

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

Qu Feng      Shang-Jin Wei      Guiying Laura Wu  
Mengying Yuan

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## Abstract

Both capital controls and domestic capital market regulations impose a cost on firms. By comparing Chinese firms listed at home and abroad, that takes into account the endogenous nature of the IPO locational choices, we estimate entrepreneurs' willingness-to-pay to bypass these costs is equivalent to a haircut in firm value by over 50%. With a structurally estimated model, we quantify the welfare gains from various reforms of capital market regulations.

**JEL Classification:** G32, F38, O16

**Key Words:** Overseas IPO, capital control, self-selection

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# 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. With an estimated structural model, we convert them into a calculation of a loss in entrepreneurs' welfare. We also evaluate the extent of entrepreneurial gains from reforming the IPO review process and removing capital controls.

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.<sup>1</sup>

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 market (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

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<sup>1</sup>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.

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 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 1586 Chinese firms listed the Hong Kong or US stock markets in 2020, 1431 do not have a corresponding listing inside mainland China.<sup>2</sup> 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.<sup>3</sup> First, neither firms nor individuals can easily convert their assets or savings into foreign currencies, or otherwise send them abroad. Such restrictions might

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<sup>2</sup>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 depository 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 on London Stock Exchange under GDRs.

<sup>3</sup>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.

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 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 ones.

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 **2009-2019**. 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 **2019** 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 Chinese 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. The selection can be regarded as arising from observable and unobservable factors. 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 52% of that in Chinese A share market, a simple model that acknowledges the endogenous nature of the treatment (listing location) produces 58% haircut for overseas listed Chinese firms. 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 rises to 66%. In both specifications, the valuation discount is persistent - the valuation gap in terms of the Tobin's Q in the two markets is ap-

proximately 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 associated 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 25%. 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 valu-

ations 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.

We estimate our structural model drawing in part from the results of our econometric estimates. We assess that the total utility loss of the entrepreneurs from the capital controls and IPO regulations to be 18.1%. Note our calculation should be a component of a larger welfare calculation that also takes into account potential benefits of capital controls. Nonetheless, the loss of the entrepreneurs due to IPO regulations is new in the literature, and the loss of the entrepreneurs due to capital controls has typically been missing in the discussion of the welfare effect of capital controls. Our research suggests the loss could be sizable quantitatively.

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 distor-

tions 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 introduces the institutional background of the specific capital market distortions of our focus. Section 3 presents the theoretical model of IPO location choice. Section 4 describes the data, sample and the pattern of market valuation gap across domestic and overseas listed Chinese firms in a comparable sample. Section 5 explains how to estimate the motives and valuation of overseas listing from an endogenous treatment effect model. Section 6 reports a series of validity checks. Section 7 provides causal evidence on the effect of policy distortions on valuation discounts. Section 8 presents a set of extensions and robustness checks. Section 9 provides a structural estimation of the model and use it to assess both the welfare consequences of the distortions and perform policy reform experiments. Finally, Section 10 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 outflows, 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 462 days for a domestic listing (conditional on eventual success), compared to 440 and 154 days in New York and Hong Kong, respectively.<sup>4</sup> 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 restrictions 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,

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<sup>4</sup>See Allen et al. (2023) for a detailed description on the administrative IPO system in China.

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.)<sup>5</sup> 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 that 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, 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.<sup>6</sup>

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

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<sup>5</sup>Tsang (2010) discusses the IPO application process and listing requirements in Hong Kong and New York.

<sup>6</sup>A Negative List on foreign investment not only exists in China but also in many other developing economies, such as Philippines, Indonesia, and Thailand

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 Model

#### 3.1 Basic Setup

To guide our econometric estimation and welfare analysis, we propose a theoretical model of IPO locational choice inspired by Borjas's (1987) classic model of immigration which in turn was built on the insight from Roy (1951). Suppose entrepreneur  $i$  can list her firm  $i$  on either the home stock exchange, denoted by 0, or an overseas exchange, denoted by 1. If listed at home, its Tobin's Q takes on the following value:

$$\ln Q_{i0} = \mu_0 + \varepsilon_{i0}, \quad (1)$$

where  $\varepsilon_{i0} \sim N(0, \sigma_0^2)$ . On the other hand, if it is listed on an overseas exchange, its Tobin's Q would be:

$$\ln Q_{i1} = \mu_1 + \varepsilon_{i1}, \quad (2)$$

where  $\varepsilon_{i1} \sim N(0, \sigma_1^2)$ , and  $\varepsilon_1$  and  $\varepsilon_0$  have a correlation coefficient  $\rho_{01} = \frac{\sigma_{01}}{\sigma_0\sigma_1}$ . In general,  $\mu_0$  and  $\mu_1$  as functions of observable firm characteristics such as firm size, industry, and growth prospect. We will discuss these characteristics more fully when we go to econometric estimation.  $\varepsilon_{i0}$  and  $\varepsilon_{i1}$  are firm characteristics unobservable to researchers.

If the entrepreneur applies for an IPO for firm  $i$  in the domestic market, there is a waiting period of  $T_{0a}$  months for the local securities market regulator and stock exchange to scrutinize the application before the IPO takes place. In our sample period,  $T_{0a}$  is about 16 month in the Chinese A share market. In addition, there is a minimum lock-up period of  $T_{0b}$  months before the entrepreneur can sell down her shares after the IPO. In our sample,  $T_{0b}$  is about 24 months. We use to  $T_0 = T_{0a} + T_{0b}$  denote total minimum amount of time needed by entrepreneur  $i$  from the time of an application for an IPO to the time that she can obtain her welfare from selling down

her shares.  $T_0$  is about 40 months in the Chinese domestic stock market. Similarly,  $T_1$  denotes the total minimum time needed by entrepreneur  $i$  to realize her equity wealth if she chooses to list her firm on an overseas stock exchange. In our sample,  $T_1$  is about 15 months (including 6 months for IPO review and 9 months of lock-up period).

There are other differences between listing at home versus abroad. With a domestic listing, the entrepreneur obtains her payout in local currency (say, K RMBs). Without capital controls, this is equivalent to  $\frac{K}{e}$  dollars at the official exchange rate of 1 dollar = e RMBs. However, with binding capital controls, one needs to spend time and other resources to obtain foreign exchanges. This might involve using black market or other underground channels to bypass capital controls. Using  $\tau$  to denote the proportional cost of converting RMBs to dollars, K RMBs can only be converted to  $(1 - \tau)\frac{K}{e}$  dollars. Even with dollars at hand, the entrepreneur might not be indifferent between holding her wealth onshore versus offshore due to differences in wealth tax or risk of expropriation. Let us assume that, in entrepreneur  $i$ 's subjective assessment, 1 unit of offshore wealth =  $1 + \delta_i$  units of onshore wealth. If  $\delta_i > 0$ , the entrepreneur prefers to keep her wealth offshore on the margin. On the hand, if  $\delta_i < 0$ , she prefers to keep her wealth onshore.

To decide where to list her company, the entrepreneur compares the value of an IPO to her in each location. In particular, let  $r$  denotes the discount rate, the value to her if the firm debuts on the domestic stock exchange is:

$$V_{i0} = \frac{(1 - \tau)}{(1 + \delta_i)e} \cdot \frac{Q_{i0} \cdot K_i}{(1 + r)^{T_0}}, \quad (3)$$

whereas the value to her obtaining  $K_i/e$  dollars from an overseas IPO is:

$$V_{i1} = \frac{1}{e} \cdot \frac{Q_{i1} \cdot K_i}{(1 + r)^{T_1}}. \quad (4)$$

She would choose an overseas IPO if and only if her utility from doing so is her,  $U_{i1} \geq U_{i0}$ . Equivalently, an overseas IPO is chosen iff

$$\ln Q_{i1} - \ln Q_{i0} \geq \ln(1 - \tau) - \ln(1 + \delta_i) - (T_0 - T_1) \cdot \ln(1 + r).$$

Denote  $q_{i1} = \ln Q_{i1}$ ,  $q_{i0} = \ln Q_{i0}$ ,  $d = r(T_0 - T_1)$  and use approximation  $\ln(1 - \tau) \simeq -\tau$ ,  $\ln(1 + \delta_i) \simeq \delta_i$  and  $\ln(1 + r) \simeq r$ , the decision rule for an overseas IPO can be written as, going for an overseas IPO iff

$$q_{i1} - q_{i0} \geq -c_i$$

where

$$c_i \equiv \tau + d + \delta_i$$

Thus, we use  $c_i$  to represent the relative combined cost associated with IPO at the home market over an overseas IPO due to differences in the capital market regulations. This relative cost arises from cost of bypassing capital controls, represented by  $\tau$ , frictions due to the differences in the IPO review process and lock-up period, represented by  $d$ , and the individual subjective preference over holding her wealth offshore, represented by  $\delta_i$ .

### 3.2 Probability of Overseas Listings

The cost of capital market distortion can be written as

$$c_i = \mu_c + \varepsilon_{ic}, \quad (5)$$

where  $\mu_c$  is potential mean of cost and  $\varepsilon_{ic} \sim N(0, \sigma_c^2)$ .  $\varepsilon_c$  and  $\varepsilon_0$  have correlation coefficient  $\rho_{c0} = \frac{\sigma_{c0}}{\sigma_c \sigma_0}$ .  $\varepsilon_c$  and  $\varepsilon_1$  have correlation coefficient  $\rho_{c1} = \frac{\sigma_{c1}}{\sigma_c \sigma_1}$ .

Together with equation (1) and (2),  $\varepsilon_0$ ,  $\varepsilon_1$ , and  $\varepsilon_c$  follow a tri-variate normal distribution with the covariance matrix of

$$\begin{bmatrix} \sigma_0^2 & \rho_{01}\sigma_0\sigma_1 & \rho_{0c}\sigma_0\sigma_c \\ \rho_{01}\sigma_0\sigma_1 & \sigma_1^2 & \rho_{1c}\sigma_1\sigma_c \\ \rho_{0c}\sigma_0\sigma_c & \rho_{1c}\sigma_1\sigma_c & \sigma_c^2 \end{bmatrix} \quad (6)$$

The probability of an overseas IPO is given by

$$\begin{aligned} P &= \Pr[\varepsilon_{i1} - \varepsilon_{i0} + \varepsilon_{ic} > -(\mu_1 - \mu_0 + \mu_c)] \\ &= \Pr[v_i/\sigma_v > -(\mu_1 - \mu_0 + \mu_c)/\sigma_v] \\ &= 1 - \Phi(w) \\ &= \Phi(-w) \end{aligned} \quad (7)$$

where

$$v_i = \varepsilon_{i1} - \varepsilon_{i0} + \varepsilon_{ic},$$

and

$$-w = (\mu_1 - \mu_0 + \mu_c)/\sigma_v,$$

$v_i \sim N(0, \sigma_v^2)$  and  $\Phi$  is the standard normal distribution function.

As summarized by Equation (7), the probability of an overseas IPO (a) is a positive function of the expected Tobin's Q in the overseas market  $\mu_1$ ,  $\partial P/\partial \mu_1 > 0$ ; (b) a

negative function of the expected Tobin's Q in home market  $\mu_0$ ,  $\partial P/\partial\mu_0 < 0$ ; and (c) a positive function of the expected cost associated with listing at home versus abroad,  $\mu_c$ ,  $\partial P/\partial\mu_c > 0$ .

In general,  $\mu_0$ ,  $\mu_1$ , and  $\mu_c$  are all function of firm characteristics  $x$ . The effect  $x$  on the probability of overseas listing could be derived as

$$\frac{\partial P}{\partial x} = \frac{d\Phi(-w)}{d(-w)} \frac{\partial(-w)}{\partial x}$$

Since  $\frac{d\Phi(-w)}{d(-w)} > 0$ , the sign of  $\frac{\partial P}{\partial x}$  thus depends on the sign of  $\frac{\partial(-w)}{\partial x}$ , that is

$$\frac{\partial(-w)}{\partial x} = \frac{\partial[\mu_1(x) - \mu_0(x) - \mu_c(x)]}{\partial x} \frac{1}{\sigma_v}$$

### 3.3 Self-Selection

Since  $v_i = \varepsilon_{i1} - \varepsilon_{i0} + \varepsilon_{ic}$ , and  $\varepsilon_{i0}$  (and  $\varepsilon_{i1}$ ) affects  $q_{i0}$  (and  $q_{i1}$ ), overseas IPO is endogenous decision. We use  $E[q_{i0}|t_i = 1]$  to denote the average Tobin's Q in the home market by those overseas listed Chinese firms if they were to be listed at home, while  $E[q_{i1}|t_i = 1]$  denotes the average Tobin's Q of those overseas listed Chinese firms when they are listed overseas. Under the normality assumptions, these conditional means are given by

$$E[q_{i0}|t = 1] = \mu_0 + \frac{\sigma_0\sigma_1}{\sigma_v}[(\rho_{01} - \frac{\sigma_0}{\sigma_1}) + \rho_{0c}\frac{\sigma_c}{\sigma_1}]h, \quad (8)$$

and

$$E[q_{i1}|t = 1] = \mu_1 + \frac{\sigma_0\sigma_1}{\sigma_v}[(\frac{\sigma_1}{\sigma_0} - \rho_{01}) + \rho_{1c}\frac{\sigma_c}{\sigma_0}]h, \quad (9)$$

where  $h = \phi(-w)/\Phi(-w) = \phi(w)/P$  with  $\phi$  being the density of the standard normal. Here,  $h$  is the hazard rate, which is equivalent to the inverse Mills ratio in Heckman (1979).

Denote

$$S_0 = \frac{\sigma_0\sigma_1}{\sigma_v}[(\rho_{01} - \frac{\sigma_0}{\sigma_1}) + \rho_{0c}\frac{\sigma_c}{\sigma_1}]h, \quad (10)$$

as the difference in the expected Tobin's Q's between the overseas listed Chinese firms and all Chinese listed firms when they are both listed at home, and

$$S_1 = \frac{\sigma_0\sigma_1}{\sigma_v}[(\frac{\sigma_1}{\sigma_0} - \rho_{01}) + \rho_{1c}\frac{\sigma_c}{\sigma_0}]h, \quad (11)$$

as the difference in expected Tobin's Q between the same two groups when they are both to be listed overseas.

