The Cost of Capital Market Distortions: Evidence from Chinese Overseas IPOs*

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Abstract

Both cross-border capital controls and behind-the-border capital market regulations impose a cost on firms. We propose a willingness-to-pay approach to estimate the overall cost from the viewpoint of entrepreneurs, by comparing Chinese firms listed at home and abroad, that takes into account the endogenous nature of the IPO locational choices. The estimated cost is sizable – equivalent to a haircut in firm value by over 60% - and varies systematically with the tightness of either the capital controls or domestic regulations. We also find that the overseas listings exhibit a positive selection – they are better on average than their domestically listed counterparts.

JEL Classification: G32, F38, O16
Key Words: Overseas IPO, capital control, self-selection

1   Introduction

Capital controls are common, especially among emerging market economies and developing countries. A number of countries also have behind-the-border regulations of domestic capital market regulations that also impose a cost on firms. We propose a willingness-to-pay approach to estimate the overall cost of such regulations in China from the viewpoint of entrepreneurs, by comparing the Chinese firms listed on stock exchanges either at home or abroad. Importantly, we take into account the endogenous nature of the IPO locational choices so that the valuation differences due to a possible negative or positive selection of the overseas listings are corrected.

Overseas listing by domestic firms provides an important linkage of an individual country to international capital markets. In recent decades, few countries can beat China in terms of the number of entrepreneurs who take their firms for listings outside their home countries. By the end of 2020, about 1,700 Chinese firms (or about 30% of all Chinese publicly listed firms) are listed outside mainland China. The total market capitalization of these firms was 5.4 trillion US dollars in 2020, more than one-third of China's GDP.[1]

Overseas listings by themselves are neither new nor uncommon. As early as in the 1980s, many non-US firms were listed in the United States (but none from China). The explanations offered in the literature include: making shares accessible to global investors (Errunza and Losq, 1985; Miller, 1999), increasing stock liquidity in a more developed equity markets (Merton, 1987; Foerster and Karolyi, 1999), signalling firm quality by accepting stronger disclosure requirements (Baker et al., 2002; Lang et al., 2003), improving corporate governance by "bonding" themselves to stronger investor protection (Coffee, 1999, 2002; Lel and Mill, 2008), as well as building a stronger brand in the product or labor market (Pagano et al., 2001; Tolmunen and Torstila, 2005). Karolyi (2006), Roosenboom and Van Dijk (2009) and Liu (2014) provide a nice review of the overall literature on the subject. Most studies find that listing in the US generates a reduction in the cost of capital and a premium in valuation. For example, Doidge et al. (2004) summarize that "foreign companies with shares cross-listed in the US had Tobin's Q ratios that were 16.5% higher than the Q ratios of non-cross-listed

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[1] Feng, Wei, Wu and Yuan (2023), "A Narrative on Overseas Listing by Chinese Firms", provides a detailed description of the number of listed Chinese firms and their market capitalization in mainland China, Hong Kong, US, Singapore, and UK stock markets. We also document the evolution of Chinese firms' initial public offerings outside mainland China; discuss the important reforms of the listing requirements in both mainland China and Hong Kong; and examine the recent delisting pressure on Chinese stocks from the US exchanges from both the Chinese and US authorities.

firms from the same country." It is also worth noting that very few Chinese firms are included in the samples of these studies because overseas listing by Chinese firms only become common in more recent years.

The overseas listed Chinese firms, however, do exhibit some differences. First, while foreign firms in the US stock market typically have a listing in their home country, most overseas listed Chinese firms do not. Out of the 1588 Chinese firms listed the Hong Kong or US stock markets in 2020, 1433 do not have a corresponding listing inside mainland China.[2] Second, instead of achieving a higher valuation in an overseas stock market, the Chinese firms appear to receive a lower valuation overseas. What is less clear is whether this could be explained by a negative selection effect - the possibility that overseas listed Chinese firms are on average of lower quality than their domestically listed counterparts. Third, except for 130 firms that are simultaneously listed in Hong Kong and mainland China, it is possible that the Chinese firms listed at home and overseas are not comparable as some of the overseas listed firms do not satisfy the more demanding listing requirements at home.

This paper aims to understand the reasons for the Chinese firms choose to go for an overseas IPO and the size of the valuation discount (or premium). The valuation discount can be thought of as a willingness-to-pay by the entrepreneurs to bypass the inconveniences associated with the capital market regulations. China has both binding restrictions on cross-border capital account transactions and regulation of domestic capital market.[3] First, neither firms nor individuals can easily convert their assets or savings into foreign currencies, or otherwise send them abroad. Such restrictions might be justified by a rationale to safeguard domestic financial stability, but it could be a legacy of the previous central plan mode. Second, an application for IPO on a Chinese stock exchange by a domestic firm involves a long review process by China Securities

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[2] 130 are dual-listed in Hong Kong and mainland China; 21 are cross-listed in Hong Kong and US via ADRs; 4 are cross-listed in Hong Kong, US, Singapore and Canada via ordinary shares. A dual listing is when a company lists its stocks on two primary stock exchanges under different registered entities. Essentially, dual-listed stocks are different stocks of the same business traded on more than one exchange in different geographical regions. A cross listing company is a single legal entity that lists the same stock on more than one stock exchanges. Generally such a company's primary listing is on a stock exchange in its country of incorporation, and its secondary listing is on an exchange in another country. Besides a direct listing of ordinary shares, a cross listing company may issue depositary receipts, which is a certificate of ownership of a number of shares of the company that trades on a foreign exchange. Strictly speaking, only 4 Chinese firms cross listed in mainland China and overseas markets by the end of 2020, which are all listed in London Stock Exchange under GDRs.

[3] Amstad, Sun, and Xiong (2020) provide an overview of China's financial system and various significant reforms. Li and Wei (2020) and Allen, Qian, Shan, Zhu (2023) provide a more specialized review on reforms and challenges in China's international and domestic capital markets, respectively.

Regulatory Commission (CSRC) with an uncertain outcome. One interpretation of the long and arduous review is that the government wants to select only "good" firms to be on the stock exchanges in order to protect the interests of households as investors. This is part of China's paternalistic approach to domestic capital market regulation. This suggests at least in principle that overseas listed Chinese firms are negatively selected - they have lower quality on average than domestically listed one.

An important reason for an entrepreneur to choose to list her firm on an overseas stock exchange is to bypass these regulations. For example, when a firm is listed in New York, all the dividend payout will be in US dollars outside China, which the founder (and other shareholders) can keep and use freely outside China. In addition, when the founder downsizes her ownership holdings, the proceed will also be in US dollars. She would not need to deal with Chinese capital control regimes for moving assets around the world. It is useful to note that, for the purpose of bypassing capital controls, listing a firm in Hong Kong is similar to doing so in New York since Hong Kong has no capital controls and the founder and shareholders can easily convert proceeds from selling shares or dividends from Hong Kong dollars to US dollars or other currencies. By choosing to list her firm on an overseas stock exchange, the entrepreneur also bypasses the long IPO application process in China. As we document later, the time from initial IPO application to eventual IPO is often half as many days in New York or Hong Kong as in mainland China. Presumably, the entrepreneur is willing to pay something in order to gain the right to bypass China's capital controls and domestic capital market regulations. Accepting a haircut in the overseas stock valuation can thus be regarded as what the entrepreneur is willing to pay to circumvent these frictions.

To estimate the valuation haircut for the overseas listed Chinese firms, comparing directly their valuation with that of the Chinese firms listed in China may not give the right answer. This is because the IPO location is a choice made by the founder, and factors that influence the choice could also affect the firm valuation. This is analogous to point made in the literature on the wages of the immigrants to the United States (Borjas, AER 1987) that the wages in their home country could be higher, lower, or equal to the observed average wages there depending on the nature of immigrants selection. We take into account possible selection by entrepreneurs in their IPO locational choices, and propose an endogenous treatment effect model to the average valuation discount associated the overseas listings. We also conduct a series of internal and external validity checks on our approach and findings.

To implement our estimation, we look at all IPOs by Chinese firms in New York and Hong Kong (two most important overseas listing locations) and Shanghai and Shenzhen (two domestic listing locations) during 2009-2020. The starting year 2009 coincides with the establishment of the Growth Enterprise Market (ChiNext) on the Shenzhen Stock Exchange, which in many ways, have the least demanding requirements on firm financial indicating among all Chinese stock exchanges. The end year 2020 is chosen so that the overseas valuation is not contaminated by the delisting threat from the US Holding Foreign Firms Accountable Act (which was first proposed in May of 2020 and became a law in 2021). Because overseas listings generally have less demanding requirements on financial indicators (e.g., whether or not to have positive earnings) than Chinese domestic listings, we constrain our sample of overseas listings to those that satisfy the ChiNext requirements. This is to ensure the comparability of the treatment (overseas listed Chines firms) and the control (domestically listed firms) groups at least in terms of financial performance indicators at the time of the IPO. Note that we also exclude those Chinese firms that simultaneously have A shares in mainland China and H shares in Hong Kong. These firms are potentially different from the firms in our treatment group that are listed exclusively outside mainland China.

Our main results are as follows. First, we can reject the negative selection hypothesis. If anything, overseas listings exhibit a (moderate) positive selection on average. After controlling for a long list of observable firm characteristics suggested by the literature, we estimate that the unobservable factors leading to a decision to do an overseas listing tend to be correlated with factors leading to a higher market valuation of the firm. Second, the valuation discount for overseas listings is sizable. While unconditional Tobin's Q for overseas listed Chinese firms is about 50% of that in Chinese A share market, a simple model that acknowledges the endogenous nature of the treatment (listing location) raise the haircut for overseas listed Chinese firms to 56%. With a generalized endogenous treatment model that also allows similar firm or market characteristics to produce different valuation effects in domestic versus overseas stock market, the haircut becomes 64%. In both specifications, the valuation discount is persistent - the valuation gap in terms of the Tobin's Q in the two market is approximately the same five years after the IPOs as one year after. In other words, the entrepreneurs are willing to give up a substantial portion of firm valuation in order to bypass capital controls and other domestic capital market regulations.

While we are not able to decompose the valuation haircut into components asso-

ciated with specific individual frictions or distortions, we validate our interpretation by examining how the estimated haircut responds to shocks that alter the strength of some distortions. For example, during the time periods when China tightens capital controls (2017) or when it suspends the domestic IPO approval (2013), we find that the entrepreneurs appear to be willing to accept an even larger valuation haircut for overseas listings. These findings support the interpretation that the valuation discount reflects an entrepreneur's willingness-to-pay to bypass capital market regulations.

The A-H dual listed firms provide an interesting complementary check on our story. By definition, they have secured a listing both inside and outside mainland China, and no longer need to worry about some of the distortions that purely overseas listed firms do such as a long waiting period for a domestic listing. Nonetheless, the founder would still have to deal with capital controls as the dividend payment to her A share holdings or the proceeds from selling down her A shares would be in RMB and cannot be easily converted into US dollars. By comparing the A and H share prices (and converted into the same currency), we find that the H shares tend to have a price discount of about 20%. It seems sensible that the price discount for the dual listed firms than those listed only overseas because they face fewer distortions (once dual listings are consummated). If we interpret this price discount as an entrepreneur's willingness-to-pay to bypass capital controls, it suggests that the capital account non-convertibility is quite costly in the eyes of an entrepreneur.

Note that our willingness-to-pay approach to estimate the cost of capital market regulations for the entrepreneurs does not assume that the stock price valuation is "correct." For example, the Chinese A share market might overvalue the stocks relative to their fundamentals. This could arise from characteristics of the investors (a higher share of retail investors in mainland Chinese market than overseas markets, or stronger behavioral biases of these investors). It could arise from characteristics of the regulatory environment (greater difficulty to do short-selling in China leads to an under-representation of investors who have a negative view about a given valuation). Similarly, the overseas market might under-value a firm relative to its fundamentals. Our approach takes the perspective of an entrepreneur who takes as given the valuations that she could obtain for her firm in different stock markets. Relative market valuations are not the only thing that affects her decision on where to list her firm. Being able to achieve an IPO in a timely manner and being able to obtain, retain, and use a convertible currency after the IPO are also worth something to her. The

exact amount that the entrepreneur pays through an overseas listing depends on a combination of the percentage discount in the stock price and the scale of the initial and subsequent public offerings.

While capital controls are one of the things that an entrepreneur is willing to pay to bypass, we note that the existence of capital controls also facilitates our estimation approach. In particular, if the domestic and overseas stock markets are fully integrated, then the valuation gap for a given firm in the two markets would disappear as well. While an absence of capital controls does not guarantee a common underlying pool of investors or a common marginal investor, the presence of capital controls is an important reason for the existence of a valuation gap. The entrepreneur takes the existence of capital controls and valuation gap as a fact of life, and decides when it makes sense to take her firm to be listed in a market that assigns a lower valuation.

Our paper contributes to several strands of literature. First, the existing theories on cross-listings emphasize overcoming transaction costs due to market segmentation or mitigating asymmetric information between investors and firms by bonding to an advanced stock market. In addition to these frictions, we propose a willingness-to-pay approach to estimate the cost of all capital market imperfections from the viewpoint of an entrepreneur while taking into account the endogenous nature of the IPO locations.

Second, our paper contributes to the literature on measuring resource misallocation which lowers aggregate total factor productivity (Restuccia and Rogerson, 2013). While China is known to have capital misallocation (Dollar and Wei, 2007; Hsieh and Klenow, 2009; Song and Wu, 2015), the existing research focuses primarily on distortions in the credit market (Song et al., 2011; Wu, 2018; Ek and Wu, 2018). We instead propose a way to estimate the size of the distortions in the capital market, especially restrictions on capital flows and IPO process.

Finally, our paper contributes to the broad literature on the effect of financial globalization for developing economies. As surveyed in Kose et al. (2009), there has been a long-lasting and intense debate on the benefits and costs of integrating into the international capital market. Our paper provides one estimate of the cost of capital market regulations. Our methodology can be applied to other countries with capital account restrictions and overseas listings.

The rest of the paper is organized as follows. Section 2 describes the data, sample and the pattern of market valuation gap across domestic and overseas listed Chinese firms in a comparable sample. Section 3 introduces the institutional background of the

specific capital market distortions of our focus. Section 4 explains how to estimate the motives and valuation of overseas listing from an endogenous treatment effect model. Section 5 provides causal evidence on the effect of policy distortions on valuation discount. Section 6 presents a set of validity and robustness checks. Finally, Section 7 summarizes the findings and discusses the policy implications.

2 Capital Market Distortions

2.1 Capital Controls

Capital controls are often used by emerging countries to prevent capital flights or currency crises but can generate their own inefficiencies. While China has pursued current account convertibility, it retains restrictions on capital account transactions on both inflows and outflows.

For Chinese firms, activities that may lead to capital outflow, such as outbound direct investment and offshore portfolio investment, must seek approval from the related departments to obtain foreign exchange. The approval or review process may take a long time especially when the government tightens capital outflow controls. For Chinese citizens, each individual only has a $50,000 annual foreign exchange quota. There is also explicit forbiddance on offshore property purchase or portfolio investment. Finding a way around the regulations is something of a national enthusiasm. For middle-class families, this means making money and diversifying portfolio. For rich and powerful, this means protecting fortunes and setting a backup plan. Potential sanctions for violating capital controls range from a monetary fine to jail terms.

An overseas listing provides a way for entrepreneurs to move wealth outside the country without triggering the capital controls. The dividend payment and the proceeds from selling down shares would be in a foreign currency and can be kept and used outside the country.

2.2 Administrative IPO System

Throughout our sample period, China Securities Regulatory Commission reviews all applications for an IPO on a domestic stock exchange and needs to grant a formal approval before a company can be listed. Importantly, the CSRC's review is not only about the authenticity of information disclosures but also about the "quality" of the stocks. This means not all applications will result in an approval, and even conditional

on eventual approval, the time it takes from initial application to eventual listing could be much longer than their counterparts in New York or Hong Kong. By our computation, the median waiting time is 457 days for a domestic listing (conditional on eventual success), compared to 237 and 152 days in New York and Hong Kong, respectively.[4] This could be a source of inconvenience for entrepreneurs who take the firm public.

