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CSI Index Reconstitutions: A Quasi-Natural Experiment in China*

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Abstract

We investigate whether the China Securities Index (CSI) reconstitutions are suitable as a quasi-natural experiment to investigate the influence of institutional ownership. Using both actual and predicted CSI 300 and 500 index constituents, we document a sharp discontinuity in institutional ownership, especially of domestic mutual funds around index thresholds, overcoming a key concern of the Russell reconstitution approach. Using inclusion in the CSI 500 index as an instrument, we find that higher institutional ownership increases dividend payouts, improves firm performance, and improves the firms' information environment. These findings inform us of the salience of domestic institutions in emerging markets.

Keywords Institutional ownership; Index reconstitution; Payout policies; Firm value; Information environment

JEL Classification: G23, G30, G32, G35

1. Introduction

We examine whether the index reconstitution of the China Securities Index (hereafter CSI) causes systematic variation in institutional ownership and study its suitability as a potential quasi-natural experiment to investigate the effect of institutional ownership on corporate policies and outcomes. Although numerous studies have investigated similar questions (e.g. Crane *et al.*, 2016), the majority of the findings are based on developed markets such as the United States, where the ownership structure is relatively dispersed, making existing institutions more effective. Causal evidence of the effect of institutional ownership on firms in countries

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with higher controlling shareholding is very scarce. Furthermore, the unique characteristics of the Chinese equity markets such as the outsized participation of individual investors (Bailey *et al.,* 2009), lower participation of foreign institutional investors (Firth *et al.,* 2016), and weaker prevailing governance environment (Fan *et al.,* 2007), increase the significance of the role played by professional investors such as institutions, in monitoring and protecting minority shareholder rights.

The general idea behind studies using index reconstitutions for identification is as follows: Institutional money managers who are benchmarked to indices face stronger incentives to invest in securities with higher weights in the index to reduce tracking error. Therefore, when firms move from being included in an index consisting of larger firms with a minuscule weight to an index consisting of smaller firms with a more substantial weight, they experience a disproportionate increase in demand from institutional investors. Since index reconstitutions are based only on criteria such as market capitalization, it is unrelated to other firm characteristics, and thus provides a clean exogenous shock to institutional ownership.

However, the application of the Russell index reconstitutions for studies focused on US public firms is not without controversy. Although there is consensus that passive institutional ownership in the United States is highly sensitive to Russell index constitutions, the ability of Russell reconstitutions to affect active, or for that matter aggregate, institutional ownership, is highly debated. For example, Appel *et al.* (2019) show that only passive ownership increases significantly around Russell reconstitutions. Thus, the generalizability of the findings based on Russell reconstitutions is lower. Furthermore, the complex interactions between different types of institutions in the United States may produce heterogeneous effects of index reconstitutions. For example, the sudden increase in demand from passive institutional investors around index reconstitutions can create incentives for other types of institutions to exploit the liquidity provided by passive owners and trade against them. Moreover, higher costs of active investment strategies and an increase in free-rider problems with an influx in passive owners, may encourage non-passive institutional owners to "exit" their positions. In sum, the lack of effect of Russell reconstitution on aggregate institutional ownership complicates interpretation of the effect of the latter on any corporate policy, as any findings may be due to either an increase in passive ownership or due to a decrease in other forms of institutional ownership such as blockholdings.

In contrast, when investigating the effect of CSI index reconstitutions on institutional ownership in China, we find that CSI reconstitution has strong predictive power on institutional ownership, increasing both aggregate institutional ownership and most individual types of institutional owners, including domestic mutual funds, banks and insurance companies, and pension funds. Furthermore, we still find a large significant effect of CSI reconstitutions on institutional ownership when correcting for the rearrangement of firms near the index thresholds according to unobservable free-float adjustments made by the index provider (e.g. Appel *et al.,* 2020), as detailed in Section 5.4.

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Next, we examine whether the findings in prior studies hold up in this causal setting using Chinese data. Institutional owners with large blocks of shares have strong incentives to monitor the firm and improve firm performance and information environment. Specifically, using two-stage regressions and actual index inclusions as an instrument for *Ins. Own*, we confirm the effect of institutional ownership on payout policies (Crane *et al.,* 2016; Firth *et al.,* 2016), on firm performance (Yuan *et al.,* 2008), and on information environment (Boone and White, 2015), finding that institutional ownership increases dividend payouts, boosts firm performance, and improves the information environment.

Our results remain robust to the inclusion of control variables, to various bandwidths of firms around index thresholds, to lagged index inclusion in June, and to predicted index inclusions which are free from float-adjustment induced biases around index thresholds. Examining the effect of index reconstitutions on various categories of institutional ownership, our findings remain robust in the largest category of institutional owners, the domestic mutual funds (*MFOwn*). Also, other categories of institutional ownership such as banks and insurance companies (*BISOwn*), and social security funds (*SSOwn*) remain sensitive to CSI index reconstitutions. However, unsurprisingly, qualified foreign institutions (*QFOwn*) are insensitive to changes in CSI indices.

Finally, we also examine the cross-sectional variation in our findings according to ownership structure, firm age, and growth opportunities. Although the magnitude of the effect of being a top CSI 500 inclusion on institutional ownership is lower for value firms (versus growth firms) and those with high state ownership, the increase remains positive in a statistically significant manner in all the subsamples. Furthermore, payouts increase more for firms with higher state or promoter ownership (i.e. firms with high agency problems) and for value firms. In terms of performance and information environment, however, we do not observe any systematic differences along these dimensions.

We contribute to the literature in the following ways: First, we validate the CSI index reconstitution as a novel quasi-natural experiment, which can be employed in other studies to investigate the effect of institutional ownership on various corporate policies in China. Furthermore, the effect of index inclusions in the CSI indices demonstrate a stronger discontinuity than the Russell index changes, suggesting the greater relevance of CSI equity indices to domestic institutional investors. Inclusion in the Russell 2000 index, for example, has an insignificant effect on total mutual fund ownership although having a positive significant effect on passive ownership (Appel *et al.,* 2019). However, in the case of CSI index reconstitution, inclusion in the CSI 500 has a strong effect on aggregate institutional ownership as well as all domestic categories.

Second, the documented sharp discontinuity in institutional ownership around the CSI indices informs us of the implications of institutional environment on ownership structure and corporate policies. For example, the typical absence of a higher amount of free-float shares in China may lower the incentives of institutional

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investors to participate actively in governance, and hence rely more on strategies such as closet indexing (Cremers *et al.*, 2016), thereby increasing sensitivity to index reconstitutions. Also, reduced competition among index companies can potentially account for increased sensitivity to index reconstitutions, especially those focused on domestic investors.[1]

2. Institutional Details of CSI Indices

The CSI 300 and 500 indices serve as popular benchmarks for investors, especially domestic institutional investors in China. According to ETFGI, an independent ETF research firm, both the CSI 300 and 500 indices are estimated to be in the top 10 emerging market benchmarks based on net new asset additions in 2016. Based on a variety of data sources, ETFGI estimates assets benchmarked to CSI 300 and CSI 500 in 2016 to be US$13.61bn and US$3.51bn, respectively.[2] Thus, at the outset there is sufficient interest from institutional investors in both the indices that they are likely to pay keen attention to their constitutions.

2.1. CSI Index Methodology

Both these indices are reconstituted semi-annually, in June and December. To identify the constituents of each of these indices, China Securities Index Co. Ltd uses the average daily market capitalization and trading volumes in the most recent year of all stocks in the Shanghai and Shenzhen stock exchanges. To identify the CSI 300 constituents, stocks with greater than median trading volumes in the recent year among Shanghai and Shenzhen stocks are ranked according to average daily market capitalization, and the top 300 stocks are included in the index. For the CSI 500 index, first the CSI 300 index constituents are excluded, followed by the stocks in the lowest quintile of trading volumes. The remaining stocks are ranked by average daily market capitalization in the recent year and the top 500 ranked stocks are included in the CSI 500 index. Although index inclusion is straightforward and only based on market capitalization and trading volumes, there are two specific methodological features which create issues in empirical analyses. First, within-index

[1]In the USA, popular multi-exchange equity benchmarks, which include stocks traded in multiple exchanges, are provided by S&P, DowJones, Russell, Wilshire, and MSCI, in addition to exchange-specific indices such as the NYSE and NASDAQ composite indices. However, in China, the only notable multi-exchange index provider is CSI. Although MSCI China indices have been around since 1995, MSCI methodology assumes the perspective of a foreign institutional investor, and hence are not representative enough for Chinese stocks, especially for use by domestic investors. For example, MSCI uses filters such as foreign ownership limits and available room for foreign investors, in computing index weights.