In the special case of  $\sigma_c = 0$ , we could follow Borjas (1987) and consider four cases of interest. In the first case, if  $S_0 > 0$  and  $S_1 > 0$ , then overseas listings reflect a positive selection, where those firms choosing for an overseas IPO would on average be on the right side of the distribution for Tobin's Q across all Chinese firms in both the home and overseas markets. In the second case, if  $S_0 < 0$  and  $S_1 < 0$ , then overseas listings represent a negative selection as they would be on the left side of the Tobin's Q distribution across all Chinese listed firms in both the home and overseas markets. In Case 3, if  $S_0 < 0$  and  $S_1 > 0$ , it would be called "refuge sorting" in the immigration context, where firms that are listed overseas are on average selected from "worse firms" in terms of Tobin's Q at the home market and would do better than other Chinese firms in the overseas market. Finally, in Case 4, if  $S_0 > 0$  and  $S_1 < 0$ , this would be consider nonsensical or irrational as those firms actually list abroad would have been the "better firms" in terms of Tobin's Q in the home market but "worse firms" compared to other Chinese firms in the overseas market. However, in the more general case where  $\sigma_c \neq 0$ , the signs of  $S_0$  and  $S_1$  will also depend on  $\rho_{0c}$  and  $\rho_{1c}$ . Case 4 could happen if  $\rho_{1c} < 0$  and  $\rho_{0c} > 0$ .

### 3.4 The "Treatment" Effect of an Overseas Listing

Recall that about 20% of the Chinese listed firms choose to list outside China. Using our model, we interpret this as an equilibrium outcome after all entrepreneurs shopping around different listing locations. There exists a marginal entrepreneur  $n$ , who is indifferent between listing at home versus abroad, given his firm characteristics and the general market and policy environment. By definition of (3) and (4),  $E[U_{n1}] - E[U_{n0}] = 0$  suggests that

$$E(q_{n1}) - E(q_{n0}) = -c_n \tag{12}$$

If this market equilibrium condition did not hold, due to, for example, one additional entrepreneur moving from the overseas to the home market, she would find her expected waiting period at the home market increases and her expected waiting period at the overseas market decreases. This would reduce her  $E[U_{n0}]$  and increase his  $E[U_{n1}]$ , attracting her back to the overseas market. Such adjustment continues until the marginal entrepreneur is indifferent between listing in the two markets.

We use  $ATE$  and  $ATET$  to denote the average treatment effect and the average

treatment effect on the treated. According to equation (1), (2) and (12),

$$ATE = E[q_{i1} - q_{i0}] = \mu_1 - \mu_0 = -c_n, \quad (13)$$

and according to equation (8) and (9),

$$ATEET = E[q_{i1} - q_{i0}|t_i = 1] = (\mu_1 - \mu_0) + (S_1 - S_0) = -c_n + (S_1 - S_0). \quad (14)$$

$ATE$  indicates the capital market distortions  $-c_n$  and  $ATEET$  implies both capital market distortions  $-c_n$  and relative position of those overseas listed Chinese firms in overseas and domestic market distribution  $S_1 - S_0$ .

It is interesting to compare our findings with the migration literature or the existing literature on cross-listed stocks. Both only consider a migration cost without taking into account the potential cost associated with working or listing at home market. As the migration cost is typically positive, it is common for the literature to find a positive  $ATE$ . In contrast, we will report a negative estimate of  $ATE$ , suggesting a positive relative cost to the marginal entrepreneur associated with listing in the home market.

Since  $c_i \equiv \tau + d + \delta_i$ , equation (13) also provides a clear prediction for how a particular policy shock or firm characteristic may affect the magnitude of  $ATE$ :

$$\frac{\partial ATE}{\partial \tau} < 0, \quad \frac{\partial ATE}{\partial d} < 0, \quad \text{and} \quad \frac{\partial ATE}{\partial \delta} < 0$$

Either a tighter capital control, a longer IPO review process at home relative to the overseas market, or a stronger subjective preference of holding wealth offshore should translate into a larger valuation discount. We will report results from various difference-in-differences exercises that are consistent with these predictions.

We label the gap in the expected home market valuation between those actually listed overseas and at home as selection bias or SB:

$$\begin{aligned} SB &= E[q_{i0}|t_i = 1] - E[q_{i0}|t_i = 0] \\ &= (\mu_0 + S_0) - \left( \mu_0 - \frac{P}{1-P} S_0 \right) \\ &= \frac{S_0}{1-P} \end{aligned} \quad (15)$$

This means that  $SB$  has the same as  $S_0$ . Therefore,  $SB$  can be used to determine the direction of selection in the home market. Note that researchers can only observe the



group mean difference, which is by definition

$$\begin{aligned}
 GMD &= E[q_{i1}|t_i = 1] - E[q_{i0}|t_i = 0] & (16) \\
 &= (\mu_1 + S_1) - \left( \mu_0 - \frac{P}{1-P} S_0 \right) \\
 &= -c_n + (S_1 - S_0) + \left( \frac{S_0}{1-P} \right) \\
 &= ATET + SB
 \end{aligned}$$

We will empirically estimate and decompose  $GMD$  into items associated with various capital market distortions.

## 4 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) 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 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.

## 4.1 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 caused 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.<sup>7</sup> We added in delisted firms, and use the Chinese Stock Market and

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<sup>7</sup>We only include firms listed on the exchanges. We exclude the firms listed on Over-The-Counter

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 prohibited 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 face foreign ownership restrictions, as they do not have the liberty to choose between domestic and foreign markets 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 2,153 Chinese firms listed in mainland China, 512 in Hong Kong, and 64 in the US markets. These firms in principle can choose where to list.

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as some information is missing for such firms.

## 4.2 Pattern

Table 5 presents the mean, 25th percentile, median and 75th percentile of Tobin's Qs for domestic and overseas-listed Chinese firms 1 to 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 1.91 for the former but only 4.05 for the latter. This suggests a 53% 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 a 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.

# 5 Motives and Valuations of Overseas IPO

## 5.1 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:

$$t_i = 1\{m_i'\alpha + v_i > 0\}, i = 1, \dots, N, \quad (17)$$

where the binary variable  $t_i$  equals 1 if a Chinese firm ( $i$ ) is listed overseas and 0 otherwise.  $m_i$  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:

$$y_{i,k} = x_i' \beta_1 + \theta t_i + \varepsilon_i, i = 1, \dots, N, \quad (18)$$

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,  $\theta$  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

$$Cov(\varepsilon_i, v_i) \neq 0, \quad (19)$$

which renders  $t_i$  endogenous in equation (18). Thus, to identify  $\theta$ , like in Heckman sample selection model, covariates  $w_i$  in equation (17) should include some variables  $z_i$  that are different from  $x_i$  in equation (18), i.e.,  $m_i = (x_i', z_i)'$ . Therefore, equation (18) 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):

$$ATE = E(y_{i1} - y_{i0}) = \theta, i = 1, \dots, N,$$

where  $y_{i1}$  is the market value of an overseas listing firm  $i$ , and  $y_{i0}$  is the market value of a domestic listing firm.

Under the context of this research, 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 counterfactual 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:

$$ATET = E(y_{i1} - y_{i0} | t_i = 1) = E(y_{i1} | t_i = 1) - E(y_{i0} | t_i = 1).$$

$E(y_{i0}|t_i = 1)$  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,  $E(y_{i0}|t_i = 1)$  is observable, and  $ATE$  is the negative AH price premium, or the valuation discount of overseas listed firms. As pointed out by Cameron and Trivedi (2005), the  $ATE$  measure is relevant when we consider the average loss (or willingness-to-pay) for the overseas listed firms from their decision of going IPO abroad in our context. In this simple model,  $ATE = ATE = \theta$ , which can be inferred below, no matter whether treatment is exogenous or endogenous. Linking with our theory model,  $\sigma_0 = \sigma_1 = \sigma$  and  $\rho_{0v} = \rho_{1v} = \rho$  in the simple model, thus,  $S_0 = S_1 = \rho\sigma h$ ,  $SB = \frac{\rho\sigma h}{1-P}$ , and  $GMD = \theta + \frac{\rho\sigma h}{1-P}$ .

When the treatment is randomly assigned,  $ATE = ATE = \theta$  in the simple model (18) 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 (17), (18) and (19).

## 5.2 A General Model

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

$$y_{i0} = x'_i\beta_{10} + \varepsilon_{i0}, \quad (20)$$

$$y_{i1} = x'_i\beta_{11} + \varepsilon_{i1}, \quad (21)$$

where subscript 0 denotes control group with  $t = 0$ , and subscript 1 for treatment group. Different from the simple model (18), in which the only difference between the treatment and control groups lies in the intercept (denoted by  $\theta$ ), the slopes  $\beta_{10}, \beta_{11}$  vary across the two groups in the general model (20) and (21).

In this general model,

$$\begin{aligned} ATE &= E(y_{i1} - y_{i0}) = E(x'_i\beta_{11} + \varepsilon_{i1} - x'_i\beta_{10} - \varepsilon_{i0}) \\ &= E\{x'_i(\beta_{11} - \beta_{10})\}, \end{aligned} \quad (22)$$

where  $E(\varepsilon_1) = E(\varepsilon_0) = 0$ , regardless endogeneity. In addition,

$$\begin{aligned} ATET &= E(y_{i1} - y_{i0} | t_i = 1) = E(x'_i \beta_{11} + \varepsilon_{i1} - x'_i \beta_{10} - \varepsilon_{i0} | t_i = 1) \\ &= E\{x'_i(\beta_{11} - \beta_{10}) | t_i = 1\} + E(\varepsilon_{i1} - \varepsilon_{i0} | t_i = 1). \end{aligned} \quad (23)$$

In general,  $E(\varepsilon_{i1} - \varepsilon_{i0} | x_i, t_i = 1) \neq 0$ , or  $E(\varepsilon_{i1} - \varepsilon_{i0} | t_i = 1) \neq 0$  when the unobserved factors that determine firm's post-IPO valuation depend on the treatment decision (going IPO overseas). This is the case of endogenous treatment or selection. In the case of exogeneity,  $E(\varepsilon_{i1} - \varepsilon_{i0} | t_i = 1) = 0$ ,  $ATE = E\{x'_i(\beta_{11} - \beta_{10})\}$  and  $ATET = E\{x'_i(\beta_{11} - \beta_{10}) | t_i = 1\}$  can be easily calculated once  $\beta_{11}, \beta_{10}$  are consistently estimated by OLS in (20) and (21).

In the general model, the equations (22) and (23) show that the effects of interest ATE and ATET are not simply the slope parameters.  $E\{x'_i(\beta_{11} - \beta_{10})\}$  and  $E\{x'_i(\beta_{11} - \beta_{10}) | t_i = 1\}$  can be calculated once  $\beta_{11}$  and  $\beta_{10}$ , or the difference  $(\beta_{11} - \beta_{10})$  are consistently estimated. However, the second component  $E(\varepsilon_{i1} - \varepsilon_{i0} | t_i = 1)$  of the ATET in (23) depends on the distributional assumption of errors  $\varepsilon_{i0}$  and  $\varepsilon_{i1}$ . In a special case of the simple model (18) above,  $x'_i(\beta_{11} - \beta_{10}) = \theta$ , and  $\varepsilon_{i1} = \varepsilon_{i0}$  so that  $E\{x'_i(\beta_{11} - \beta_{10}) | t_i = 1\} = E\{x'_i(\beta_{11} - \beta_{10})\} = \theta$  and  $E(\varepsilon_{i1} - \varepsilon_{i0} | t_i = 1) = 0$ . This is why  $ATE = ATET = \theta$  in the simple model.

Due to the firm's endogenous listing location choice, the errors in equations (17), (20), and (21) may be correlated,

$$Cov(\varepsilon_{ij}, v_i) \neq 0, j = 0, 1. \quad (24)$$

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

$$\begin{bmatrix} \sigma_0^2 & \rho'_{01} \sigma'_0 \sigma'_1 & \rho'_{0v} \sigma'_0 \\ \rho'_{01} \sigma'_0 \sigma'_1 & \sigma_1^2 & \rho'_{1v} \sigma'_1 \\ \rho'_{0v} \sigma'_0 & \rho'_{1v} \sigma'_1 & 1 \end{bmatrix}$$

where  $\sigma'_0$  and  $\sigma'_1$  are for subsamples of  $t_i = 0$  and  $t_i = 1$ .  $\rho'_{01}$  is not identified as we never observe a firm listed in the overseas and domestic markets simultaneously. Linking the empirical model with theory model, we have: 1)  $\mu_1 = x'_i \beta_{11}$  and  $\mu_0 = x'_i \beta_{10}$ ; 2)  $-w = (\frac{\mu_1 - \mu_0 + \mu_\varepsilon}{\sigma_v}) = \frac{-m'_i \alpha}{\sigma_v}$ ; and 3)  $v_i = \varepsilon_{i1} - \varepsilon_{i0} + \varepsilon_{ic}$ .

In empirical model,  $\mu_1 = x'_i \beta_{11}$  and  $\mu_0 = x'_i \beta_{10}$  vary for different firm  $i$ . Thus, the empirical  $S_0$  and  $S_1$  has observable component. We denote them as  $S_{0y}$  and  $S_{1y}$

and decompose them into the selection on observables ( $S_{0x}$  and  $S_{1x}$ ) and selection on unobservables ( $S_{0\varepsilon}$  and  $S_{1\varepsilon}$ ). We have  $S_{0y} = S_{0x} + S_{0\varepsilon}$  and  $S_{1y} = S_{1x} + S_{1\varepsilon}$  where

$$\begin{aligned} S_{0x} &= [E(x'_i|t_i = 1) - E(x'_i|t_i = 0)]\beta_{10}(1 - P), \\ S_{1x} &= [E(x'_i|t_i = 1) - E(x'_i|t_i = 0)]\beta_{11}(1 - P), \\ S_{0\varepsilon} &= \frac{\sigma_0\sigma_1}{\sigma_v}[(\rho_{01} - \frac{\sigma_0}{\sigma_1}) + \rho_{0c}\frac{\sigma_c}{\sigma_1}]h, \\ S_{1\varepsilon} &= \frac{\sigma_0\sigma_1}{\sigma_v}[(\frac{\sigma_1}{\sigma_0} - \rho_{01}) + \rho_{1c}\frac{\sigma_c}{\sigma_0}]h \end{aligned}$$

Similarly, the *GMD*, *ATET*, and *SB* can all be decomposed into an observable and an unobservable component.