Occasionally, the waiting time could be unforecastable when the CSRC suspends reviews of any IPO application. For example, this happened in 2014 when the regulator thought an IPO suspension could help to support the price level or prevent any further decline in the broad market index. For the entrepreneurs, an IPO suspension is a negative shock to an already long waiting period for a domestic IPO.

From time to time, especially following major reforms of the stock market, the CSRC also sets restriction on initial offered price. During our sample period, after a long period of IPO suspension, from April 2014 and until the recent reform of the registration IPO system, CSRC implicitly mandated that the initial offered price cannot be more than 23 times of the estimated earnings. The ceiling on the initial PE ratio is meant to improve the chance that the stock price will rise after the IPO. Presumably, this is a serious cost to those entrepreneurs who believe that the fair value of their stocks is more than 23 times the earnings. In contrast, Hong Kong and US use a checklist-based registration system. The presumption is that as long as an aspirant firm satisfies a set of known financial and legal conditions, and fully and truthfully discloses the required information, the firm will be listed (usually within 6 to 12 months of initial application). There is no ceiling on initial stock price (i.e., the initial PE ratio can go above 23.) [5] Presumably, those entrepreneurs who value a speeded IPO or who believe the fair value of their stocks is more than 23 times the earnings would consider an overseas listing especially favorably.

2.3 Negative List

Although foreign investment is generally welcomed and has played an important role in China's economic miracle, there are sectors which prohibit or restricted foreign investment. In the Catalogue of Industries for Guiding Foreign Investment (the Investment Catalogue) to regulate foreign investment in mainland China, promulgated in 1995,

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[4] See Allen et al. (2023) for a detailed description on the adminstrative IPO system in China.

[5] Tsang (2010) discusses the IPO application process and listing requirements in Hong Kong and New York.

the industries were divided as encouraged (e.g., furniture production), restricted (e.g., foreign ownership in automobile manufacturing should be 50% or less), and prohibited (e.g., gene diagnosis, and internet news provider) for foreign investment. Until 2013, China established Shanghai Free-Trade Zone and first introduced Special Management Measures for the Market Entry of Foreign Investment or the Negative List to replace the Investment Catalogue. In 2018, China introduced the first nationwide Negative List for Access of Foreign Investment on a national scale. National treatment to foreign investment is granted only for industry sectors beyond the Negative List.[6]

As early as late 1990s, foreign VC and PE seek for investment opportunities in China. Certain industries, such as internet and healthcare, also heavily rely on foreign VC and PE to finance capital expenditure and R&D. In normal circumstance, VC and PE achieve a profitable exit following a successful IPO. However, the Negative List imposes a legal restriction on domestic listing for firms with foreign investment in the specified industries. Going IPO abroad via a Variable Interest Entity (VIE) has been the creative solution adopted by many Chinese firms. A VIE is an overseas holding company that is most often registered in a tax heaven. It separates the listed entity from the operational entity in terms of shareholding, as the listed entity controls the operating business in mainland China through a series of contracts. The VIE structure circumvents the Negative List by effectively disguising foreign ownership. That is why ever since the NASDAQ IPO of Sina.com in 2000, most private shares listed on Hong Kong and about two thirds of Chinese firms listed on the NYSE and NASDAQ have employed the VIE structure, including those most well-known internet giants "BAT" – Baidu, Alibaba and Tencent.

3   Data and Patterns

We start with all Chinese firms that were debuted between 2009 and 2019 on either one of the two domestic stock exchanges in Shanghai (SSE) and Shenzhen (SZSE), or one of the exchanges in Hong Kong (HKEX) and New York (NYSE and NASDAQ). Following FTSE Russell's Guide to Chinese Share Classes, a firm is defined as "Chinese" if it meets any of the following criteria: (1) incorporated in mainland China; (2) with the headquarters, establishment, or origin of the firm in mainland China; (3) with the controlling shareholder (holding more than 30% of the total outstanding shares)

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[6]A Negative List on foreigne investment not only exists in China but also in many other developing economies, such as Philippines, Indonesia and Thailand

located in mainland China; or (4) with more than 55% of the sales revenue from mainland China.

We download the official prospectus of IPO from the website of corresponding listing exchanges for mainland China and Hong Kong listed firms, and from the SEC website for US listed firms. We then hand-collect from each firm's prospectus the information on pre-IPO ownership structure and corporate governance, including the ownership share of each of the top five shareholders, the number of independent and other board directors, the presence of strategic investors, and whether CEO and chairman are the same person. From Wind Financial Database, we obtain basic firm characteristics and financial indicators such as year of establishment, industry, headquarters address, and standard financial variables from balance sheet, income statement and cash flow tables, together with stock prices at various points in time. Table 1 provides a list of the variables and their definitions. Tables 2, 3 and 4 present their summary statistics for firms listed in the mainland China, Hong Kong and US markets, respectively.

3.1 Sample Construction

We choose 2009 as the starting year of our sample for two reasons. First, ChiNext was launched that year as a new segment of the Shenzhen Stock Exchange to provide an opportunity for small and medium-sized firms to become public traded firms. While Chinese stock exchanges generally have more demanding listing conditions especially minimum financial performance requirements than either Hong Kong or New York, ChiNext has the least demanding requirements among all segments of Chinese stock exchanges. Second, due to an agreement between Hong Kong and mainland China on accounting reporting requirements in 2007, 2009 is also the first year for which two previous years of accounting data can be obtained on a consistent basis (which are needed to compute some of our regressors).

We choose 2019 as the end year of our IPO sample in order to filter out the impacts of major regulatory changes in both China and the United States since 2020. In particular, China's State Administration for Market Regulation published in 2021 the Anti-Monopoly Guidelines for the Platform Economy which surprised the market and cause a stock price crash for many overseas listed Chinese firms. Three of them - Alibaba, China Literature, and Hive Box received hefty fines for failing to notify some merger transactions. In the same year, the China Securities Regulatory Commission (CSRC) issued new regulations on Chinese firms pursuing overseas listings. The main

ride sharing company, Didi, received a regulatory punishment shortly after its IPO in New York. On the US side, the Holding Foreign Companies Accountable Act (HFCAA), which was proposed in 2020 and became law in 2021, threaten to delist Chinese firms from US stock exchanges for failing to comply with the audit requirement of the PCAOB, something that Chinese companies cannot do on their own without the consent from the Chinese securities regulator. These regulatory changes on the two sides imply a structural change in the regulatory environment facing Chinese overseas listed firms after 2020.

We extract all Chinese firms from Wind Financial Database that issued A shares in mainland China during 2009-2019, including those that were later delisted. For Chinese firms listed offshore, we first utilize the Wind Financial Terminal to find the firms that issued H-shares, red-chips, Chinese private shares (P-shares) on the Hong Kong stock exchange, and all China Concept Stocks listed on the New York stock exchange and NASDAQ.[7] We added in delisted firms, and use the Chinese Stock Market and Accounting Research (CSMAR) to include the set of delisted firms and other firms that had switched boards and were not clearly reported in the Wind Financial Terminal. We also use S&P Capital IQ to add in any missing Chinese firms whose headquarters are in mainland China. After merging Chinese firms from all three databases, we then exclude those that do not meet our criteria or those for which it is impossible to obtain a prospectus. This results in an initial sample of 2207 firms listed in mainland China, 777 in Hong Kong, and 255 in the US markets.

As the listing requirements are more stringent in mainland China than in either Hong Kong or New York, some of the overseas Chinese firms do not satisfy the listing conditions in terms of financial performance in mainland China. For example, Chinese exchanges require a positive profit for certain number of years before IPO, which is generally not required outside mainland China. The detailed requirements on financial indicator thresholds and operating history are described in Feng et al. (2023). To increase comparability between our treatment group (overseas listed Chinese firms) and control group (domestically listed Chinese firms), we include only those overseas listed firms that in principle can be listed in the A share market.

In addition, according to the Negative List for foreign investment, Chinese firms in the prohibited industries cannot be listed in overseas markets directly, as overseas listing immediately comes together with foreign investment. Chinese firms in the pro-

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[7]We only include firms listed on the exchanges. We exclude the firms listed on Over-The-Counter as some information is missing for such firms.

hibited industries with any foreign ownership or restrictive industries beyond certain percentage of foreign ownership cannot be listed in domestic market. Thus, we exclude all firms in industries that are on the Negative List, as they do not have the liberty to choose between domestic and foreign market for IPO.

This means that we exclude those overseas listed firms that either do not satisfy the lowest financial indicator requirements in mainland China at the times of their IPOs, or on the Negative List in our baseline estimation. However, as an extension, we will also perform robustness checks where we include all overseas listed Chinese firms in the treatment group.

Because A-H dual listed firms are different from other overseas listed firms, we also exclude them from our sample in our baseline regressions, though we will report some information from them later for a validity check. With all these filters, we are left with a sample of 2039 Chinese firms listed in mainland China, 586 in Hong Kong, and 112 in the US markets. These firms in principle can choose where to list.

3.2 Pattern

Table 5 presents the mean, 25th percentile, median and 75the percentile of Tobin's Qs for domestic and overseas-listed Chinese firms 1, 3, and 5 years post-IPO, respectively. A striking fact is that, across all the statistics and over all the periods, the Tobin's Q for overseas listed Chinese firms is always lower than those in mainland China. For example, the average value one year after IPO is 1.99 for the former but only 4.07 for the latter. This suggests a 51% valuation discount for overseas-listed Chinese firms relative to their domestic peers.

When we look at the Price-to-Book Value ratio and Price-to-Earnings ratios as alternative ways to gauge market valuation, we reach similar conclusion. The valuation is always higher inside China than outside, and the magnitude of the valuation discount for overseas listed firms is substantial. To visualize the valuation gap between these two groups of firms, we plot the 25 percentile, the median and the 75 percentile of Tobin's Q, the PB ratio and the PE ratio (normalized by 10 to be on the similar scale), 1, 3 and 5 years post-IPO in Figure 1. The horizontal and vertical axes correspond to the values for overseas-listed and domestic-listed firms, respectively. All the 27 dots appear far above the 45-degree line. Once again, this highlights the large and robust valuation discount facing overseas-listed Chinese firms relative to domestic-listed counterparts.

It is important to note that these patterns do not mean that the overseas listed

firms would have received twice the valuation if they were listed at home. Since firms choose their listing locations optimally based on both observable and unobservable characteristics, the valuation discount could be affected by a selection effect.

4 Motives and Valuations of Overseas IPO

4.1 Endogenous Treatment Framework

We use a two-equation system to describe the IPO locational choice and the determination of market valuation. First, a binary choice model specifies determinants of overseas listing decision:

$$t_i = 1\{w_i'\alpha + v_i > 0\}, i = 1, ..., N, \tag{1}$$

where the binary variable t_i equals 1 if a Chinese firm (i) is listed overseas and 0 otherwise. w_i denotes a set of variables that determine firm's listing locational choice, including foreign ownership and other pre-IPO features.

Second, a linear equation relates the market valuation of a stock to its IPO location and other firm and market characteristics:

$$y_{i,k} = x_i'\beta_1 + \delta t_i + \varepsilon_i, i = 1, ..., N, \tag{2}$$

where $y_{i,k}$ is firm (i)'s Tobin's Q at k periods after IPO, x_i denotes a set of firm characteristics and other variables that determine firm's market valuation, including some pre-IPO features and post-IPO factors. In this valuation equation, δ is our key parameter of interest, representing the valuation gap associated with an overseas listing. Conditional on observables, a firm's post-IPO valuation could still be correlated to the unobserved factors of firm's listing location choice. For example, a firm's founder network with the US financial market would make it both more likely to be listed in the US and more likely to achieve a higher market valuation. This implies that

$$Cov(\varepsilon_i, v_i) \neq 0, \tag{3}$$

which renders t_i endogenous in equation (2). Thus, to identify δ, like in Heckman sample selection model, covariates w_i in equation (1) should some variables z_i that are different from x_i in equation (2), i.e., $w_i = (x_i', z_i')'$. Therefore, equation (2) can be estimated by Heckit.

If going for an overseas listing is a treatment, the effect of overseas listing on firm's valuation can be considered as the average difference in valuation between the

treatment group ($t = 1$), i.e., overseas listed Chinese firms, and the control group ($t = 0$), i.e., the domestically listed Chinese firms. This is defined as the average treatment effect (ATE):

$$ATE = E(y_{1i} - y_{0i}) = \delta, i = 1, ..., N,$$

where y_{1i} is the market value of an oversea listing firm i, and y_{0i} is the market value of a domestic listing firm. In the simple model (2),

We are especially interested in the average treatment effect on the treated (ATET), which is the gap between the actual average market value of the overseas listed firms and the counterfactural value at home if they were listed domestically. ATET is the average difference in y_i in the treatment and control groups on the treated group:

$$ATET = E(y_{1i} - y_{0i}|t_i = 1) = E(y_{1i}|t_i = 1) - E(y_{0i}|t_i = 1).$$

$E(y_{0i}|t_i = 1)$ is the average *counterfactual* market value of oversea listed firms if they were listed domestically. For a special group of Chinese firms who are dual listed both in mainland China and Hong Kong stock markets, $E(y_{0i}|t_i = 1)$ is observable, and $ATET$ is the negative AH premium, or the valuation discount of overseas listed firms.

When the treatment is randomly assigned, $ATET = ATE = \delta$ in the simple model (2) and can be consistently estimated by OLS. However, the listing location (or treatment) decision is more likely to be nonrandom. Oversea listed Chinese firms could be significantly different from domestically listed firms. In addition, those unobserved factors that determine firm's listing location choice are most likely to be correlated with other unobserved factors that determine the valuation of a firm after listing. In this case, we consider an endogenous treatment effect model, consisting of three equations (1), (2) and (3).

4.2 A General Model

It is possible that a given firm characteristic could be assigned a different valuation in the two markets. A general model that accommodate would specify two separate valuation equations for the firms in the treatment and control groups:

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\begin{aligned}
y_{0i} &= x'_{0i}\beta_{10} + \varepsilon_{0i}, & (4) \\
y_{1i} &= x'_{1i}\beta_{11} + \varepsilon_{1i}, & (5)
\end{aligned}
$$

where subscript 0 denotes control group with $t = 0$, and subscript 1 for treatment group. Different from the simple model (2), in which the only difference between the

treatment and control groups lies in the intercept (denoted by δ), the slopes β_{10}, β_{11} vary across the two groups in the general model (4) and (5).

Due to the firm's endogenous listing location choice, the errors in equations (1), (4), and (5) may be correlated,

$$Cov(\varepsilon_{ji}, v_i) \neq 0, j = 0, 1. \tag{6}$$

Under the assumption that the vector of error terms $(\varepsilon_{i0}, \varepsilon_{i1}, v_i)'$ comes from a mean zero trivariate normal distribution with covariance matrix

$$\begin{bmatrix} \sigma_0^2 & \sigma_{01} & \sigma_0 \rho_0 \\ \sigma_{01} & \sigma_1^2 & \sigma_1 \rho_1 \\ \sigma_0 \rho_0 & \sigma_1 \rho_1 & 1 \end{bmatrix}$$

Following Cerulli (2015), by the law of iterated expectations, the ATE is:

$$
\begin{aligned}
E(y_{1i} - y_{0i}) &= E\left\{E\left(y_{1i} - y_{0i}|x_i, \varepsilon_{0i}, \varepsilon_{1i}\right)\right\} \\
&= E\left(x_i'\beta_{11} + \varepsilon_1 - x_i'\beta_{10} - \varepsilon_0\right) \\
&= E\left\{x_i'\left(\beta_{11} - \beta_{10}\right)\right\}
\end{aligned}
$$

while the $ATET$ is:

$$
\begin{aligned}
E(y_{1i} - y_{0i}|t_i &= 1) = E\left\{E\left(y_{1i} - y_{0i}|x_i, w_i, t_i = 1\right)\right\} \\
&= E\left\{x_i'\left(\beta_{11} - \beta_{10}\right) + \left(\sigma_1 \rho_1 - \sigma_0 \rho_0\right)\phi\left(w_i'\alpha\right)/\Phi\left(w_i'\alpha\right)|t_i = 1\right\}
\end{aligned}
$$

where ϕ and Φ are the pdf and cdf of a normal distribution.