[2]These estimates are described in a publication by the London Stock Exchange Group in 2016 intended to familiarize investors with Chinese ETFs: http://www.lseg.com/documents/lseg-china-etf-guide-pdf

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weights are assigned based on free-float adjusted market capitalization, which excludes shares held by promoters, the state, employee-plans, and those regarded as strategic by CSI.[3] Second, CSI methodologies allow for banding, that is, retaining firms in original indices to minimize churn for investors when there is frequent switching of stocks between indices. Specifically, new potential additions to (old constituents of) CSI 300 need to rank better than 240 (worse than 360) to be added (removed) from CSI 300. Similarly, new potential additions to (old constituents of) CSI 500 need to rank better than 400 (worse than 600) to be added (removed) from CSI 500.

2.2. Suitability as a Natural Experiment

The validity of index reconstitutions as a natural experiment for institutional ownership relies on two key conditions. First, there should be a non-trivial amount of assets benchmarked to the two neighbouring indices, and therefore when stocks switch from a larger index with minuscule weights to a smaller index with greater weights, institutions keen on minimizing tracking errors create a large variation in institutional demand for the stock added to the smaller index. This condition is naturally satisfied in the CSI setting as described above. Second, there should not be any systematic variation in institutional ownership across the index thresholds due to index methodologies. The use of free-float adjustments in computing index weights has the potential to create systematic biases (e.g. see Appel *et al.,* 2020). Firms with greater free-float are likely to have higher institutional ownership, and also receive greater within-index weights, which may create an artificial discontinuity in institutional ownership around the index thresholds. Such rearrangement of firms within the indices will violate the exogeneity assumption for identification as documented in previous studies that rely on Russell reconstitutions.

A potential solution to satisfy this second condition when free-float adjustments are made, is to use predicted index assignments without the free-float adjustments instead of actual constituent data (Crane *et al.,* 2016). Predictions can be computed based on market capitalization and trading volume data along with information on lagged constituent data to account for banding adjustments. Since the free-float computations are unobservable and the predicted assignment is only a noisy proxy for actual index inclusion, such identification can be implemented using a fuzzy RDD estimation with a noisy instrument (Wei and Young, 2019). In our study, we implement empirical analyses using both actual and predicted index assignments, and unsurprisingly we find that the magnitude of effects on institutional ownership

[3]Such specific free-float adjustment methods are similar to those of other popular free-float adjusted indices such as Russell or MSCI country indices. Using total and free-float-adjusted market capitalization for screening and weighting index constituents is rational from an index company's perspective because it allows the index to have very high coverage of publicly available market capitalization while at the same time allowing the index to be easily investable with lower transaction costs.

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of CSI 500 inclusion based on predicted assignments are smaller than those based on actual index assignments. For example, in two-stage regression implementation, we find that actual (predicted) inclusion in the CSI 500 index is associated with an 11.1% (6.3%) increase in institutional ownership. Nevertheless, even using predicted assignments we find a strong positive and statistically significant effect on institutional ownership, thereby mitigating concerns about the influence of free-float adjustments on our interpretation.

3. Data and Methodology

3.1. Sample Selection

Our sample consists of 7150 firm-year observations of non-financial Chinese firms belonging to either the CSI 300 or CSI 500 index between the years 2008 and 2017. We exclude firms with incomplete information in the China Stock Market and Accounting Research (*CSMAR*) and Wind Financial Database (or *Wind*). We also exclude firms that are relegated to the special treatment (ST) category by the China Securities Regulatory Commission (CSRC) when listed firms have operational losses in two consecutive years or due to accounting irregularities. We obtain annual financial statements data and CSI index constituents from the *CSMAR* and supplement with institutional ownership data from the *Wind*.

3.2. Measures Based on CSI Index Constituents

We construct our key explanatory variable as an indicator, *CSI500*, according to whether the stock is included in the CSI 500 (value of one) or the CSI 300 (value of zero) after the December reconstitution.[4] Similar to Crane *et al.* (2016), we construct a variable *Rank gap* to measure the distance of the firm's market capitalization from the annual index threshold. In our regressions, we control for *Rank gap* and *Rank gap*×*CSI500* to account for variation in the discontinuity effect as a function of distance from the thresholds and for the asymmetry in the effect on either side of the threshold, respectively (Crane *et al.,* 2016).

To perform the analysis with predicted assignments in the CSI 300 and CSI 500 indices, we follow the CSI index methodologies explicitly, including the market capitalization and liquidity data to identify constituents and lagged historical constituent information to account for banding policies of CSI. Specifically, beginning with all A-shares at the end of November, we compute the average market

[4]CSI indices are rebalanced every June and December each year, as described in Section 2.1, with the new constitution being effective on the second Friday of June and December, respectively. However, institutional ownership data on *Wind* is available at an annual frequency and is reported for each calendar year. Therefore, the December index reconstitution is most relevant to our study as the timing of the index membership data and institutional ownership are available within a small window without much lag. However, we also present robustness results based on the June index reconstitution in Table 5, which are qualitatively similar.

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capitalization and trading volumes in the most recent year. To construct CSI 300 constituents, we exclude those stocks with below median trading volumes. The remaining stocks are ranked by market capitalization. Those that have a rank within 300 are considered as predicted to be in CSI 300. However, if it is a new stock entering CSI 300 or an old constituent exiting CSI 300 (based on previous index reconstitution data), then we use the rank cutoffs to be 240 or 360, respectively, to account for banding. For CSI 500, we follow a similar approach to predict constituents with trading volume filters of 20 percentiles and alternate cutoffs of 400 and 600 for new entrants and old constituents, respectively. Using these predicted constituents, we then define *Est. CSI500* as an indicator variable for whether the firm is estimated to be in the CSI 500 (value of one) or the CSI 300 (value of zero) after the December reconstitution. We also construct *Est. rank gap*, similar to *Rank gap*, as described above. Following Crane *et al.* (2016) we also construct a float adjustment factor computed as the difference between the actual index weight assigned for the firm and the predicted index weight based on market capitalization in November.

3.3. Measures of Institutional Ownership

Using data from *Wind*, we identify total institutional ownership, *Ins. Own*, as the sum of all categories of institutional owners including the following: Mutual funds, *MFOwn*, are the largest category of domestic institutional owners to whom benchmarks such as the CSI indices are highly relevant to compare their relative performance. Other categories, such as banks and insurance companies, *BISOwn*, especially in Chinese equity markets, often have business relationships with the firm along with an ownership interest in the firm (Firth *et al.,* 2016), and may or may not be sensitive to index reconstitutions. Social security funds, or *SSOwn*, such as the National Social Security fund (the largest state-owned investment fund with assets of US$319bn in 2016), are controlled by government agencies and invest mostly in domestic markets, both directly and through passive strategies, again having unclear benchmarking incentives. The last category of institutions is qualified foreign institutional owners, *QFOwn*, who are more likely to be benchmarked to global indices or indices of developing economies that club together various emerging countries (such as MSCI Emerging market indices).

3.4. Summary Statistics

Table 1 presents descriptive statistics of variables in our sample. We winsorize all continuous variables at 1st and 99th percentiles to reduce the effect of outliers on our findings. In Panel A, we present statistics in the full sample and using subsamples of CSI 300 and 500 indices. When we split into subsamples of CSI 300 and CSI 500, we find that the level of institutional ownership across all our measures is higher, using both mean and medians, for firms in the CSI 300 when compared to firms in the CSI 500, with the differences being statistically significant as well. Also, our key dependent variables and key firm characteristics that we employ as control

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Table 1 Summary statistics

This table shows descriptive statistics of the main variables in Panel A in our full sample, in the CSI 300 index, and in the CSI 500 index, respectively, and in Panel B using a subsample of firms that are within a bandwidth of 50 firms around the CSI index thresholds (i.e. the 50 smallest firms in CSI 300 and the 50 largest firms in CSI 500). All the variables are defined in Appendix 1.