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

$$\begin{aligned} E(y_{i1} - y_{i0}) &= E\{E(y_{i1} - y_{i0}|x_i, \varepsilon_{i0}, \varepsilon_{i1})\} \\ &= E(x'_i\beta_{11} + \varepsilon_1 - x'_i\beta_{10} - \varepsilon_0) \\ &= E\{x'_i(\beta_{11} - \beta_{10})\} \end{aligned}$$

while the *ATET* is:

$$\begin{aligned} E(y_{i1} - y_{i0}|t_i = 1) &= E\{E(y_{i1} - y_{i0}|x_i, m_i, t_i = 1)\} \\ &= E\{x'_i(\beta_{11} - \beta_{10}) + (\rho'_{1v}\sigma'_1 - \rho'_{0v}\sigma'_0) \phi(m'_i\alpha) / \Phi(m'_i\alpha) | t_i = 1\} \end{aligned}$$

where  $\phi$  and  $\Phi$  are the pdf and cdf of a normal distribution. Same as the Heckman's selection model, the second term  $E\{(\rho'_{1v}\sigma'_1 - \rho'_{0v}\sigma'_0) \phi(m'_i\alpha) / \Phi(m'_i\alpha) | t_i = 1\}$  is the selection effect due to firm's endogenous decision on IPO location. It suggests a non-zero selection effect on ATET even in a special case of  $x'_i(\beta_{11} - \beta_{10}) = \theta$  but with non-identical errors in (20) and (21).

### 5.3 Identification

In our econometric framework, the valuation discount boils down to two parameters of interest: ATE and ATET. In the simple model,  $ATE = ATET = \theta$ . In the simple endogenous treatment effect model consisting of three equations (17), (18) and (19),  $ATE = ATET = \theta$  cannot be consistently estimated by OLS. Under bivariate normal distributional assumption on  $\varepsilon_i$  and  $v_i$ , this model and  $\theta$  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  $\varepsilon_i$  in equation (18) by projecting  $\varepsilon_i$  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

$$E(y_i|t_i, x_i, z_i) = x_i'\beta_1 + \theta t_i + v_i\beta_2. \quad (25)$$

The correlation between  $t_i$  and  $\varepsilon_i$  in equation (18) due to selection of firm's listing location can be controlled by including the additional term  $v_i$ . This suggests that  $(\beta_1, \theta)$  can be consistently estimated by regressing  $y_i$  on  $x_i, t_i$  and  $\hat{v}_i = t_i - \Phi(m_i'\hat{\alpha})$ , which is the residual from the probit regression (17). Efficient CF estimator of  $(\beta_1, \theta)$  can be obtained by the generalized method of moments (GMM) estimation using additional moment restrictions.

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  $\beta_2$ . An important advantage of the CF approach is that it does not require any distributional assumption on  $(\varepsilon_i, v_i)$  such as the 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 the additional identifying variables  $z_i$  in  $v_i$ , parameters  $\beta_1$  in equation (25) 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 (17), (18) can be considered as a two-equation simultaneous equations model. If (17) is considered as a linear probability model, then (17) can be treated as the first-stage regression, and variables  $z_i$  in  $m_i$  in equation (17) can be considered as excluded exogenous variables and thus as instruments for endogenous  $t_i$  in equation (18). In this case, Hausman test for endogeneity is equivalent to the  $F$  test for  $\beta_2 = 0$ . Fourth,  $\theta$  can be consistently estimated by the IV estimation directly in equation (18), and it can also be interpreted as the local average treatment effect (LATE) (Cameron and Trivedi, 2005, p.884). Fifth,  $v_i = t_i - E(t_i|x_i, z_i)$  is different from the error term  $v_i$  in the listing decision equation (17). If (17) is considered as a linear probability model, they are equal.

In the general model of (17), (20) and (21) with heterogeneous responses,  $ATE = E[x'_i(\beta_{11} - \beta_{10})]$ ,  $ATET = E[x'_i(\beta_{11} - \beta_{10})|t_i = 1] + E[\varepsilon_{i1} - \varepsilon_{i0}|t_i = 1]$ . When the treatment is endogenous, the second component of ATET,  $E[\varepsilon_{i1} - \varepsilon_{i0}|t_i = 1] \neq 0$ . In the Heckit method, under multivariate normal distribution,  $E[\varepsilon_{i1} - \varepsilon_{i0}|t_i = 1] = E[(\rho'_{1v}\sigma'_1 - \rho'_{0v}\sigma'_0) \phi(m'_i\alpha) / \Phi(m'_i\alpha) | t_i = 1]$ , parameters  $\beta_{11}, \beta_{10}$  and  $\sigma'_1, \rho'_{1v}, \sigma'_0, \rho'_{0v}$  can be consistently by MLE or Heckit two-step procedure.

Similarly, in the general model of (17), (20) and (21) with heterogeneous responses, the CF approach deals with the selection bias due to the correlation (24) by adding  $v_i = t_i - E(t_i|x_i, z_i)$  as an additional regressor in (20) and (21),

$$y_{ij} = x'_i\beta_{1j} + v_i\beta_{2j} + e_{ij}, \quad j \in \{0, 1\} \quad (26)$$

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

In this general model, the second component of the ATET,  $E(\varepsilon_{i1} - \varepsilon_{i0}|t_i = 1) = E[(\beta_{21} - \beta_{20})v_i|t_i = 1]$ , which is similar to the term  $E[(\rho'_{1v}\sigma'_1 - \rho'_{0v}\sigma'_0) \phi(m'_i\alpha) / \Phi(m'_i\alpha) | t_i = 1]$  in the Heckit/MLE model. The estimated ATE and ATET can be calculated as

$$\begin{aligned} \widehat{ATE} &= \frac{1}{N} \sum_{i=1}^N x'_i (\hat{\beta}_{11} - \hat{\beta}_{10}) \\ \widehat{ATET} &= \frac{1}{\sum_{i=1}^N t_i} \sum_{i=1}^N x'_i (\hat{\beta}_{11} - \hat{\beta}_{10}) t_i + \frac{1}{\sum_{i=1}^N t_i} \sum_{i=1}^N \hat{v}'_i (\hat{\beta}_{21} - \hat{\beta}_{20}) t_i, \end{aligned}$$

where  $\hat{\beta}_{11}, \hat{\beta}_{10}, \hat{\beta}_{21}, \hat{\beta}_{20}$  are the CF (GMM) estimates, and  $\hat{v}_i$  is the residual in the probit regression. Alternatively, IV estimates can be obtained by estimating equation (26) using OLS instead of GMM.

When the multivariate normality assumption fails or the identifying instruments are weak or endogenous, Heckit/MLE and CF or IV estimates could be misleading. In this case, alternative methods assuming selection on the observables (i.e., conditional mean independence) could be considered, including inverse probability weighting and matching estimators (Wooldridge, 2010, chapter 21). We will include the results using these methods as robustness checks.

How to find an identifying or instrumental variable  $z_i$ , which is a predictor of a firm's listing location choice (17) 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 a relative waiting day at the industry level as its identifying variable  $z_i$ . That is to predict how many days, on

average, firms in the same industry will have to wait before IPO approval in overseas and Chinese stock markets respectively. We only observe the waiting days for firms in their listed market. Given characteristics of firm  $i$ , we predict expected waiting days using coefficients from a regression with all observations in the market other than firm  $i$ . For example, the waiting days of Meituan (3690.HK, a Hong Kong listed Chinese firm) if listed in mainland China is predicted using the coefficients from the regression that predicts the number of waiting days for mainland China listed firms. Taking the average of waiting days for firms in the same industry and IPO year, we construct the average waiting days for firm  $i$  one year before its IPO application at the industry level.

The second IV is inspired by general IPO literature, such as 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 industry level 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 conditions.

## 5.4 Empirical Results

We report probit regression results on the determinants of IPO locational choice in Table 6.<sup>8</sup> 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 and foreign ownership percentage (capture incentives to bypass capital controls), and operating cash flow ratio, PE restriction measure and the waiting days for a domestic listing relative to an overseas listing (capture the need for a timely and unrestricted IPO). We see that a higher pre-IPO foreign ownership share (the sum of the ownerships of foreign individuals or entities) or a longer relative waiting days for IPO would significantly raise the chance that the entrepreneur takes her to an overseas stock exchange. Restrictive initial PE ratio regulation, a lower cash flow from operations, or a slower foreign reserve growth would also do the same. These results

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<sup>8</sup>OLS results for Table 6, 7 and 9 are reported in Appendix Table A5 for comparison.

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 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 results at IPO and first trading day indicate 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, Table 7 reports 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 year 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 (3) of table 7, we see that most firm characteristics display the expected sign in explaining determinants of firm value. In particular, smaller firms with a higher ROA, higher sales growth, 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.  $POM_{-}(E[Y_0])$  indicates the "potential outcome mean" of Tobin's Q, if the Chinese firms were listed in mainland China.  $POM_{-}(E[Y_1])$  refers to the "potential outcome mean" of Tobin's Q, if the Chinese firms were listed overseas.  $t = 1$  in the brackets indicates the treated group, overseas listed Chinese firms, 0 otherwise. For example, in the first year after IPO, the value -2.62 indicates a valuation haircut, which is 58% 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 44%, smaller than 58% 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 55%, 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 row 48 in Table 7 shows the selection effects. Across all the columns, we find a positive selection. 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: the firms with higher market valuation prefer to list overseas. The valuation discount is not due to the fact that firms going overseas IPO are inherently worse. The selection effects can be decomposed into selection caused by observable factors and unobservable factors, respectively. The next two rows indicate that the selection caused by observable factors and unobservable factors are always positive. The  $\beta_2$  provides the same message. Those unobserved factors that lead to an overseas listing also tend to lead to a higher market valuation.

The positive selection of unobservable factors in the first year after IPO is small. To further explore the selection effect in the first year post-IPO, we study heterogeneous responses from overseas listed (treated group) and domestically listed Chinese firms (control group). Table 8A 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 characteristics. 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. ATET is our key interest. If all overseas listed firms in our sample were listed in mainland China, their Tobin's Q one year after IPO would be 5.57. As their actual value is 1.91, this leads to an ATET being -3.66. As 3.66 is 66% of 5.57, this suggests an even larger valuation haircut, in contrast to the 58% as we obtained from a simple model of column (3) of Table

7. More importantly, Table 8B reports the selection effect. It shows that selection is significantly positive, whether selection is caused by observables or selection due to unobservables. The last rows of Table 8A report the estimated values for  $\beta_{20}$  and  $\beta_{21}$  in (26), respectively. A positive  $\beta_{20}$  together with a negative  $\beta_{21}$  suggests that those unobserved factors leading to overseas listing contribute to a higher valuation in domestic market but lead to a lower valuation in overseas market. For example, government officials may encourage firms with close connections to list overseas for their private interest. Overseas investors may be concerned that these close ties to government agencies could lead to weak corporate governance or high political risk. However, domestic investors may value this connection as more investment opportunities and fewer regulations. A positive  $\beta_{20}$  together with a negative  $\beta_{21}$  indicates why the correlation in the simple model in the first year after IPO is insignificant. This also explains why the general model produces an even larger valuation discount for overseas listings, compared with the simple model.

Table 9 reports the valuation discount of overseas listing after IPO under the simple endogenous selection model. This discount is estimated to be from 38% to 60%, in their first to fifth years after IPOs, suggesting that the valuation discount is persistent many years after the IPO. The trend in valuation discounts is "V" shaped. The valuation discount in the third year after listing is relatively small. This can be explained by the difference in lock-up period in mainland China and overseas markets. Based on the regulations of Shanghai and Shenzhen stock exchanges, the actual controllers or controlling shareholders have a lock-up period of 36 months. While the lock-up period for controlling shareholders in Hong Kong and US markets is 6 months. Some literature finds that IPO lock-up expiration is usually accompanied by a decline in stock price, an increase in trading volume, and negative abnormal returns (Bradley et al, 2001; Ofek, 2000; Brau et al, 2004; Field & Hanka, 2001). This explains why there is a "V" shape trend in valuation discount one to five years after listing. Table 10 presents the valuation discount under the general model over five years post-IPO. Just as in the simple model, the valuation discount in the general model is also persistent over time and the "V" shape trend is still presented.

## 6 Validity Checks

### 6.1 Internal Validity

From Table 7 of the simple endogenous treatment effect model, we conclude that overseas listings represent a mild positive selection. From Table 8A 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 11 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 the first trading day 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 1.9 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 general 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 Chinese 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 12 reports the results for those AH shares whose H shares were listed during our sample period. We find the valuation discount, in this case, is somewhere between 22-40%, 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 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 51% 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 a 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 13 reports their Tobin's Q one-year before delisting and one-year after relisting. Figure 2 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 66% valuation discount estimated from our generalized endogenous treatment method is not implausibly too large.

## 6.4 The Argentina Case

Capital outflow restrictions also exist in other countries, such as Argentina. By the last quarter of 2001, Argentina's economy was teetering on the edge of a complete collapse. During the period between July and November 2001, more than \$15 billion was withdrawn from banks by Argentines. In an effort to stem further massive capital outflows, Argentina implemented financial market controls on December 3, which included various restrictions, including a \$1,000 monthly withdrawal limit. In January, the Argentine peso was officially devalued. Under the financial market controls, depositors were restricted to withdrawing 250 pesos per week per account but they were still allowed to transfer funds within the banking system. These measures have resulted in the inability of all investors, whether from within or outside the country, to transfer their funds abroad. However, the financial market control does not restrict investors from trading in Argentine securities, including securities cross-listed on other markets.