4.3 Identification

We start with the simple endogenous treatment effect model consisting of three equations (1), (2) and (3). Neither $ATE = \delta$ nor $ATET$ can be consistently estimated by OLS. Under bivariate normal distributional assumption on ε_i and v_i, this model could be consistently estimated by MLE and Heckit 2-step procedure,

When bivariate normality is not assumed, a less restrictive and more efficient alternative is the control function (CF) approach (Wooldridge, 2010). The main idea of control function is to model the correlation between endogenous treatment t_i and the error term ε_i in equation (2) by projecting ε_i on t_i and x_i and identifying variables z_i. Given that $t_i = E(t_i|x_i, z_i) + (t_i - E(t_i|x_i, z_i))$,

$$
\begin{aligned}
&E(\varepsilon_i|t_i, x_i, z_i) \\
&= E(\varepsilon_i|E(t_i|x_i, z_i) + (t_i - E(t_i|x_i, z_i)), x_i, z_i) \\
&= E(\varepsilon_i|t_i - E(t_i|x_i, z_i)) = E(\varepsilon_i|v_i) = v_i\beta_2
\end{aligned}
$$

where $v_i = t_i - E(t_i|x_i, z_i)$. This implies

$$E(y_i|t_i, x_i, z_i) = x_i'\beta_1 + \delta t_i + v_i\beta_2. \tag{7}$$

The correlation between t_i and ε_i in equation (2) due to selection of firm's listing location can be controlled by including the additional term v_i. This suggests that (β_1, δ) can be consistently by regressing y_i on x_i, t_i and $\hat{v}_i = t_i - \Phi(w_i'\hat{\alpha})$, which is the residual from the probit regression (1). Efficient CF estimator of (β_1, δ) can be obtained by the generalized method of moments (GMM) estimation using additional moment restrictions, and $ATET$ can be calculated afterwards.

Some remarks are in order. First, similar to the Heckit, this CF approach deals with the selection bias by including an additional regressor v_i. In addition, the selection bias can be tested by looking at the coefficient β_2. An important advantages of the CF approach is that it does not require any distributional assumption on (ε_i, v_i) like bivariate normality to derive the form of v_i. Second, as in Heckit, different variables from x_i should be included in $v_i = t_i - E(t_i|x_i, z_i)$, for example, z_i. Without identifying variables z_i in v_i, parameters β_1 in equation (7) are not identified due to multi-collinearity. Third, as pointed out by Wooldridge (2010), the CF approach includes the incremental variable estimation as a special case in linear regression models. Similarly, the endogenous treatment effect model (1), (2) can be considered as a two-equation simultaneous equations model. If (1) is considered as a linear probability model, then (1) can be treated as the first-stage regression, and variables z_i in w_i in equation (1) can be considered as excluded exogenous variables and thus as instruments for endogenous t_i in equation (2). In this case, Hausman test for endogeneity is equivalent to the F test for $\beta_2 = 0$. Fourth, $v_i = t_i - E(t_i|x_i, z_i)$ is different from the error term v_i in the listing decision equation (1). If (1) is considered as a linear probability model, they are equal.

Similarly, in the general model of (1), (4) and (5) with heterogeneous responses, the CF approach deals with the selection bias due to the correlation (6) by adding $v_i = t_i - E(t_i|x_i, z_i)$ as an additional regressor in (4) and (5),

$$y_{ji} = x_{ji}'\beta_{1j} + v_i\beta_{2j} + e_{ji}, \ j \in \{0, 1\} \tag{8}$$

where the error term e_{ji} above is no longer correlated with the treatment status. Then, β_{1j} and β_{2j} are estimated by the GMM.

How to find an identifying or instrumental variable z_i, which is a predictor of a firm's listing location choice (1) but is uncorrelated with its post-IPO valuation? We

consider two innovative variables. First, we make use of the prolonged and uncertain IPO review period in mainland China stock market to construct an expected relative waiting days for firm i as its identifying variable z_i. That is to predict how many days firm i will have to wait before IPO approval in overseas and Chinese stock markets respectively, given its firm characteristics but using coefficients from a regression with all other observations except firm i. Second, inspired by general IPO literature, Ljungqvist et al. (2006) and Pastor and Veronesi (2005), that firms tend to time their IPO. That is why stock exchanges often see hot IPO waves during market boom. We leverage this rationale to construct the relative market index between overseas and Chinese stock markets 12-months prior to the IPO application date of firm i as its instrumental variable z_i. The first instrumental variable is a pre-IPO self-excluded average expectation and the second is a pre-IPO market-wide condition. They are primary determinants of firm's listing location choice and meanwhile they are unlikely to affect the market valuation of firm i post-IPO, conditional on firm-specific characteristics and post-IPO market-wide condition.

4.4 Empirical Results

We report probit regression results on the determinants of IPO locational choice in Table 6.[8] A firm's pre-IPO fundamentals such as its age, total assets, ROA, sales growth rate, and leverage are included. In addition, we include China foreign reserve growth rate (as a way to capture time-varying pressure on capital controls) and the predicted waiting days for a domestic listing relative to an overseas listing. We see that a higher pre-IPO foreign ownership share (the sum of the ownerships of foreign individuals or entities) or a longer relative expected waiting days for IPO would significantly raise the chance that the entrepreneur takes her to an overseas stock exchange. Restrictive initial PE ratio regulation or a slower foreign reserve growth would also do the same. These results are consistent with the intuition that an overseas listing is a way to bypass China's capital market regulations (e.g., long waiting time, low PE ratio, or restrictions on access to foreign currency), allowing both the founder and foreign investors access to hard currency when selling down their shares and receiving future dividends.

We also examine whether a stringent capital outflow control environment could make firms more keen to list overseas. The decline of the foreign reserve often makes

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[8]OLS results for Table 6, 7 and 8 are reported in Appendix Table A4 for comparison.

China's policy maker to tight its capital outflow control. In this paper, foreign reserve growth is used to measure such a situation, and it refers to the growth rate of foreign exchange reserves in the 12 months prior to a firm's IPO application. The result indicates that when there are fewer channels for Chinese firms to obtain foreign exchanges or invest overseas under stricter capital outflow controls, they are more likely to go public abroad to bypass capital outflow controls and obtain foreign currency.

To investigate the valuation effects of overseas listing choice, Tables 7 and 8 report the results of the valuation equation from a two-equation endogenous treatment effects model. We evaluate firm valuations by Tobin's Q at the time of their IPO, at the end of their first trading day, and one, three, and five years after the IPOs. It is worth noting that firm's fundamentals such as age, total assets, ROA, sales growth rate, and leverage in the valuation equation are time-varying, depending on the year of estimation. For other variables that are the same as the variables in the listing choice equation, we use their value one year before IPOs. That is, these are pre-IPO firm characteristics.

For the Tobin's Q one year after IPO, reported in Column (5) of table 7, we see that most firm characteristics display the expected sign in explaining determinants of firm value. In particular, smaller, younger firms with a higher ROA, a lower leverage and more intangible assets on average have a higher market valuation. In endogenous treatment effect models, the ATE and ATET are our key parameters of interest. In the simple model as presented in Table 7, ATET is the same as the ATE, both described by the coefficient on the overseas listing dummy in the valuation equation. POM indicates the "potential outcome mean" of Tobin's Q, if the overseas-listed Chinese firms were listed in mainland China. For example, in the first year after IPO, the value -2.41 indicates a valuation haircut, which is 55.5% lower than what these overseas listed firms would obtain if they were listed in mainland China. It shows that at IPO issue price, the valuation discount is 39.9%, smaller than 55.5% in their first year. This difference could be due to the implicit PE restrictions during IPOs in the mainland China. If we look at the results using closing price after the first trading day of IPOs, this valuation discount bounces back to 50.2%, consistent with the well-known IPO underpricing of A-shares. Because additional share offerings in the A share market are not subject to the PE restrictions, the larger estimated discount after the IPO apply.

The second to the last row in Table 7 shows the estimated correlation coefficients between ε and v. Across all the columns, we find a positive correlation between

these two error terms, and the correlation is significant at the moment of IPO. It suggests that instead of a negative selection, the competing hypothesis to capital market distortions in explaining the valuation discount, there is in fact a positive selection: Those unobserved factors that lead to an overseas listing also tend to lead to a higher market valuation, at least at the moment of IPO. Table 8 reports the valuation discount of overseas listing after IPO. This discount is estimated to be 35.9% and 58.8% respectively, in their third and fifth years after IPOs, suggesting that the valuation discount is persistent many years after the IPO. The correlation between ε and v is no longer statistically different from zero. Intuitively, several years after IPO, those pre-IPO firm characteristics have little impact on firm valuation under an efficient market.

To accommodate heterogeneous responses from overseas listed (treated group) and domestically listed Chinese firms (control group), Table 9 presents the empirical results of the general model of endogenous treatment effect. There are several interesting findings. First, the overseas market and domestic market seem to assign different values to the same firm characteristic. For example, both state ownership and foreign ownership are better appreciated in the domestic market than the overseas market. This suggests that the general model may be more suitable than the simple endogenous selection model.

Recall that the ATE and ATET are different in the more general model - the potential outcome mean for the population and for the treated group are also different, precisely because the valuation equation (2) assigns different coefficients for the same characteristics across the control and treatment groups. For example, if all firms in our sample were listed in mainland China, their Tobin's Q one year after IPO would be 4.42. Since their actual value is 3.10, this means an ATE of -1.32. In contrast, if all overseas listed firms in our sample were listed in mainland China, their Tobin's Q one year after IPO would be 5.51. As their actual value is 1.97, this leads to an ATET being -3.54. As 3.54 is 64.2% of 5.51, this suggests an even larger valuation haircut, in contrast to the 55.5% as we obtained from a simple model of column (1) of Table 7. Finally, the last rows of Table 9 report the estimated values for β_{20} and β_{21} in (8), respectively. A positive β_{20} together with a negative β_{21} suggests that those unobserved factors leading to overseas listing contribute to a higher valuation in domestic market but leads to a lower valuation in overseas market. This explains why the general model produces an even larger valuation discount for overseas listings,

compared with the simple model. Just as in the simple model, the valuation discount in the general model is also persistent over time.

5 Validating the roles of capital market regulations

Our finding of a valuation discount for overseas listed Chinese firms contrasts with the typical finding of a valuation premium for overseas listed firms from other developing countries. We have suggested that valuation discount represents in part a willingness to pay to bypass various capital market regulations including controls on capital flows crossing the Chinese borders and regulations on IPO and seasonal offerings. We now seek to validate this interpretation by exploring some policy shocks that alter the intensity of some of these capital market regulations.

5.1 Tightening of Capital Controls

In response to a sharp decline in China's foreign exchange reserve in 2017, the country tightened controls on capital account restrictions during 2018-19, mostly through "window guidance" from the central bank to commercial banks, aiming at reducing the speed of a loss of foreign exchange reserves. If our interpretation of the ATET is correct, we should expect to see a higher valuation discount - as there are now fewer legal channels to take assets outside China, the urge to bypass capital controls by the entrepreneurs via an overseas listing should become stronger. In this sense, this policy change can serve an opportunity to check our interpretation.

This policy change can be used as an exogenous shock to examine the impact of capital outflow controls on the valuation discount of overseas listing. Overseas listing is considered as an effective way for owners to exchange their domestic assets for foreign assets under China's current stringent capital outflow control policy. In the case of a tightening of control policy, owners of Chinese firms may be willing to take bigger valuation discounts of listing overseas, thereby obtaining foreign exchange and helping foreign investors exit.

We can confirm the change in the tightness of capital controls from deviations from covered interest rate parity. Following Cappiello and Ferrucci(2008), a capital control premium is constructed as below:

$$P_t = (f_t - s_t) - (i_{dt} - i_{ft}),$$

where f_t is the logarithm of the one-period ahead forward rate and s_t is the logarithm of the spot rate. The difference between the forward rate and the spot rate is commonly referred to as the forward margin. i_{dt} and i_{ft} are domestic and foreign deposit rates, respectively. In open financial markets without any capital controls, the forward margin is equal to the interest rate differential between two currencies, implying capital control premium P_t is zero. A negative capital control premium suggests that the covered returns on foreign assets are lower than the returns on domestic assets, indicating the existence of arbitrage opportunity. This arbitrage opportunity has not been eliminated due to the strict capital account restrictions that prevent capital from flowing into the country. On the contrary, a positive capital control premium indicates that the covered returns on domestic assets are lower than the returns on foreign assets and capital controls prevent capital from fleeing the country.

We collect monthly data on the spot exchange rate, 3-month, 6-month, and 12-month RMB forward contract middle price in USD, and corresponding deposit interest rates in the US and mainland China to establish the capital control premium for mainland China. Figure 2 shows capital control tightness the mid prices of the RMB forward contracts (in USD) in the three maturities, respectively. We see two episodes of tightening of capital inflow restrictions during 2010 - 2014 and during 2018 - 2019.

Firms that submitted their IPO applications (in any stock market) during 2018 - 2019 are defined as affected by China's tightening of capital controls. We use a straightforward DID specification to evaluate our hypothesis by including an interaction term between a dummy for this tightened capital control period and the overseas listing dummy in the valuation equation (2). As shown in column (1) of Table 10, the tightening of capital outflow controls amplifies the valuation discount. In particular, the Tobin's Q for overseas listed Chinese firms decline by a further 1.06.

5.2 IPO Suspension and PE Regulation

The administrative approval IPO system in mainland China is another potential "inconvenience" that Chinese entrepreneurs are willing to pay to bypass. China's suspensions of initial public offerings in history between 2012 and 2014 represents a shock to the already long wait for IPO approval in the country's domestic stock market, and therefore may provide another opportunity to check whether the valuation discount

reflects a willingness to bypass the capital market distortions.[9]

Firms look harder for alternatives when the door to the domestic stock market is closed suddenly. For example, from the documents from the Bank of Chongqing, the bank applied to the CSRC for an A-share listing on the Shanghai Stock Exchange in 2007, and spend the next few years responding to various inquiries from the CSRC, including extensive ones in both July 2009 and March 2013. Upon understanding that domestic IPOs have been suspended, the bank turned to the Hong Kong Stock Exchange and indeed succeeded in listing there in November 2013.

While Bank of Chongqing is an extreme case, it is not uncommon for companies to wait for two years or more in mainland China before receiving an approval for domestic IPO. In comparison, the process is considerably faster in Hong Kong or New York with a typical length of 6 months from application to listing.

It is reasonable to assume that those firms that submitted an IPO application (to any stock exchange) between 2013 and 2015 are affected by the Chinese IPO suspension during 2012-2014. In column (2) of Table 10, we see that the Chinese IPO suspension indeed enlarges the valuation discount for overseas-listed Chinese firms. The coefficient on the interaction term indicates that the firms during the IPO suspension period are willing to accept an additional haircut on Tobin's Q by -1.75.

The restriction on the PE ratio at the time of IPOs (i.e, initial PE ratio < 23) is another policy distortion under the administrative IPO approval system. The PE restriction is in place from early 2014 to June 2020, and is probably motivated by a desire by the regulator to generate a stock price increase after the IPO. Presumably, an entrepreneur would estimate the likely PE ratio in the absence of the restriction, and if it is close to or above 23, she would be more inclined to take her firm for an overseas listing. In column (3) of Table 10, we see that the firms listed overseas during this period also experienced a larger valuation discount. Compared with those listed overseas during other time periods in the sample, firms overseas listed in this PE restriction period accept an additional or further reduction in Tobin's Q by -1.27.

In column (4) of Table 10, we include all three policy distortions in the same regression. We see that the valuation discount is significantly larger in periods when the capital controls are tightened or when the domestic IPOs are suspended. The interaction terms involving regulation on initial PE is not statistically significant, but still has the expected negative sign.

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[9]Exploiting the same exogenous shock, Cong and Howell (2021) studies how this IPO suspension reduces corporate innovation activity both during the delay and for years after listing.