Panel A. Full sample

	Full sample (N = 7150)					CSI 300 (N = 2611): A			CSI 500 (N = 4539): B			Test of difference: A − B			
	Mean	SD	p25	Median	p75	Mean	SD	Median	Mean	SD	Median	Mean	t-stat	Median	z-stat
Measures of institutional ownership															
Ins. Own	0.072	0.082	0.014	0.041	0.098	0.092	0.088	0.061	0.060	0.077	0.030	0.032	(16.14)	0.032	(21.91)
MFOwn	0.058	0.074	0.010	0.029	0.077	0.076	0.080	0.045	0.048	0.069	0.020	0.027	(15.18)	0.025	(22.71)
QFOwn	0.001	0.005	0.000	0.000	0.000	0.002	0.006	0.000	0.001	0.004	0.000	0.001	(9.49)	0.000	(13.33)
BISOwn	0.007	0.014	0.000	0.000	0.008	0.008	0.015	0.000	0.006	0.013	0.000	0.002	(5.36)	0.000	(9.13)
SSOwn	0.004	0.008	0.000	0.000	0.002	0.004	0.008	0.000	0.003	0.008	0.000	0.000	(2.44)	0.000	(6.90)
Key dependent variables															
Div (indicator)	0.781	0.414	1.000	1.000	1.000	0.864	0.342	1.000	0.733	0.442	1.000	0.131	(13.09)	0.000	(12.94)
Ln(Div)	0.116	0.137	0.016	0.082	0.166	0.161	0.162	0.104	0.091	0.113	0.052	0.070	(21.53)	0.053	(21.21)
Div/BV	0.027	0.030	0.005	0.019	0.038	0.036	0.034	0.027	0.022	0.026	0.015	0.014	(19.27)	0.012	(19.17)
Tobin's q	2.296	1.335	1.370	1.880	2.760	2.297	1.454	1.810	2.295	1.261	1.920	0.002	(0.05)	−0.110	(−4.61)
ROA	0.050	0.052	0.017	0.041	0.075	0.061	0.056	0.048	0.044	0.048	0.037	0.017	(13.52)	0.011	(11.42)
EBITDA margin	0.188	0.156	0.082	0.147	0.246	0.207	0.174	0.156	0.177	0.144	0.143	0.030	(7.78)	0.013	(4.72)
Analyst coverage	11.675	11.484	2.000	8.000	18.000	17.714	13.050	15.000	8.201	8.762	5.000	9.512	(36.77)	10.000	(33.70)

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Table 1 (*Continued*)

Panel A. Full sample

	Full sample (N = 7150)					CSI 300 (N = 2611): A			CSI 500 (N = 4539): B			Test of difference: A − B			
	Mean	SD	p25	Median	p75	Mean	SD	Median	Mean	SD	Median	Mean	*t*-stat	Median	*z*-stat
Analyst reports	24.157	27.902	4.000	14.000	35.000	37.747	33.755	28.000	16.340	20.094	8.000	21.407	(33.61)	20.000	(32.51)
Liquidity	0.004	0.003	0.002	0.003	0.005	0.003	0.002	0.002	0.004	0.003	0.004	−0.001	(−24.66)	−0.001	(−26.98)
Other control variables															
Leverage	0.496	0.193	0.357	0.503	0.642	0.519	0.198	0.527	0.482	0.189	0.490	0.037	(6.88)	0.037	(6.52)
Growth	0.146	0.269	−0.006	0.116	0.252	0.171	0.259	0.137	0.131	0.274	0.102	0.040	(5.38)	0.034	(6.91)
Size	9.154	1.351	8.205	8.931	9.837	10.160	1.389	9.898	8.553	0.894	8.463	1.608	(52.38)	1.435	(42.58)
Cash	0.167	0.119	0.086	0.135	0.215	0.173	0.129	0.140	0.163	0.113	0.132	0.010	(3.00)	0.008	(1.50)
Age	11.634	5.354	7.400	11.600	15.600	11.363	5.417	11.500	11.795	5.310	11.800	−0.432	(−2.91)	−0.300	(−2.68)
SOE	0.292	0.248	0.013	0.303	0.513	0.367	0.258	0.441	0.248	0.230	0.237	0.119	(17.76)	0.204	(17.03)
TopOwn	0.380	0.161	0.246	0.378	0.503	0.418	0.171	0.424	0.357	0.150	0.345	0.061	(13.84)	0.078	(13.18)
SEO	0.128	0.334	0.000	0.000	0.000	0.127	0.334	0.000	0.129	0.335	0.000	−0.001	(−0.13)	0.000	(−0.13)
Capex	0.069	0.068	0.022	0.049	0.094	0.077	0.068	0.056	0.065	0.067	0.045	0.011	(5.80)	0.011	(7.75)

Panel B. Subsample using a bandwidth = 50

	CSI 300 (N = 421): A			CSI 500 (N = 426): B			Test of difference: A − B			
	Mean	SD	Median	Mean	SD	Median	Mean	*t*-stat	Median	*z*-stat
Measures of institutional ownership										
Ins. Own	0.051	0.053	0.034	0.128	0.117	0.093	−0.077	(−12.29)	−0.059	(−9.92)
MFOwn	0.041	0.047	0.024	0.112	0.109	0.077	−0.071	(−12.27)	−0.053	(−10.20)
QFOwn	0.001	0.004	0.000	0.002	0.005	0.000	0.000	(−0.48)	0.000	(2.33)
BISOwn	0.005	0.009	0.000	0.008	0.013	0.000	−0.003	(−3.29)	0.000	(−0.63)
SSOwn	0.003	0.008	0.000	0.005	0.010	0.000	−0.002	(−2.71)	0.000	(−0.99)

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Table 1 (*Continued*)

Panel B. Subsample using a bandwidth = 50

	CSI 300 (N = 421): A			CSI 500 (N = 426): B			Test of difference: A – B			
	Mean	SD	Median	Mean	SD	Median	Mean	*t*-stat	Median	*z*-stat
Key dependent variables										
Div(indicator)	0.789	0.409	1.000	0.826	0.379	1.000	−0.038	(−1.39)	0.000	(−1.39)
Ln(Div)	0.106	0.118	0.095	0.117	0.115	0.095	−0.010	(−1.28)	0.000	(−2.04)
Div/BV	0.027	0.031	0.018	0.030	0.031	0.023	−0.004	(−1.69)	−0.005	(−2.52)
Tobin's q	2.258	1.389	1.845	3.003	1.734	2.410	−0.745	(−6.83)	−0.565	(−7.26)
ROA	0.041	0.048	0.035	0.075	0.055	0.062	−0.034	(−9.49)	−0.026	(−9.11)
EBITDA margin	0.203	0.188	0.140	0.221	0.150	0.190	−0.018	(−1.57)	−0.051	(−4.33)
Analyst coverage	11.048	9.128	9.000	15.141	11.277	14.000	−4.093	(−5.80)	−5.000	(−5.09)
Analyst reports	20.819	20.120	15.000	32.697	27.964	27.000	−11.878	(−7.09)	−12.000	(−5.92)
Liquidity	0.003	0.002	0.002	0.005	0.003	0.004	−0.002	(−11.28)	−0.002	(−10.11)
Other control variables										
Leverage	0.509	0.187	0.523	0.472	0.166	0.485	0.037	(2.46)	0.038	(2.68)
Growth	0.104	0.209	0.086	0.206	0.219	0.169	−0.102	(−1.61)	−0.084	(−4.01)
Size	9.486	0.968	9.375	8.678	0.880	8.518	0.808	(10.81)	0.857	(10.24)
Cash	0.172	0.138	0.127	0.183	0.121	0.143	−0.012	(−1.11)	−0.016	(−2.70)
Age	10.853	5.059	10.900	12.390	4.927	12.500	−1.538	(−3.80)	−1.600	(−3.55)
SOE	0.425	0.269	0.522	0.172	0.191	0.084	0.253	(13.43)	0.438	(11.13)
TopOwn	0.485	0.153	0.497	0.274	0.134	0.237	0.210	(18.09)	0.260	(14.61)
SEO	0.102	0.303	0.000	0.220	0.415	0.000	−0.118	(−3.99)	0.000	(−3.94)
Capex	0.073	0.069	0.053	0.078	0.067	0.063	−0.005	(−0.91)	−0.010	(−1.31)

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variables are significantly greater among CSI 300 firms than CSI 500 firms in terms of means and medians, with the exception of *Liquidity* and *Age*, which are greater among CSI 500 firms. This is not surprising, given the larger market capitalization of the firms in the CSI 300 index as compared to CSI 500. Also, this provides the underlying motivation to employ an RDD, because comparing all the firms in both the indices might be subject to severe endogeneity concerns due to systematic differences between them, whereas focusing on firms within a narrow bandwidth of CSI index thresholds can reduce such concerns. In Panel B, we present statistics of CSI 300 and CSI 500 firms within a bandwidth of 50 firms on either side of the index thresholds. Here, we find that the difference in institutional ownership and other key dependent variables flip sign and remain statistically significant. For example, firms in the CSI 500 have higher levels of institutional ownership, pay more dividends (measured as *Div/BV*), perform better, and have a better information environment, when compared to firms in the CSI 300 index.

4. Research Design

To examine whether there is a discontinuity around the CSI index thresholds, we perform graphical and univariate analyses of institutional ownership within different bandwidths of firms around the index thresholds. We also obtain RDD estimates of the difference in institutional ownership, controlling for covariates and local polynomial smoothing functions.