Auguste et al. (2002) studies cross-border trading under such financial market controls in Argentina. Argentine residents purchase Argentine stock using bank deposits and transfer these stocks to ADRs in the US market if stocks happened to be cross listed in the US. Then, they sold the ADRs in US market and obtain the US dollars in their US account. By doing so, investors move money abroad legally under strict capital outflow controls. The study finds that Argentine ADR discounts exceed 50%, suggesting that Argentine investors were willing to pay a significant amount to legally move their money abroad when capital outflow controls exist. This is comparable to the valuation discounts we find in our paper.

## 7 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.

### 7.1 Tightening of Capital Controls

In response to a sharp decline in China's foreign exchange reserve in 2016, the country tightened controls on capital account restrictions after 2017, 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 as 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 com-

monly 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 3 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 14, 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 0.67.

## 7.2 Exchange Rate Reform

In August 2015, China started its most important exchange rate reform to gradually achieve a two-way floating of the exchange rate. The Public Bank of China announced the Optimization of the Median Price Quotation Mechanism for the RMB-USD exchange rate. On August 11, the median price of the RMB-USD exchange rate depreciated by around 1000 basis points. Since the exchange rate reform, The RMB has been on a depreciating trend for nearly one and a half years. Figure 4 shows the USD to RMB exchange rate from 1994 to 2021. The Chinese government implemented a managed floating exchange rate system based on market supply and demand and adjusted with reference to a basket of currencies after the reform of the exchange rate in

2005. After that, RMB appreciated steadily. The unilateral appreciation of the RMB led to expectations of RMB depreciation against the USD increased significantly in the markets. Then, the RMB began a 2-year-long depreciation in 2015 and 2016.

A firm can observe the exchange rate and the corresponding exchange rate policy to predict exchange rate trends in the near future. When firms realized that RMB was overvalued, they knew the value would fall later. An overseas listing is an available channel for firms and individuals to obtain foreign currency to bypass risks associated with the continued depreciation of the RMB.

The firms that submitted their IPO application in 2015 and 2016 are defined as affected by exchange rate reform (RMB depreciation). As shown in column (2) of Table 14, firms affected by exchange rate reform face higher valuation discounts when listing overseas. They are willing to undertake additional haircuts on Tobin's Q by -1.29 to bypass the risk of the exchange rate.

### **7.3 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 suspension 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.<sup>9</sup>

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.

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<sup>9</sup>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.

It is reasonable to assume that those firms that submitted an IPO application (to any stock exchange) between 2013 and 2014 are affected by the Chinese IPO suspension during 2012-2014. In column (3) of Table 14, 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 -1.68.

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 (4) of Table 14, 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 -0.99.

In column (5) of Table 14, 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 term involving regulation on initial PE is not statistically significant, but still has the expected negative sign.

## **7.4 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 three 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 15, those firms with state

ownership exhibit a smaller valuation discount than those without any state ownership by 26% (0.716/2.787).

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 (2), we indeed see a larger valuation discount for those firms with a higher share of foreign ownership.

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. Firms with high operating risk tend to expose to high risk, therefore have difficulty obtaining funding from banks and mainland China stock markets. In column (3) of Table 15, the valuation discount is higher for more risky firms. The valuation discount is 35% (0.726/2.091) greater for the overseas listed Chinese firms with a higher operating risk.

In the last column of Table 15, 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 14 or 15. We continue to see that a firm 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.

## 8 Extensions and Robustness Checks

### 8.1 Various Samples

In the baseline results, we exclude firms in the Negative list and those unqualified for listing in mainland China markets. Figure 5 shows the sample construction for

the overseas listed Chinese firms in our empirical studies. First, we exclude the firms with missing data such as Luckin Coffee’s failure to disclose information about its financial status due to financial fraud. Then, the dual-listed AH shares and the Hong Kong shares of those cross listed HK-US firms are excluded from our sample, e.g. HTSC(6886). As the mainland markets implemented the most stringent listing requirements, we exclude the firms that do not meet the listing financial requirements for listing in ChiNext on Shenzhen stock exchange. Some biomedical and internet firms, e.g. Pinduoduo(PDD), without positive net profits fall into this category and are excluded from our baseline sample. Last, we exclude the firms in restricted or prohibited industries subject to foreign ownership restrictions, as they lack the freedom to select between domestic and international markets for IPOs. Many well-known firms may be excluded, such as Alibaba(BABA). These firms are investors’ first impressions of overseas listed Chinese firms and are also the most interesting ones.

Industries on the negative list are divided into two categories: restricted or prohibited. Overseas investors are prevented from investing in firms in prohibited industries but are permitted to invest in restricted industries with some foreign ownership restrictions. Firms with foreign ownership restrictions may list overseas by Variable Interest Entity(VIE) structure, which separates the listing subjects from the operational entity. The listed entity controls the operational entity through a series of contracts rather than direct shareholdings to bypass the restrictions on foreign ownership for firms in specific industries. As shown in Figure 6, we have 191 overseas listed firms in industries with foreign ownership restrictions before IPO. Among them, 59 firms belong to prohibited industries. These firms are listed abroad via VIE structure. In addition, there are 72 other firms in restricted industries that have also gone overseas through VIEs.

Excluding these firms from the benchmark makes our sample more comparable, but it is also a loss. These firms are likely to have large market capitalization, with high growth, and attract more interest from investors. Thus, 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. From Table 16, our main findings remain unchanged. The valuation discount becomes larger compared with the benchmark results. The valuation discount even increases as firms that are prohibited from foreign investment and firms that are unable to be listed in A shares market due to financial

requirements fall into our sample. 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. Table 17 shows the results under the general endogenous treatment effect model across samples. The valuation discounts are even larger around 60%. The only difference is the valuation discount has not widened further as "unqualified" firms are included.

## 8.2 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 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 18 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 (-3.01) than Hong Kong (-2.66), and the absolute valuation discount is larger for firms with a VIE (-3.21) than without a VIE (-2.74). 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. The firms listed in US or listed with VIE structure potentially to be highly valued if they were listed in mainland China market.



### 8.3 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 discounts 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 columns (1) to (3), 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.

One may be curious whether the significant valuation discount of overseas-listed Chinese firms are due to our fancy model. Table TA4 shows the results from instrumental variable (IV) regression, exogenous treatment effect model, and the matching approach. In column (2), the valuation discount still exists if we use IV regression. The Hansen J test indicates that our instrument set is appropriate. Columns (3) and (4) of Table TA4 report the results of inverse-probability-weighted regression adjustment (IPWRA) estimator under the treatment effect model. The valuation discount is still exist if we ignore the endogeneity from unobserved factors. Column (5) presents the results using propensity score matching approach.

## 9 Welfare Analysis

### 9.1 Structural Estimation

To quantify the welfare loss due to these capital market distortions, we estimate the structural parameters in our model using the simulated method of moments (SMM). The SMM estimates a set of structural parameters by minimizing the quadratic distance between a set of simulated moments from the theoretical model and the same set of empirical moments from the data. Intuitively, the value of the simulated moments depends on the structural parameters imposed in each round of simulation. Therefore, if the model is well-specified, the distance between the moments is minimized at the optimal estimates of the parameters. A formal technical presentation can be found at Gourieroux and Monfort (1996). This methodology has been employed in the empirical investment and finance literature including Bloom (2009) and Hennessy and Whited (2007).

In our case, the model has 9 structural parameters:  $\mu_0$ ,  $\mu_1$ , and  $\mu_c$ , the population means of the Tobin's Q in the domestic and overseas market ( $q_0$  and  $q_1$ ) and the population mean of the cost arising from capital market distortions ( $c$ );  $\sigma_0$ ,  $\sigma_1$ , and  $\sigma_c$ , the standard deviation of the  $\varepsilon_0$ ,  $\varepsilon_1$ , and  $\varepsilon_c$ ; together with  $\rho_{01}$ ,  $\rho_{0c}$ , and  $\rho_{1c}$ , the pairwise correlation coefficients between  $\varepsilon_0$ ,  $\varepsilon_1$ , and  $\varepsilon_c$ ; where  $\varepsilon_0$ ,  $\varepsilon_1$ , and  $\varepsilon_c$  are firm-specific random draws in valuation and cost. Our empirical exercises from the endogenous treatment effect model provides 9 moments that are informative for these 9 parameters. They

are the population mean of the valuation in domestic and overseas market, predicted as the potential outcome  $E(y_{0i})$  and  $E(y_{1i})$ , the probability of going overseas IPO in our final sample,  $P(t_i = 1)$ ; the first and second moment of the residuals from the valuation equation for the control and treatment groups  $E(\varepsilon_{0i}|t_i = 0)$ ,  $E(\varepsilon_{1i}|t_i = 1)$ ,  $sd(\varepsilon_{0i}|t_i = 0)$ , and  $sd(\varepsilon_{1i}|t_i = 1)$ , together with the correlation coefficients between the residuals from the probit model and the valuation equations  $corr(v_i, \varepsilon_{0i}|t_i = 0)$  and  $corr(v_i, \varepsilon_{1i}|t_i = 1)$ .

Table 19 presents the SMM estimation results. The left panel lists the estimates for the structural parameters and their standard errors. The right panel reports the data moments and the simulated moments. Overall the model is able to fit the data moments closely. As this is an exactly identified model, we also compare two untargeted moments – the subsample mean of market valuation in the domestic market and overseas market. Different from the 9 targeted moments, which are estimated from the endogenous treatment effect model, these two untargeted moments are directly observed from data. As shown in Table 19, simulating our model at the structural estimates reported in the left panel generates the salient feature of the substantial valuation gap between the domestic and overseas listed Chinese firms, which fundamentally motivates for this research.

The estimates for the structural parameters all have important economic implications. First,  $\mu_0$  is estimated to be significantly higher than  $\mu_1$ . In our willing-to-pay approach, entrepreneurs take the potential market valuations in the home and overseas markets as given, and our estimates find that on average the valuation is higher in the home market than the overseas market. Second, we find  $\mu_c$  to be positive and statistically significant indicating the significant distortions in the home market in the minds of entrepreneurs. On average, to make initial public offering for every 1 dollar of capital, an entrepreneur has paid 32 cents due to capital market distortions. Third, the estimates for three standard deviations  $\sigma_0$ ,  $\sigma_1$ , and  $\sigma_c$  suggest three things. First, there is a substantial heterogeneity in valuation with either the home or overseas markets. Second, the dispersion is greater for the valuation in the overseas market. Third, the dispersion in the distortion cost is even larger than either of the market valuations. According to the probability of an overseas IPO (7), it highlights the importance of hidden cost in driving the overseas listing decision.

The relative magnitude of  $\sigma_0$ ,  $\sigma_1$ , and  $\sigma_c$  also has important implications on the self-selection, together with the estimates on  $\rho_{01}$ ,  $\rho_{0c}$ , and  $\rho_{1c}$ . We cannot formally

reject the null hypothesis that  $\rho_{01} = 0$ . In other words, the correlation between the unobservables in the valuation in the two market is insignificant. In contrast,  $\rho_{0c}$  and  $\rho_{1c}$  are significantly positive and negative, respectively. Since  $\sigma_c$  is larger than  $\sigma_0$  and  $\sigma_1$ , this explains why we have obtained  $S_{0\epsilon} > 0$  and  $S_{1\epsilon} < 0$  in our empirical exercises, according to (10) and (11). All else being equal, those firms facing higher distortion costs at home (e.g., with higher  $\delta_i$ ) are more likely to list overseas. However, since there is a positive correlation between the unobservables in valuation in domestic market and the unobservables in cost ( $\rho_{0c} > 0$ ) and a negative correlation between the unobservables in valuation in overseas market and the unobservables in cost ( $\rho_{1c} < 0$ ), those who finally choose to list overseas are on average selected from the right half in domestic market in terms of Tobin's Q but end up in the left half of the overseas market.

In summary, the structural estimation backs out the primitive parameters of our theoretical model. Going overseas IPO even under a valuation haircut is a seemingly puzzling stock market anomaly. However, this anomaly turns out to be an optimal choice of entrepreneurs, once taking into account the existence of hidden cost and the potential correlation between the cost and valuation.

## 9.2 Counterfactual Simulation

With the estimated structural parameters, we can use our model in Section 3 to assess the welfare effect of capital market distortions and to perform counterfactual thought experiments. In particular, the cost parameter  $c$  would be our central focus (while we hold other parameters constant). The results are presented in Table 20A.

Recall that we model  $c_i = \tau + d + \delta_i$  and we estimate  $c_i = \mu_c + \varepsilon_{ic}$ , where  $\mu_c = 0.32$  and  $\sigma_c^2 \sim N(0, 1.17^2)$ . One way to interpret  $c$  is to take  $\mu_c = \tau + d$ , as policy distortions that are common to all entrepreneurs; and  $\varepsilon_{ic} = \delta_i$  as an idiosyncratic factor due to subjective preference for holding one's wealth offshore. Furthermore, recall that  $d = r(T_0 - T_1)$ . In the data, the average IPO waiting period for domestic listing in our sample is 16 months, together with a 2-year lockup period, we have a value for  $T_0 = 3.33$ . For overseas listing, the average IPO waiting period is 6 months, together with a 9-month lockup period, we assign a value  $T_1 = 1.25$ . If the discount rate is  $r = 5\%$ , the cost due to regulations in the IPO system will suggest  $d = 0.10$ . Since  $\mu_c = 0.32$ , this implies  $\tau = 0.22$ . In other words, there is a 22% transaction cost to convert RMBs to US dollars. With these estimates, the simulated probability of

overseas listing is 0.232 and the expected utility of a representative entrepreneur is 1.21.

Policy reforms can be performed by altering the value of some model parameters. If China streamline its IPO approval/review process, and harmonize the post-IPO lock-up period to the international form, the post-reform  $T_0 = T_1 = 1.25$ . This reform would reduce the probability of overseas listing to 0.188 and raise the expected utility of the representative entrepreneur by 6.8% (from 1.21 to 1.29, or a 6.8%). While some of the entrepreneurs whose firms are currently listed overseas gain from the reform by switching to list their firms at home, all entrepreneurs with actual domestic IPOs benefit from this reform.