5.3 Valuation Discount of Overseas Listing: Firm Heterogeneities

We can also learn from heterogeneity across firms about the impact of these capital market policy distortions. We consider five firm-specific features in particular. First, state ownership should reduce the need to bypass domestic capital market restrictions. A large number of studies compare SOEs and non-SOEs and find that the political connection with the government helps SOEs obtain a low cost of capital, regulatory benefits, and strong market power (Sapienza, 2004; Khwaja and Mian, 2005; Li et al., 2008). SOEs usually have leeway to bypass capital outflow controls and regulations because of the political connection. Thus, one might expect a higher state ownership share should lead the less likely to go abroad for listing and less likely to accept a large valuation discount. As shown in column (1) of Table 11, those firms with state ownership exhibit a smaller valuation discount than those without any state ownership by 28% (0.632/2.266). Similarly, banks and other financial firms often have overseas branches and therefore may have some ability to bypass capital outflow controls. In column (2) of Table 11, we see that these firms indeed exhibit a smaller valuation discount as well.

The CSRC, with a paternalistic view of investor protection, often prefers mature firms with stable growth and cash flow, increasing the difficulty of risky firms in the public offering. To reflect firms' needs for external equity finance and highlight the impact of the administrative approval IPO system in mainland China, we investigate whether firms with high operating risks have a larger discount. The operating risk is defined as the standard deviation of the ratio of earnings before interest and taxes (EBIT) to total assets (Billingsley et al.,1990). The firms with a higher than the median level of operating risk are classified in the high operating risk groups, where the high operating risk dummy equals 1. Similarly, according to the median level of a firm's intangible asset ratio 1-year pre-IPO, we split our sample into firms with high intangible assets ratio and firms with low intangible assets ratio. Firms with high operating risk and intangible asset ratios tend to expose to high risk, have few pledgeable assets, and therefore have difficulty obtaining funding from banks and mainland China stock markets. In column (3) to (4), the valuation discount is higher for more risky firms. Similarly, the valuation discount is 26% (0.526/2.036) bigger for the overseas-listed Chinese firms with a higher intangible assets ratio.

Foreign investors in the pre-IPO stage generally prefer to get their returns in hard

currency. We therefore examine if a higher share of foreign investment raises both the chance of an overseas listing and a large valuation discount. We divide our sample into two groups of firms based on whether their foreign ownership share is above the sample median or not. From column (5), we indeed see a larger valuation discount for those firms with a higher share of foreign ownership.

In the last column of Table 11, we include these measures of firm heterogeneity together with indicators of policy distortions in the same regression. This specification has the most comprehensive list of variables and therefore is more general than other columns in either Table 10 or 11. We continue to see that firms with a higher operating risk or a higher foreign ownership share tends to tolerate a larger valuation discount in an overseas market. Furthermore, the valuation discount tends to be bigger during the periods of tightening capital controls or suspension of domestic IPOs.

6   Extensions and Robustness Checks

6.1   Internal Validity

From Table 7 and 8 of the simple endogenous treatment effect model, the correlation in the error terms in the selection and valuation equation is estimated to be positive at the moment of IPO ($Cov(\varepsilon_i, v_i) > 0$) and not different from zero in later years. We conclude that overseas listings represent a mild positive selection. From Table 9 of the general endogenous treatment effect model, the positive selection is also confirmed by $\beta_{20} > 0$ and $\beta_{21} < 0$, which indicates that the unobserved factors increasing the overseas listing probability will increase (decrease) firm's valuation if listed domestically (overseas).

We can check the sensibility of the conclusion by additional and independent tabulations of the data. Table 12 reports the valuation discounts estimated by the raw data, OLS regression, simple and general models of endogenous treatment effect during different time periods. The model-estimated valuation discounts that take into account endogenous issues are greater than the valuation discounts either displayed in the raw data or estimated by OLS at the time of IPO and in the first year after IPO. The greater valuation discount in endogenous treatment effect models than in exogenous models is consistent with a positive selection. On average, better firms choose to be listed abroad. In the first year post-IPO, Tobin's Q of overseas-listed Chinese firms is around 2 if they go public abroad in different models while the potential valuation

they may obtain is varying. These firms have a higher potential valuation if they return to A-share markets under the endogenous treatment effect models compared with the OLS setup. The overseas-listed Chinese firms are equipped with some unobserved factors that will be helpful for a higher valuation if they are listed in the mainland China market.

6.2 A-H Dual-listed Shares

The AH dual-listed firms - the A shares in mainland China and H shares in Hong Kong issued by the same companies - are intentionally not in our sample, but the H shares also represent an interesting set of overseas listed Chinese stocks. The A-share and H-share are issued by the same firms, which have identical cash flow, voting rights, and fundamentals. Since for every H share in the dual listed pair, there is an A share already listed on a mainland Chinses stock exchange, there is no more additional IPO delay at home, and there is no question about whether such firm is on a negative list or not. Yet, such firms are still subject to capital controls. Dividends paid to the A shares are in RMBs and cannot be converted into hard currency without going through the foreign exchange control. Proceeds from selling down the A shares are also in RMBs. In other words, A shares in companies that also have H shares share a subset but not all of the "inconveniences" associated with the companies that are only listed in China. If the valuation discount in the previous estimates reflects the willingness to pay to bypass all the "inconvenience", one may expect the discount embedded in the H shares to be smaller than the previous estimates.

We can compute the haircut in the H share prices by directly comparing them to their corresponding A share prices. Table 13 reports the results for those AH shares listing during our sample period. We find the valuation discount in this case is somewhere between 18-40%, smaller than those experienced by the stocks solely listed outside China but far above zero. This seems to be quite sensible. In particular, it indicates that capital controls are costly in the minds of the Chinese entrepreneurs who are willing to give up a non-trivial part of their firm valuation in order to have a partial way to bypass the regulation. Presumably they are willing to endure an even bigger haircut if they do not have a listing in the A-share market.

6.3 The Re-shoring Case

As our estimated valuation discount for overseas listed firms is fairly large, it is natural to wonder if such a discount is plausible. We have already seen from the A-H dual listed stocks, that the H-shares exhibit a 20% valuation discount relative to their A-share twins. It is reasonable to expect the valuation discount to be greater than 20% for those overseas listed stocks that do not have a corresponding A share, since they need to bypass many more "inconveniences" than the dual listed stocks. Still, it would be useful to obtain additional validation on the plausibility of the 55% plus estimated valuation discount.

In this regard, it is useful to examine the set of stocks that used to be listed outside mainland China, but choose to delist from these overseas markets and relist on the A share market. These stocks offer an window to see how the valuation might change for a given company from an overseas listing to a domestic listing. About 40 Chinese firms went through the process of "delisting overseas, and relisting at home" during 2009-2022. We have filtered out several firms as they have altered their business substantially in the relisting process. This leaves us with 17 firms - 15 delisted from the United States and 2 from Hong Kong - with no known change of business and a reasonably short gap in time between delisting and relisting.

Table 14 reports their Tobin's Q one-year before delisting and one-year after relisting. Figure 3 visualizes the values in a diagram under the similar spirit as Figure 1. Once again, all the 17 dots lie above the 45 degree line. We calculate the percentage difference between the overseas listing and its counterpart in the A share market. The average difference in the Tobin's Q is 71%, and the median difference is 82%. Because this comparison does not account for possible endogenous nature of the delisting-relisting decisions, the estimates need to be taken with a grain of salt. Nonetheless, these numbers suggest that the 64% valuation discount estimated from our generalized endogenous treatment method is not implausibly too large.

6.4 Multiple Choices

Our econometric model does not distinguish between Hong Kong and New York as separate overseas stock markets. We now consider a further generalization that treats them as separate markets. In addition, whether the valuation of the overseas listed firms depends on whether they choose a "variable interest entity" (VIE) structure or not. In particular, we consider a two-step estimation. We conduct a multinomial logit

model in the first step to investigate the determinants of the different choices. In the spirit of a control function approach, we obtain the estimated residual from the multinomial logit model and plug it into our second equation on firm valuation. The endogeneity due to the correlation between treatment status and unobserved factors in the second equation is controlled for by the addition of the term (though the two-step method is not as efficient as the one-step endogenous treatment effect model). Nonetheless, the coefficients in the valuation equation are consistently estimated.

Table 15 reports our empirical results under the two-step multiple-choice model. In terms of listing locational choice, all else being equal, having a higher state ownership implies a lower probability of listing in the US or listing with a VIE; and having a controlling shareholder implies a higher probability of listing in the Hong Kong or listing without a VIE. In terms of valuation, both the Hong Kong-listed and US-listed Chinese firms face a valuation discount compared with their domestically-listed counterparts, with the absolute value of discount somewhat larger in US (-2.96) than Hong Kong (-2.66), and the absolute valuation discount slightly larger for firms with a VIE (-2.88) than without a VIE (-2.57). However, the differences in valuation discount percentage across listing location and listing mode is very small, because listing in the US or listing with a VIE also implies a larger counterfactual valuation for those firms.

6.5   Other Robustness Checks

We conduct additional robustness checks and present results in the appendix. First, we use Market-to-Book ratio (PB ratio), calculated by dividing the current market value by the most current book value on equity, as an alternative gauge for valuation discount. As shown in column (1) of Table A1, the motives for Chinese firms listed overseas remain similar to the baseline estimates and there is a substantial and persistent valuation discount for Chinese firms listed overseas.

In the previous estimation, we use the 12-month average relative market index prior to the IPO application date in the IPO locational decision equation. This is functionally equivalent to an instrumental variable. As a robustness check, we use the 6-month average relative market index and 24-month average relative market index prior to the IPO application date. From columns (2) and (3) of Table A1, we find the impact of the relative market index on the overseas listing to still be significantly positive. The estimated valuation discount for the overseas listings are almost unchanged (50% or more).

We also check the sensitivity of the results to sample construction. Results are reported in Table A2. In column (1) and (2), we sequentially include all firms listed in the A-share market, Hong Kong market, and the US market from 2009 to 2019, including those that cannot be listed domestically due to Negative Lists and harsh financial listing requirements. Our main findings remain unchanged. If there is anything different, the valuation discounts slightly increase compared with the benchmark results, as in column (1) of Table 8. This is because these "excluded" or "unqualified" firms would obtain an even higher valuation than firms in our "qualified" sample if they were listed in domestic market. In column (3) to (5), we exclude the firms from various specific industries (e.g., real estate, finance, software), and find that the main results are robust. In other words, the valuation discount we find is not driven by a specific industry but a general feature of overseas listed Chinese firms.

Another set of robustness checks investigates whether our valuation equation misses any important variables or includes redundant ones. Results are reported in Table A3. Firstly, according to the Fama French model, a stock's excess return can be explained by many risk, liquidity, and size factors. Thus, we include those factors in our outcome model to explain the firm's valuation. As a robustness check, the Beta coefficients, a measure of the sensitivity of securities to the movement of markets, turnover ratio, a measure of liquidity, and tradable shares, a measure of share size, are included. We find consistent results with our baseline model. The valuation discounts still exist for Chinese firms listed overseas. Secondly, in the baseline model, we include many pre-IPO features in both the treatment model and outcome models. Someone may argue that those pre-IPO features should not affect the firms' valuation after listing as these factors are pre-IPO features that may affect the post-IPO valuation only by affecting the listing location. Thus, we exclude those pre-IPO firm-specific features from our outcome models to examine whether the main findings remain unchanged. As we have the same observations, the treatment model is the same as the treatment model in our baseline results. Despite excluding the pre-IPO features in the outcome models, our main results still remain.

7 Conclusion

This paper uses a willingness-to-pay approach to estimate the cost of capital market regulations in China by comparing the valuations of Chinese overseas listed firms with their domestic counterparts. We find that overseas listings exhibit a mild positive

selection. There is a substantial and persistent valuation discount (about 50% - 60%) facing overseas listed Chinese firms. This suggests that the Chinese entrepreneurs are willing to give up a sizable valuation in order to bypass the inconveniences associated with China's capital controls, IPO approval delays, and other capital market regulations.

Our findings have important policy implications. Capital account liberalization and reforms of other capital market regulations would reduce the costs faced by entrepreneurs and reduce their incentive to take their firms for an overseas listing.

