainty and lost strategic opportunities.

Despite the stated objective of the regulatory authorities to achieve stabilization of the broader market, the evidence of the impact on the market of the IPO suspensions has been mixed. Figure 1 shows the Shanghai stock exchange index (SSE) from 2008 through 2016, a period which includes the three suspensions at the core of this study. While the suspensions followed sustained declines in 2008 and 2012, and a sharper decline in 2015, Graph 1 shows no consistent direction in the longer-term movement of the SSE during the suspension periods. Though in 2008-2009 the stock market rebounded a significant amount during the suspension period, over the 2012-2014

[3]The last IPO suspension was lifted in November 2015, and the head of the CSRC who oversaw the last two of the suspensions, Xiao Gang, was removed from his post in February 2016. The Chinese securities regulator has since not imposed another despite episodes of volatility in the overall market.

[4]Our choice of dates follow Shi et al. (2018), who in turn refer to Hexun, a Chinese financial news web-site (http://stock.hexun.com/2015-07-15/177286288.html). Our analysis covers only back to the 2008-09 suspension and the two that follow, since the availability of IPO approval dates does not extend reliably further back.

Shanghai Stock exchange composite index, 2008-2015 Graph 1



The lines indicate the three suspensions starting from 6 December 2008, 3 November 2012 and 4 July 2015.

Source: CEIC.

suspension, it remained fairly constant, and in the immediate aftermath of the 2015 suspension announcement share prices continued an ongoing decline that was only partially reversed late in the period.[5]

The above results are consistent with Packer and Spiegel (2016), who showed that there is little correlation between the size of market issuance of IPOs and overall market movement. They are also consistent with Shi et al. (2018)'s examination of the Shanghai Stock Exchange Index response to nine IPO suspensions from 1995, which concludes that the market does not respond positively to the announcement of the suspension, and is "inconsistent with the view that IPO moratoriums can mitigate the downward price pressure during bad times." It is possible that the mixed results on the broader market could be due to the endogeneity of suspensions to macroeconomic conditions. The suspensions may have been viewed as a signal of adverse aggregate news, which weighed on market sentiment.

III.2. **Cross-sectional implications for individual listed firms.** Regardless of the factors that might be affecting the overall market at the time of an IPO suspension, there is reason, as mentioned in the above literature review, to expect that differences in the $cross - section$ of listed firms should be reflected in the impact of IPO suspensions. Particularly firms with a similar profile—in terms of industry affiliation or asset returns characteristics—as the prospective firms whose IPOs were

[5]Both the CSI 300 and the Shenzhen stock exchange index show very similar patterns.

suspended should be affected more greatly by an IPO suspension. And the related hypotheses can be tested because, at the time of each of the three suspensions, there was a readily identifiable list of firms about to go public.

There are a series of steps required for Chinese firms to go public in mainland China. After applying for approval by the CSRC, or Chinese Securities Regulatory Commission, there is a preliminary review of the application that may take years. This process usually involves multiple meetings and repeated requests to the applicant for more information. This is followed by a formal assessment by the Stock Issuance Examination and Verification Committee of the CSRC as to whether listing criteria are met, and a decision by this Committee whether or not approve the listing. Around 70-80% of firms gain approval, and the results of the IPO approval process are publicly announced. The firm receiving formal approval may then apply to go public listing at one of the domestic exchanges within six months, though the exchange approval is merely a formality due to exchange rules being identical to CSRC requirements. The firm with the help of underwriters builds a book, conducts a road show and decides on a share subscription day. After subscription it takes around 4 weeks for the shares to list; in total the time between approval and listing averages around 3 months, though the interval has varied between two and five months (when there has not been an intervening suspension).

This process allows us to identify the group of firms that have been approved for IPO that have yet to issue at the time of the suspension announcement. Namely, ahead of the 2008-09, 2012-14 and 2015 suspensions that are examined in this paper, 30, 66 and 62 firms had been approved for an IPO and were waiting to list, respectively. The average size of the total 158 postponed IPOs, when they later occurred, was around one billion RMB, though IPO size shows considerable variation across suspensions, averaging more than 3 billion RMB in 2008, compared to 0.4 and 0.6 billion RMB in 2012 and 2015, respectively (Table 1). The difference in average size in turn is what drives a much larger sum of suspended IPOs in 2008 (91 billion RMB) relative to those in the 2012 and 2015 suspensions (29 and 35 billion RMB). Importantly, we know the industry affiliation of each of these firms, and thus the percent of each industry's market capitalisation the IPOs would have occupied at the time of the suspension: in Table 1, we see that this averages 0.5% for the entire queue sample, though again considerably more for the 2008 sub-sample (1.3%).

Not only is there a variety of industries represented in the prospective IPO queue, there is also considerable heterogeneity in the length of time the postponed IPOs

Table 1. Postponed IPO Firm Characteristics

Pooled suspensions (158 firms)		Mean	Median	Std. Dev.	Min	Max
Size of postponed IPO	RMB bn	0.984	0.363	4.166	0.115	50.160
Postponed IPO/Industry Market Cap	%	0.455	0.101	1.585	0.010	15.950
Length of Suspension	Days	284.810	214	131.816	156	438
Days from Approval to IPO	Days	464.994	396.5	243.464	175	1500
SUM of postponed IPOs	RMB bn	155.437				
2008 Suspension (30 firms)						
Size of postponed IPO	RMB bn	3.037	0.670	9.284	0.266	50.160
Postponed IPO/Industry Market Cap	%	1.251	0.340	2.999	0.100	15.950
Length of Suspension	Days	214				
Days from Approval to IPO	Days	409.100	386	73.573	367	726
SUM of postponed IPOs	RMB bn	91.110				
2012 Suspension (66 firms)						
Size of postponed IPO	RMB bn	0.444	0.290	0.529	0.129	4.000
Postponed IPO/Industry Market Cap	%	0.295	0.103	0.668	0.024	4.876
Length of Suspension	Days	438				
Days from Approval to IPO	Days	698.955	616.5	184.035	546	1500
SUM of postponed IPOs	RMB bn	29.280				
2015 Suspension (62 firms)						
Size of postponed IPO	RMB bn	0.565	0.366	0.909	0.115	7.238
Postponed IPO/Industry Market Cap	%	0.252	0.032	1.205	0.010	9.462
Length of Suspension	Days	156				
Days from Approval to IPO	Days	242.984	236	55.127	175	417
SUM of postponed IPOs	RMB bn	35.046				

Note: The size of the postponed IPO is taken from the actual IPOs of queue firms that listed subsequent to the end of the IPO suspension. Industry market capitalisation measures are taken at the time of the suspension. Days from approval to IPO is measured for each queue firm going public from its approval date for IPO prior to the suspension to its IPO date subsequent to the end of the suspension. Sum of postponed IPOs adds up the sizes of each IPO that was postponed across queue firms, both for the pooled sample and for each suspension separately.

Source: Wind.

are delayed. The actual lengths of the suspensions themselves vary from 214 days in 2008-2009 to more than one year at 438 days in 2012-2014 and to a relatively modest 156 days in 2015. However, variation in the length of time IPOs have been in queue ahead of the suspension and the time it subsequently takes to go public imply that the overall time from approval to the eventual IPO vary within each suspension as well, e.g. ranging from 367 to 726 days for IPOs postponed by the 2008-09 suspension, and from 546 to 1500 days for the 2012-14 suspension.[6] We later test whether industry and suspension-based differences in the listing delays, as proxied by the time between approval and listing, matter for the competitive impact of the IPO suspensions.