To formally estimate the effect of institutional ownership on corporate policies, we adopt Crane *et al.*'s (2016) specification and employ a two-stage model as specified in Equation (2) below, using Equation (1) as the first stage. In the second stage, we use payout policies, firm performance measures, and measures of firm information environment as the dependent variables.

$$Ins\,Own_{i,t} = \alpha + \beta_1 CSI\,500_{i,t} + \beta_2 Rank\,gap_{i,t} + \beta_3 CSI\,500_{i,t} \times Rank\,gap_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$Corp\,Outcome_{i,t+1} = \theta + \gamma_1 \widehat{MFOwn}_{i,t} + \gamma_2 Rank\,gap_{i,t} + \gamma_3 CSI\,500_{i,t} \times Rank\,gap_{i,t} + \eta_{i,t} \quad (2)$$

5. Empirical Results

5.1. Effect of CSI Index Reconstitution on Institutional Ownership

Figure 1 plots the lagged market capitalization and index weights of the actual CSI 300 and CSI 500 firms on *Rank gap* during our sample period. In the left panel using lagged market capitalization, we find that there is no apparent discontinuity among firms around the index thresholds, suggesting that firms are similar around index thresholds. However, in the right panel using index weights, we find a large

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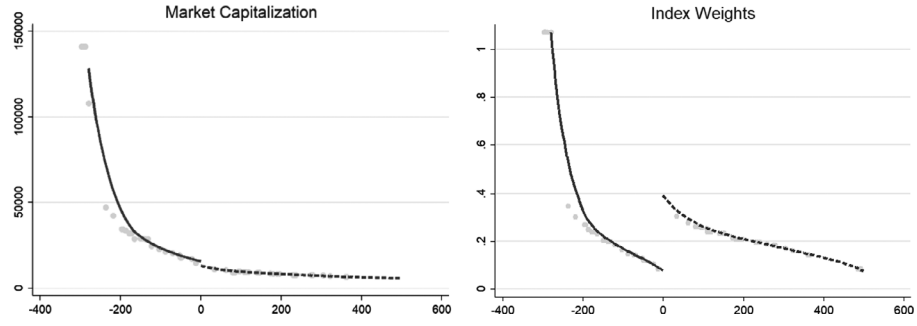
Figure 1 Index weights and market capitalization around index thresholds.
This figure presents the continuity in lagged market capitalization (left) and discontinuity in index weights around index thresholds. The solid and dashed curves represent graphs of local polynomial regressions of the y-axis variable for firms in the CSI 300 and CSI 500 indices, respectively, estimated using a bandwidth of 100 firms around the index thresholds. The grey dots represent averages of y-axis variables.



discontinuity among firms around the index thresholds, that is, firms in the CSI 500 index near the index thresholds have quite a substantial index weight when compared to CSI 300 firms near the index thresholds. To the extent that institutional investors focus on minimizing tracking errors of their benchmark indices, this difference in index weights suggests that firms that are possibly ignored by a manager benchmarked to the CSI 300 suddenly become more important to managers who are benchmarked to the CSI 500 index. This difference in index weight forms the basis for the variation in institutional demand around index thresholds.

Figure 2 plots total institutional ownership and domestic mutual fund ownership on *Rank gap*. Using both measures of institutional ownership, we find a striking discontinuity among firms in the CSI 500 and the CSI 300 near the index thresholds, that is, near the index thresholds, institutional ownership (left panels) and mutual fund ownership (right panels) in the larger CSI 500 firms are much greater than corresponding measures for smaller firms in the CSI 300 index. Furthermore, this also alleviates the concern that the amount of assets tracking the CSI 500 index is non-trivial.

Next, we compare the mean ownership of different categories of institutional owners according to the index membership of firms, focusing on different bandwidths near the thresholds. The statistics are reported in Table 2 for bandwidths of ± 50, ± 100, and ± 200 firms around the CSI 300/500 index thresholds for both semi-annual index reconstitutions. Examining the average institutional ownership, we find that for both June and December reconstitutions, institutional ownership in the CSI 500 is higher than the CSI 300 among all the bandwidths for *Ins. Own* and *MFOwn*. *BISOwn* and *SSOwn* are only higher in the CSI 500 among narrow bandwidths. Furthermore, the economic magnitude of these findings is also strinking: the average *Ins. Own* in CSI 500 firms is 7.6 percentage points higher when

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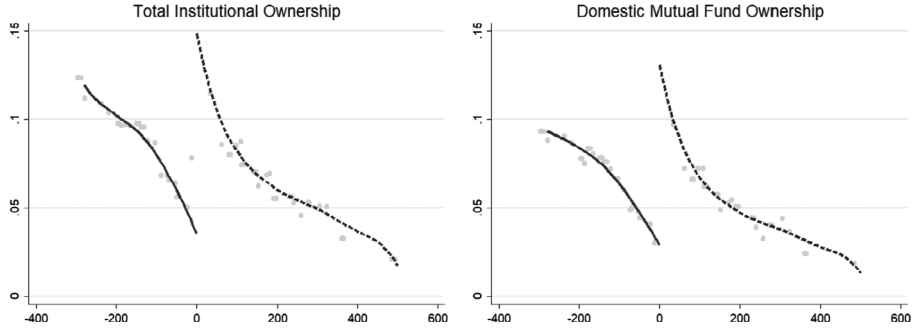
Figure 2 Discontinuity in institutional ownership around index thresholds.
This figure presents discontinuity in institutional ownership (left) and mutual fund ownership (right) around the index thresholds. The solid and dashed curves represent graphs of local polynomial regressions of the y-axis variable for firms in the CSI 300 and CSI 500 indices, respectively, estimated using a bandwidth of 100 firms around the index thresholds. The grey dots represent averages of y-axis variables.



compared to CSI 300 firms following the December reconstitution when the sample mean is 7.2%. Interestingly, *QFOwn* is similar among CSI 500 and CSI 300 indices, possibly due to the irrelevance of the CSI index as a benchmark. The overall findings in Table 2 suggest sharp discontinuities in institutional ownership, especially those of domestic mutual funds around the index thresholds of CSI 300 and CSI 500 indices.

Next, we examine the RDD estimates of the effect of inclusion in the CSI 500 index on institutional ownership. In the RDD estimation, we also use control variables and a polynomial function of the treatment variable of order three. This functional form controls for any direct impact of market capitalization on institutional ownership around the thresholds, thus capturing the continuous effect of market capitalization on institutional ownership. The discontinuous effect at the threshold is thus captured by the RDD estimate for the *CSI500(indicator)*. The results are presented in Table 3 for the three different explicit bandwidths of ± 50, ± 100, and ± 200, and two optimal data-driven bandwidths based on the mean square error and the coverage error rate algorithms. Again, the findings are identical to those in Table 2, that is, inclusion in the CSI 500 index has a causal effect on total institutional ownership and domestic mutual fund ownership. However, after controlling for observable firm characteristics and distilling out any direct effect of market capitalization on institutional ownership, we find that the magnitude of the differences, especially for *Ins. Own* and *MFOwn*, are almost double when compared to corresponding values in Table 2.

5.2. Effect of Institutional Ownership on Corporate Policies and Performance

Next, we examine the relationship between institutional ownership and corporate policies and outcomes. Crane *et al.* (2016) find that firms in the Russell 2000 Index

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Table 2 Institutional ownership around index thresholds: univariate analysis

This table reports the results of univariate analysis of institutional ownership for firms around the CSI 300/500 index thresholds after the annual reconstitution in June and December. In the first three columns, the mean percentage of shares held by different types of institutions are reported for a set of three fixed bandwidths of 50, 100, and 200 firms around the index thresholds. The bandwidth represents the number of firms on either side of the CSI 300/500 thresholds. Mean (CSI 300) and Mean (CSI 500) are the mean value of institutional ownership for the firms exclusively in the CSI 300 and CSI 500 within the given bandwidth. Column (4) presents the difference between Mean (CSI 300) and Mean (CSI 500). The test of difference in means in column (5) is performed using the *t*-test. ***, ** and * indicates significance at 1, 5, and 10% levels, respectively.