If China were to remove the binding capital controls so that capital  $\tau = 0$ , there would be a 14.6% gain in the entrepreneurs' welfare. If both reforms are implemented, the overseas listing probability will reduce to 0.115 and the gain in entrepreneurial welfare reaches 22.1%. Alternatively, since the utility under no capital market distortions would be 1.48 and the actual utility is 1.21, the welfare loss facing a representative entrepreneur due to capital market distortions is  $(1.21-1.48)/1.48 = 18.1\%$ .

Counterfactuals associated with an increase in  $c$  is also informative. First, if either the Chinese authorities ban overseas listing, or overseas authorities ban Chinese firms on their stock exchanges, how much would this affect entrepreneurial welfare? Suppose we raise  $T_1$  to 30, there would be no more overseas listing and the entrepreneur suffers a 7.8% welfare loss. As a second thought experiment, consider a complete capital control,  $\tau = 1$ . In this case, 65% of the entrepreneurs would choose overseas IPOs, even with a large haircut in firm valuations. Under this scenario, a representative entrepreneur faces a substantial welfare loss of 36.7%.

Finally, it is also interesting to separate welfare loss of those currently listed at home versus abroad. Table 20B reports such an anatomy. Under the ideal scenario when  $\mu_c = 0$ , only 11.5% of the entrepreneurs in our sample would still choose to go overseas listing. Those are entrepreneurs who happen to have such a large random draw on  $\delta_i$  that home market reform does not change their choice and affect their welfare. However, there are 11.6% of the entrepreneurs in our sample who would list at home and have an average utility of 0.610 if  $\mu_c = 0$ , in fact switch to overseas IPO due to  $\mu_c = 0.32$ . Their factual average utility decreases to 0.436, which is equivalent to a 28.5% welfare loss. The most interesting group is those 76.8% of entrepreneurs, who would list at home if  $\mu_c = 0$  and also currently list at home at  $\mu_c = 0.32$ .

Although there seems no change in their listing locational choice, their average utility has decreased from 1.784 to 1.462, or a 18.0% welfare loss due to capital market distortions. Since the total welfare loss comes from those who switch and from those who currently list at home, with the proportion of each category of such entrepreneurs and the average welfare loss in each category, we find the switchers and the home listers contribute 19.3% and 80.7% respectively in the total welfare loss.

## 10 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, significant, and persistent valuation discount (about 50% - 60%) facing overseas listed Chinese firms. This suggests that 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.

With estimation of the structural model, we show that the combination of IPO regulations and capital controls reduces the entrepreneurial welfare by 18.1%. Interestingly, even though our estimation leverages the observation that a portion of the entrepreneurs in the data have chosen an overseas IPOs, about 80% the welfare loss are accrued to the group of entrepreneurs that have stayed in the domestic capital market. That is because they have to endure the longer IPO review process and the longer lockup period, and there are more of them than those with an overseas IPOs.

With the estimates of the structural parameters, we show that reforming the IPO process and removing capital controls can both raise the welfare of the entrepreneurs (by 6.8% and 14.6%, respectively). On the other hands, making it harder to do overseas listing (such as through the actions of either overseas or domestic authorities), or tightening capital controls could substantially reduce the welfare of the entrepreneurs. These 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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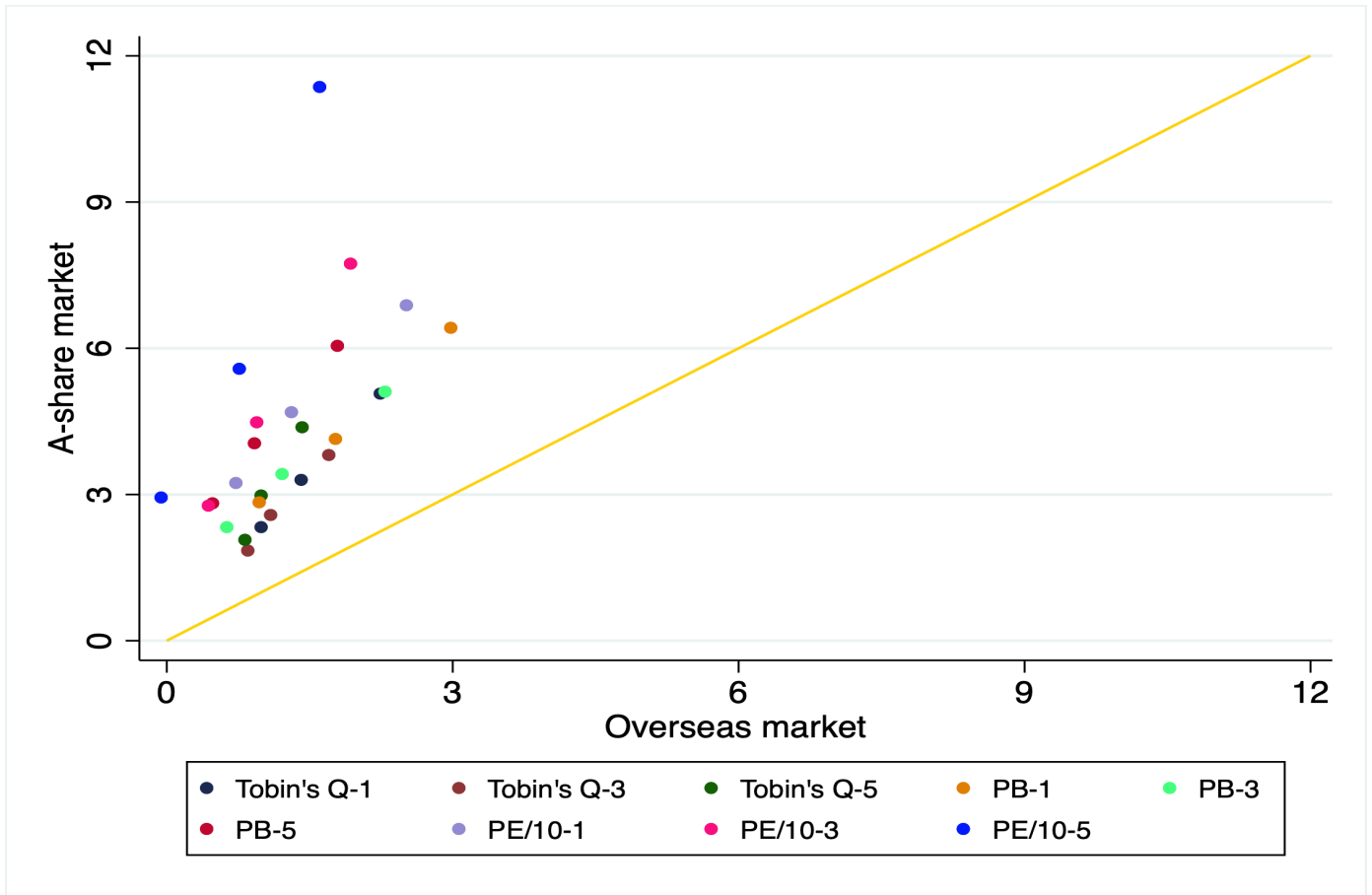
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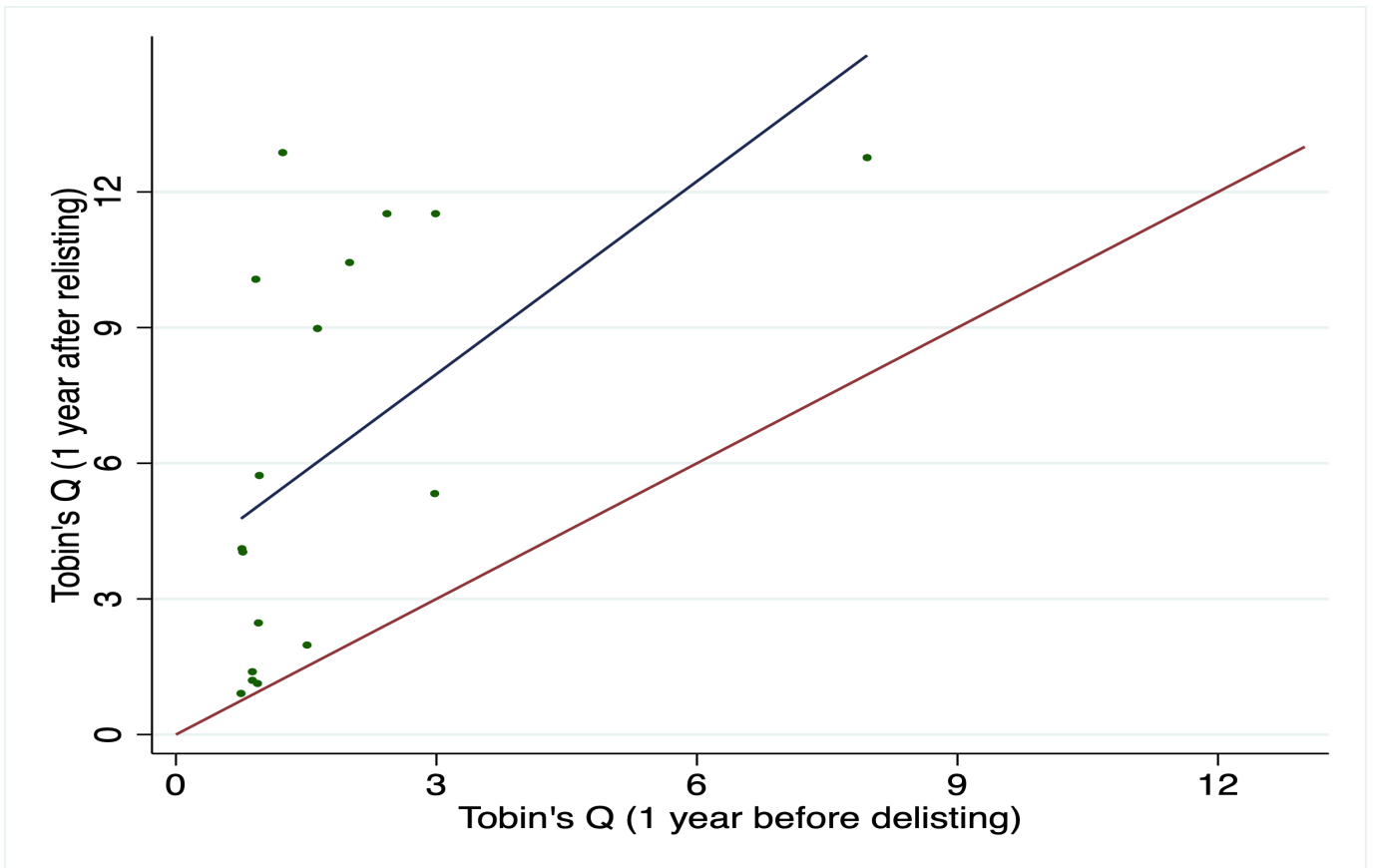
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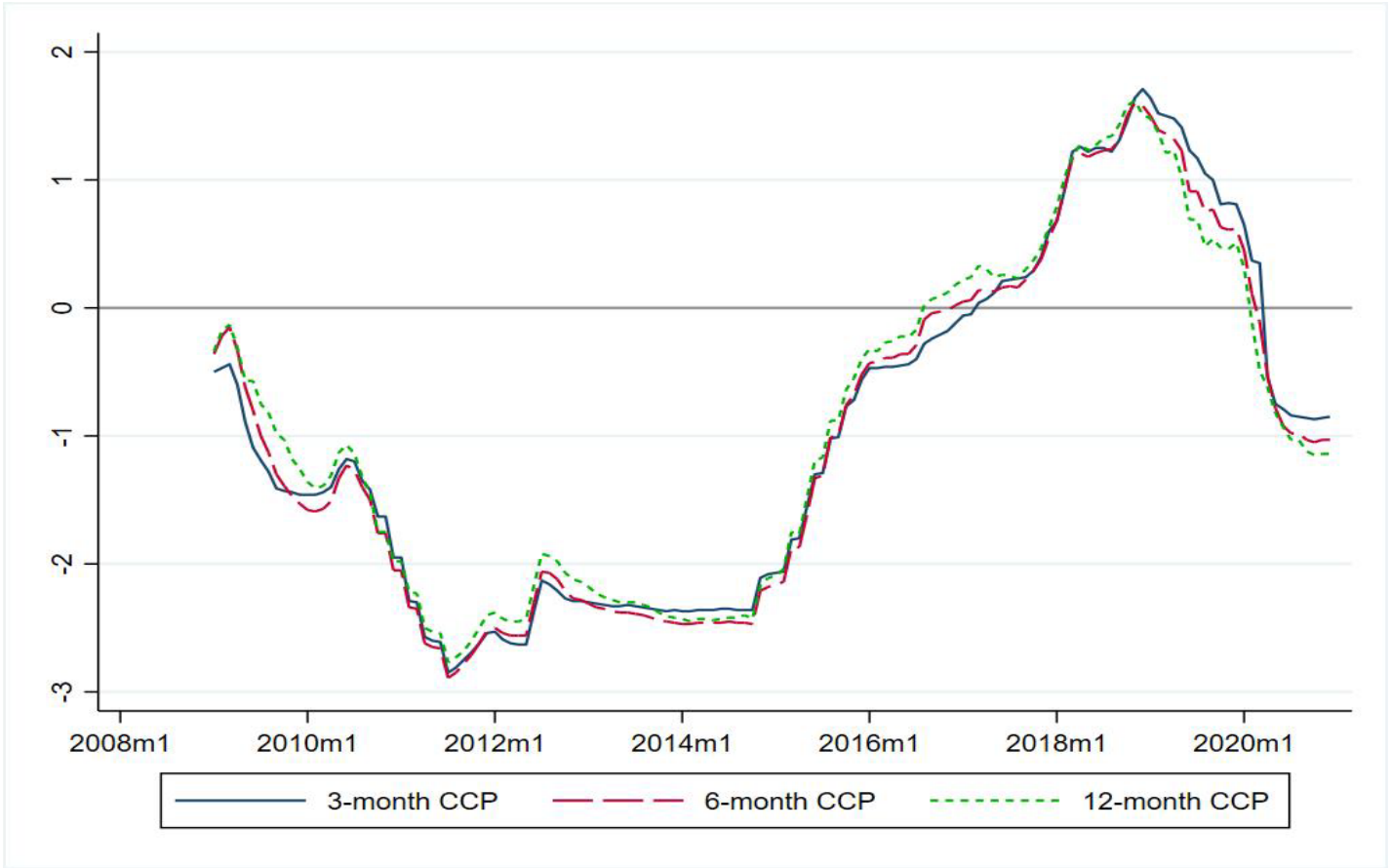
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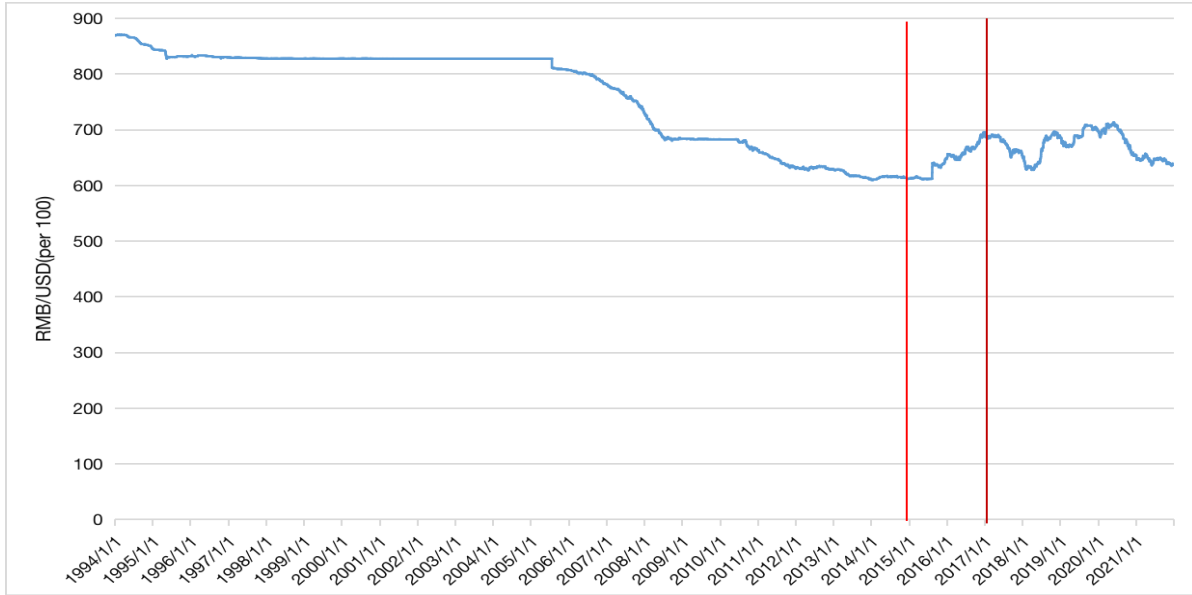
**Figure 1: Comparison of Market Valuation of Chinese Firms in A-share and Overseas Markets**