IV. Data

IV.1. **Sample and variable definitions.** Our panel sample consists of pooled data for listed firms on the Shenzhen and Shanghai stock exchanges at the time of the announcements of the 2008, 2012 and 2015 suspensions. Our base specification includes 6,045 observations, with 1,484 firms from the 2008 suspension, 2,390 firms from the 2012 suspension, and 2,171 firms from the 2015 suspension. Our dependent variable is $r_{i,t}$, the one-day return on equity values. The returns are taken over the one-day window corresponding to the closing price of the first trading day after the announcement of the suspension over the end of the previous trading day's close.

Our variables of interest are proxies for the intensity of our two channels of potential competition raised by the firms at the time of the suspensions. We first consider an industry-level measure of potential delay in direct competition based on the firms from each listed firm's industry at the time of the suspension. First, we identify the pre-IPO firms in the queue at the time of the IPO suspension, and sort by industry, using the CSRC industry definitions from WIND. For each of the firms in the queue, we then take the realized public offering amounts at the time of their later IPO (for queue firms that ended up never going public, the number is zero) and sum them up across all firms within each industry i at time t. This yields a proxy for the expected total potential market cap of queue firms in industry i at time t, or $MCQ_{i,t}$. Our measure implictly assumes that investors have unbiased expectations of both the ultimate size of the IPO, and those IPOs that will never take place. Because the impact on a particular industry should be greater, the higher the proportion of suspended IPOs relative to existing industry market capitalization, we divide this sum by the total market capitalization of all listed firms within industry i at the time of the suspension t, or $MCL_{i,t}$.

[6]Among the queue firms in our sample, there is a negative correlation between the time from approval to suspension and the time from the end of suspension to the eventual IPO, in the case of both the 2008-2009 and 2015 episodes, which suggests that the queue was respected, at least to some extent. However, the same correlation is negative for prospective IPO firms ahead of the 2012 event, where perhaps the length of the suspension—438 days—implied that the order of approval prior to the suspension was no longer viewed as relevant when the IPO market opened up again.

Our primary proxy for potential direct competition from firms in the IPO queue at the time of suspension, which we term $IPO_{i,t}$, then satisfies

$$IPO_{i,t} = \frac{MCQ_{i,t}}{MCL_{i,t}}. \tag{1}$$

As an alternative proxy, we also adjust for the length of time that the suspension delayed the IPO process. We again assume unbiased foresight and base these expectations on realized IPO delays. In particular, for each pre-IPO firm f in industry i in the IPO queue we evaluate delay as the days between the eventual IPO date and the approval date by the CSRC, which we term $Delay_{f,i,t}$. We then multiply the days of delay for each queue firm by its public offering amount $MCQ_{f,i,t}$, and take the sum across all f firms in the queue in industry i at time t, $\sum_f(Delay_{f,i,t} \cdot MCQ_{f,i,t})$. We subsequently divide this total by total market capitalization of the same industry used earlier, or $\sum_n MCL_{i,t}$. Our alternative proxy, which we term $DIPO_{i,t}$ satisfies

$$DIPO_{i,t} = \sum_f \frac{(Delay_{f,i,t} \cdot MCQ_{f,i,t}}{MCL_{i,t}}). \tag{2}$$

$DIPO_{i,t}$ therefore corresponds to the average delay in days for IPOs in an industry, weighted by the public offering amount of the firms in the queue relative to industry market capitalization. For example, if a single IPO corresponding to 10% of the industry market capitalization was delayed 100 days, the number of average days delay impacting already listed firms in the industry, or $DIPO_{i,t}$, would be estimated at 10.

Our proxy for potential competition in asset space from the firms in the queue is based on the covariance of each individual security with a synthetic portfolio of listed firms whose industry composition matches that of the delayed IPO queue portfolio. This is calculated as the weighted sum (across industries) of covariances between the monthly return (of the three years prior to suspension t) of each listed firm's stock price, R_f, and the monthly return in each industry, R_i. This proxy, which we term $COV_{f,t}$, satisfies

$$COV_{f,t} = \frac{\sum_i(Cov(R_f, R_i) \cdot MCQ_{i,t})}{MCQ_t}, \tag{3}$$

where the weights are the eventual market capitalisation of all the suspended IPOs in the relevant industry ($MCQ_{i,t}$)) relative to the total of suspended IPOs at the time of suspension t, MCQ_t. The industry index returns are calculated as the averages of equity returns within an industry, weighted by ratio of company market cap to industry market cap.

As discussed below, we allow for heterogeneity by firm profitability, under the hypothesis that more profitable firms will be less vulnerable, and hence their equity values less sensitive to the suspension announcement. We therefore interact our measures of potential IPO competition from firms in the queue with indicators of firm profitability. We consider five different gauges of profitability: a) net profit margin, NPM, defined as income before extraordinary items divided by sales/revenue; b) return on assets, ROA, defined as income before extraordinary items divided by average of the beginning balance and ending balance of total assets; c) return on equity, ROE, defined as net income available for common shareholders divided by the average of the beginning balance and ending balance of the total common equity, measured in book values; d) return on invested capital, ROI, defined as profits divided by sum of debt and equity; and e) Operating profitability, $OROC$, defined as operating revenues divided by operating costs.[7] Data is obtained from WIND. For further details on variable construction, see Appendix Table 2.

Finally, in addition to our inclusion of firm fixed effects we also include a number of conditioning variables to control for individual firm heterogeneity. As with the profitability measures above, data are from Wind and defined in more detail in Appendix Table 2.

We include a measure of market capitalization, $MKTCAP$, measured in billions of RMB before the suspension date. It is possible that, holding all else equal, larger firms would be less vulnerable to the impact of suspended IPOs of a given size in the same industry. Another motivation for using size is that large firms are likely to have more information flows available to investors, and thus reduced uncertainty (Ismail et al. (2015)).

We also include a measure of leverage, LEV, measured as the three-year average, taken from the year prior to the suspension, of the ratio of total assets to total equity in book values. The higher the leverage, the more burdensome are a firm's debt payments, and the greater the vulnerability to creditors unwilling to roll over obligations. A higher ratio indicates relatively little equity to cover losses in the firm's value to pay back debt holders, and should be positively related to vulnerability to the disruption posed by new IPOs.

[7]Profits defined in this latter way is independent of interest expenses and thus should be independent of the firm's capital structure.

The price to book ratio, $PBOOK$, is often viewed as measure of value, and enters significantly in some asset pricing models. We take the average of the price to book ratio for the three years before the suspension. Firms with high price-to-book ratios might be construed as more vulnerable to the disruption caused by IPOs in the same industry.

Firms with more volatile earnings could be more sensitive to a suspension of IPOs. We measure earnings variability, $SDEBIT$, as the standard deviation of earnings before interest and taxes/totas, over the three years before the suspension.

We also include a 0-1 dummy to indicate state ownership, SOE. A large number of firms in China are state-owned enterprises. These firms have been shown to enjoy preferential access to borrowing from state-owned banks (e.g. Chang et al. (2019)). State-owned firms may therefore differ from private firms in creditworthiness and profitability. However, as preferential treatment to state-owned firms has waned in the wake of reforms (Liu et al. (2020)), SOEs might also be viewed as more vulnerable to competition from an IPO in their industry, and thus more likely to benefit from a suspension. We include a dummy variable, denoted by SOE, that equals 1 if the company is state owned, meaning the firm's biggest shareholder (or controlling shareholder) is the central government or its agencies, or the local government or its agencies, according to Wind's definition. In addition to acting as a control variable on its own, the state-ownership variable is used to segment samples to test the main hypotheses separately.