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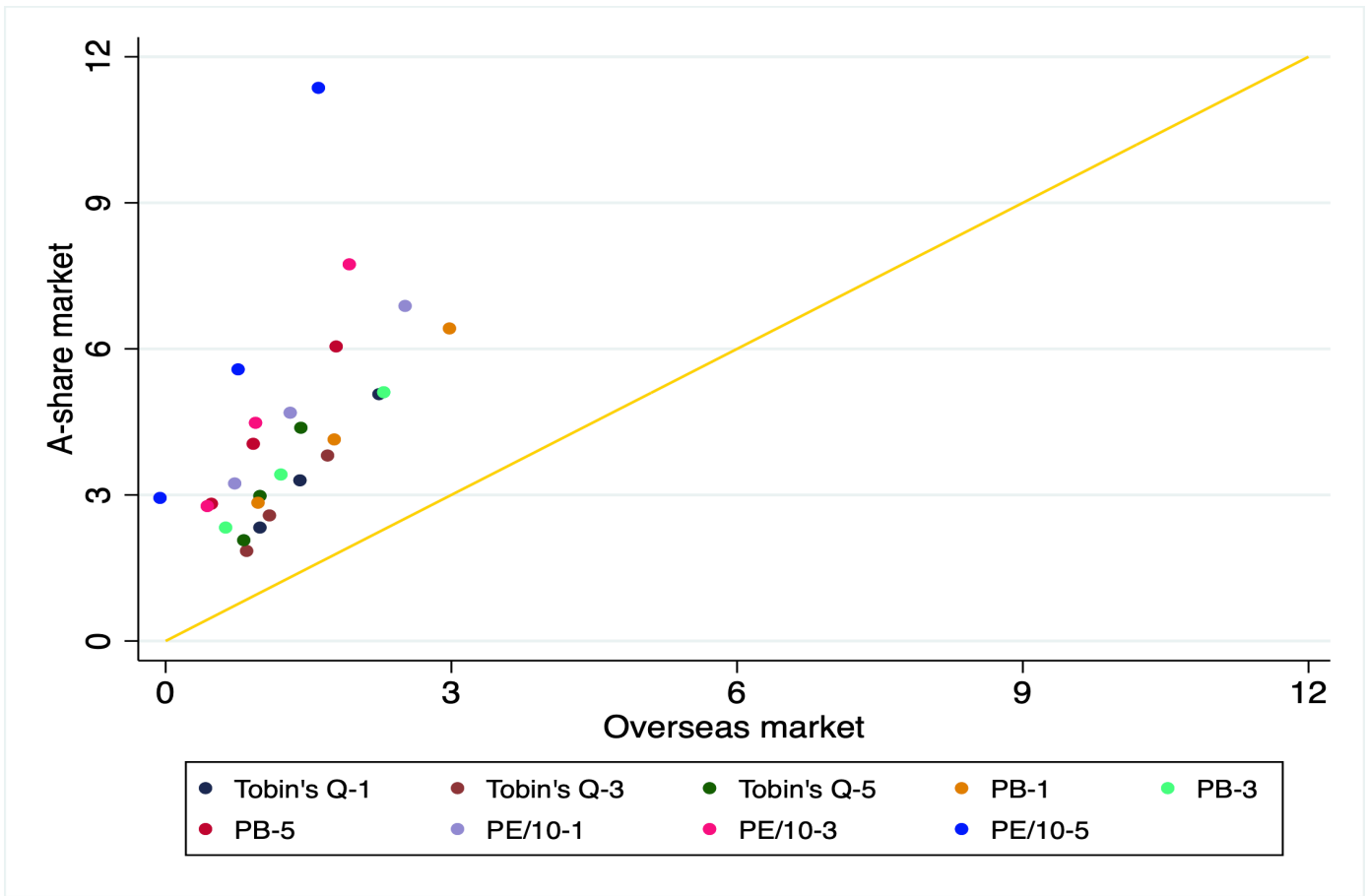
Figure 1: Comparision of Market Valuation of Chinese Firms in A-share and Overseas Markets
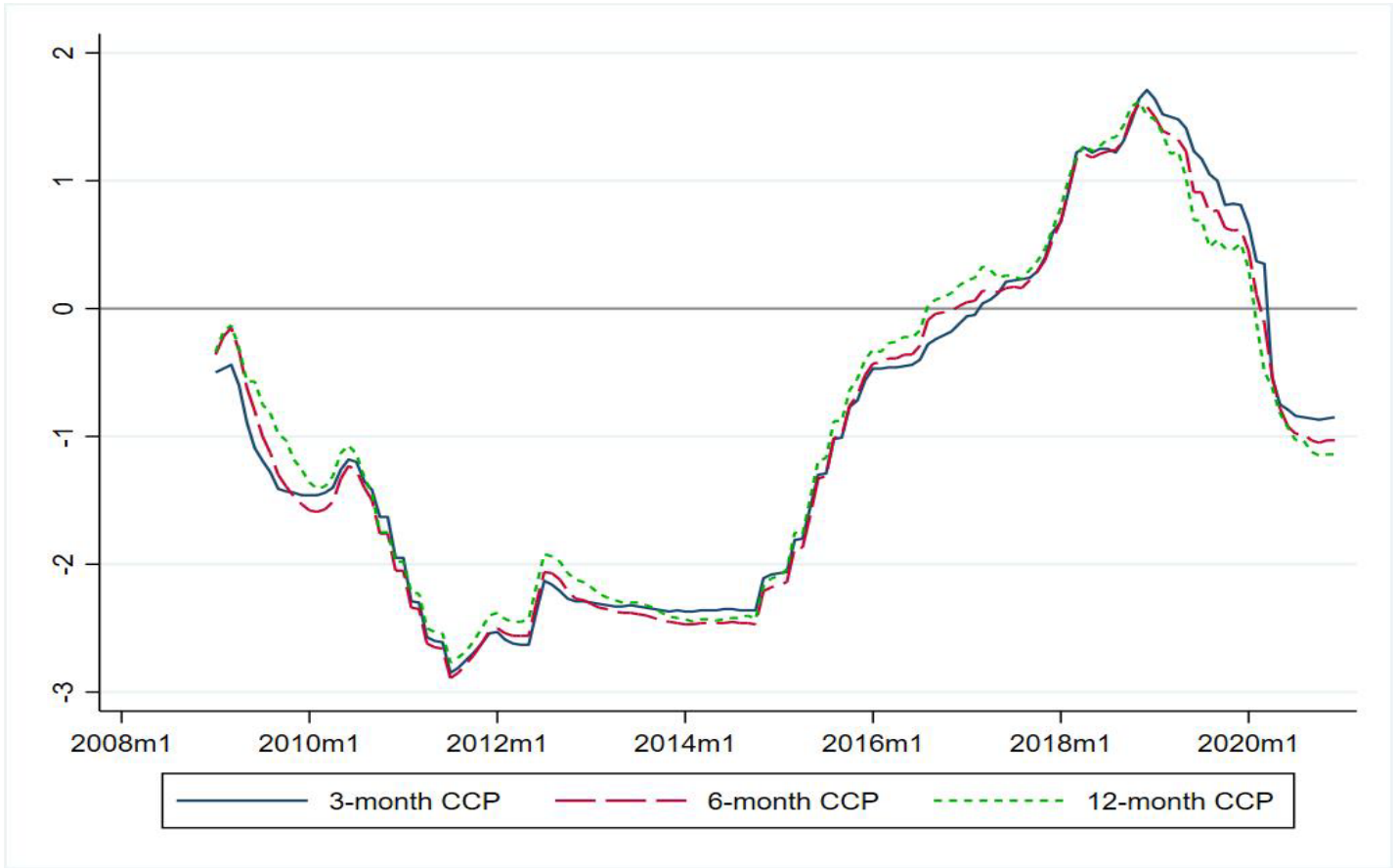
Figure 2: Capital Control Premium (CCP)
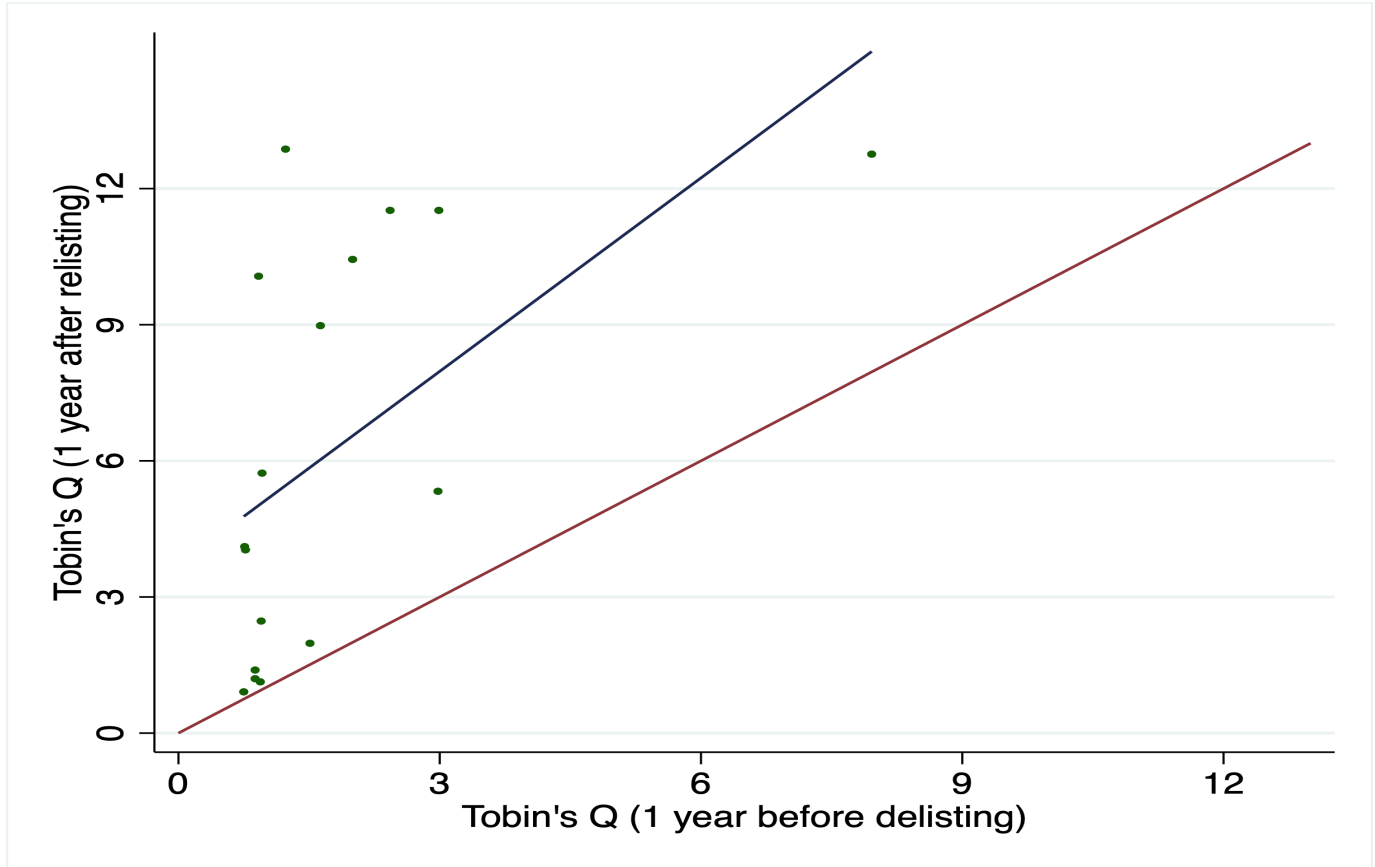
Figure 3: Market valuation of delisted and relisted Chinese firms

Table 1: Variable List and Data Sources

Variable	Definition	Sources
Tobin's Q	(market value of equity + book value of total assets - book value of equity) / the book value of assets	Wind
OverList	Dummy = 1 if the firm is listed in Hong Kong or New York (NYSE or Nasdaq), and 0 otherwise.	Wind; CSMAR; S&P capital IQ
Age	number of years since establishment	Prospectus
Log(total assets)	Log (the book value of total assets)	Wind
ROA (%)	Earnings before interest and tax × 2/(total assets at the beginning of the period + total assets at the end of the period) × 100 (%)	Wind
Sales growth rate (%)	Growth rate of total sales × 100 (%)	Wind
Leverage (&)	Book value of total liabilities / book value of total assets × 100 (%)	Wind
Intangible assets ratio (%)	Intangible capital (constructed by following Peters and Taylor (2017)) / book value of total assets	Wind
State ownership percentage (%)	Percentage of shares owned by state entities prior to IPO (only the top5 shareholders considered)	Prospectus
Independent director ratio (%)	Number of independent directors/ number of directors on board	Wind
CEO=Chairman	Dummy= 1 if CEO and Chairperson of the board are the same person at IPO; 0 otherwise.	Prospectus
Top5 ownership percentage (%)	Total shares (%) owned by the top 5 shareholders just prior to IPO	Prospectus
Controlling shareholders dummy	Dummy: 1 if the top shareholder holds 50% or more of the shares and 30% or more of the voting rights prior to IPO; 0 otherwise	Wind; Prospectus
Import and export ratio (%)	(imports/revenue + foreign sales/ revenue) × 100. The import ratio is calculated from the input and output table at industry level, while the foreign sales revenue ratio is at the firm level. For those firms without observations on foreign sales revenue ratio, we replace them with industrial average export ratio from the input and output table.	Wind; National Bureau of Statistics of China
Strategic investor dummy	Dummy: 1 if there is at least one of the strategic investors at IPO; 0 otherwise	Prospectus
Foreign reserve growth rate	12-month growth rate of Chna's foreign exchange reserve before the firm's IPO application	SAFE
Foreign ownership percentage	Shares owned by foreign entities (among the top 5 owners) prior to IPO	Prospectus
Operating cash flow ratio	Operating cash flow/total assets × 100 (%)	Wind
PE regulation	PE regulation=Median PB ratio in HK among those firms in the same industry* Dummy for IPO dates between 31 March 2014 and 30 June 2020	Wind
Expected relative waiting days	Predicted waiting days when listed in Mainland China/Predicted waiting days when listed overseas	Wind
Log(relative market index)	Log(Overseas market index 12-month before IPO application date / Mainland market index 12-month before IPO application date)	Wind
Industry dummy	4-digits code of Wind industry classification	Wind
Year dummy	Year dummy from 2009 to 2020	
Province GDP per capita	Log (provincial GDP per capita in 2009)	National Bureau of Statistics of China

Table 2: Summary Statistics: Chinese Firms Listed in Mainland China

Variables	N	Mean	S.D.	Min	P25	P50	P75	Max
Tobin's Q	2,039	4.07	2.67	1.00	2.32	3.28	5.06	20.00
Age	2,039	14.10	6.08	2	10	13	17	64
Log(total asset)	2,039	20.97	0.99	19.35	20.36	20.78	21.34	27.98
ROA (%)	2,039	11.63	5.17	-0.34	8.19	10.86	14.29	44.10
Sales growth rate (%)	2,039	18.72	24.79	-49.85	4.18	15.89	29.76	188.92
Leverage (%)	2,039	26.17	17.18	4.87	12.86	22.33	35.38	93.46
Intangible asset ratio (%)	2,039	8.30	6.87	0.48	4.19	6.57	10.09	66.48
State ownership percentage (%)	2,039	7.51	20.74	0	0	0	0	100
Independent director ratio (%)	2,039	37.21	5.07	33.33	33.33	33.33	42.86	80
Chairmen=CEO	2,039	0.51	0.50	0.00	0.00	1.00	1.00	1.00
Top5 ownership percentage (%)	2,039	84.51	14.66	14.13	76.51	88.26	96.20	100
Controlling shareholder dummy	2,039	0.45	0.50	0	0	0	1	1
Import and export rate (%)	2,039	27.25	28.37	0.80	6.40	14.49	39.79	132.46
Stratigic investor dummy	2,039	0.05	0.21	0	0	0	0	1
Foreign reserve growth rate (%)	2,039	7.80	14.15	-13.35	-5.56	7.92	18.58	42.32
Foreign ownership percentage (%)	2,039	10.79	23.44	0	0	0	4.9	100
Operating cash flow ratio(%)	2,039	11.74	9.09	-17.28	5.89	11.03	17.02	36.69
PE regulation	2,039	0.75	0.70	0	0	0.96	1.24	2.51
Expected relative waiting days	2,039	2.43	0.80	0.61	1.84	2.25	2.88	6.10
Log(relative market index)	2,039	0.11	0.27	-0.41	-0.12	0.11	0.31	0.65

Notes:

This sample is used as our baseline result in the 1st year after IPO.

Table 3: Summary Statistics: Chinese Firms Listed in Hong Kong

Variables	N	Mean	S.D.	Min	P25	P50	P75	Max
Tobin's Q	586	1.91	1.83	0.43	1.00	1.40	2.18	18.47
Age	586	16.67	10.16	2	11	15	20	68
Log(total asset)	586	21.42	1.81	17.63	20.20	21.15	22.43	27.29
ROA (%)	586	12.96	10.40	-72.73	7.19	11.71	17.87	51.22
Sales growth rate (%)	586	29.67	51.01	-73.86	5.47	21.29	41.07	496.18
Leverage (%)	586	43.18	22.93	5.75	24.49	40.07	61.14	102.70
Intangible asset ratio (%)	586	11.60	13.69	0.48	2.83	6.95	14.99	83.28
State ownership percentage (%)	586	10.43	27.93	0	0	0	0	100
Independent director ratio (%)	586	42.59	10.60	23.08	33.33	42.86	50	100
Chairmen=CEO	586	0.56	0.50	0	0	1	1	1
Top5 ownership percentage (%)	586	94.66	12.39	22.98	96.29	100	100	100
Controlling shareholder dummy	586	0.74	0.44	0.00	0.00	1.00	1.00	1.00
Import and export rate (%)	586	20.23	30.11	0.80	2.25	5.52	20.23	132.46
Stratigic investor dummy	586	0.19	0.39	0	0	0	0	1
Foreign reserve growth rate (%)	586	6.58	11.14	-13.35	-2.10	5.54	15.87	32.92
Foreign ownership percentage (%)	586	34.24	41.47	0	0	9.77	84.01	100
Operating cash flow ratio(%)	586	9.58	13.80	-39.21	1.42	9.04	17.07	44.45
PE regulation	586	0.67	0.69	0	0	0.69	1.18	2.99
Expected relative waiting days	586	3.29	0.80	0.89	2.76	3.24	3.76	6.10
Log(relative market index)	586	0.19	0.37	-2.15	0.14	0.24	0.35	0.58

Notes:

This sample is used as our baseline result in the 1st year after IPO.

Table 4: Summary Statistics: Chinese Firms Listed in the US

Variables	N	Mean	S.D.	Min	P25	P50	P75	Max
Tobin's Q	112	2.36	4.93	0.18	0.73	1.38	2.75	51.05
Age	112	11.11	6.29	2	6	10	14	40
Log(total asset)	112	20.62	1.24	17.63	19.85	20.64	21.16	26.07
ROA (%)	112	15.78	17.50	-84.75	9.06	16.89	25.13	48.98
Sales growth rate (%)	112	43.98	45.74	-57.18	16.41	36.90	60.07	196.89
Leverage (%)	112	32.19	19.91	4.69	15.54	28.77	44.04	88.09
Intangible asset ratio (%)	112	16.39	15.51	0.83	4.77	10.31	21.82	65.75
State ownership percentage (%)	112	0.07	0.69	0	0	0	0	7.32
Independent director ratio (%)	112	52.60	17.53	0	42.8571	57.1429	60	100
Chairmen=CEO	112	0.73	0.44	0	0	1	1	1
Top5 ownership percentage (%)	112	75.82	20.73	13.70	59.30	81.80	93.79	100
Controlling shareholder dummy	112	0.38	0.49	0	0	0	1	1
Import and export rate (%)	112	18.61	26.37	0.96	2.92	6.84	19.44	132.46
Stratigic investor dummy	112	0.13	0.33	0	0	0	0	1
Foreign reserve growth rate (%)	112	17.36	15.74	-12.41	4.27	17.04	26.80	51.71
Foreign ownership percentage (%)	112	28.54	32.17	0	0	18.6	38.64	100
Operating cash flow ratio(%)	112	14.95	16.79	-40.53	3.81	14.87	25.15	56.54
PE regulation	112	0.44	0.66	0	0	0	1.04	2.36
Expected relative waiting days	112	1.87	1.30	0.61	0.91	1.55	2.35	6.10
Log(relative market index)	112	0.39	0.46	-0.15	-0.02	0.20	0.80	1.24

Notes:

This sample is used as our baseline result in the 1st year after IPO.