		Mean	Mean (CSI 300)	Mean (CSI 500)	Difference	*t*-stat
CSI June rebalancing						
Bandwidth = 50	*Ins. Own*	0.087	0.053	0.122	0.069***	(−11.36)
	MFOwn	0.073	0.041	0.105	0.064***	(−11.40)
	QFOwn	0.001	0.001	0.002	0.000	(−1.02)
	BISOwn	0.006	0.005	0.007	0.003***	(−3.09)
	SSOwn	0.005	0.004	0.005	0.001*	(−1.79)
Bandwidth = 100	*Ins. Own*	0.085	0.064	0.106	0.042***	(−10.08)
	MFOwn	0.070	0.051	0.090	0.038***	(−9.95)
	QFOwn	0.001	0.001	0.002	0.000	(−0.27)
	BISOwn	0.007	0.006	0.008	0.002***	(−3.60)
	SSOwn	0.005	0.004	0.005	0.001**	(−2.03)
Bandwidth = 200	*Ins. Own*	0.084	0.082	0.087	0.006*	(−1.93)
	MFOwn	0.069	0.067	0.072	0.005**	(−2.07)
	QFOwn	0.002	0.002	0.002	0.000**	(1.99)
	BISOwn	0.007	0.007	0.007	0.000	(−0.68)
	SSOwn	0.004	0.004	0.005	0.000	(−0.72)
CSI December rebalancing						
Bandwidth = 50	*Ins. Own*	0.090	0.052	0.128	0.076***	(−12.18)
	MFOwn	0.077	0.042	0.112	0.070***	(−12.09)
	QFOwn	0.001	0.001	0.002	0.000	(−0.40)
	BISOwn	0.006	0.005	0.008	0.003***	(−3.29)
	SSOwn	0.004	0.003	0.005	0.002***	(−2.79)
Bandwidth = 100	*Ins. Own*	0.084	0.063	0.105	0.042***	(−10.24)
	MFOwn	0.070	0.050	0.089	0.039***	(−10.35)
	QFOwn	0.002	0.002	0.002	0.000	(−0.54)
	BISOwn	0.007	0.006	0.007	0.001**	(−2.27)
	SSOwn	0.004	0.004	0.005	0.001*	(−1.94)
Bandwidth = 200	*Ins. Own*	0.085	0.082	0.088	0.006**	(−2.07)
	MFOwn	0.070	0.067	0.073	0.007**	(−2.49)
	QFOwn	0.002	0.002	0.001	−0.000**	(2.23)
	BISOwn	0.007	0.008	0.007	−0.000	(0.51)
	SSOwn	0.004	0.004	0.004	0.000	(−1.13)

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Table 3 Institutional ownership around index thresholds—RDD analysis

This table reports the regression discontinuity estimates of the effect of inclusion in the CSI 500 on institutional ownership for firms around the CSI 300/500 index thresholds after the annual reconstitution in June and December based on local polynomial regressions. The treatment effect is computed separately for the CSI June and CSI December rebalancings for each of the five bandwidths of firms around the index thresholds. The five bandwidths include fixed bandwidths of 50, 100, and 200 firms and data driven optimal bandwidths computed by mean square error and coverage error rate algorithms. Each bandwidth represents the number of firms on either side of CSI 300/500 thresholds. EBITDA margin, leverage, growth, size, cash, Tobin's *q*, age, SOE, TopOwn, SEO, capex, and liquidity, and a smoothing polynomial function of order three are included as covariates. ***, **, and * indicates significance at 1, 5, and 10% levels, respectively.

	Ins. Own	*MFOwn*	*QFOwn*	*BISOwn*	*SSOwn*
CSI June rebalancing					
Bandwidth = 50	0.123 (7.83)***	0.113 (7.56)***	0.001 (1.27)	0.007 (2.63)***	0.005 (2.64)***
Bandwidth = 100	0.092 (8.29)***	0.086 (8.42)***	0.000 (0.46)	0.004 (1.86)*	0.004 (2.72)***
Bandwidth = 200	0.068 (9.05)***	0.063 (9.08)***	0.000 (0.61)	0.003 (2.26)**	0.003 (3.02)***
Optimal bandwidth$_{MSE}$	0.114 (10.02)***	0.103 (10.16)***	0.001 (1.91)*	0.005 (3.55)***	0.003 (2.58)***
Optimal bandwidth$_{CER}$	0.129 (9.06)***	0.116 (9.06)***	0.001 (2.27)**	0.006 (3.46)***	0.004 (2.70)***
CSI December rebalancing					
Bandwidth = 50	0.111 (6.45)***	0.103 (6.30)***	0.001 (1.25)	0.004 (1.62)	0.005 (3.44)***
Bandwidth = 100	0.103 (8.91)***	0.095 (8.71)***	0.000 (0.63)	0.002 (1.43)	0.005 (4.66)***
Bandwidth = 200	0.082 (10.40)***	0.076 (10.42)***	0.000 (0.66)	0.002 (1.84)*	0.003 (3.80)***
Optimal bandwidth$_{MSE}$	0.118 (11.24)***	0.105 (10.99)***	0.000 (1.10)	0.004 (2.73)***	0.005 (4.46)***
Optimal bandwidth$_{CER}$	0.122 (9.56)***	0.111 (9.46)***	0.001 (1.72)*	0.003 (1.66)*	0.005 (4.17)***
N	6565	6565	6565	6565	6565

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pay more dividends than those in the Russell 1000 near index thresholds. Firth *et al.* (2016) confirm the effect of institutional ownership on dividends in China, but without clear identification. Similarly, Yuan *et al.* (2008) find that Chinese firms with greater institutional ownership outperform those without, but without a causal identification. Boone and White (2015) find that the information environment surrounding firms that are in the Russell 2000 Index are significantly better than those in Russell 1000 indices within narrow bandwidths of index thresholds. We try to examine the validity of all these studies in our setting. We investigate payout policies by examining whether a firm pays a dividend or not (*Div(indicator)*), the amount of dividends (*Ln(Div)*), and the ratio of dividends to book value per share (*Div/BV*). To examine firm performance, we investigate *Tobin's q* that measures the market value relative to book value of assets, and measures of profitability including *ROA* and *EBITDA margin*. To investigate the information environment, we look at *Analyst coverage*, number of analyst reports (*Analyst report*), and stock liquidity.

Using a sharp RDD as specified in Equation (1) and Equation (2), and a sample of firms within a bandwidth of ± 100 around index thresholds, we present the results in Table 4. Our findings in Panel A of Table 4 demonstrate that firms in the CSI 500 indices when compared to those in the CSI 300 indices within a bandwidth of 100 firms, have generous dividend policies, better performance, and a more transparent information environment, thus confirming the various previous studies using Chinese data in a causal setting.

The identified causal effects of institutional ownership are also economically meaningful beyond their observed statistical significance. For example, a one standard deviation change in instrumented institutional ownership of 0.113 (i.e. standard deviation of the predicted value of first-stage regression) increases dividend probability by 19.03% (estimated marginal effect of 1.684×0.113), *Tobin's q* by 1.046 (coefficient of 9.259×0.133), and *Analyst coverage* by 8.566 (coefficient of 75.809×0.113), representing 24.37, 45.57, and 73.37% of the corresponding sample means of *Div(indicator)*, *Tobin's q*, and *Analyst coverage*, respectively.

The RDD specifications, in principle, provide estimates that are consistent without inclusion of control variables and fixed effects. Controls and fixed effects are useful only to reduce sampling variability (Lee and Lemieux, 2010). Thus, we examine the sensitivity of our findings to the inclusion of control variables and fixed effects. In Panel B of Table 4, we add firm characteristics control variables, as well as industry and year fixed effects. Our results remain robust.

Finally, in Panel C, rather than using an arbitrary bandwidth of 100, we use an optimal bandwidth based on the mean-squared error algorithm and still find consistent results. Overall, the results in Table 4 demonstrate the validity and flexibility of the CSI index reconstitutions as a quasi-natural experiment.

5.3. Robustness Tests

We present the results of various additional robustness tests in Table 5 including alternate bandwidths, subcategories of *Ins. Own*, and June reconstitution. For the

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Table 4 Effect of institutional ownership on corporate policies—instrumental variable regressions

This table presents the estimates of two-stage instrumental variable regressions on a sample of firms between 2008 and 2017. In all the Panels, the dependent variables in the second stage are measures of dividends (columns (1)–(3)), firm performance (columns (4)–(6)), and information environment (columns (7)–(9)). In Panels A and B, the sample is restricted to firms within the bandwidth of 100 firms around the CSI 300/500 index thresholds. In Panel C, the sample is restricted to firms that are within the bandwidth of 74 firms around the CSI 300/500 index thresholds, where 74 is the data driven optimal bandwidth using the mean squared error (MSERD)algorithm. In the first-stage regressions in all panels, we instrument institutional ownership with an indicator for whether the firm is in the CSI 500 index after the December reconstitution (CSI500(indicator)). Lagged control variables including EBITDA margin, leverage, firm size, growth, cash, Tobin's *q*, age, SOE, TopOwn, SEO, and Capex are included in Panels B and C. Year and industry effects are included in Panels B and C. Constants are included but not reported. *t*-statistics and *z*-statistics are displayed in parentheses based on standard errors clustered by firm in the 2SLS and Probit specifications, respectively. ***, **, and * indicates significance at 1, 5, and 10% levels, respectively.