Finally, we include $SHANGHAI$, a $0-1$ dummy that takes value 1 if the firm is listed on the Shanghai exchange, and value 0 if it is instead listed on the Shenzhen exchange. As one exchange tends to include larger firms that are more established, while the other exchange more representing of technology and the new economy, it is conceivable that suspensions could affect firms differentially depending on the exchange on which they are listed.

In addition to the above explanatory variables, we also include separate dummies for each suspension to take into account possible particularities of the individual suspension episodes, including any differences in macroeconomic and overall financial conditions.

IV.2. **Summary statistics.** Summary statistics for the full sample of over 6000 observations of listed firms, pooled across the three periods covering the suspensions, are shown in Table 2. The key dependent variable $R1$—share price return on the

Table 2. Summary Statistics

Variable	Mean	Median	Std. Dev.	Min	Max
R1	-0.907	-0.174	5.457	-10.057	10.196
IPO	0.304	0.073	1.151	0	15.950
DIPO	1.519	0.185	5.038	0	66.831
COV	103.676	58.873	225.027	-122.462	4341.443
NPM	17.850	15.610	10.666	0.008	44.684
ROA	8.848	8.050	5.135	0.006	25.371
ROE	16.071	15.319	8.895	0.009	46.423
ROI	11.342	10.418	6.723	0.001	35.929
OROC	107.729	105.094	14.355	83.148	145.242
MKTCAP	14.276	4.008	75.886	0.277	2165.138
LEV	2.218	1.900	1.028	1.132	5.008
PBOOK	9.734	5.200	11.157	1.300	44.649
SDEBIT	0.040	0.019	0.300	0.000	22.253
SOE	0.478	0	0.500	0	1
SHANGHAI	0.433	0	0.496	0	1
Observations	6045				

Note: Variables defined as in Appendix Table 2.
Source: Wind.

first trading day after the announcement of the suspension —averages a -0.9% decline, and the median is only -0.2%. However, the standard deviation of returns of 5.4 percentage points, and maximum and minimum values of plus and minus 10%, respectively, are indicative of considerable cross-sectional variation in share price returns on suspension days across the full listed firm sample. The percentage of market cap that postponed IPOs represent in any industry, the IPO variable, averages only 0.3%, though this can range as high as 15.9%. While the mean (weighted by percent of suspended IPOs of industry market cap) length of delay of IPOs ($DIPO$) is 1.5 days, the standard deviation is 5 days, and the measure ranges as high as 66 days. The listed firm return covariance with delayed IPO firm assets (COV) also shows considerable cross-sectional variation, with a standard deviation more than twice the mean and a maximum observation of 40 times the mean.

Market capitalization of the listed firms averages 14 billion RMB, compared to a median of 4 billion, and ranging as high as 2165 billion. Price-to-book ratios average around 10

Table 3. Summary Statistics

Pooled	Mean	Median	Std. Dev.	Min	Max
R1	-0.91	-0.18	5.46	-10.06	10.20
IPO	0.30	0.07	1.15	0	15.95
DIPO	1.52	0.19	5.04	0	66.83
Delay	288.55	239.50	280.28	0	959
COV	103.68	58.87	225.03	-122.46	4341.44
Observations	6045				
2008	Mean	Median	Std. Dev.	Min	Max
R1	4.50	4.11	2.33	-0.32	10.20
IPO	0.71	0.11	2.20	0	15.95
DIPO	2.98	0.44	9.25	0	66.83
Delay	216.65	368	200.85	0	481.17
COV	190.07	187.82	56.20	-49.76	951.64
Observations	1484				
2012	Mean	Median	Std. Dev.	Min	Max
R1	-0.24	-0.36	1.94	-9.06	10.13
IPO	0.26	0.14	0.43	0	4.88
DIPO	1.82	0.99	2.84	0	30.28
Delay	446.38	611.67	345.19	0	959
COV	45.13	46.15	17.18	-58.73	137.01
Observations	2390				
2015	Mean	Median	Std. Dev.	Min	Max
R1	-5.340594	-8.692	5.907	-10.05747	10.0415
IPO	0.0761081	0.067	0.118	0	1.42845
DIPO	0.1891824	0.142	0.294	0	3.413994
Delay	163.9535	219	116.393	0	398
COV	109.0782	59.954	360.063	-122.4615	4341.443
Observations	2171				

Note: R1, IPO, DIPO, COV defined as in Appendix Table 2. Delay is defined as the average number of days between approval and IPO among all queue firms in the listed firm's industry, and thus has the same value across all firms in the same industry.

Source: Wind.

with a median value of 5. The mean of the profitability measures – 17.9, 8.8, 16.1, 11.3 and 107.9% for NPM, ROA, ROE, ROI and $OROC$, respectively—are all quite close to the median observations. The mean and medians of the measure for leverage (Assets over book equity) are both around 2, with a standard deviation of 1. Roughly 47.8% percent of the entire listed firm sample (which includes double-counting across suspensions) are state-owned, while 43.3% are listed on the Shanghai exchange (as opposed to Shenzhen).

Table 3 reports sample values both pooled and separated by suspension dates, as well as mean IPO delays. The average single day return was much higher for the first suspension in 2008 (4.5%) than the last in 2015 (-5.3%), while the middle 2012 suspension was in between at (-0.2%). The mean (unweighted) length of delay averaged 217 days in 2008, vs. 446 days in 2012, and 164 days in 2015. DIPO results in much smaller numbers across the board than the unweighted delay length, given the weighting scheme by the proportion of queue firms to industry market cap.

V. Methodology

We estimate a conventional panel specification. Our base specifications include an indicator of firm performance on its own, and interacted with the two channels of potential exposure to competition from IPO activity. Our first is $IPO_{j,t}$, which represents the value of IPOs in the queue in industry j at time t, and our second is $COV_{i,j,t}$, which is measured as the average covariance of returns over the previous three years of firm i in industry j at time t with a weighted portfolio of industries in queue.

Our performance indicators consist of four alternative indicators of firm profitability and one indicator of firm productivity. Our profitability indicators include net profit margin, $NPM_{i,j,t}$, return on assets, $ROA_{i,j,t}$, return on equity, $ROE_{i,j,t}$, and return on investment, $ROI_{i,j,t}$. Our proxy for productivity is the ratio of operating revenue to operating costs, $OROC_{i,j,t}$. For example, our specification with the $NPM_{i,j,t}$ performance indicator satisfies

$$\begin{aligned} r_{i,j,t} = c + \beta_1 NPM_{i,j,t} + \beta_2 IPO_{j,t} + \beta_3 IPO_{j,t} \cdot NPM_{i,j,t} + \beta_4 COV_{i,j,t} \\ + \beta_5 COV_{i,j,t} \cdot NPM_{i,j,t} + \gamma X_{i,j,t} + D_{12} + D_{15} + \epsilon_{i,j,t} \end{aligned} \tag{4}$$

where in addition to the variables defined above, $r_{i,j,t}$ represents the one-day return on firm i in industry j at time t; $X_{i,j,t}$ is a vector of firm characteristics, including market capitalization ($MKTCAP$), leverage (LEV), the price-to-book ratio ($PBOOK$), earnings volatility ($SDEBIT$), and a 0-1 indicator that takes value 1 if the firm is listed on the Shanghai stock exchange and 0 if listed on the Shenzhen ($SHANGHAI$); D_{12} and D_{15} are time dummies indicating observations from the 2012 or 2015 suspensions respectively; and $\epsilon_{i,j,t}$ is the residual, assumed to be well-behaved.