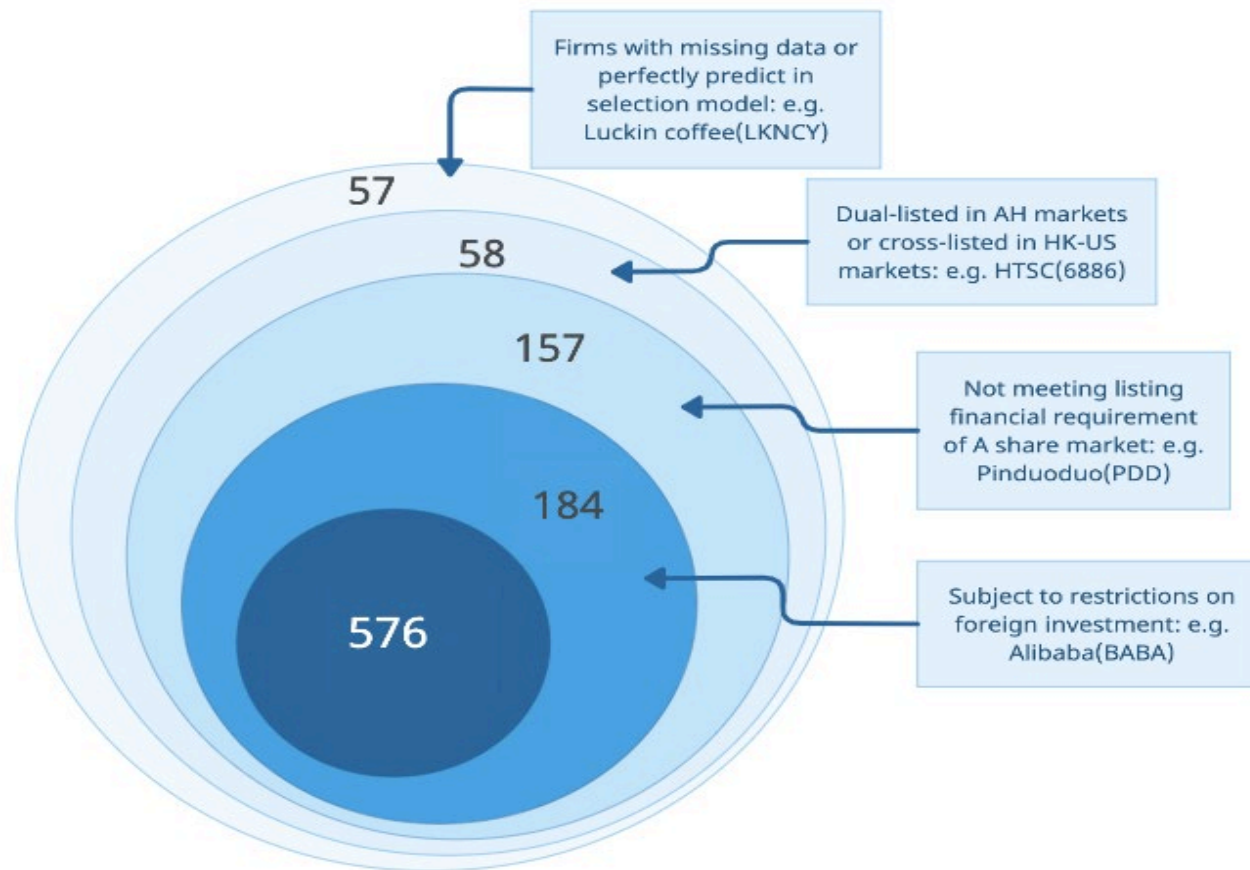
**Figure 2: Market valuation of delisted and relisted Chinese firms**