Panel A. Bandwidth = 100

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First stage:									
CSI500 (indicator)	0.111 (10.53)***	0.111 (10.53)***	0.111 (10.53)***	0.112 (10.54)***	0.111 (10.53)***	0.111 (10.53)***	0.111 (10.53)***	0.111 (10.53)***	0.111 (10.53)***
	Crane *et al.* (2016); Firth *et al.* (2016)			Yuan *et al.* (2008)			Boone and White (2015)		
Second stage:	*Div(indicator)*	Ln(*Div*)	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Ins. Own	3.823 (2.52)**	0.307 (2.27)**	0.078 (2.25)**	9.259 (4.90)***	0.437 (6.81)***	0.298 (1.40)	75.809 (7.71)***	194.366 (8.06)***	0.020 (5.47)***
Rank gap: a	−0.001 (−0.63)	−0.000 (−0.79)	−0.000 (−0.22)	0.005 (3.05)***	0.000 (0.85)	0.000 (0.49)	−0.012 (−1.15)	−0.016 (−0.64)	−0.000 (−0.37)
CSI500 (indicator)×a	−0.001 (−0.34)	−0.000 (−0.44)	−0.000 (−0.81)	−0.008 (−2.74)***	−0.000 (−1.43)	−0.001 (−1.44)	−0.021 (−1.21)	−0.043 (−1.08)	0.000 (3.78)***
N	1622	1622	1622	1587	1622	1622	1622	1622	1622

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Table 4 (*Continued*)

Panel B. Bandwidth = 100 Including fixed effects & firm characteristics control variables

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First stage: *CSI500 (indicator)*	0.075 (6.05)***	0.075 (6.05)***	0.075 (6.05)***	0.077 (6.06)***	0.075 (6.05)***	0.075 (6.05)***	0.075 (6.05)***	0.075 (6.05)***	0.075 (6.05)***
	Crane *et al.* (2016); Firth *et al.* (2016)			Yuan *et al.* (2008)			Boone and White (2015)		
Second stage:	*Div(indicator)*	Ln(*Div*)	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Ins. Own	9.051 (3.56)***	0.910 (3.40)***	0.224 (3.24)***	7.936 (4.62)***	0.670 (5.78)***	0.412 (2.90)***	111.431 (5.30)***	301.372 (5.65)***	0.016 (2.71)***
Rank gap: a	−0.002 (−1.04)	−0.000 (−0.78)	−0.000 (−1.13)	−0.001 (−0.88)	−0.000 (−0.53)	0.000 (0.35)	0.007 (0.58)	0.034 (1.08)	−0.000 (−1.12)
CSI500 (indicator)×a	0.005 (1.24)	0.000 (1.20)	0.000 (1.29)	0.001 (0.63)	0.000 (1.34)	−0.000 (−0.41)	−0.004 (−0.17)	0.001 (0.01)	0.000 (3.48)***
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Other firm characteristics	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	1153	1180	1180	1153	1180	1180	1180	1180	1180

Panel C. Optimal $\text{Bandwidth}_{\text{MSERD}}$ = 74

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First stage: *CSI500 (indicator)*	0.084 (5.81)***	0.084 (5.81)***	0.084 (5.81)***	0.085 (5.71)***	0.084 (5.81)***	0.084 (5.81)***	0.084 (5.81)***	0.084 (5.81)***	0.084 (5.81)***

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Table 4 (*Continued*)

	Crane *et al.* (2016); Firth *et al.* (2016)			Yuan *et al.* (2008)			Boone and White (2015)		
Second stage:	*Div(indicator)*	Ln(*Div*)	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Ins. Own	5.374 (3.68)***	0.345 (2.40)**	0.068 (1.86)*	8.084 (4.02)***	0.645 (5.02)***	0.377 (2.43)**	94.665 (4.19)***	272.888 (4.75)***	0.016 (2.64)***
Rank gap: a	−0.001 (−0.35)	0.000 (0.29)	0.000 (1.53)	0.000 (0.01)	0.000 (0.63)	0.000 (0.48)	0.028 (1.44)	0.099 (1.91)*	−0.000 (−1.35)
CSI500 (indicator)×a	−0.005 (−1.12)	−0.001 (−1.38)	−0.000 (−2.30)**	−0.001 (−0.16)	0.000 (0.47)	−0.000 (−0.15)	−0.043 (−1.31)	−0.118 (−1.38)	0.000 (3.31)***
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Other firm characteristics	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	1172	1140	1140	787	808	808	808	808	808

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sake of brevity, we report only the first-stage coefficients on the instrumental variable (i.e. *CSI500(indicator)*) and the second-stage coefficients on a measure of institutional ownership (e.g. *Ins. Own*). In the first few rows, the first-stage coefficients on *CSI500(indicator)* are smaller (larger) in magnitude when we focus on a bandwidth of 200 (50) firms around index thresholds. But in the second stage, the findings remain similar.

In the subsequent rows, we replace *Ins. Own* with *MFOwn*, *BISOwn*, and *SSOwn*, respectively. We find that only *MFOwn* and *SSOwn* are sensitive to CSI 500 index inclusions as evidenced by the significant first-stage coefficient on *CSI500 (indicator)*. Both *MFOwn* and *SSOwn* have a similar effect on corporate policies and performance, as documented using aggregate institutional ownership.

In the last few rows, we replace the first-stage instrumental variable with an indicator for inclusion in the CSI 500 during the June reconstitution instead of the December reconstitution. We observe that our results remain unchanged.

5.4. Fuzzy RDD Estimation

To overcome concerns about unobservable float adjustments, we use predicted index constituents that act as noisy instruments for examining institutional ownership using a fuzzy RDD regression. Using the same specification as given by Equation (1) and Equation (2) and a sample of firms within a bandwidth of ± 100 around predicted index thresholds, we present the results in Table 6.

The first-stage regression results are similar to those in Table 4. However, the coefficient of *Estimated CSI500(indicator)* is smaller in magnitude (0.063 versus 0.111 in Panel A of Table 4). The second-stage regression results remain qualitatively similar to our baseline findings, except those of *Tobin's q* and *Liquidity*.

5.5. Variation in Findings

In this section, we examine the cross-sectional variation in our baseline findings. To overcome weaker property rights, firms in emerging countries have concentrated controlling shareholders (La Porta *et al.*, 1999), which gives rise to a significant amount of agency problems between large and small shareholders that can reduce dividends, reduce firm value, and so on, and also influence incentives and effectiveness of *Ins. Own*. To that extent, we examine the variation in our findings according to state and promoter ownership. Furthermore, Chen and Feng (2000) argue that rapid economic growth in China can be on account of the recent emergence of private enterprises and absence of state-owned enterprises in growth oriented sectors. To that extent, we examine the variation in our findings according to firm age and investment opportunities (i.e. *Tobin's q*). Specifically, we split our sample based on median levels of state ownership, promoter ownership, age, and growth opportunities, respectively, and examine the sensitivity of our findings in each of these subsamples.