We estimate this specification using ordinary least squares with standard errors clustered by industry. Our time dummies account for differences in prevailing overall macroeconomic and financial conditions prevailing on different suspension dates.

There are four primary variable coefficients of interest. The importance of direct competition effects of IPO activity are measured by the sensitivity of one-day returns to the eventual value of the IPOs in industry j that were in the queue at the time of the suspension, normalized by the market capitalization of industry j (β_2), and the adjustment of that sensitivity for firm performance, here measured by interacting $IPO_{j,t}$ with firm net profit margins (β_3). Similarly, the importance of the asset-space competition effects of IPO activity are measured by the sensitivity of one-day returns to the covariance of the returns to firm i in industry j over the previous three years with the returns on a synthetic portfolio of firms with the industry mix of the IPO queue (β_4), and the estimated adjustment of that sensitivity for firm performance, here measured by interacting $IPO_{j,t}$ with firm net profit margins (β_5).

As discussed in the previous section, as a robustness check we also consider an alternative indicator of potential competitors in the IPO queue, $DIPO_{j,t}$. This specification weights eventual firm IPO values in the queue by the length of time from the event date to their eventual listing. This alternative measure accounts for the fact that the CSRC appears to respect firms' places in the queue. As such, the announcement of a blanket moratorium on IPOs represented a larger expected delay on firms that had been approved for IPO listing for a longer period prior to the suspension announcement. To keep the specification simple, we use the realized IPO delay as a proxy for the expected delay at the time of suspension.

VI. Results

VI.1. **Base specification.** Our base specification results are shown in Table 4. Each column interacts the competition channel proxies IPO and COV with a different firm performance indicator.

Model 1 runs our base specification with the performance variable firm net profit margin (NPM). It can be seen that firms with higher net profit margins fared better on suspension dates, as NPM enters positively at statistically significant levels. This is not surprising, as suspensions all occurred during relatively tumultuous periods where stronger firms were likely outperforming their weaker counterparts. Given the standard errors in Table 1, our point estimate indicates that a one standard deviation in NPM results in a 59 basis point increase in returns.

Both the proxy for potential direct IPO competition (IPO) and that variable interacted with NPM enter at statistically significant levels with their expected positive and negative point estimates respectively. Our point estimates indicate that these channels are economically significant as well. A one standard deviation increase in IPO is estimated to raise

Table 4. Base specification results

Performance indicator (PI)	(1) NPM	(2) ROA	(3) ROE	(4) ROI	(5) OROC
PI	0.055***	0.134***	0.082***	0.090***	0.036***
	(0.010)	(0.015)	(0.011)	(0.012)	(0.004)
IPO	0.209***	0.290**	0.257**	0.243*	1.863***
	(0.063)	(0.127)	(0.124)	(0.140)	(0.628)
IPOxPI	-0.018***	-0.049***	-0.019**	-0.028**	-0.018***
	(0.003)	(0.018)	(0.011)	(0.008)	(0.006)
COV	0.002**	0.002**	0.004***	0.003***	0.006**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
COVxPI	-0.000	-0.000**	-0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MKTCAP	0.010***	0.007***	0.007***	0.008*	0.008*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
LEV	0.239***	0.303***	0.148**	0.129**	0.165***
	(0.074)	(0.078)	(0.069)	(0.065)	(0.060)
PBOOK	-0.011**	-0.015***	-0.014***	-0.012***	-0.009**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
SDEBIT	0.046	-0.020	0.003	-0.006	0.069**
	(0.045)	(0.042)	(0.041)	(0.040)	(0.030)
SOE	-0.058	-0.038	-0.056	-0.080	-0.081
	(0.129)	(0.123)	(0.171)	(0.127)	(0.129)
SHANGHAI	0.663***	0.661***	0.651***	0.638***	0.696***
	(0.1037)	(0.101)	(0.100)	(0.101)	(0.106)
Constant	2.602***	2.242***	2.381***	2.758***	-0.157
	(0.330)	(0.301)	(0.332)	(0.253)	(0.443)
Observations	6,045	6,048	5,984	5,916	5,937
R-squared	0.513	0.515	0.514	0.531	0.530

Note: Dependent variable is one-day return on equity. Ordinary least squares estimation, with standard errors clustered by industry in parentheses. Models (1) through (5) alternate performance indicators, as indicated at tops of column. See text for variable definitions. *** p<0.01, ** p<0.05, * p<0.1.

one-day returns by 24.4 basis points, while our point estimate on the interactive term indicates that a one standard deviation increase in NPM for firms with average IPO values reduces those returns by 5.9 basis points.

Our proxy for potential asset-space IPO competition (COV) also enters at statistically significant levels with its expected positive sign. Our coefficient estimate indicates that a one-standard deviation increase in COV results in a 42.8 basis point increase in one-day returns. Our interactive term ($COVxNPM$) misses statistical significance at conventional cutoffs, but the point estimate indicates economically meaningful heterogeneity across firms in their sensitivity to this channel as well, with a one standard deviation increase in NPM for firms with average COV values reducing returns by 5.6 basis points.

The four other models substitute the performance variables, ROA, ROE, ROI, and the productivity measure, $OROC$, one at a time for NPM in our base regression. All of the performance variables enter positively and significantly on their own, again demonstrating that better-performing firms tended to have higher returns on the suspension dates.

Turning to the competition channel proxies, our qualitative results are largely robust to the use of the alternative firm performance variables. Both the IPO and COV variables consistently enter positively at statistically significant levels, although the COV variable only enters at a 10% confidence level using the ROI performance variable. The interactive terms also continue to enter negatively, with both interactive terms exhibiting statistical significance at least at a 5% confidence level.

Overall, our results for our primary hypotheses are quite robust to the use of all of our firm performance variables and send the same message: The suspensions of IPO activity was taken as better news for firms with greater exposure through either the direct or asset-space competition channels. Moreover, the sensitivity to these channels of competition through IPO activity was measurably related to firm performance, with poorer-performing firms exhibiting more sensitivity.

Turning to the other covariates, their importance and robustness varies. Our $MKTCAP$ proxy enters positively and significantly throughout, although sometimes only at a 10% confidence level. Our base specification point estimate indicates that a one standard deviation movement in market capitalization results in a 50 basis point increase in expected return on IPO suspension dates. This finding would be in keeping with the possibility that the suspensions occurred on turbulent dates, which larger firms with greater market capitalization were more capable of weathering.

Our $LEVERAGE$ proxy also enters positively and significantly throughout. Our base specification point estimate indicates that a one standard deviation increase in firm leverage results in a 24.5 basis point increase in expected return on IPO suspension dates. This finding may reflect the expectation that the IPO suspension would be more helpful to more leveraged existing firms who may face greater equity market needs going forward.

Our price-to-book measure, $PBOOK$, enters negatively at statistically significant levels throughout as well. Our base specification point estimate indicates that a one standard deviation increase in a firm's price-to-book ratio results in a 10.6 basis point decrease in expected return on IPO suspension dates. This result appears in keeping with those for our performance variables, which suggest that better-performing firms, who are also likely to have higher price-to-book ratios holding all else equal, did better on the suspension dates.