Table 5: Summary Statistics: Tobin's Q Post IPO

Tobin's Q	1st Year		3rd Year		5th Year		1-3 Years		1-5 Years	
	Mainland	Overseas	Mainland	Overseas	Mainland	Overseas	Mainland	Overseas	Mainland	Overseas
Mean	4.07	1.99	3.26	1.51	3.61	1.39	3.51	1.72	3.49	1.6
p25	2.32	0.99	1.83	0.84	2.08	0.79	2.14	0.96	2.31	0.93
p50	3.28	1.4	2.58	1.07	2.98	0.97	2.97	1.26	3.07	1.19
p75	5.06	2.23	3.83	1.68	4.39	1.41	4.32	1.97	4.24	1.79
No. of firms	2,039	698	1,755	507	1,129	388	1,755	538	1,132	441

Table 6: Determinants of Overseas Listings

Dependent	Overseas llisting								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	At IPO			1st Day			1st Year		
Variables	Coeff	dy/dx	dy/dx * S.D.	Coeff	dy/dx	dy/dx * S.D.	Coeff	dy/dx	dy/dx * S.D.
Age	0.019***	0.002***	19.42%	0.019***	0.002***	19.42%	0.025***	0.003***	3.26%
	(0.007)	(0.001)		(0.007)	(0.001)		(0.006)	(0.001)	
Log(total asset)	-0.339***	-0.041***	-62.80%	-0.339***	-0.041***	-62.80%	-0.269***	-0.036***	-6.44%
	(0.050)	(0.006)		(0.050)	(0.006)		(0.046)	(0.006)	
ROA(%)	0.023***	0.003***	28.06%	0.023***	0.003***	28.06%	0.025***	0.003***	4.13%
	(0.007)	(0.001)		(0.007)	(0.001)		(0.006)	(0.001)	
Sales growth rate (%)	0.013***	0.002***	70.03%	0.013***	0.002***	70.03%	0.013***	0.002***	9.32%
	(0.002)	(0.000)		(0.002)	(0.000)		(0.001)	(0.000)	
Leverage (%)	0.023***	0.003***	49.60%	0.023***	0.003***	49.60%	0.018***	0.002***	5.51%
	(0.003)	(0.000)		(0.003)	(0.000)		(0.003)	(0.000)	
Intangible assets ratio (%)	0.028***	0.003***	39.39%	0.028***	0.003***	39.39%	0.034***	0.004***	6.35%
	(0.006)	(0.001)		(0.006)	(0.001)		(0.005)	(0.001)	
State ownership percentage (%)	0.002	0.000	6.28%	0.002	0.000	6.28%	0.002	0.000	0.56%
	(0.002)	(0.000)		(0.002)	(0.000)		(0.002)	(0.000)	
Independent director ratio (%)	0.064***	0.008***	74.88%	0.064***	0.008***	74.88%	0.070***	0.009***	11.71%
	(0.008)	(0.001)		(0.008)	(0.001)		(0.008)	(0.001)	
CEO=Chairman	0.441***	0.053***	21.77%	0.441***	0.053***	21.77%	0.415***	0.055***	2.73%
	(0.086)	(0.010)		(0.086)	(0.010)		(0.082)	(0.011)	
Top5 ownership percentage (%)	0.016***	0.002***	23.21%	0.016***	0.002***	23.21%	0.007*	0.001*	1.37%
	(0.005)	(0.001)		(0.005)	(0.001)		(0.004)	(0.000)	
Controlling shareholders dummy	0.294***	0.035***	13.43%	0.294***	0.035***	13.43%	0.343***	0.046***	2.13%
	(0.095)	(0.011)		(0.095)	(0.011)		(0.093)	(0.013)	
Import and export ratio (%)	-0.003**	-0.000**	-9.30%	-0.003**	-0.000**	-9.30%	-0.002	-0.000	-0.82%
	(0.002)	(0.000)		(0.002)	(0.000)		(0.001)	(0.000)	
Strategic investor dummy	0.710***	0.085***	27.70%	0.710***	0.085***	27.70%	0.678***	0.091***	3.50%
	(0.135)	(0.016)		(0.135)	(0.016)		(0.126)	(0.016)	
Foreign reserve growth rate (%)	-0.035***	-0.004***	-38.92%	-0.035***	-0.004***	-38.92%	-0.017**	-0.002**	-2.92%
	(0.008)	(0.001)		(0.008)	(0.001)		(0.008)	(0.001)	
Foreign ownership percentage (%)	0.011***	0.001***	44.43%	0.011***	0.001***	44.43%	0.012***	0.002***	6.24%
	(0.001)	(0.000)		(0.001)	(0.000)		(0.001)	(0.000)	
Operating cash flow ratio(%)	-0.017***	-0.002***	-23.92%	-0.017***	-0.002***	-23.92%	-0.021***	-0.003***	-3.99%
	(0.005)	(0.001)		(0.005)	(0.001)		(0.004)	(0.001)	
PE regulation	0.300*	0.036*	20.78%	0.300*	0.036*	20.78%	0.196	0.026	1.80%
	(0.157)	(0.019)		(0.157)	(0.019)		(0.144)	(0.019)	
Expected relative waiting days	0.770***	0.093***	72.50%	0.770***	0.093***	72.50%	0.583***	0.078***	8.07%
	(0.079)	(0.008)		(0.079)	(0.008)		(0.075)	(0.009)	
Log(relative market index)	0.706***	0.085***	27.86%	0.706***	0.085***	27.86%	0.819***	0.109***	4.25%
	(0.163)	(0.020)		(0.163)	(0.020)		(0.159)	(0.021)	
Industry	YES			YES			YES		
Year	YES			YES			YES		
Province GDP per capita	YES			YES			YES		
No. of Obs.	2,667			2,667			2,735		

Notes:

1. Columns (1), (4), and (7) reports the Probit resluts.

2. Columns (2), (5), and (8) reports the partial effects.

3.We use the standard deviation of overseas listed Chinese firms in our sample.

4. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: Valuation Equation in the Two-Equation Endogenous Treatment Model

Dependent	Tobin's Q					
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	At IPO		1st Day		1st Year	
Age	-0.006	-6.09%	-0.018	-18.58%	-0.009	-9.28%
	(0.007)		(0.012)		(0.007)	
Log(total asset)	-0.360***	-66.77%	-0.773***	-143.35%	-0.467***	-82.07%
	(0.059)		(0.111)		(0.090)	
ROA (%)	0.163***	196.81%	0.197***	237.93%	0.042***	50.24%
	(0.012)		(0.020)		(0.014)	
Sales growth rate (%)	0.006***	30.86%	0.008**	44.44%	0.006***	32.09%
	(0.002)		(0.003)		(0.002)	
Leverage (%)	0.006*	13.83%	-0.002	-4.07%	-0.011***	-25.86%
	(0.004)		(0.006)		(0.004)	
Intangible assets ratio (%)	-0.002	-2.36%	-0.016	-22.66%	0.022**	31.40%
	(0.007)		(0.011)		(0.009)	
State ownership percentage (%)	0.003	8.44%	0.012***	32.01%	0.004***	11.43%
	(0.002)		(0.004)		(0.002)	
Independent director ratio (%)	-0.005	-6.00%	0.005	5.37%	-0.007	-9.00%
	(0.008)		(0.014)		(0.009)	
CEO=Chairman	0.136	6.72%	0.096	4.75%	0.044	2.16%
	(0.092)		(0.170)		(0.093)	
Top5 ownership percentage (%)	0.004	5.85%	-0.008	-11.67%	-0.008	-12.10%
	(0.004)		(0.008)		(0.007)	
Controlling shareholders dummy	-0.223**	-10.18%	-0.174	-7.93%	0.205*	9.57%
	(0.102)		(0.189)		(0.115)	
Import and export ratio (%)	-0.001	-3.36%	0.002	4.70%	-0.001	-2.08%
	(0.002)		(0.004)		(0.002)	
Strategic investor dummy	0.179	6.99%	0.158	6.16%	0.054	2.09%
	(0.177)		(0.275)		(0.171)	
Foreign reserve growth rate (%)	0.008	8.70%	-0.013	-14.28%	-0.000	-0.15%
	(0.009)		(0.016)		(0.009)	
Foreign ownership percentage (%)	-0.001	-2.56%	0.005	20.04%	0.003*	12.37%
	(0.002)		(0.003)		(0.002)	
Operating cash flow ratio(%)	0.029***	41.76%	0.037***	53.88%	0.017**	24.94%
	(0.008)		(0.013)		(0.007)	
PE regulation	-0.508***	-35.22%	-0.720**	-49.90%	-0.318	-21.98%
	(0.169)		(0.295)		(0.208)	
Overseas listing	-1.939***		-3.379***		-2.412***	
	(0.202)		(0.345)		(0.568)	
ATET=ATE	-1.94***		-3.38***		-2.41***	
	(0.20)		(0.35)		(0.57)	
POM_treated(overseas listing=0)	4.86***		6.74***		4.34***	
	(0.19)		(0.29)		(0.38)	
POM_treated(overseas listing=1)	2.92***		3.36***		1.93***	
	(0.13)		(0.20)		(0.22)	
ATET/POM(overseas listing=0)	-39.92%		-50.15%		-55.53%	
Industry	YES		YES		YES	
Year	YES		YES		YES	
Province GDP per capita	YES		YES		YES	
Var(e)	4.975***		16.457***		4.598***	
	(0.494)		(2.193)		(0.857)	
Corr(e,v)	0.125***		0.124***		0.051	
	(0.035)		(0.031)		(0.163)	
Observations	2,669		2,669		2,737	

Notes:

1. The outcome models are estimated with the treatment models simultaneously.

2. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level.

Table 8: Valuation Equation over Longer Horizons in the Endogenous Treatment Model

Dependent	Tobin's Q				
	(1)	(2)	(3)	(4)	(5)
Variables	1st Year	3rd Year	5th Year	1-3 Years	1-5 Years
Age	-0.009	-0.008	0.004	0.000	0.003
	(0.007)	(0.006)	(0.008)	(0.005)	(0.006)
Log(total asset)	-0.467***	-0.378***	-0.683***	-0.478***	-0.501***
	(0.090)	(0.061)	(0.071)	(0.070)	(0.086)
ROA(%)	0.042***	0.044***	0.024**	0.043***	0.018
	(0.014)	(0.012)	(0.012)	(0.012)	(0.014)
Sales growth rate(%)	0.006***	0.004**	0.002**	0.019***	0.017***
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)
Leverage(%)	-0.011***	-0.006**	0.003	-0.005	-0.003
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
Intangible assets ratio(%)	0.022**	0.007	0.008	0.012***	0.011**
	(0.009)	(0.006)	(0.011)	(0.004)	(0.005)
State ownership percentage(%)	0.004***	0.003*	0.002	0.004***	0.002
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Independent director ratio(%)	-0.007	-0.008	-0.007	-0.007	-0.009
	(0.009)	(0.010)	(0.011)	(0.005)	(0.005)
CEO=Chairman	0.044	0.059	0.197*	-0.017	0.092
	(0.093)	(0.083)	(0.101)	(0.062)	(0.065)
Top5 ownership percentage(%)	-0.008	0.002	0.007	0.004	0.005**
	(0.007)	(0.003)	(0.005)	(0.002)	(0.002)
Controlling shareholders dummy	0.205*	0.106	0.000	0.114	0.100
	(0.115)	(0.105)	(0.133)	(0.074)	(0.078)
Import and export ratio(%)	-0.001	0.003*	0.001	0.002	-0.000
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Strategic investor dummy	0.054	-0.119	0.290	-0.008	0.170
	(0.171)	(0.150)	(0.212)	(0.117)	(0.122)
Foreign reserve growth rate(%)	-0.000	0.008	-0.014	-0.001	-0.006
	(0.009)	(0.009)	(0.011)	(0.006)	(0.006)
Foreign ownership percentage(%)	0.003*	-0.001	-0.000	0.001	0.001
	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)
Operating cash flow ratio(%)	0.017**	0.015***	0.021***	0.012***	0.019***
	(0.007)	(0.004)	(0.005)	(0.004)	(0.004)
PE regulation	-0.318	0.082	-0.095	-0.124	-0.207
	(0.208)	(0.161)	(0.210)	(0.147)	(0.141)
Overseas listing	-2.412***	-0.945	-2.006***	-1.670***	-1.824***
	(0.568)	(0.587)	(0.668)	(0.224)	(0.183)
ATET=ATE	-2.41***	-0.95***	-2.01***	-1.67***	-1.82***
	(0.57)	(0.59)	(0.67)	(0.22)	().18)
POM_treated(overseas listing=0)	4.34***	2.65***	3.40***	3.45***	3.41***
	(0.38)	(0.38)	(0.45)	(0.16)	(0.14)
POM_treated(overseas listing=1)	1.93***	1.70***	1.39***	1.78***	1.59***
	(0.22)	(0.22)	(0.25)	(0.10)	(0.09)
ATET/POM(overseas listing=0)	-55.53%	-35.85%	-58.82%	-48.41%	-53.37%
Industry	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES
Province GDP per capita	YES	YES	YES	YES	YES
Var(e)	4.598***	3.233***	3.464***	2.067***	1.513***
	(0.857)	(0.300)	(0.388)	(0.172)	(0.145)
Corr(e,v)	0.051	-0.196	-0.013	-0.069	0.018
	(0.163)	(0.231)	(0.294)	(0.078)	(0.091)
Observations	2,737	2,262	1,517	2,293	1,573

Notes:

1. The outcome models are estimated with the treatment models simultaneously.

2. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Dependent	Tobin's Q					
	(1)	(2)	(3)	(4)	(5)	(6)
	Treated	Control	Treated	Control	Treated	Control
Variables	1st Year	1st Year	3rd Year	3rd Year	5th Year	5th Year
Age	-0.019**	-0.009	-0.011*	-0.013*	0.002	-0.009
	(0.009)	(0.007)	(0.006)	(0.007)	(0.007)	(0.011)
Log(total asset)	-0.214	-0.780***	-0.140	-0.741***	-0.260***	-1.118***
	(0.140)	(0.073)	(0.110)	(0.063)	(0.069)	(0.106)
ROA(%)	-0.021	0.152***	0.000	0.139***	-0.013	0.068***
	(0.013)	(0.016)	(0.014)	(0.013)	(0.015)	(0.012)
Sales growth rate(%)	0.001	0.010***	0.005*	0.002	0.000	0.004**
	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)
Leverage(%)	-0.007	-0.006	0.005	0.001	0.016**	-0.001
	(0.006)	(0.004)	(0.005)	(0.003)	(0.006)	(0.004)
Intangible assets ratio(%)	0.015	0.027***	0.002	0.013*	0.026	0.002
	(0.015)	(0.008)	(0.008)	(0.007)	(0.018)	(0.010)
State ownership percentage(%)	0.001	0.010***	-0.001	0.005***	0.000	0.003
	(0.003)	(0.002)	(0.003)	(0.002)	(0.004)	(0.002)
Independent director ratio(%)	-0.036***	0.016*	-0.022**	0.011	-0.012	0.021
	(0.008)	(0.009)	(0.009)	(0.010)	(0.009)	(0.014)
CEO=Chairman	-0.391	0.072	-0.001	0.051	0.169	0.076
	(0.281)	(0.086)	(0.153)	(0.086)	(0.133)	(0.122)
Top5 ownership percentage(%)	-0.023	-0.008**	0.002	0.001	-0.001	0.003
	(0.026)	(0.004)	(0.005)	(0.004)	(0.008)	(0.005)
Controlling shareholders dummy	-0.058	0.220**	-0.078	0.204*	0.092	0.095
	(0.247)	(0.096)	(0.205)	(0.104)	(0.252)	(0.138)
Import and export ratio(%)	0.003	-0.001	0.003	0.004*	0.000	-0.001
	(0.004)	(0.002)	(0.003)	(0.002)	(0.005)	(0.002)
Strategic investor dummy	-0.299	0.240	-0.188	-0.058	0.301	0.173
	(0.187)	(0.207)	(0.148)	(0.187)	(0.277)	(0.237)
Foreign reserve growth rate(%)	-0.019	-0.005	-0.008	0.012	-0.025*	-0.017
	(0.031)	(0.010)	(0.013)	(0.009)	(0.014)	(0.013)
Foreign ownership percentage(%)	-0.003	0.008***	-0.002	-0.001	-0.001	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Operating cash flow ratio(%)	0.030***	-0.004	0.012***	0.015**	0.012**	0.024***
	(0.011)	(0.006)	(0.004)	(0.006)	(0.005)	(0.007)
PE regulation	-0.269	-0.174	-0.186	0.041	-0.401	-0.346
	(0.262)	(0.242)	(0.297)	(0.168)	(0.373)	(0.244)
ATE	-1.315***		-1.061***		-2.276***	
	(0.385)		(0.411)		(0.316)	
POM_population		4.421***		3.163***		3.603***
		(0.110)		(0.088)		(0.121)
ATE/POM		-29.74%		-33.54%		-63.17%
ATET	-3.539***		-1.295***		-2.128***	
	(0.410)		(0.357)		(0.425)	
POM_treated		5.512***		2.818***		3.554***
		(0.384)		(0.355)		(0.414)
ATET/POM		-64.21%		-45.95%		-59.88%
Industry	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Province GDP per capita	YES	YES	YES	YES	YES	YES
β_{20}	1.19***	1.19***	-0.30	-0.30	0.21	0.21
	(0.43)	(0.43)	(0.42)	(0.42)	(0.49)	(0.49)
β_{21}	-1.53***	-1.53***	-0.79	-0.79	-0.35	-0.35
	(0.43)	(0.43)	(0.52)	(0.52)	(0.36)	(0.36)
Endogenous test(Prob>chi2)	0.000	0.000	0.255	0.255	0.5698	0.5698
Observations	2,687	2,687	2,203	2,203	1,386	1,386

Notes:

1. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

2. Null hypothesis of the endogenous test is no correlation between the errors of listing and valuation equations.

3. No. of obs used in the generalized endogenous treatment effect model are smaller than that in the simple model as some obs violating the over-lap assumption are dropped.