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Table 5 Robustness tests

This table presents the coefficient estimates of two-stage instrumental variable regressions on a sample of firms between 2008 and 2017. In all the regressions, the dependent variables in the second stage are measures of dividends (columns (1)–(3)), firm performance (columns (4)–(6)), and information environment (columns (7)–(9)). Each column corresponds to summary results of multiple regressions of the first-stage coefficient of the instrument (i.e. *CSI500 (indicator)*) followed by the second-stage coefficient of the measure of institutional ownership (e.g. *Ins. Own*) and the number of observations in each two-stage regression. The regression samples are restricted to either 50, 100, or 200 firms around the CSI 300/500 index thresholds, as indicated above the first-stage coefficients. The regressions presented in the last few rows are based on the June reconstitution of CSI 300 and 500 indices, while all others rely on the December reconstitution. In all the regressions, lagged control variables including EBITDA margin, leverage, firm size, growth, cash, Tobin's *q*, age, SOE, TopOwn, SEO, and Capex are included, in addition to Rank gap and an interaction term between Rank gap and CSI500 indicator. Year and industry effects are included in all regressions. *t*-statistics and *z*-statistics are displayed in parentheses based on standard errors clustered by firm in the 2SLS and Probit specifications, respectively. ***, **, and * indicates significance at 1, 5, and 10% levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Crane *et al.* (2016); Firth *et al.* (2016)			Yuan *et al.* (2008)			Boone and White (2015)		
	Div(indicator)	Ln*(Div)*	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Sample using a bandwidth of 200 firms									
CSI500 (indicator)	0.048 (5.65)***	0.048 (5.65)***	0.048 (5.65)***	0.050 (5.79)***	0.048 (5.65)***	0.048 (5.65)***	0.048 (5.65)***	0.048 (5.65)***	0.048 (5.65)***
Ins. Own	8.282 (2.84)***	0.979 (3.27)***	0.194 (2.72)***	9.288 (4.83)***	0.743 (5.65)***	0.440 (2.68)***	140.690 (5.56)***	384.118 (5.73)***	0.020 (3.06)***
N	2441	2487	2487	2439	2487	2487	2487	2487	2487
Sample using a bandwidth of 50 firms									
CSI500 (indicator)	0.084 (4.47)***	0.084 (4.47)***	0.084 (4.47)***	0.082 (4.19)***	0.084 (4.47)***	0.084 (4.47)***	0.084 (4.47)***	0.084 (4.47)***	0.084 (4.47)***
Ins. Own	9.924 (3.69)***	1.231 (3.12)***	0.255 (2.63)***	8.809 (3.31)***	0.566 (3.75)***	0.270 (1.33)	100.391 (3.51)***	270.990 (3.98)***	0.021 (2.42)**
N	499	538	538	523	538	538	538	538	538
Sample using a bandwidth of 100 firms									
CSI500 (indicator)	0.070 (6.22)***	0.070 (6.22)***	0.070 (6.22)***	0.070 (6.16)***	0.070 (6.22)***	0.070 (6.22)***	0.070 (6.22)***	0.070 (6.22)***	0.070 (6.22)***
MFOwn	9.575 (3.42)***	0.987 (3.40)***	0.243 (3.25)***	8.690 (4.70)***	0.727 (5.84)***	0.446 (2.91)***	120.784 (5.24)***	326.668 (5.62)***	0.017 (2.76)***
N	1153	1180	1180	1153	1180	1180	1180	1180	1180

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Table 5 (*Continued*)

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Crane *et al.* (2016); Firth *et al.* (2016)			Yuan *et al.* (2008)			Boone and White (2015)		
	Div(indicator)	Ln*(Div)*	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Sample using a bandwidth of 100 firms									
CSI500 (indicator)	0.002 (0.86)	0.002 (0.86)	0.002 (0.86)	0.002 (1.08)	0.002 (0.86)	0.002 (0.86)	0.002 (0.86)	0.002 (0.86)	0.002 (0.86)
BISOwn	76.511 (15.71)***	44.295 (0.84)	10.892 (0.84)	312.925 (1.06)	32.616 (0.86)	20.031 (0.83)	5421.024 (0.88)	14661.475 (0.87)	0.755 (0.81)
N	1153	1180	1180	1153	1180	1180	1180	1180	1180
Sample using a bandwidth of 100 firms									
CSI500 (indicator)	0.006 (4.36)***	0.006 (4.36)***	0.006 (4.36)***	0.006 (4.44)***	0.006 (4.36)***	0.006 (4.36)***	0.006 (4.36)***	0.006 (4.36)***	0.006 (4.36)***
SSOwn	98.250 (6.62)***	12.345 (2.94)***	3.036 (2.88)***	105.813 (3.70)***	9.090 (4.23)***	5.583 (2.63)***	1510.804 (3.94)***	4086.057 (4.14)***	0.210 (2.55)**
N	1153	1180	1180	1153	1180	1180	1180	1180	1180
Sample using a bandwidth of 100 firms									
CSI500 June (indicator)	0.062 (5.34)***	0.062 (5.34)***	0.062 (5.34)***	0.062 (5.33)***	0.062 (5.34)***	0.062 (5.34)***	0.062 (5.34)***	0.062 (5.34)***	0.062 (5.34)***
Ins. Own	5.505 (1.52)	0.859 (2.78)***	0.155 (2.21)**	9.693 (4.21)***	0.515 (4.75)***	0.092 (0.66)	81.796 (3.76)***	189.638 (3.66)***	0.021 (3.16)***
N	1132	1162	1162	1137	1162	1162	1162	1162	1162

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Table 6 Effect of institutional ownership on corporate policies—fuzzy RDD estimation

This table presents the estimates of two-stage instrumental variable regressions on a sample of firms between 2008 and 2017. The dependent variables in the second stage are measures of dividends (columns (1)–(3)), firm performance (columns (4)–(6)), and information environment (columns (7)–(9)). The sample is restricted to firms that are within the bandwidth of 100 firms around the CSI 300/500 index thresholds. In the first-stage regressions, we instrument institutional ownership with an indicator for whether the firm is estimated to be in the CSI 500 index after the December reconstitution (*Est. CSI500(indicator)*), based on the index reconstitution methodologies of CSI 300 and CSI 500 indices. Constants are included but not reported. *t*-statistics and *z*-statistics are displayed in parentheses based on standard errors clustered by firm in the 2SLS and Probit specifications, respectively. ***, **, and * indicates significance at 1, 5and 10% levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First stage:									
Est. CSI500(indicator)	0.063 (7.15)***	0.063 (7.15)***	0.063 (7.15)***	0.064 (7.21)***	0.063 (7.15)***	0.063 (7.15)***	0.063 (7.15)***	0.063 (7.15)***	0.063 (7.15)***
	Crane *et al.* (2016); Firth *et al.* (2016)			Yuan *et al.* (2008)			Boone and White (2015)		
Second stage:	*Div(indicator)*	Ln*(Div)*	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Ins. Own	10.792 (9.36)***	2.080 (6.07)***	0.466 (5.94)***	3.803 (1.33)	0.809 (6.93)***	1.691 (3.99)***	185.126 (7.98)***	417.384 (8.03)***	−0.097 (−7.14)***
Estimated rank gap: a	0.001 (0.63)	0.000 (1.85)*	0.000 (1.61)	0.002 (1.16)	0.000 (1.72)*	−0.000 (−0.20)	0.010 (0.73)	0.037 (1.17)	−0.000 (−1.67)*
Est. CSI500 (indicator)×a	−0.002 (−0.74)	−0.001 (−2.36)**	−0.000 (−1.90)*	−0.004 (−1.28)	−0.000 (−1.73)*	−0.000 (−0.62)	−0.064 (−2.27)**	−0.160 (−2.50)**	0.000 (1.23)
Float adjustment	−2.390 (−5.27)***	−0.517 (−5.26)***	−0.112 (−4.68)***	1.332 (1.41)	−0.126 (−3.41)***	−0.384 (−2.92)***	−36.044 (−5.85)***	−77.573 (−5.53)***	0.030 (7.33)***
N	1791	1791	1791	1791	1791	1791	1791	1791	1791

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Table 7 Cross-sectional variation

This table presents the coefficient estimates of two-stage instrumental variable regressions on a sample of firms between 2008 and 2017. In all the regressions, the dependent variables in the second stage are measures of dividends (columns (1)–(3)), firm performance (columns (4)–(6)), and information environment (columns (7)–(9)). Each column corresponds to summary results of multiple regressions of the first-stage coefficient of the instrument (i.e. *CSI500(indicator)*) followed by the second-stage coefficient of the measure of institutional ownership (e.g. *Ins. Own*) and the number of observations in each two-stage regression. The estimations are performed on subsamples created using the sample median level of state ownership (SOE), promoter ownership (TopOwn), age of the firm, and the Tobin's *q* ratio. The samples are restricted to 100 firms around the CSI 300/500 index thresholds. In all the regressions, lagged control variables including EBITDA margin, leverage, firm size, growth, cash, Tobin's *q*, age, SOE, TopOwn, SEO, and Capex are included, in addition to Rank gap and an interaction term between Rank gap and CSI500 indicator. Year and industry effects are included in all regressions. *t*-statistics and *z*-statistics are displayed in parentheses based on standard errors clustered by firm in the 2SLS and Probit specifications, respectively. ***, **, and * indicates significance at 1, 5, and 10% levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Crane *et al.* (2016); Firth *et al.* (2016)			Yuan *et al.* (2008)			Boone and White (2015)		
	Div(indicator)	Ln(*Div*)	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Subsample of high SOE									
CSI500 (indicator)	0.059 (3.44)***	0.059 (3.44)***	0.059 (3.44)***	0.059 (3.43)***	0.059 (3.44)***	0.059 (3.44)***	0.059 (3.44)***	0.059 (3.44)***	0.059 (3.44)***
Ins. Own	8.962 (3.70)***	1.141 (3.55)***	0.214 (3.19)***	12.718 (2.76)***	0.913 (3.16)***	0.415 (1.80)*	129.901 (2.89)***	353.036 (3.14)***	0.018 (1.62)
N	658	658	658	576	586	586	586	586	586
Subsample of low SOE									
CSI500 (indicator)	0.084 (4.49)***	0.084 (4.49)***	0.084 (4.49)***	0.084 (4.45)***	0.084 (4.49)***	0.084 (4.49)***	0.084 (4.49)***	0.084 (4.49)***	0.084 (4.49)***
Ins. Own	2.736 (0.92)	−0.073 (−0.22)	0.005 (0.07)	4.539 (2.38)**	0.647 (4.36)***	0.557 (2.26)**	113.541 (4.22)***	339.335 (4.42)***	0.013 (1.87)*
N	658	658	658	577	594	594	594	594	594
Subsample of high TopOwn									
CSI500 (indicator)	0.069 (4.08)***	0.069 (4.08)***	0.069 (4.08)***	0.068 (4.03)***	0.069 (4.08)***	0.069 (4.08)***	0.069 (4.08)***	0.069 (4.08)***	0.069 (4.08)***
Ins. Own	10.655 (4.72)***	1.076 (3.17)***	0.245 (3.14)***	9.432 (3.03)***	0.870 (3.76)***	0.210 (1.12)	128.306 (3.32)***	336.373 (3.41)***	0.014 (1.58)
N	659	659	659	581	595	595	595	595	595