Not all of the conditioning variables enter significantly. Our proxy for revenue risk, $SDEBIT$, is insignificant throughout, with the exception of our specification with the $OROC$ firm-productivity variable. Our SOE dummy is also insignificant throughout, suggesting that after controlling for difference in firm performance there are no systematic differences in exposure to competition through IPO activity between SOE and non-SOE firms.

In contrast, our dummy indicating firms that trade on the Shanghai, rather than the Shenzhen, exchange enter positively and significantly throughout. This may also reflect a systematic superiority in more established firms, which are more likely to be listed on the Shanghai exchange. Our base specification indicates that the average return on the Shanghai exchange on suspension dates was 66.3 basis points higher than firms listed on the Shenzhen exchange.

Lastly, we don't report our dummies for the event dates, but our event dummies for the 2012 and 2015 suspensions both enter significantly negative. This contrasts with the constant term, which can be interpreted as the impact of the 2008 suspension and enters significantly positive.[8]

VI.2. **Adjusting for expected issuance delay.** As the CSRC typically respected the IPO queue when scheduling listing dates, firms who had been in the queue longer experienced a greater disruption to their IPO timing than those who had not. To adjust for this potential heterogeneity in the news content of the suspension announcement, we weight the IPO variable for each firm in the queue by the realized period of delay. We term this alternative variable $DIPO$.

Our results for this alternative variable are shown in Table 5. As in our base specification, each column interacts the competition channel proxies $DIPO$ and COV with a different firm performance indicator, as explained in the previous section.

Our overall results for our variables of interest are quite similar to those for our base IPO variable, with similar coefficient estimates for the variables of interest. Model 1 runs our base specification with firm net profit margin (NPM). Firms with higher net profit margins again fared better on suspension dates, as NPM enters positively at statistically significant levels, with an almost-identical point estimate. Similarly, both our alternative the proxy for potential direct IPO competition ($DIPO$) and that variable interacted with NPM also

[8]The full regression results are available in an online appendix. GIVE ADDRESS In addition, while we are concerned about potential endogeneity issues, we report the results using our two potential measures of direct competition for individual suspension dates in Appendix Table A1. The results are quite poor for all of the individual suspension dates, illustrating the importance of our pursued panel approach.

Table 5. IPO queue adjusted for delay

Performance indicator (PI)	(1) NPM	(2) ROA	(3) ROE	(4) ROI	(5) OROC
PI	0.056***	0.136***	0.083***	0.093***	0.037***
	(0.010)	(0.016)	(0.011)	(0.013)	(0.004)
DIPO	0.054***	0.074**	0.074**	0.069*	0.421***
	(0.019)	(0.032)	(0.036)	(0.038)	(0.133)
DIPOxPI	-0.004***	-0.012***	-0.005**	-0.008**	-0.004***
	(0.001)	(0.004)	(0.002)	(0.003)	(0.001)
COV	0.002**	0.002**	0.004***	0.003***	0.006**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
COVxPI	-0.000	-0.000**	-0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MKTCAP	0.010***	0.007***	0.007***	0.008*	0.008*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
LEV	0.237***	0.301***	0.147**	0.129**	0.163***
	(0.073)	(0.077)	(0.069)	(0.064)	(0.060)
PBOOK	-0.011**	-0.015***	-0.014***	-0.012***	-0.009**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
SDEBIT	0.044	-0.024	0.001	-0.010	0.069**
	(0.044)	(0.042)	(0.042)	(0.040)	(0.029)
SOE	-0.059	-0.036	-0.053	-0.077	0.082
	(0.128)	(0.122)	(0.123)	(0.126)	(0.129)
SHANGHAI	0.659***	0.657***	0.650***	0.636***	0.691***
	(0.103)	(0.100)	(0.100)	(0.101)	(0.105)
Constant	2.573***	2.203***	2.342***	2.719***	-0.261
	(0.334)	(0.306)	(0.339)	(0.260)	(0.474)
Observations	6,045	6,048	5,984	5,916	5,937
R-squared	0.513	0.515	0.514	0.531	0.523

Note: Dependent variable is one-day return on equity. Ordinary least squares estimation, with standard errors clustered by industry in parentheses. Models (1) through (5) alternate performance indicators, as indicated at tops of column. See text for variable definitions. *** p<0.01, ** p<0.05, * p<0.1.

continue to enter at statistically significant levels with their expected respective positive and negative point estimates.

The performances for our proxy for potential asset-space IPO competition (COV), as well as its interactive term ($COVxNPM$), are also similar to those in our base specification. Both enter with their expected signs, at statistically significant levels for the COV variable on its own, but again just missing 10% statistical significance for that variable interacted with NPM. As before, however, the two variables both enter with statistically significant coefficient estimates in all of the other models in Table 5. Overall, our results for our variables of interest are robust to the use of the alternative $DIPO$ measure of the intensity of potential direct competition in the queue.

The performance of the other covariates also remain quite similar. The $MKTCAP$ proxy continues to enters positively and significantly throughout, as does the $LEVERAGE$ variable. The price-to-book ratio variable ($PBOOK$) also continues to enter negatively throughout. While the proxy for revenue risk ($SDEBIT$) remains insignificant for four of the five specifications, it enters positively and significantly at a 5% confidence level for Model 5 with our $OROC$ performance variable. The SOE dummy remains insignificant throughout, and the Shanghai dummy and event dummies remain significantly positive and negative respectively as well.

Overall, then, our results are generally robust to the use of our alternative proxy for potential direct competition in the queue, confirming that the IPO suspensions were viewed as better news for firms with greater potential competition from either the direct or asset channels in the IPO queue at the time of the suspension announcement.

VII. Robustness checks

This section subjects our results to a battery of robustness tests, concentrating on the NPM indicator of firm performance. We organize the robustness tests into three tables, and concentrate our discussion on the performances of our variables of interest. The first table considers changes in the specification of the base regression. The second investigates the robustness of our results to a variety of changes to our sample. Lastly, we examine the robustness of our results to perturbations in our investigation methodology.

VII.1. **Specification changes.** Table 6 displays a variety of alternative changes in our base regression specification.

Model 1 drops the conditioning variables, only retaining the variables of interest and the time dummies. Our results for this alternative specification are quite similar. NPM continues to enter positively on its with an almost identical coefficient estimate. Both the IPO and COV variables also continue to enter positively and significantly as well, while the interactive terms also continues to enter negatively with the $IPOxNPM$ variable again entering with statistical significance and the $COVxNPM$ variable just missing.

Model 2 drops our interactive terms. NPM and COV continue to enter positively and significantly on their own, with modestly lower coefficient point estimates. However, the IPO variable now enters significantly with the opposite sign. This sensitivity illustrates the importance of allowing for differences across firms in sensitivity to the composition of the queue on suspension dates by firm performance.