Dependent	Tobin's Q			
	(1)	(2)	(3)	(4)
VARIABLES	Capital ontrol	IPO suspension	PE restriction	All distortions
Age	-0.009	-0.012	-0.010	-0.011
	(0.007)	(0.008)	(0.008)	(0.007)
Log(total asset)	-0.479***	-0.441***	-0.479***	-0.464***
	(0.092)	(0.088)	(0.089)	(0.089)
ROA(%)	0.043***	0.037**	0.034**	0.033**
	(0.015)	(0.015)	(0.015)	(0.015)
Sales growth rate(%)	0.006***	0.006***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage(%)	-0.010***	-0.013***	-0.013***	-0.013***
	(0.004)	(0.003)	(0.004)	(0.003)
Intangible assets ratio(%)	0.024**	0.017**	0.021**	0.019**
	(0.009)	(0.008)	(0.009)	(0.008)
State ownership percentage(%)	0.004***	0.004***	0.005***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)
Independent director ratio(%)	-0.007	-0.015*	-0.010	-0.016**
	(0.010)	(0.008)	(0.012)	(0.007)
CEO=Chairman	0.030	0.035	0.023	0.014
	(0.096)	(0.102)	(0.104)	(0.095)
Top5 ownership percentage(%)	-0.007	-0.007	-0.006	-0.006
	(0.007)	(0.007)	(0.007)	(0.007)
Controlling shareholders dummy	0.206*	0.167	0.188*	0.161
	(0.112)	(0.102)	(0.111)	(0.101)
Import and export ratio(%)	-0.001	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Strategic investor dummy	0.056	0.034	0.084	0.057
	(0.177)	(0.169)	(0.204)	(0.148)
Foreign reserve growth rate(%)	-0.002	-0.001	0.005	0.002
	(0.009)	(0.009)	(0.009)	(0.008)
Foreign ownership percentage(%)	0.003	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Operating cash flow ratio(%)	0.017**	0.019**	0.019**	0.020***
	(0.007)	(0.008)	(0.007)	(0.008)
PE regulation	-0.343	-0.209	-0.323	-0.245
	(0.213)	(0.204)	(0.210)	(0.213)
Overseas listing	-2.349***			-1.195***
	(0.673)			(0.400)
Capital control	1.204***			1.174***
	(0.394)			(0.393)
Overseas listing*Capital controls	**-1.057****			**-1.279***
	(0.481)			(0.680)
IPO suspension		-0.072		-0.116
		(0.158)		(0.218)
Overseas listing*IPO suspension		**-1.751****		**-1.621****
		(0.289)		(0.492)
PE restriction			1.814***	-0.190
			(0.480)	(0.450)
Overseas listing*PE restriction			**-1.271****	**-0.530**
			(0.193)	(0.421)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
Province GDP per capita	YES	YES	YES	YES
Var(e)	4.567***	4.502***	4.538***	4.457***
	(0.851)	(0.866)	(0.859)	(0.861)
Corr(e,v)	0.041	-0.064	0.001	-0.090
	(0.188)	(0.153)	(0.250)	(0.101)
Observations	2,737	2,737	2,737	2,737

Notes:

1. The results are estimated using simple endogeneous treatment effect model for firms in their first year of IPO.

2. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

3. Capital control==1 if firms submit IPO application during 2018 and 2019.

4. IPO suspension==1 if firms submit IPO application during 2013 and 2015.

5. PE restriction==1 if firms go IPO during 31 March 2014 and 30 June 2020.

Table 11: Firm Heterogeneities and Valuation Haircuts

Dependent				Tobin's Q			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SOE	Financial	Operating risk	Intangible assets	Foreign ownership	All firm heterogeneities	Heterogeneities + policy distortions
Age	-0.012	-0.009	-0.013	-0.010	-0.011	-0.012*	-0.013*
	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)	(0.007)	(0.006)
Log(total asset)	-0.478***	-0.459***	-0.483***	-0.473***	-0.475***	-0.474***	-0.488***
	(0.089)	(0.084)	(0.089)	(0.090)	(0.089)	(0.074)	(0.075)
ROA(%)	0.042***	0.043***	0.042***	0.040***	0.041***	0.041***	0.032**
	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)	(0.014)	(0.014)
Sales growth rate(%)	0.006***	0.006***	0.007***	0.006***	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Leverage(%)	-0.011***	-0.011***	-0.011***	-0.012***	-0.012***	-0.012***	-0.012***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Intangible assets ratio(%)	0.021**	0.022**	0.023***	0.022**	0.021**	0.022**	0.019**
	(0.008)	(0.009)	(0.008)	(0.010)	(0.009)	(0.009)	(0.009)
State ownership percentage(%)	0.003	0.004***	0.005***	0.004***	0.004**	0.003	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Independent director ratio(%)	-0.010	-0.009	-0.012*	-0.008	-0.009	-0.013*	-0.017***
	(0.012)	(0.011)	(0.007)	(0.010)	(0.011)	(0.007)	(0.007)
CEO=Chairman	0.023	0.013	0.002	0.035	0.033	-0.011	-0.037
	(0.113)	(0.115)	(0.096)	(0.101)	(0.105)	(0.098)	(0.093)
Top5 ownership percentage(%)	-0.009	-0.008	-0.010	-0.008	-0.009	-0.011	-0.009
	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Controlling shareholders dummy	0.201*	0.196*	0.210**	0.190*	0.213*	0.216**	0.198*
	(0.106)	(0.107)	(0.107)	(0.112)	(0.110)	(0.108)	(0.106)
Import and export ratio(%)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Strategic investor dummy	0.021	0.001	-0.056	0.034	0.051	-0.116	-0.037
	(0.213)	(0.211)	(0.164)	(0.190)	(0.201)	(0.182)	(0.164)
Foreign reserve growth rate(%)	0.002	0.000	-0.001	0.002	0.001	-0.000	0.001
	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)	(0.008)	(0.009)
Foreign ownership percentage(%)	0.003	0.003	0.003	0.003	0.002	0.002	0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Operating cash flow ratio(%)	0.018**	0.018**	0.017**	0.018**	0.018**	0.016**	0.018***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.006)	(0.007)
PE regulation	-0.324	-0.329	-0.305	-0.329	-0.327	-0.321	-0.254
	(0.215)	(0.214)	(0.212)	(0.210)	(0.212)	(0.213)	(0.217)
Overseas listing	-2.266***	-2.366***	-1.696***	-2.036***	-1.864**	-1.150***	-0.133
	(0.861)	(0.791)	(0.385)	(0.736)	(0.866)	(0.373)	(0.338)
SOE dummy	-0.042					0.097	0.075
	(0.175)					(0.164)	(0.159)
Overseas listing*SOE dummy	**0.632****					**-0.130**	**-0.064**
	(0.284)					(0.312)	(0.298)
Financial firms		0.867				0.818	1.026**
		(0.708)				(0.526)	(0.521)
Overseas listing*Financial firms		**1.635***				**3.525**	**3.477**
		(0.880)				(2.957)	(2.959)
High operating risk			0.444***			0.461***	0.489***
			(0.087)			(0.089)	(0.090)
Overseas listing*High operating risk			**-0.761***			**-0.713***	**-0.880***
			(0.193)			(0.202)	(0.192)
High intangible assets ratio				0.229*		0.225*	0.169
				(0.122)		(0.125)	(0.125)
Overseas listing*High intangible assets ratio				**-0.526***		**-0.353**	**-0.133**
				(0.199)		(0.230)	(0.228)
High foreign ownership percentage					0.354**	0.333**	0.302**
					(0.157)	(0.155)	(0.152)
Overseas listing*High foreign ownership					**-0.823***	**-0.795**	**-0.826***
					(0.300)	(0.314)	(0.299)
Capital control							1.165***
							(0.391)
Overseas listing*Capital control							**-1.156***
							(0.598)
IPO suspension							-0.092
							(0.231)
Overseas listing*IPO suspension							**-1.362***
							(0.471)
PE restriction							0.146
							(0.477)
Overseas listing*PE restriction							**-0.865***
							(0.376)
Industry	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES
Province GDP per capita	YES	YES	YES	YES	YES	YES	YES
Var(e)	4.589***	4.574***	4.574***	4.582***	4.566***	4.496***	4.363***
	(0.866)	(0.839)	(0.848)	(0.859)	(0.843)	(0.776)	(0.776)
Corr(e,v)	-0.037	-0.005	-0.071	0.013	-0.002	-0.087	-0.130***
	(0.272)	(0.248)	(0.089)	(0.212)	(0.244)	(0.070)	(0.049)
Observations	2,737	2,737	2,681	2,737	2,737	2,681	2,681

Notes:

1. The results are estimated using simple endogeneous treatment effect model for firms in their first year of IPO.

2. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 12: Comparing the Valuations under Different Approaches

Tobin's Q	At IPO			1st Day			1st Year			3rd Year			5th Year		
	mainland	overseas	**discount**	mainland	overseas	**discount**	mainland	overseas	**discount**	mainland	overseas	**discount**	mainland	overseas	**discount**
Raw data mean	4.53	3.05	**-1.48**	6.26	3.62	**-2.64**	4.07	1.99	**-2.08**	3.26	1.51	**-1.75**	3.61	1.39	**-2.22**
OLS	4.61	3.05	**-1.56**	6.31	3.62	**-2.69**	4.25	1.99	**-2.26**	2.92	1.51	**-1.41**	3.42	1.39	**-2.03**
Simple model	4.86	2.92	**-1.94**	6.74	3.36	**-3.38**	4.34	1.93	**-2.41**	2.65	1.70	**-0.95**	3.40	1.39	**-2.01**
Generalized model	4.95	3.12	**-1.83**	7.47	3.63	**-3.84**	5.51	1.97	**-3.54**	2.82	1.52	**-1.30**	3.55	1.42	**-2.13**

Table 13: H-Share Discounts for A-H Dual Listed Stocks

samples	(1) AH dual-listed 1st Year	(2) only overseas listed 1st Year	(3) AH dual-listed 3rd Year	(4) only overseas listed 3rd Year	(5) AH dual-listed 5th Year	(6) only overseas listed 5th Year	(7) AH dual-listed 1-3 Years	(8) only overseas listed 1-3 Years	(9) AH dual-listed 1-5 Years	(10) only overseas listed 1-5 Years
Valuation discount	-22%	-56%	-28%	-36%	-40%	-59%	-21%	-48%	-18%	-53%
Number of firms	29		31		35		23		18	

Table 14: Valuation Changes for Stocks Moving from Overseas to A-Share Markets

Overseas Code	Year of delisting	Firms in A shares	A-share Code	Year of relisting in A	Tobin's Q 1 year after relisting	Tobin's Q 1 year before delisting	Valuation discount-Tobin's Q
QIHU.N	2016	三六零	601360.SH	2018	5.33	2.98	-44.12%
CEO.N	2021	中国海油	600938.SH	2022	1.20	0.88	-27.00%
CHA.N	2021	中国电信	601728,SH	2021	0.91	0.75	-17.01%
CHL.N	2021	中国移动	600941.SH	2022	1.13	0.94	-17.21%
FMCN.O	2013	分众传媒	002027.SZ	2016	10.44	2.00	-80.87%
CTFO.O	2012	千方科技	002373.SZ	2013	10.07	0.92	-90.91%
0597.HK	2011	华润微	688396.SH	2020	5.73	0.96	-83.29%
0963.HK	2017	华熙生物	688363.SH	2019	11.52	2.43	-78.94%
TSL.N	2017	天合光能	688599.SH	2020	2.47	0.95	-61.69%
XUE.N	2016	学大教育	000526.SZ	2016	1.98	1.51	-23.79%
YTEC.O	2012	宇信科技	300674.SZ	2018	4.11	0.76	-81.45%
PWRD.O	2015	完美世界	002624.SZ	2015	12.87	1.23	-90.43%
GA.N	2014	巨人网络	002558.SZ	2016	11.52	2.99	-74.00%
MY.N	2016	明阳智能	601615.SH	2019	1.39	0.88	-36.66%
JASO.O	2018	晶澳科技	002459.SZ	2018	4.04	0.77	-80.92%
MONT.O	2014	澜起科技	688008.SH	2019	12.76	7.96	-37.64%
MR!.N	2016	迈瑞医疗	300760.SZ	2018	8.98	1.63	-81.90%
Average					**6.26**	**1.80**	**-71.32%**
Median					**5.33**	**0.96**	**-82.04%**

Table 15: Separate Valuation Effects for NY and HK Listed Stocks: Multinomial logit