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Table 7 (*Continued*)

Independent variables	(1) Crane *et al.* (2016); Firth *et al.* (2016)			(4) Yuan *et al.* (2008)			(7) Boone and White (2015)		
	Div(indicator)	Ln(*Div*)	*Div/BV*	*Tobin's q*	*ROA*	*EBITDA margin*	*Analyst coverage*	*Analyst reports*	*Liquidity*
Subsample of low TopOwn									
CSI500 (indicator)	0.070 (3.38)***	0.070 (3.38)***	0.070 (3.38)***	0.071 (3.42)***	0.070 (3.38)***	0.070 (3.38)***	0.070 (3.38)***	0.070 (3.38)***	0.070 (3.38)***
Ins. Own	1.754 (0.47)	0.141 (0.49)	−0.007 (−0.08)	5.347 (2.14)**	0.600 (3.11)***	0.528 (1.70)*	82.374 (2.70)***	256.908 (3.17)***	0.030 (2.29)**
N	657	657	657	572	585	585	585	585	585
Subsample of old firms									
CSI500 (indicator)	0.073 (4.60)***	0.073 (4.60)***	0.073 (4.60)***	0.074 (4.57)***	0.073 (4.60)***	0.073 (4.60)***	0.073 (4.60)***	0.073 (4.60)***	0.073 (4.60)***
Ins. Own	2.741 (1.08)	0.436 (1.97)*	0.086 (1.66)*	8.147 (3.66)***	0.622 (3.89)***	0.314 (1.64)	139.734 (4.73)***	368.150 (4.99)***	0.023 (2.53)**
N	659	659	659	604	618	618	618	618	618
Subsample of young firms									
CSI500 (indicator)	0.064 (3.48)***	0.064 (3.48)***	0.064 (3.48)***	0.065 (3.48)***	0.064 (3.48)***	0.064 (3.48)***	0.064 (3.48)***	0.064 (3.48)***	0.064 (3.48)***
Ins. Own	6.775 (3.45)***	0.401 (1.76)*	0.128 (2.15)**	8.451 (2.64)***	0.778 (3.71)***	0.554 (2.01)**	99.203 (2.77)***	268.209 (2.97)***	0.012 (1.35)
N	657	657	657	549	562	562	562	562	562
Subsample of growth firms									
CSI500 (indicator)	0.110 (6.37)***	0.110 (6.37)***	0.110 (6.37)***	0.109 (6.21)***	0.110 (6.37)***	0.110 (6.37)***	0.110 (6.37)***	0.110 (6.37)***	0.110 (6.37)***
Ins. Own	1.772 (0.79)	0.159 (0.81)	0.037 (0.75)	6.291 (3.84)***	0.527 (5.16)***	0.289 (2.05)**	98.376 (5.06)***	254.745 (5.18)***	0.003 (0.62)
N	652	652	652	572	584	584	584	584	584
Subsample of value firms									
CSI500 (indicator)	0.033 (2.18)**	0.033 (2.18)**	0.033 (2.18)**	0.035 (2.23)**	0.033 (2.18)**	0.033 (2.18)**	0.033 (2.18)**	0.033 (2.18)**	0.033 (2.18)**
Ins. Own	9.695 (4.35)***	0.904 (2.82)***	0.227 (2.76)***	9.268 (1.86)*	1.230 (2.20)**	0.833 (1.55)	208.465 (2.49)**	575.573 (2.47)**	0.058 (1.80)*
N	647	647	647	581	596	596	596	596	596

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The findings are presented in Table 7, similar to the presentation format of Table 5. The first-stage coefficients are significant in all the regressions, but the magnitudes are larger when state ownership is lesser and in growth firms.

Examining the second-stage results, we find that institutional owners are able to increase dividends among firms with greater state or private ownership, that is, among firms with higher agency problems. Also, institutional owners are effective in pressuring value firms to increase payouts, as these are the firms that can afford higher payments without sacrificing investment opportunities. However, firm age does not seem to moderate the effect of institutional owners on dividends as observed by the significant coefficient on *Ins. Own* in both young and old subsamples. Finally, when examining the effect on firm performance and information environment, however, all the subsamples exhibit a significant positive effect.

6. Conclusion

We examine whether the CSI index reconstitutions can be a suitable quasi-natural experiment to investigate the effect of institutional ownership on corporate policies in China. We find that aggregate institutional ownership is unambiguously responsive to CSI index reconstitutions, thus mitigating some concerns in the literature about the use of Russell index reconstitutions (Wei and Young, 2019; Appel *et al.*, 2020). We document a significant discontinuity in institutional ownership, around the index thresholds of the CSI 300 and CSI 500 indices. Exploiting this discontinuity, we instrument institutional ownership using the membership in the CSI 500 and find that higher levels of institutional ownership are associated with generous payout policies, improved firm performance, and better information environment. Our findings illustrate the relevance of equity benchmarks to institutional investors in China and also highlight the latter's role in monitoring and influencing corporate policies.

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Appendix 1

Variable	Definition
Age	Number of years since IPO
Analyst coverage	Number of analysts who provide at least one estimate on the firm during a year
Analyst reports	Number of analyst reports released during a year
BISOwn	Percentage of shares held by banks, insurance, and securities companies
Capex	Expenditure on property, plant and equipment (PP&E), intangible assets, and other long-term assets, scaled by lagged total assets
Cash	Cash and cash equivalents divided by total assets
CSI500	Indicator variable that takes the value of one if a firm is included in the CSI 500 index after the December index rebalancing, and zero if a firm is included in the CSI 300 index after the December index rebalancing
Div	Indicator variable that takes the value of one for firms that pay one or more cash dividends during a fiscal year, and zero otherwise
Div/BV	Cash dividends / book value of assets
EBITDA margin	Ratio of earnings before income, taxes, depreciation, and amortization to sales
Est. CSI500	Indicator variable that takes the value of one (zero) for firms which are estimated to be in the CSI 500 (CSI 300) index after December reconstitutions

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Appendix 1 (*Continued*)

Variable	Definition
Est. rank gap	Difference between November month end market capitalization rank and 300 for firms estimated to be in the CSI 500 or CSI 300 indices, where the market capitalization rank ranges from 1 to 800
Float adjustment	Difference in actual index weight and implied index weight according to November end of month market capitalization
Growth	Growth in revenue over previous year
Ins. Own	Percentage of shares held by institutions
Leverage	Ratio of debt to total assets
Liquidity	Turnover of shares computed as the ratio of trading volume in RMB in the year divided by total market capitalization
Ln*(Div)*	Natural logarithm of dividend per share in RMB
MFOwn	Percentage of shares held by domestic mutual fund institutions
QFOwn	Percentage of shares held by qualified foreign institutional investors
Rank gap	Difference between the market capitalization rank implied by index weights and 300 for firms in the CSI 500 or CSI 300 indices, where implied market capitalization rank ranges from 1 to 800
ROA	Ratio of operating profit to total assets
SEO	Indicator variable that takes the value of one if a firm undertakes a seasoned equity offering (SEO) in the year, and zero otherwise
Size	Natural logarithm of total assets
SOE	Percentage of shares held by central, provincial, or local government
SSOwn	Percentage of shares held by social security or pension funds
Tobin's q	Ratio of sum of total debt and market value of equity to total assets
TopOwn	Percentage of shares held by the promoter

This appendix provides a detailed description of the variables used in the tables.

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