TABLE 6. Changes in specification

	(1)	(2)	(3)	(4)	(5)	(6)
NPM	0.055***	0.046***		0.054***	0.044***	0.061***
	(0.012)	(0.009)		(0.010)	(0.010)	(0.013)
IPO	0.251***	-0.045**	-0.046***	0.228***	0.467***	0.226**
	(0.056)	(0.022)	(0.017)	(0.064)	(0.097)	(0.086)
IPOxNPM	-0.021***			-0.019***	-0.030***	-0.025***
	(0.004)			(0.004)	(0.007)	(0.006)
COV	0.002**	0.001*	-0.001		0.001**	0.002**
	(0.001)	(0.000)	(0.001)		(0.001)	(0.001)
COVxNPM	-0.000		0.000		-0.000	-0.000**
	(0.000)		(0.000)		(0.000)	(0.000)
MKTCAP		0.007***	0.008***	0.007***	0.006***	0.014***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.004)
LEV		0.238***	0.154*	0.248***	0.190***	0.390***
		(0.073)	(0.081)	(0.079)	(0.065)	(0.129)
PBOOK		-0.011***	-0.005	-0.009**	-0.003	0.001
		(0.004)	(0.003)	(0.004)	(0.004)	(0.006)
SDEBIT		0.047	0.049	0.031	0.034	0.191
		(0.046)	(0.037)	(0.051)	(0.034)	(0.135)
SOE		-0.059	-0.121	-0.151	-0.337***	-0.133
		(0.131)	(0.130)	(0.120)	(0.123)	(0.155)
SHANGHAI		0.677***	0.676***	0.637***	0.414***	0.540***
		(0.104)	(0.101)	(0.108)	(0.093)	(0.134)
Constant	3.468***	2.814***	3.798***	2.890***	0.181	-0.196
	(0.240)	(0.321)	(0.233)	(0.328)	(0.309)	(0.508)
Observations	6,058	6,045	6,045	6,106	6,060	6,045
R-squared	0.495	0.512	0.505	0.492	0.543	0.638

Note: Dependent variable is one-day return on equity, except Model 5, whose dependent variable is the 1-day excess return on equity, and Model 6, whose dependent variable is the 2-day return on equity. Ordinary least squares estimation, with standard errors clustered by industry in parentheses. See text for variable definitions and details on sample perturbations. *** p<0.01, ** p<0.05, * p<0.1.

We next drop the IPO and its interactive term $IPOxNPM$ (Model 3). Our NPM variable continues to enter positively and significantly with a very similar coefficent estimate. Both the positive coefficient estimates on our COV variable, and the negative point estimate on that variable interacted with NPM are also robust to dropping the IPO variable, as both enter with coefficient estimates that are modestly larger in absolute value.

Model 4 drops the COV and $COVxNPM$ variables. Our NPM variable enters positively and significantly with a very similar coefficient estimate. Both the positive coefficient estimates on our IPO variable, and the negative point estimate on that variable interacted with NPM are also robust to dropping the COV variable, as both again enter with coefficient estimates that are statistically significant and modestly larger in absolute value.

Model 5 retains all of the explanatory variables of our base regression, but examines 1 day excess, rather than raw returns as the dependent variable. Our results for the variables of interest continue to enter at statistically significant levels with their expected signs, with the exception of the $COVxNPM$ variable, which is negative as expected, but statistically insignificant.

Lastly, Model 6 also retains all of the variables in our base repression, but extends our dependent variable to a longer 2-day event window. Our results for the variables of interest continue to enter at statistically significant levels with their expected signs, again with modestly larger coefficient point estimates in absolute value.

Overall, our base regression results are quite robust to modest perturbations in our specification. The lone exception is that of Model 2, where the IPO variable actually entered with the incorrect negative sign when the interactive terms were dropped. As discussed above, this sensitivity illustrates the importance of accounting for heterogeneity across firms by performance in assessing sensitivity to IPO activity among listed firms.

VII.2. **Sample changes.** We next investigate the robustness of our results to changes in our sample. Because we investigate omitting outliers for a wide variety of reasons, we only report our coefficient estimates for our variables of interest.[9] Our results are shown in Table 7.

Model 1 reduces our sample to a sub-sample that only includes SOE firms, resulting in 2,890 observations. NPM continues to enter significantly positive, with a modestly larger coefficient estimate than our base specification. Moreover, the two measures of potential channels for IPO competitive effects both enter significantly with their expected positive signs. Similarly the interactive terms remain negative and statistically significant.

Model 2 displays the results for the Non-SOE sub-sample (3,155 observations). The NPM performance variable continues to enter positively and significantly, as does the IPO variable and the term interacting these ($IPOxNPM$). However, the COV variable and its interactive term are both insignificant. We therefore conclude that both SOE and Non-SOE firms face exposure to IPO activity through direct competition, of roughly the same magnitude, but while SOE firms appear to also face potential competition through the asset-space channel, we find no evidence that this channel is at work for our Non-SOE sub-sample.

[9]Full results are available from the authors upon request at GIVE ADDRESS.

Table 7. Changes in sample

	(1) IPO	(2) IPOxNPM	(3) NPM	(4) COV	(5) COVxNPM	(6) Constant
(1) SOE sample	0.203***	-0.017***	0.070***	0.006*	-0.000**	2.144***
	(-0.0651)	(-0.004)	(-0.019)	(-0.003)	(-0.000)	(-0.739)
(2) Non-SOE sample	0.211*	-0.017***	0.050***	0.001	0.000	2.480***
	(-0.112)	(-0.005)	(-0.009)	(-0.001)	(0.000)	(-0.404)
(3) Shanghai listed	0.249***	-0.021***	0.051***	-0.000	0.000	3.494***
	(-0.081)	(-0.006)	(-0.014)	(-0.002)	(-0.000)	(-0.510)
(4) Shenzhen listed	0.219***	-0.018***	0.036***	0.002**	-0.000*	3.251***
	(-0.077)	(-0.004)	(-0.007)	(-0.001)	(0.000)	(-0.269)
(5) Balanced panel	0.118	-0.010**	0.070***	-0.001	-0.000***	3.5307***
	(-0.073)	(-0.005)	(-0.013)	(-0.002)	(-0.000)	(-0.567)
(6) Drop profitable	0.209***	-0.018***	0.055***	0.002**	0.000	2.602***
	(-0.063)	(-0.003)	(-0.010)	(-0.001)	(0.000)	(-0.330)
(7) Drop unprofitable	0.209***	-0.018***	0.055***	0.002**	0.000	2.602***
	(-0.063)	(-0.003)	(-0.010)	(-0.001)	(0.000)	(-0.330)
(8) Drop productive	0.189*	-0.017**	0.045***	0.002**	0.000	2.950***
	-0.096	(-0.007)	(-0.006)	(-0.001)	(0.000)	(-0.225)
(9) Drop unproductive	0.209***	-0.018***	0.055***	0.002**	0.000	2.602***
	(-0.063)	(-0.003)	(-0.010)	(-0.001)	(0.000)	(-0.330)
(10) Drop big	0.215***	-0.019***	0.055***	0.002**	0.000	2.658***
	(-0.062)	(-0.003)	(-0.010)	(-0.001)	(0.000)	(-0.330)
(11) Drop small	0.209***	-0.018***	0.055***	0.002**	0.000	2.602***
	(-0.063)	(-0.003)	(-0.010)	(-0.001)	(0.000)	(-0.330)
(12) Drop high IPO	0.781***	-0.051***	0.077***	0.003***	-0.000**	2.098***
	(-0.261)	(-0.015)	(-0.016)	(-0.001)	(0.000)	(-0.588)
(13) Drop large ImpactM	0.810***	-0.045***	0.060***	0.002**	0.000	2.448***
	(-0.250)	(-0.013)	(-0.011)	(-0.001)	(0.000)	(-0.375)

Note: Dependent variable is one-day return on equity. Ordinary least squares estimation, with standard errors clustered by industry in parentheses. See text for variable definitions. *** p<0.01, ** p<0.05, * p<0.1.