Dependent	HK listing	US listing	Tobin's Q	Without VIE	With VIE	Tobin's Q
	(1)	(2)	(3)	(4)	(5)	(6)
Age	0.047***	-0.074*	-0.008	0.049***	0.020	-0.009
	(0.015)	(0.044)	(0.007)	(0.012)	(0.023)	(0.006)
Log(total asset)	-0.635***	0.364	-0.477***	-0.510***	-0.272*	-0.465***
	(0.101)	(0.431)	(0.089)	(0.093)	(0.142)	(0.090)
ROA(%)	0.038***	0.037*	0.044***	0.054***	0.035*	0.043***
	(0.013)	(0.022)	(0.014)	(0.012)	(0.018)	(0.014)
Sales growth rate(%)	0.024***	0.019***	0.006***	0.021***	0.024***	0.007***
	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	(0.002)
Leverage(%)	0.038***	-0.002	-0.010***	0.036***	0.022***	-0.011***
	(0.006)	(0.012)	(0.003)	(0.006)	(0.008)	(0.004)
Intangible assets ratio(%)	0.048***	0.096***	0.024***	0.058***	0.061***	0.023**
	(0.011)	(0.023)	(0.008)	(0.011)	(0.013)	(0.010)
State ownership percentage(%)	0.001	-0.499***	0.004***	0.005	-0.037**	0.004***
	(0.004)	(0.154)	(0.002)	(0.004)	(0.015)	(0.002)
Independent director ratio(%)	0.097***	0.204***	-0.003	0.141***	0.139***	-0.006
	(0.015)	(0.026)	(0.006)	(0.016)	(0.018)	(0.008)
CEO=Chairman	0.810***	0.695	0.061	0.807***	0.491*	0.053
	(0.176)	(0.447)	(0.096)	(0.160)	(0.255)	(0.087)
Top5 ownership percentage(%)	0.064***	-0.058***	-0.008	0.010	0.018*	-0.008
	(0.013)	(0.019)	(0.006)	(0.008)	(0.009)	(0.007)
Controlling shareholders dummy	0.502**	-0.285	0.221**	0.695***	-0.048	0.210*
	(0.199)	(0.485)	(0.111)	(0.184)	(0.258)	(0.118)
Import and export ratio(%)	-0.007**	-0.000	-0.001	-0.002	-0.016**	-0.001
	(0.003)	(0.007)	(0.002)	(0.003)	(0.007)	(0.002)
Strategic investor dummy	1.274***	1.005	0.098	1.168***	1.501***	0.081
	(0.272)	(0.782)	(0.147)	(0.228)	(0.334)	(0.147)
Foreign reserve growth rate(%)	-0.075***	0.119**	-0.000	-0.038**	-0.034*	-0.001
	(0.015)	(0.049)	(0.009)	(0.015)	(0.019)	(0.009)
Foreign ownership percentage(%)	0.018***	0.030***	0.004**	0.021***	0.016***	0.003**
	(0.002)	(0.006)	(0.002)	(0.002)	(0.004)	(0.002)
Operating cash flow ratio(%)	-0.041***	-0.008	0.017**	-0.042***	-0.018	0.017**
	(0.010)	(0.015)	(0.007)	(0.008)	(0.012)	(0.007)
PE regulation	0.544*	-0.550	-0.308	0.313	0.554	-0.311
	(0.309)	(0.749)	(0.210)	(0.277)	(0.423)	(0.209)
US listing			-2.962***			
			(0.417)			
HK listing			-2.660***			
			(0.255)			
Listing with VIE						-2.878***
						(0.631)
Listing without VIE						-2.564***
						(0.379)
Expected relative waiting days	1.857***	-1.237*		1.190***	0.780***	
	(0.174)	(0.703)		(0.145)	(0.248)	
Log(relative market index)	0.451	13.045***		1.335***	2.005***	
	(0.315)	(2.499)		(0.296)	(0.550)	
POM_treated (US listing=1)			5.32			
POM_treated (HK listing=1)			4.57			
POM_treated (with VIE=1)						5.22
POM_treated (without VIE=1)						4.47
ATET/POM (US listing)			-55.68%			
ATET/POM (HK listing)			-58.21%			
ATET/POM (with VIE)						-55.13%
ATET/POM (without VIE)						-57.36%
Industry	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Province GDP per capita	YES	YES	YES	YES	YES	YES
β_2	0.685***	0.685***	0.685***	0.418	0.418	0.418
	(0.248)	(0.248)	(0.248)	(0.450)	(0.450)	(0.450)
No. of obs	2,737	2,737	2,737	2,737	2,737	2,737

Notes:

1. The results are estimated using firms in their first year of IPO.

2. The valuation equation added by residuals from the multinomial logit model are estimated by OLS.

3. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A1 Valuation Effects of Overseas Listing: Robustness Checks 1

Dependent	PB ratio	Tobin's Q	Tobin's Q
	(1)	(2)	(3)
Variables	1st Year	6-month index	24-month index
Age	-0.022*	-0.010	-0.010
	(0.013)	(0.008)	(0.007)
Log (total asset)	-0.867***	-0.465***	-0.465***
	(0.181)	(0.089)	(0.089)
ROA (%)	0.059**	0.042***	0.042***
	(0.025)	(0.014)	(0.014)
Sales growth rate (%)	0.010***	0.006***	0.006***
	(0.003)	(0.002)	(0.002)
Leverage (%)	0.033***	-0.012***	-0.012***
	(0.005)	(0.004)	(0.004)
Intangible assets ratio (%)	0.042***	0.021**	0.022**
	(0.015)	(0.009)	(0.009)
State ownership percentage (%)	0.005**	0.004***	0.004***
	(0.002)	(0.002)	(0.002)
Independent director ratio (%)	-0.021**	-0.009	-0.009
	(0.009)	(0.009)	(0.009)
CEO=Chairman	-0.023	0.035	0.040
	(0.168)	(0.100)	(0.098)
Top5 ownership percentage (%)	-0.018	-0.008	-0.008
	(0.015)	(0.007)	(0.007)
Controlling shareholders dummy	0.270	0.195*	0.199*
	(0.179)	(0.108)	(0.109)
Import and export ratio (%)	-0.001	-0.001	-0.001
	(0.003)	(0.002)	(0.002)
Strategic investor dummy	-0.021	0.023	0.031
	(0.223)	(0.177)	(0.172)
Foreign reserve growth rate (%)	0.001	0.001	0.001
	(0.013)	(0.009)	(0.009)
Foreign ownership percentage (%)	0.003	0.003	0.003
	(0.003)	(0.002)	(0.002)
Operating cash flow ratio(%)	0.030**	0.018**	0.017**
	(0.014)	(0.007)	(0.007)
PE regulation	-0.629**	-0.327	-0.325
	(0.317)	(0.212)	(0.211)
Overseas listing	-3.096***	-2.242***	-2.284***
	(0.437)	(0.592)	(0.552)
ATET=ATE	-3.10***	-2.24***	-2.28***
	(0.44)	(0.59)	(0.55)
POM_treated (overseas listing=0)	5.87***	4.23***	4.25***
	(0.24)	(0.37)	(0.36)
POM_treated (overseas listing=1)	2.77***	1.99***	1.97***
	(0.29)	(0.25)	(0.23)
ATET/POM (overseas listing=0)	-52.81%	-52.96%	-53.65%
Industry	YES	YES	YES
Year	YES	YES	YES
Province GDP per capita	YES	YES	YES
Var (e)	11.794***	4.594***	4.598***
	(4.116)	(0.857)	(0.857)
Corr (e,v)	-0.079	-0.006	0.009
	(0.051)	(0.173)	(0.161)
Observations	2,737	2,738	2,735

Notes:

1. The outcome models are estimated with the treatment models simultaneously.

2. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level.

Table A2 Valuation Effects of Overseas Listing: Robustness Checks 2

Dependent	Tobin's Q				
	(1)	(2)	(3)	(4)	(5)
	+Negative List	+Negative list & Unqualified firms	Excluding real estate	Excluding financial industry	Excluding technology industry
Variables	1st Year	1st Year	1st Year	1st Year	1st Year
Age	-0.007	-0.010*	-0.010	-0.007	-0.007
	(0.006)	(0.005)	(0.007)	(0.005)	(0.008)
Log (total asset)	-0.489***	-0.478***	-0.491***	-0.393***	-0.432***
	(0.089)	(0.087)	(0.101)	(0.053)	(0.094)
ROA (%)	0.042***	0.002	0.041***	0.052***	0.036**
	(0.012)	(0.013)	(0.015)	(0.013)	(0.017)
Sales growth rate (%)	0.007***	0.009***	0.008***	0.008***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Leverage (%)	-0.010***	-0.010**	-0.012***	-0.013***	-0.010***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Intangible assets ratio (%)	0.022**	0.027***	0.023**	0.017***	0.016*
	(0.009)	(0.009)	(0.010)	(0.006)	(0.010)
State ownership percentage (%)	0.003*	0.002	0.005***	0.004**	0.003**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Independent director ratio (%)	-0.004	0.009	-0.006	-0.009	-0.009
	(0.008)	(0.010)	(0.010)	(0.007)	(0.006)
CEO=Chairman	0.043	0.091	0.046	0.067	0.044
	(0.083)	(0.086)	(0.098)	(0.076)	(0.106)
Top5 ownership percentage (%)	-0.009	-0.007	-0.008	-0.002	-0.005
	(0.006)	(0.006)	(0.007)	(0.003)	(0.009)
Controlling shareholders dummy	0.206*	0.191	0.217*	0.129	0.115
	(0.114)	(0.117)	(0.119)	(0.092)	(0.109)
Import and export ratio (%)	-0.001	-0.003	-0.001	-0.000	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Strategic investor dummy	0.103	0.086	0.075	-0.021	-0.099
	(0.144)	(0.156)	(0.183)	(0.150)	(0.125)
Foreign reserve growth rate (%)	-0.001	-0.008	-0.002	-0.001	0.006
	(0.009)	(0.011)	(0.010)	(0.008)	(0.008)
Foreign ownership percentage (%)	0.004**	0.005**	0.003	0.003*	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Operating cash flow ratio(%)	0.015**	0.017***	0.018**	0.013***	0.021**
	(0.006)	(0.006)	(0.008)	(0.005)	(0.008)
PE regulation	-0.320	-0.241	-0.329	-0.257	-0.066
	(0.196)	(0.210)	(0.220)	(0.206)	(0.188)
Overseas listing	-2.793***	-3.080***	-2.489***	-2.367***	-1.932***
	(0.404)	(0.544)	(0.610)	(0.289)	(0.343)
ATET=ATE	-2.79***	-3.08***	-2.49***	-2.37***	-1.93***
	(0.40)	(0.54)	(0.61)	(0.29)	(0.34)
POM_treated (overseas listing=0)	4.64***	5.06***	4.44***	4.32***	3.90***
	(0.30)	(0.43)	(0.39)	(0.21)	(0.21)
POM_treated (overseas listing=1)	1.85***	1.98***	1.95***	-1.95***	1.97***
	(0.13)	(0.14)	(0.25)	(0.11)	(0.17)
ATET/POM (overseas listing=0)	-60.13%	-60.87%	-56.08%	-54.86%	-49.49%
Industry	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES
Province GDP per capita	YES	YES	YES	YES	YES
Var (e)	4.569***	5.239***	4.696***	3.774***	4.024***
	(0.822)	(0.886)	(0.887)	(0.279)	(1.055)
Corr (e,v)	0.145	0.264*	0.065	0.001	-0.085
	(0.110)	(0.142)	(0.172)	(0.069)	(0.080)
Observations	2,916	3,075	2,645	2,632	2,190

Notes:

1. The outcome models are estimated with the treatment models simultaneously.

2. Standard errors are reported in parenthesis. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level.

Table A3 Valuation Effects of Overseas Listing: Robustness Checks 3

Dependent	Tobin's Q	
	(1)	(2)
	including Factors in FF model	excluding pre-IPO firm charactistics
	Outcome	Outcome
Variables	1st Year	1st Year
Age	-0.007	-0.009
	(0.006)	(0.007)
Log (total asset)	-0.725***	-0.424***
	(0.117)	(0.090)
ROA (%)	0.046***	0.045***
	(0.015)	(0.013)
Sales growth rate (%)	0.007***	0.006***
	(0.002)	(0.002)
Leverage (%)	-0.010**	-0.015***
	(0.004)	(0.003)
Intangible assets ratio (%)	0.023**	
	(0.010)	
State ownership percentage (%)	0.004**	
	(0.002)	
Independent director ratio (%)	0.001	
	(0.009)	
CEO=Chairman	0.105	
	(0.084)	
Top5 ownership percentage (%)	-0.012*	
	(0.006)	
Controlling shareholders dummy	0.169	
	(0.121)	
Import and export ratio (%)	-0.001	
	(0.002)	
Strategic investor dummy	0.093	
	(0.154)	
Foreign reserve growth rate (%)	0.009	
	(0.009)	
Foreign ownership percentage (%)	0.002	
	(0.002)	
Operating cash flow ratio(%)	0.019***	
	(0.007)	
PE regulation	-0.263	
	(0.198)	
Domestic Beta coefficients	-0.252*	
	(0.139)	
Oveseas Beta coefficients	-0.040	
	(0.115)	
Turnover rate	0.094***	
	(0.017)	
Log (tradable shares)	0.530***	
	(0.081)	
Overseas listing	-2.801***	-2.119***
	(0.554)	(0.313)
ATET=ATE	-2.80***	-2.12***
	(0. 55)	(0.31)
POM_treated (overseas listing=0)	4.60***	4.14***
	(0. 45)	(0. 18)
POM_treated (overseas listing=1)	1.80***	2.02***
	(0. 15)	(0. 18)
ATET/POM (overseas listing=0)	-60.87%	-51.21%
Industry	YES	YES
Year	YES	YES
Province GDP per capita	YES	YES
Var (e)	4.389***	4.690***
	(0.897)	(0.904)
Corr (e,v)	0.171	-0.029
	(0.140)	(0.097)
Observations	2,736	2737

Notes:

1. The outcome models are estimated with the treatment models simultaneously.

2. Standard errors are reported in parenthesis.

 ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table A4: Motives and valuation Effects of Overseas Listing: OLS

Dependent	Overseas listing	Tobin's Q				
Variables	1 year before IPO	At IPO	1st day	1st Year	3rd Year	5th Year
Age	0.005***	-0.008	-0.022*	-0.010	-0.006	0.005
	(0.001)	(0.007)	(0.012)	(0.007)	(0.005)	(0.007)
Log(total asset)	-0.049***	-0.354***	-0.761***	-0.465***	-0.375***	-0.682***
	(0.008)	(0.059)	(0.112)	(0.091)	(0.062)	(0.072)
ROA (%)	0.005***	0.161***	0.193***	0.042***	0.045***	0.024**
	(0.001)	(0.012)	(0.020)	(0.014)	(0.012)	(0.012)
Sales growth rate (%)	0.002***	0.005***	0.007**	0.006***	0.004**	0.002*
	(0.000)	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)
Leverage (%)	0.003***	0.005	-0.005	-0.012***	-0.005*	0.003
	(0.000)	(0.004)	(0.006)	(0.003)	(0.003)	(0.004)
Intangible assets ratio (%)	0.005***	-0.004	-0.020*	0.021**	0.009*	0.008
	(0.001)	(0.007)	(0.011)	(0.009)	(0.005)	(0.011)
State ownership percentage (%)	-0.000	0.003	0.012***	0.004***	0.002	0.002
	(0.000)	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)
Independent director ratio (%)	0.013***	-0.010	-0.004	-0.009	-0.002	-0.007
	(0.001)	(0.008)	(0.013)	(0.006)	(0.005)	(0.006)
CEO=Chairman	0.051***	0.119	0.066	0.036	0.075	0.198**
	(0.012)	(0.092)	(0.170)	(0.093)	(0.079)	(0.100)
Top5 ownership percentage (%)	0.001*	0.003	-0.009	-0.008	0.003	0.007
	(0.000)	(0.004)	(0.008)	(0.007)	(0.003)	(0.005)
Controlling shareholders dummy	0.049***	-0.243**	-0.211	0.196*	0.132	0.002
	(0.013)	(0.103)	(0.192)	(0.111)	(0.097)	(0.129)
Import and export ratio (%)	-0.000	-0.001	0.002	-0.001	0.003*	0.001
	(0.000)	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)
Strategic investor dummy	0.139***	0.117	0.046	0.027	-0.057	0.293
	(0.025)	(0.179)	(0.276)	(0.142)	(0.132)	(0.203)
Foreign reserve growth rate (%)	-0.004***	0.010	-0.008	0.001	0.003	-0.015*
	(0.001)	(0.009)	(0.016)	(0.009)	(0.007)	(0.008)
Foreign ownership percentage (%)	0.002***	-0.001	0.003	0.003*	-0.000	-0.000
	(0.000)	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)
Operating cash flow ratio(%)	-0.004***	0.030***	0.039***	0.018**	0.014***	0.021***
	(0.001)	(0.008)	(0.013)	(0.007)	(0.004)	(0.005)
PE regulation	0.033	-0.533***	-0.765***	-0.326	0.116	-0.092
	(0.024)	(0.170)	(0.296)	(0.211)	(0.155)	(0.210)
Expected relative waiting days	0.114***					
	(0.013)					
Log(relative market index)	0.143***					
	(0.029)					
Overseas listing		-1.556***	-2.688***	-2.260***	-1.412***	-2.033***
		(0.172)	(0.300)	(0.151)	(0.134)	(0.154)
Industry	YES	YES	YES	YES	YES	YES
Province	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
No. of Obs.	2737	2,669	2,669	2,737	2,262	1,517
R^2	0.544	0.606	0.487	0.415	0.387	0.395