Models 3 and 4 divide our sample into the sub-samples of firms listed on the Shanghai stock exchange and those listed on the Shenzhen stock exchange. The two sample have 2,617 and 3,428 observations respectively. While the $SHANGHAI$ variable itself was positive and significant in our base specification, indicating that variables listed on the Shanghai exchange enjoyed modestly superior returns on suspension dates, our results for the sub-samples divided by exchange listings are quite similar.

For both sub-samples, the NPM performance variable continues to enter positively and significantly, as does the IPO variable and the term interacting these ($IPOxNPM$). However, we do observe differences in the COV variable and its interactive term. For the observations from firms listed on the Shenzhen exchange, our results for the COV variable and its interactive term are the same as those for our base specification, with the former entering positively and significantly, while the interctive term is significantly negative. In contrast, both of the variables enter insignificantly with the wrong sign for observations from firms listed on the Shanghai exchange. We conclude that the relative lack of robustness we find for our asset-space competition channel is attributable to firms listed on the Shanghai exchange, although it is not clear why this would be the case.

Model 5 reduces our sample to a balanced panel of listed firms with observations from each of the suspension dates. This leaves us with the majority of observations (5,021) in our base panel, but this specification is obviously exposed to some extent to both potential survivorship bias and potential differences associated with firm age. For that reason, we only examine this specification as a robustness check.

The performance variable NPM continues to enter significantly positive, with a modestly larger coefficient estimate. However, the two measures of the competition channels are both insignificant. The IPO variable does better, continuing to enter positively with a smaller point estimate at close to a 10% confidence level, while the interactive term remains negative and statistically significant. However, the COV variable is very insignificant and enters with the wrong sign, although its interactive term also remains significantly negative. Overall, our results do not appear to be robust to estimation under a truncated balanced panel.

The remainder of specifications in Table 7 examine the robustness of our results to dropping a variety of outliers from our sample, with outliers defined as realizations more than three standard deviations from our sample mean. Models 6 and 7 drop extremely profitable and unprofitable firms, defined by the NPM measure, respectively. Models 8 and 9 drop extremely productive and unproductive firms, defined by the $OROC$ measure, respectively. Models 10 and 11 drop extremely large and small firms, defined by extreme values of firm asset holdings. Model 12 drops industries that had extremely large IPOs from our queue sample. Lastly, Model 13 drops firms from industries most closely correlated with the sample queue, identified as those with very high values of IPO.

Our results are generally robust to the omission of all of these outliers. The NPM variable enters significantly with its expected sign throughout, as does the IPO variable and its interactive term, as well as the COV variable. However, the interactive term $COVxNPM$ is often insignificant, with the exception of Model 12, which drops the high IPO industries.

Overall, our results are quite robust to our sample perturbations, with the exception of the interactive $COVxNPM$ term, which continues to display some fragility. However, even here the variable consistently enters with its predicted negative sign and is usually close to the 10% confidence level.

VII.3. **Alternative estimation methodologies.** Lastly, we consider the robustness of our base specification results to a variety of estimation methodologies. Our results are displayed in Table 8.

Models 1 and 2 re-estimate the base specification with White's heteroscedasticity robust and conventional standard errors respectively (Table 8's model 2 is thus the same specification as reported in Table 4, model 1). It can be seen that all of our variables of interest continue to enter at statistically significant levels in model 1, except for the interactive $COVxNPM$ variable, which fails to enter significantly under robust standard error estimation, despite entering significantly with conventional standard errors.

Model 3 runs our base specification using weighted least squares, with firm size, measured by firm asset holdings. Our performance variable continues to enter positively with statistical significance and a coefficient estimate similar to that in our base specification. Our IPO variable is also robust to estimation under weighted least squares, as is that variable's interactive term, $IPOxNPM$. Indeed, both coefficient point estimates are larger than we obtain in our base specification. However, our COV variable and its interactive term $COVxNPM$ are insignificant, suggesting that the significance of the asset substitution channel in our earlier results may have been driven by the smaller firms in our sample.

Model 4 winsorizes variables at a 1% level, rather than the 5% level in our base specification, while Model 5 trims instead of winsorizing them at the 5% level. For both methods, our performance variable continues to enter positively with statistical significance, as does our IPO variable, as well as that variable interacted with our performance variable, $IPOxNPM$. Our COV also continues to enter significantly positive, with comparable coefficient point estimates, but that variable interacted with our performance variable just misses 10% significance under 1% winsorizing, and enters with only 10% statistical significance when we trim rather than winsorize.

Overall, our results for our variables of interest are robust to the perturbations in estimation methods, particularly for our measure of potential direct competition, the IPO variable and that variable interacted with our performance variable. Our COV proxy for the asset-space competition channel is also quite robust. However, we again observe sensitivity and less robustness for that variable interacted with our performance variables, although it consistently continues to enter with its expected negative sign.

VIII. Conclusion

This paper uses data from Chinese IPO suspensions to evaluate the efficacy of two proposed channels in the literature for competition from IPO activity to adversely affect listed firms. The Chinese suspensions, which eliminated all IPO activity for uncertain periods of

Table 8. Changes in estimation method

	(1) Robust SE	(2) Regular SE	(3) Weighted LS	(4) 1% Winsor	(5) 5% Trim
NPM	0.055***	0.055***	0.023**	0.051***	0.063***
	(0.007)	(0.006)	(0.010)	(0.010)	(0.009)
IPO	0.209***	0.209**	0.070***	0.204***	0.228***
	(0.053)	(0.087)	(0.019)	(0.058)	(0.062)
IPOxNPM	-0.018***	-0.018***	-0.009***	-0.017***	-0.019***
	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)
COV	0.002*	0.002***	0.003**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
COVxNPM	-0.000	-0.000*	-0.001*	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MKTCAP	0.007***	0.007***	0.006	0.007***	0.008
	(0.002)	(0.001)	(0.005)	(0.002)	(0.007)
LEV	0.239***	0.239***	0.108	0.065**	0.334***
	(0.058)	(0.052)	(0.072)	(0.028)	(0.116)
PBOOK	-0.011***	-0.011**	-0.009	-0.005***	-0.006
	(0.004)	(0.005)	(0.007)	(0.002)	(0.008)
SDEBIT	0.046	0.046	0.033	0.043	-1.378
	(0.047)	(0.164)	(0.420)	(0.046)	(1.266)
SOE	-0.058	-0.058	0.110	0.014	-0.198
	(0.110)	(0.109)	(0.150)	(0.133)	(0.134)
SHANGHAI	0.663***	0.663***	0.233	0.711***	0.608***
	(0.110)	(0.107)	(0.152)	(0.107)	(0.127)
Constant	2.602***	2.602***	3.507***	2.942***	2.402***
	(0.248)	(0.219)	(0.278)	(0.262)	(0.469)
Observations	6,045	6,045	3,803	6,045	4,899
R-squared	0.513	0.513	0.591	0.512	0.516

Note: Dependent variable is one-day return on equity. Ordinary least squares estimation, with standard errors clustered by industry in parentheses. See text for variable definitions. *** p<0.01, ** p<0.05, * p<0.1.

time, provide an opportunity to evaluate the proposed competitive effects of IPOs without contamination from the endogeneity of individual firm listing decisions. Because we have multiple suspensions, we pursue a panel approach, which allows us to condition for disparities in aggregate conditions at the time of the suspension announcements.

We evaluate the first channel, which we term “direct competition," through the share of firms in the IPO queue in their industry at the time of the suspension, weighted by the size of their eventual IPOs. The second channel is the “asset space" channel, where firms that enjoyed additional demand due to desirable risk characteristics might find IPOs providing new competition for this asset attribute. We measure this second channel by the covariance of a listed firm with the returns on a synthetic portfolio of listed firms with the same industry mix as those firms in the IPO queue at the time of the suspension announcement. Our results provide evidence of anticipated competition from new IPO firms through both channels. These results are robust to a wide variety of sensitivity tests.

We also examine the possibility of heterogeneity in exposure to new competition by firm performance. We evaluate this heterogeneity through a term which interacts our proxies for competition with a variety of performance measures. Our results demonstrate a meaningful and robust degree of heterogeneity of firm exposure through the direct competition channel, with better-performing firms exhibiting less sensitivity to the suspension announcements through this channel than their weaker counterparts. We also find evidence of heterogeneity through the asset-space channel, although measured heterogeneity by firm performance is weaker and less robust to sensitivity tests. As this term is particularly weak under weighted least squares by firm size and for the subset of firms listed on the Shanghai exchange, which tend to be larger than those on the Shenzhen exchange, it seems likely that the heterogeneity in exposure to asset-space competition through IPOs is more pronounced among smaller listed firms.

IX. Appendix

Table A1. Individual event dates

	(1) 1st event	(2) 1st event	(3) 2nd event	(4) 2nd event	(5) 3rd event	(6) 3rd event
NPM	0.009	0.010	-0.016	-0.016	0.144***	0.142***
	(0.023)	(0.023)	(0.011)	(0.011)	(0.023)	(0.023)
IPO	0.092**		-0.003		-0.028	
	(0.044)		(0.190)		(2.095)	
IPOxNPM	-0.011***		0.001		0.022	
	(0.004)		(0.006)		(0.124)	
DIPO		0.020**		0.001		-0.196
		(0.010)		(0.029)		(0.891)
DIPOxNPM		-0.002***		0.000		0.021
		(0.001)		(0.001)		(0.053)
COV	0.003	0.003	-0.003	-0.003	0.002**	0.002
	(0.003)	(0.003)	(0.006)	(0.006)	(0.001)	(0.001)
COVxNPM	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MKTCAP	-0.002***	-0.002***	-0.000	-0.000	0.012***	0.012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.004)
LEV	0.080	0.079	0.045	0.045	0.508***	0.508***
	(0.069)	(0.069)	(0.054)	(0.054)	(0.173)	(0.173)
PBOOK	0.001	0.001	-0.000	-0.000	-0.047***	-0.047***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.015)	(0.015)
SDEBIT	0.276	0.275	0.094**	0.094**	-4.363**	-4.329**
	(0.193)	(0.193)	(0.045)	(0.045)	(1.686)	(1.681)
SOE	-0.077	-0.076	0.180*	0.181*	-0.260	-0.257
	(0.124)	(0.125)	(0.105)	(0.105)	(0.323)	(0.323)
SHANGHAI	0.061	0.061	0.176	0.176	1.650***	1.651***
	(0.171)	(0.171)	(0.112)	(0.112)	(0.256)	(0.256)
Constant	3.756***	3.749***	-0.039	-0.043	-9.532***	-0.043
	(0.549)	(0.550)	(0.341)	(0.344)	(0.591)	(0.592)
Observations	1,484	1,484	2,390	2,390	2,171	2,171
R-squared	0.014	0.013	0.017	0.017	0.157	0.157

Note: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A2: Variable Definitions

Variable	**Definition**	**Formula**	**Unit**	**Sources**
Dependent variable				
r1	One-day return	$\frac{\Delta s_t}{s_{t-1}} \times 100$	%	WIND
r2	Two-day return	$\frac{s_{t+1}-s_{t-1}}{s_{t-1}} \times 100$	%	WIND
Independent variable				
IPO	Market capitalization of all queue firms in industry i, $MCQ_{i,t}$ based on IPOs after suspension at time t, divided by market capitalization of all listed firms in industry at time of suspension t, $MLC_{i,t}$.	$\frac{MCQ_{i,t}}{MCL_{i,t}}$	%	calculated
DIPO	Weighted sum of "delays of IPO process" in each industry; where the days of delay for each delayed IPO firm f in industry i ($Delay_{f,i}$) are multiplied by size of the delayed IPO ($MCQ_{f,i}$), and then summed across firms in queue at time of suspension t. The resulting sum is divided by total market cap of the industry, $MCL_{i,t}$, at suspension t. Delay in IPO process = IPO date - approval date by CSRC	$\frac{\sum_f (Delay_{f,i,t} \times MCQ_{f,i,t})}{MCL_{i,t}}$	Days	Calculated
COV	Weighted sum of covariances between monthly firm and industry returns R_f and R_i, estimated three years prior to suspension at time t, where the sum is over the industries and weights are the market cap of all suspended IPOs in the industry i, $MCQ_{i,t}$ to all the suspended IPOs during suspension t, MCQ_t. Industry index return = weighted average of equity returns within an industry; weighted by ratio of company market cap to industry market cap	$\sum_i \frac{(Cov(R_f,R_i)_t \times MCQ_{i,t})}{MCQ_t}$ where R_f is the firm monthly return and R_i is the industry monthly return index		Calculated
NPM[1,2]	Net profit margin	$\frac{net\_income_i}{revenue_i}$	%	WIND

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Variable	**Definition**	**Formula**	**Unit**	**Sources**
ROA[1,2]	Return on assets, annualized	$\frac{2\times net\_income_i}{TA_{i,bob}+TA_{i,eob}}$	%	WIND
ROE[1,2]	Return on equity, annualized	$\frac{2\times net\_inc\_shareholder_i}{CE_{i,bob}+CE_{i,eob}}$	%	WIND
ROI[1,2]	Return on invested capital	$\frac{2\times net\_income_i}{Inv\_cap_{i,bob}+Inv\_cap_{i,eob}}$	%	WIND
OROC[1]	Total operating revenue / total operating cost	$\frac{Operating\_revenue_i}{Operating\_cost_i}$	%	WIND
Control variable				
SHANGHAI	A dummy equal to 1 if the firm is listed in Shanghai and 0 for Shenzhen			WIND
SOE	A dummy equal to 1 if the firm is a state-owned enterprise and 0 for others.			WIND
MKTCAP	Market capitalization of firm, before suspension		RMBbn	WIND
LEV[1]	Leverage, average three years before the suspension	$\frac{1}{3}\sum_{i=0}^{2}\frac{total\_assets_{t-i}}{total\_equity_{t-i}}$	Ratio	WIND
PBOOK[1]	Price to book ratio, average three years before the suspension	$\frac{1}{3}\sum_{i=0}^{2}\frac{price\_value_{t-i}}{book\_value_{t-i}}$	Ratio	WIND
SDEBIT	Standard deviation of earnings before interest and taxes/total assets over three years before the suspension	$\sqrt{var(\frac{EBIT_t}{total\_assets_t})}$		WIND
D12	When it is 2012 suspension, equal to 1			CSRC
D15	When it is 2015 suspension, equal to 1			CSRC

[1]Winsorized 5% at each end. [2]When these variables are used in the regressions, a constant term is added to each varaible so that there are no negative values.

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