**Figure 3: Capital Control Premium (CCP)**

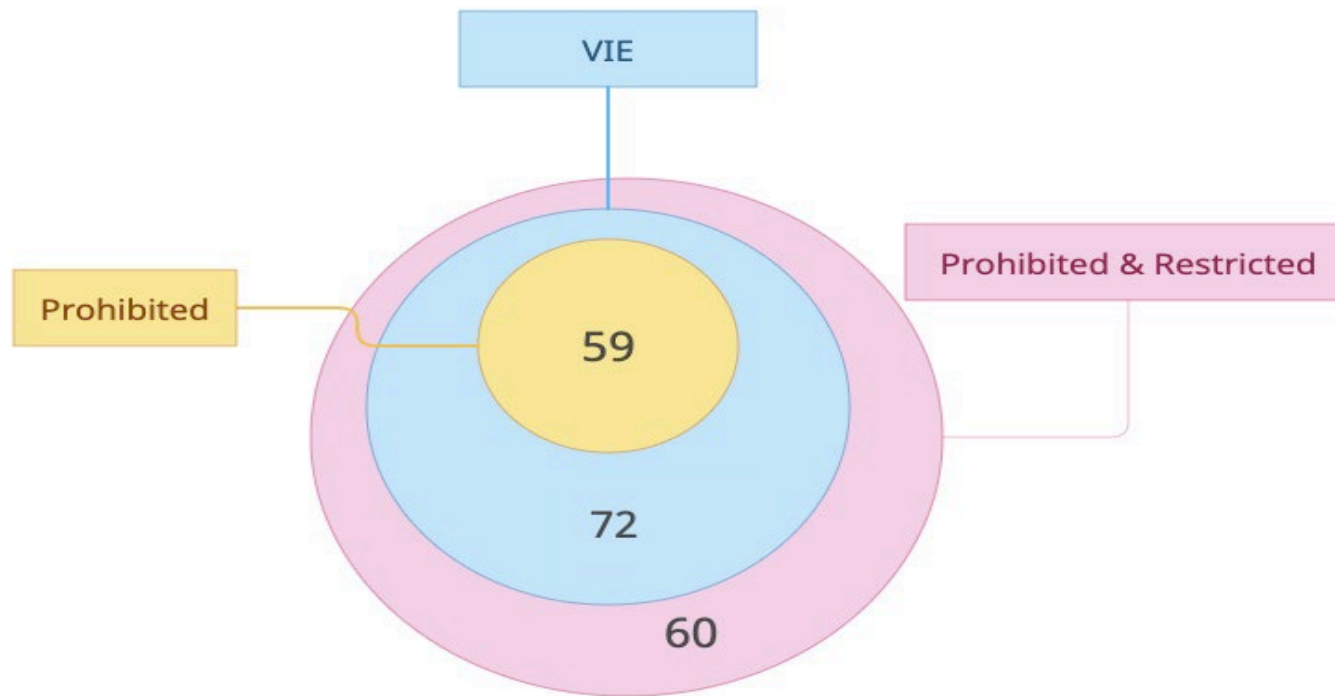


**Figure 4: Exchange rate of USD to RMB**



**Figure 5: Sample construction for overseas listed Chinese firms**





**Figure 6: VIE structure and foreign ownership restrictions**

**Table 1: Variable List and Data Sources**

| Variable                       | Definition  | Sources                                      |
|--------------------------------|---|--|
| Tobin's Q                      | $(\text{market value of equity} + \text{book value of total assets} - \text{book value of equity}) / \text{the book value of assets}$   | 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 (%)                        | $\text{Earnings before interest and tax} \times 2 / (\text{total assets at the beginning of the period} + \text{total assets at the end of the period}) \times 100 (\%)$  | Wind   |
| Sales growth rate (%)          | $\text{Growth rate of total sales} \times 100 (\%)$   | Wind   |
| Leverage (%)                   | $\text{Book value of total liabilities} / \text{book value of total assets} \times 100 (\%)$  | 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 (%)    | $(\text{imports}/\text{revenue} + \text{foreign sales}/\text{revenue}) \times 100$ . 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 China'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      | $\text{Operating cash flow}/\text{total assets} \times 100 (\%)$  | Wind   |
| PE regulation                  | PE regulation=Max(median PE ratio in HK among those firms in the same industry, median PE ratio US among those firms in the same industry)*<br>Dummy for IPO dates between 31 March 2014 and 30 June 2020   | Wind   |
| Expected relative waiting days | Average waiting days of those firms in the same industry when listed in Mainland China 1-year before IPO application date / Average waiting days of those firms in the same industry when listed overseas 1-year before IPO application date  | Wind   |
| Log(relative market index)     | $\text{Log}(\text{Overseas market index 12-month before IPO application date} / \text{Mainland market index 12-month before IPO application date})$   | 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                        | 2,153 | 4.05  | 2.58  | 1.01   | 2.32  | 3.29  | 5.05  | 15.95  |
| Age                              | 2,153 | 14.01 | 6.03  | 2      | 10    | 13    | 17    | 64     |
| Log(total asset)                 | 2,153 | 20.99 | 1.00  | 19.35  | 20.38 | 20.79 | 21.36 | 27.98  |
| ROA (%)                          | 2,153 | 11.63 | 5.16  | -0.34  | 8.19  | 10.88 | 14.27 | 44.10  |
| Sales growth rate (%)            | 2,153 | 18.81 | 24.72 | -49.85 | 4.40  | 15.74 | 29.73 | 188.92 |
| Leverage (%)                     | 2,153 | 26.08 | 17.17 | 4.87   | 12.71 | 22.33 | 35.26 | 93.46  |
| Intangible asset ratio (%)       | 2,153 | 11.61 | 9.29  | 0.48   | 5.84  | 9.39  | 14.01 | 83.28  |
| State ownership percentage (%)   | 2,153 | 8.39  | 22.39 | 0      | 0     | 0     | 0     | 100    |
| Independent director ratio (%)   | 2,153 | 37.18 | 5.03  | 33.33  | 33.33 | 33.33 | 42.86 | 80     |
| Chairmen=CEO                     | 2,153 | 0.50  | 0.50  | 0.00   | 0.00  | 1.00  | 1.00  | 1.00   |
| Top5 ownership percentage (%)    | 2,153 | 84.73 | 14.59 | 14.13  | 76.72 | 88.51 | 96.34 | 100    |
| Controlling shareholder dummy    | 2,153 | 0.46  | 0.50  | 0      | 0     | 0     | 1     | 1      |
| Import and export rate (%)       | 2,153 | 26.58 | 28.17 | 0.80   | 6.32  | 13.61 | 38.26 | 132.46 |
| Stratigic investor dummy         | 2,153 | 0.05  | 0.22  | 0      | 0     | 0     | 0     | 1      |
| Foreign reserve growth rate (%)  | 2,153 | 7.94  | 14.18 | -13.35 | -5.56 | 8.56  | 18.68 | 42.32  |
| Foreign ownership percentage (%) | 2,153 | 10.72 | 23.47 | 0      | 0     | 0     | 2.75  | 100    |
| Operating cash flow ratio(%)     | 2,153 | 11.85 | 9.10  | -17.28 | 5.96  | 11.13 | 17.05 | 36.69  |
| PE regulation                    | 2,153 | 8.98  | 8.11  | 0      | 0     | 11.84 | 16.49 | 25.02  |
| Expected relative waiting days   | 2,153 | 2.47  | 1.24  | 0.78   | 1.56  | 2.11  | 3.04  | 8.21   |
| Log(relative market index)       | 2,153 | 0.12  | 0.28  | -0.41  | -0.12 | 0.11  | 0.32  | 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                        | 512 | 1.91  | 1.53  | 0.47   | 1.00  | 1.43  | 2.22  | 11.24  |
| Age                              | 512 | 16.76 | 10.14 | 2      | 11    | 15    | 20    | 68     |
| Log(total asset)                 | 512 | 21.22 | 1.69  | 17.63  | 20.11 | 20.99 | 22.12 | 27.29  |
| ROA (%)                          | 512 | 13.59 | 10.11 | -72.73 | 7.76  | 12.07 | 18.44 | 51.22  |
| Sales growth rate (%)            | 512 | 28.20 | 51.74 | -73.86 | 3.97  | 20.54 | 38.84 | 496.18 |
| Leverage (%)                     | 512 | 41.10 | 22.04 | 5.75   | 23.56 | 38.40 | 56.90 | 102.70 |
| Intangible asset ratio (%)       | 512 | 13.28 | 15.36 | 0.48   | 3.25  | 8.40  | 16.44 | 83.28  |
| State ownership percentage (%)   | 512 | 9.53  | 27.18 | 0      | 0     | 0     | 0     | 100.01 |
| Independent director ratio (%)   | 512 | 42.87 | 10.85 | 23.08  | 33.33 | 42.86 | 50    | 100    |
| Chairmen=CEO                     | 512 | 0.57  | 0.50  | 0      | 0     | 1     | 1     | 1      |
| Top5 ownership percentage (%)    | 512 | 95.45 | 10.52 | 25.53  | 96.64 | 100   | 100   | 100    |
| Controlling shareholder dummy    | 512 | 0.76  | 0.43  | 0.00   | 1.00  | 1.00  | 1.00  | 1.00   |
| Import and export rate (%)       | 512 | 22.18 | 31.05 | 0.80   | 2.42  | 7.33  | 27.31 | 132.46 |
| Stratigic investor dummy         | 512 | 0.19  | 0.39  | 0      | 0     | 0     | 0     | 1      |
| Foreign reserve growth rate (%)  | 512 | 6.55  | 11.14 | -13.35 | -2.00 | 4.63  | 15.63 | 32.92  |
| Foreign ownership percentage (%) | 512 | 35.65 | 41.87 | 0      | 0     | 10.73 | 89.50 | 100    |
| Operating cash flow ratio(%)     | 512 | 10.32 | 13.59 | -39.21 | 2.39  | 9.62  | 17.31 | 44.45  |
| PE regulation                    | 512 | 9.72  | 10.19 | 0      | 0     | 11.57 | 17.17 | 78.80  |
| Expected relative waiting days   | 512 | 3.54  | 1.58  | 1.03   | 2.54  | 3.27  | 3.75  | 8.27   |
| Log(relative market index)       | 512 | 0.19  | 0.38  | -2.15  | 0.15  | 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                        | 64 | 1.89  | 4.07  | 0.18   | 0.56  | 0.96  | 1.85  | 32.49  |
| Age                              | 64 | 12.25 | 7.42  | 2      | 6.5   | 11.5  | 16    | 40     |
| Log(total asset)                 | 64 | 20.37 | 0.99  | 17.63  | 19.83 | 20.45 | 20.77 | 23.40  |
| ROA (%)                          | 64 | 17.38 | 19.72 | -84.75 | 12.89 | 18.30 | 28.34 | 44.73  |
| Sales growth rate (%)            | 64 | 34.32 | 41.58 | -57.18 | 11.52 | 28.29 | 53.77 | 196.89 |
| Leverage (%)                     | 64 | 31.47 | 19.94 | 4.69   | 13.62 | 30.15 | 43.75 | 84.26  |
| Intangible asset ratio (%)       | 64 | 14.38 | 16.95 | 1.31   | 3.77  | 8.70  | 18.51 | 83.28  |
| State ownership percentage (%)   | 64 | 0.11  | 0.92  | 0      | 0     | 0     | 0     | 7.32   |
| Independent director ratio (%)   | 64 | 55.97 | 16.03 | 0      | 50    | 60    | 60    | 100    |
| Chairmen=CEO                     | 64 | 0.77  | 0.43  | 0      | 1     | 1     | 1     | 1      |
| Top5 ownership percentage (%)    | 64 | 73.37 | 21.65 | 13.70  | 56.95 | 75.95 | 93.23 | 100    |
| Controlling shareholder dummy    | 64 | 0.44  | 0.50  | 0      | 0     | 0     | 1     | 1      |
| Import and export rate (%)       | 64 | 26.62 | 31.14 | 0.96   | 4.43  | 13.55 | 32.89 | 132.46 |
| Stratigic investor dummy         | 64 | 0.03  | 0.18  | 0      | 0     | 0     | 0     | 1      |
| Foreign reserve growth rate (%)  | 64 | 20.96 | 16.73 | -11.42 | 8.71  | 23.92 | 33.48 | 51.71  |
| Foreign ownership percentage (%) | 64 | 29.30 | 34.46 | 0      | 0     | 14.33 | 46.59 | 100    |
| Operating cash flow ratio(%)     | 64 | 13.11 | 15.96 | -40.53 | 0.73  | 13.53 | 24.90 | 55.25  |
| PE regulation                    | 64 | 3.96  | 6.95  | 0      | 0     | 0     | 6.91  | 22.93  |
| Expected relative waiting days   | 64 | 2.06  | 2.03  | 0.64   | 0.65  | 1.35  | 2.46  | 8.27   |
| Log(relative market index)       | 64 | 0.35  | 0.46  | -0.15  | -0.02 | 0.13  | 0.79  | 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 |          | 2nd Year |          | 3rd Year |          | 4th Year |          | 5th Year |          |
|--------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|              | Mainland | Overseas | Mainland | Overseas | Mainland | Overseas | Mainland | Overseas | Mainland | Overseas |
| Mean         | 4.05     | 1.91     | 3.23     | 1.75     | 3.25     | 1.53     | 3.44     | 1.45     | 3.63     | 1.38     |
| p25          | 2.32     | 0.98     | 1.87     | 0.88     | 1.84     | 0.84     | 1.88     | 0.82     | 2.10     | 0.79     |
| p50          | 3.29     | 1.41     | 2.62     | 1.16     | 2.58     | 1.09     | 2.68     | 1.07     | 3.00     | 0.98     |
| p75          | 5.05     | 2.22     | 4.00     | 1.85     | 3.83     | 1.70     | 4.13     | 1.59     | 4.43     | 1.47     |
| No. of firms | 2,153    | 576      | 1,963    | 492      | 1,864    | 414      | 1,431    | 356      | 1,202    | 315      |

**Table 6: Determinants of Overseas Listings**

| Dependent Variables              | Overseas listing     |                        |              |                      |                         |              |                      |                          |              |
|----------------------------------|----------------------|------------------------|--------------|----------------------|-------------------------|--------------|----------------------|--------------------------|--------------|
|                                  | (1)                  | (2)                    | (3)          | (4)                  | (5)                     | (6)          | (7)                  | (8)                      | (9)          |
|                                  | Coeff                | <u>At IPO</u><br>dy/dx | dy/dx * S.D. | Coeff                | <u>1st Day</u><br>dy/dx | dy/dx * S.D. | Coeff                | <u>1st Year</u><br>dy/dx | dy/dx * S.D. |
| Age                              | 0.029***<br>(0.006)  | 0.003***<br>(0.001)    | 3.49%        | 0.029***<br>(0.006)  | 0.003***<br>(0.001)     | 3.49%        | 0.034***<br>(0.006)  | 0.004***<br>(0.001)      | 4.29%        |
| Log(total asset)                 | -0.168***<br>(0.049) | -0.020***<br>(0.006)   | -3.46%       | -0.168***<br>(0.049) | -0.020***<br>(0.006)    | -3.46%       | -0.154***<br>(0.046) | -0.020***<br>(0.006)     | -3.33%       |
| ROA(%)                           | 0.039***<br>(0.007)  | 0.005***<br>(0.001)    | 5.59%        | 0.039***<br>(0.007)  | 0.005***<br>(0.001)     | 5.59%        | 0.036***<br>(0.006)  | 0.005***<br>(0.001)      | 5.68%        |
| Sales growth rate (%)            | 0.007***<br>(0.001)  | 0.001***<br>(0.000)    | 4.20%        | 0.007***<br>(0.001)  | 0.001***<br>(0.000)     | 4.20%        | 0.007***<br>(0.001)  | 0.001***<br>(0.000)      | 4.86%        |
| Leverage (%)                     | 0.027***<br>(0.003)  | 0.003***<br>(0.000)    | 6.78%        | 0.027***<br>(0.003)  | 0.003***<br>(0.000)     | 6.78%        | 0.023***<br>(0.003)  | 0.003***<br>(0.000)      | 6.44%        |
| Intangible assets ratio (%)      | 0.011***<br>(0.004)  | 0.001***<br>(0.001)    | 2.06%        | 0.011***<br>(0.004)  | 0.001***<br>(0.001)     | 2.06%        | 0.014***<br>(0.004)  | 0.002***<br>(0.001)      | 2.75%        |
| State ownership percentage (%)   | 0.004*<br>(0.002)    | 0.000*<br>(0.000)      | 1.16%        | 0.004*<br>(0.002)    | 0.000*<br>(0.000)       | 1.16%        | 0.003<br>(0.002)     | 0.000<br>(0.000)         | 0.94%        |
| Independent director ratio (%)   | 0.069***<br>(0.008)  | 0.008***<br>(0.001)    | 9.29%        | 0.069***<br>(0.008)  | 0.008***<br>(0.001)     | 9.29%        | 0.071***<br>(0.008)  | 0.009***<br>(0.001)      | 11.11%       |
| CEO=Chairman                     | 0.311***<br>(0.086)  | 0.037***<br>(0.010)    | 1.82%        | 0.311***<br>(0.086)  | 0.037***<br>(0.010)     | 1.82%        | 0.315***<br>(0.084)  | 0.040***<br>(0.011)      | 1.98%        |
| Top5 ownership percentage (%)    | 0.016***<br>(0.005)  | 0.002***<br>(0.001)    | 2.25%        | 0.016***<br>(0.005)  | 0.002***<br>(0.001)     | 2.25%        | 0.007*<br>(0.004)    | 0.001*<br>(0.001)        | 1.24%        |
| Controlling shareholders dummy   | 0.260***<br>(0.097)  | 0.031***<br>(0.011)    | 1.34%        | 0.260***<br>(0.097)  | 0.031***<br>(0.011)     | 1.34%        | 0.329***<br>(0.095)  | 0.042***<br>(0.012)      | 1.89%        |
| Import and export ratio (%)      | -0.002<br>(0.001)    | -0.000<br>(0.000)      | -0.56%       | -0.002<br>(0.001)    | -0.000<br>(0.000)       | -0.56%       | -0.001<br>(0.001)    | -0.000<br>(0.000)        | -0.50%       |
| Strategic investor dummy         | 0.732***<br>(0.127)  | 0.087***<br>(0.015)    | 3.31%        | 0.732***<br>(0.127)  | 0.087***<br>(0.015)     | 3.31%        | 0.693***<br>(0.122)  | 0.089***<br>(0.015)      | 3.34%        |
| Foreign reserve growth rate (%)  | -0.026***<br>(0.008) | -0.003***<br>(0.001)   | -3.46%       | -0.026***<br>(0.008) | -0.003***<br>(0.001)    | -3.46%       | -0.011<br>(0.008)    | -0.001<br>(0.001)        | -1.80%       |
| Foreign ownership percentage (%) | 0.011***<br>(0.001)  | 0.001***<br>(0.000)    | 5.25%        | 0.011***<br>(0.001)  | 0.001***<br>(0.000)     | 5.25%        | 0.011***<br>(0.001)  | 0.001***<br>(0.000)      | 6.03%        |
| Operating cash flow ratio(%)     | -0.024***<br>(0.005) | -0.003***<br>(0.001)   | -4.00%       | -0.024***<br>(0.005) | -0.003***<br>(0.001)    | -4.00%       | -0.026***<br>(0.005) | -0.003***<br>(0.001)     | -4.59%       |
| PE regulation                    | 0.023*<br>(0.013)    | 0.003*<br>(0.001)      | 2.73%        | 0.023*<br>(0.013)    | 0.003*<br>(0.001)       | 2.73%        | 0.022*<br>(0.012)    | 0.003*<br>(0.002)        | 2.77%        |
| Expected relative waiting days   | 0.384***<br>(0.043)  | 0.046***<br>(0.005)    | 7.39%        | 0.384***<br>(0.043)  | 0.046***<br>(0.005)     | 7.39%        | 0.350***<br>(0.040)  | 0.045***<br>(0.005)      | 7.61%        |
| Log(relative market index)       | 0.320***<br>(0.099)  | 0.038***<br>(0.012)    | 2.08%        | 0.320***<br>(0.099)  | 0.038***<br>(0.012)     | 2.08%        | 0.409***<br>(0.101)  | 0.052***<br>(0.013)      | 2.79%        |
| Industry                         | YES                  | YES                    |              | YES                  | YES                     |              | YES                  | YES                      |              |
| Year                             | YES                  | YES                    |              | YES                  | YES                     |              | YES                  | YES                      |              |
| Province GDP per capita          | YES                  | YES                    |              | YES                  | YES                     |              | YES                  | YES                      |              |
| No. of Obs.                      | 2,675                | 2,675                  |              | 2,675                | 2,675                   |              | 2,729                | 2,729                    |              |

Notes:

1. Columns (1), (4), and (7) reports the Probit results.
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)                  |
| Variables                        | At IPO               | 1st Day              | 1st Year             |
| Age                              | -0.002<br>(0.007)    | -0.009<br>(0.011)    | -0.006<br>(0.007)    |
| Log(total asset)                 | -0.383***<br>(0.050) | -0.816***<br>(0.096) | -0.530***<br>(0.068) |
| ROA (%)                          | 0.177***<br>(0.009)  | 0.216***<br>(0.015)  | 0.062***<br>(0.014)  |
| Sales growth rate (%)            | 0.003*<br>(0.002)    | 0.006**<br>(0.003)   | 0.006***<br>(0.002)  |
| Leverage (%)                     | 0.008**<br>(0.003)   | 0.003<br>(0.005)     | -0.007**<br>(0.003)  |
| Intangible assets ratio (%)      | 0.016***<br>(0.005)  | 0.015**<br>(0.007)   | 0.017***<br>(0.004)  |
| State ownership percentage (%)   | 0.004**<br>(0.002)   | 0.011***<br>(0.003)  | 0.004***<br>(0.002)  |
| Independent director ratio (%)   | -0.004<br>(0.008)    | 0.001<br>(0.013)     | -0.007<br>(0.007)    |
| CEO=Chairman                     | 0.128<br>(0.080)     | 0.119<br>(0.149)     | 0.090<br>(0.085)     |
| Top5 ownership percentage (%)    | 0.005<br>(0.003)     | -0.004<br>(0.007)    | -0.007<br>(0.005)    |
| Controlling shareholders dummy   | -0.131<br>(0.090)    | -0.054<br>(0.161)    | 0.146<br>(0.092)     |
| Import and export ratio (%)      | -0.000<br>(0.001)    | 0.003<br>(0.003)     | -0.002<br>(0.002)    |
| Strategic investor dummy         | 0.173<br>(0.169)     | 0.160<br>(0.279)     | 0.084<br>(0.141)     |
| Foreign reserve growth rate (%)  | -0.000<br>(0.008)    | -0.021<br>(0.015)    | 0.003<br>(0.007)     |
| Foreign ownership percentage (%) | -0.002<br>(0.002)    | 0.003<br>(0.003)     | 0.003<br>(0.002)     |
| Operating cash flow ratio(%)     | 0.009<br>(0.006)     | 0.011<br>(0.010)     | 0.012*<br>(0.007)    |
| PE regulation                    | -0.000<br>(0.010)    | -0.002<br>(0.017)    | -0.027**<br>(0.013)  |
| Overseas listing                 | -2.238***<br>(0.321) | -4.005***<br>(0.537) | -2.621***<br>(0.370) |
| ATET=ATE                         | -2.24***<br>(0.32)   | -4.01***<br>(0.54)   | -2.62***<br>(0.37)   |
| POM_(E[Y0 t=1])                  | 5.08***<br>(0.33)    | 7.28***<br>(0.55)    | 4.53***<br>(0.330)   |
| ATET/POM (E[Y0 t=1])             | -44.09%              | -55.08%              | -57.84%              |
| ATET = E[Y1 t=1] - E[Y0 t=1]     | -2.24***<br>(0.32)   | -4.01***<br>(0.54)   | -2.62***<br>(0.37)   |
| SB = E[Y0 t=1] - E[Y0 t=0]       | 0.55*<br>(0.33)      | 1.03*<br>(0.55)      | 0.48<br>(0.33)       |
| obs: Beta1* {X(t=1) - X(t=0)}    | 0.39**<br>(0.22)     | 0.74**<br>(0.35)     | 0.34*<br>(0.20)      |
| unobs: Beta2* {v(t=1) - v(t=0)}  | 0.16<br>(0.14)       | 0.29<br>(0.24)       | 0.14<br>(0.14)       |
| Industry                         | YES                  | YES                  | YES                  |
| Year                             | YES                  | YES                  | YES                  |
| Province GDP per capita          | YES                  | YES                  | YES                  |
| $\beta_2$                        | 0.407<br>(0.350)     | 0.877<br>(0.595)     | 0.318<br>(0.348)     |
| Observations                     | 2,675                | 2,675                | 2,729                |

Notes:

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



**Table 8A: Valuation Effects in the Generalized Endogeneous Treatment Model**

| Dependent Variables             | Tobin's Q                  |                            |   |   |  |
|---------------------------------|----------------------------|----------------------------|---|---|--|
|                                 | (1)<br>Treated<br>1st Year | (2)<br>Control<br>1st Year | (3)<br>( $\beta_{11} - \beta_{10}$ )*X(t=1)<br>1st Year | (4)<br>( $\beta_{11} - \beta_{10}$ )*X(t=1)/S.D<br>1st Year | (5)<br>$\beta_{10}$ *(X(t=1) - X(t=0))<br>1st Year |
| Age                             | -0.014<br>(0.009)          | -0.007<br>(0.007)          | -0.113<br>(0.187)                                       | -0.012  | -0.015<br>(0.017)                                  |
| Log(total asset)                | -0.140<br>(0.104)          | -0.806***<br>(0.065)       | 14.080***<br>(2.618)                                    | 8.523   | -0.106*<br>(0.059)                                 |
| ROA(%)                          | -0.003<br>(0.014)          | 0.145***<br>(0.015)        | -2.072***<br>(0.288)                                    | -0.177  | 0.345***<br>(0.081)                                |
| Sales growth rate(%)            | -0.000<br>(0.001)          | 0.011***<br>(0.002)        | -0.321***<br>(0.077)                                    | 0.006   | 0.110***<br>(0.033)                                |
| Leverage(%)                     | -0.005<br>(0.005)          | -0.005<br>(0.004)          | -0.014<br>(0.257)                                       | 0.001   | -0.065<br>(0.055)                                  |
| Intangible assets ratio(%)      | 0.013**<br>(0.007)         | 0.015***<br>(0.005)        | -0.023<br>(0.119)                                       | -0.002  | 0.027*<br>(0.015)                                  |
| State ownership percentage(%)   | 0.000<br>(0.003)           | 0.008***<br>(0.002)        | -0.069**<br>(0.033)                                     | -0.003  | 0.001<br>(0.010)                                   |
| Independent director ratio(%)   | -0.032***<br>(0.011)       | 0.019*<br>(0.010)          | -2.247***<br>(0.647)                                    | -0.193  | 0.135*<br>(0.071)                                  |
| CEO=Chairman                    | -0.105<br>(0.214)          | 0.064<br>(0.079)           | -0.010<br>(0.136)                                       | -0.010  | 0.006<br>(0.007)                                   |
| Top5 ownership percentage(%)    | -0.020<br>(0.023)          | -0.008**<br>(0.003)        | -1.109<br>(2.163)                                       | -0.079  | -0.068**<br>(0.029)                                |
| Controlling shareholders dummy  | -0.124<br>(0.191)          | 0.178**<br>(0.092)         | -0.219<br>(0.156)                                       | -0.219  | 0.047*<br>(0.025)                                  |
| Import and export ratio(%)      | 0.002<br>(0.003)           | -0.001<br>(0.002)          | 0.064<br>(0.077)  | 0.002   | 0.004<br>(0.007)                                   |
| Strategic investor dummy        | -0.165<br>(0.178)          | 0.159<br>(0.162)           | -0.055<br>(0.042)                                       | -0.055  | 0.019<br>(0.020)                                   |
| Foreign reserve growth rate(%)  | -0.020<br>(0.023)          | 0.000<br>(0.009)           | -0.161<br>(0.201)                                       | -0.012  | 0.000<br>(0.006)                                   |
| Foreign ownership percentage(%) | -0.002<br>(0.002)          | 0.007***<br>(0.002)        | -0.331***<br>(0.109)                                    | -0.008  | 0.169***<br>(0.052)                                |
| Operating cash flow ratio(%)    | 0.029**<br>(0.013)         | -0.006<br>(0.005)          | 0.364**<br>(0.149)                                      | 0.027   | 0.007<br>(0.007)                                   |
| PE regulation                   | 0.002<br>(0.009)           | -0.059***<br>(0.019)       | 0.550***<br>(0.187)                                     | 0.057   | -0.006<br>(0.028)                                  |
| Industry                        | YES                        | YES                        | 0.389<br>(1.229)  |   | 0.029<br>(0.025)                                   |
| Year                            | YES                        | YES                        | 1.308<br>(0.904)  |   | 0.333***<br>(0.119)                                |
| Province GDP per capita         | YES                        | YES                        | -2.592<br>(1.875)                                       |   | 0.028<br>(0.025)                                   |
| Constant                        | YES                        | YES                        | -10.155**<br>(4.792)                                    |   |  |
| $\beta_{20}$                    | -1.312**<br>(0.541)        |                            |   |   |  |
| $\beta_{21}$                    |                            | 1.252***<br>(0.425)        |   |   |  |
| Observations                    | 576                        | 2, 153                     |   |   |  |

Notes:

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

**Table 8B: Decomposition for Quantity of Interest**

| Quantity of Interest            | General model      |
|---------------------------------|--------------------|
| ATE                             | -1.42***<br>(0.49) |
| E[Y0]                           | 4.38***<br>(0.10)  |
| ATE/E[Y0]                       | -32.42%            |
| ATET                            | -3.66***<br>(0.40) |
| E[Y0 t=1]                       | 5.57***<br>(0.40)  |
| ATET/E[Y0 t=1]                  | -65.71%            |
| E[Y0 t=0]                       | 4.05               |
| E[Y1 t=0]                       | 3.24               |
| E[Y0 t=1]                       | 5.57               |
| E[Y1 t=1]                       | 1.91               |
| E[Y0]                           | 4.38               |
| E[Y1]                           | 2.96               |
| S0                              | 1.19***<br>(0.31)  |
| S1                              | -1.05**<br>(0.43)  |
| Beta10*X(t=0)                   | 4.16               |
| Beta11*X(t=0)                   | 3.12               |
| Beta10*X(t=1)                   | 5.16               |
| Beta11*X(t=1)                   | 2.34               |
| GMD = E[Y1 t=1] - E[Y0 t=0]     | -2.14***<br>(0.10) |
| ATET = E[Y1 t=1] - E[Y0 t=1]    | -3.66***<br>(0.40) |
| obs: (Beta11 - Beta10)*X(t=1)   | -2.82***<br>(0.37) |
| uobs: (Beta21 - Beta20)*v(t=1)  | -0.84***<br>(0.23) |
| SE = E[Y0 t=1] - E[Y0 t=0]      | 1.52***<br>(0.39)  |
| obs: Beta10*{X(t=1) - X(t=0)}   | 1.00***<br>(0.25)  |
| unobs: Beta20*{v(t=1) - v(t=0)} | 0.52***<br>(0.18)  |

**Table 9: Simple Model over Longer Horizons using Comparable Sample**

| Dependent Variables             | Tobin's Q            |                      |                      |                      |                      |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                 | (1)<br>1st Year      | (2)<br>2nd Year      | (3)<br>3rd Year      | (4)<br>4th Year      | (5)<br>5th Year      |
| Age                             | -0.006<br>(0.007)    | -0.008<br>(0.006)    | -0.010**<br>(0.005)  | -0.004<br>(0.007)    | 0.002<br>(0.007)     |
| Log(total asset)                | -0.530***<br>(0.068) | -0.490***<br>(0.062) | -0.420***<br>(0.056) | -0.571***<br>(0.060) | -0.754***<br>(0.071) |
| ROA(%)                          | 0.062***<br>(0.014)  | 0.048***<br>(0.008)  | 0.058***<br>(0.010)  | 0.046***<br>(0.010)  | 0.035***<br>(0.011)  |
| Sales growth rate(%)            | 0.006***<br>(0.002)  | 0.007***<br>(0.002)  | 0.003*<br>(0.002)    | 0.003**<br>(0.001)   | 0.003***<br>(0.001)  |
| Leverage(%)                     | -0.007**<br>(0.003)  | 0.001<br>(0.003)     | -0.004*<br>(0.003)   | -0.005*<br>(0.003)   | 0.001<br>(0.004)     |
| Intangible assets ratio(%)      | 0.017***<br>(0.004)  | 0.019***<br>(0.004)  | 0.015***<br>(0.005)  | 0.010**<br>(0.005)   | 0.011**<br>(0.006)   |
| State ownership percentage(%)   | 0.004***<br>(0.002)  | 0.002*<br>(0.001)    | 0.002<br>(0.002)     | 0.002<br>(0.002)     | 0.003<br>(0.002)     |
| Independent director ratio(%)   | -0.007<br>(0.007)    | -0.009*<br>(0.005)   | -0.011*<br>(0.006)   | -0.007<br>(0.008)    | -0.002<br>(0.007)    |
| CEO=Chairman                    | 0.090<br>(0.085)     | -0.089<br>(0.078)    | 0.023<br>(0.077)     | 0.111<br>(0.093)     | 0.162<br>(0.103)     |
| Top5 ownership percentage(%)    | -0.007<br>(0.005)    | -0.002<br>(0.005)    | 0.004<br>(0.003)     | 0.004<br>(0.004)     | 0.010**<br>(0.005)   |
| Controlling shareholders dummy  | 0.146<br>(0.092)     | 0.095<br>(0.084)     | 0.061<br>(0.096)     | 0.037<br>(0.112)     | -0.032<br>(0.120)    |
| Import and export ratio(%)      | -0.002<br>(0.002)    | 0.001<br>(0.001)     | 0.004**<br>(0.002)   | 0.001<br>(0.002)     | 0.003<br>(0.002)     |
| Strategic investor dummy        | 0.084<br>(0.141)     | -0.097<br>(0.123)    | -0.169<br>(0.141)    | -0.002<br>(0.184)    | 0.236<br>(0.189)     |
| Foreign reserve growth rate(%)  | 0.003<br>(0.007)     | 0.002<br>(0.006)     | 0.008<br>(0.007)     | -0.001<br>(0.008)    | -0.015*<br>(0.008)   |
| Foreign ownership percentage(%) | 0.003<br>(0.002)     | -0.000<br>(0.002)    | -0.002<br>(0.002)    | -0.002<br>(0.002)    | -0.001<br>(0.002)    |
| Operating cash flow ratio(%)    | 0.012*<br>(0.007)    | 0.020***<br>(0.006)  | 0.013***<br>(0.004)  | 0.018***<br>(0.005)  | 0.020***<br>(0.005)  |
| PE regulation                   | -0.027**<br>(0.013)  | -0.019**<br>(0.010)  | 0.016*<br>(0.009)    | 0.017**<br>(0.009)   | 0.005<br>(0.013)     |
| Overseas listing                | -2.621***<br>(0.370) | -1.494***<br>(0.288) | -0.921***<br>(0.256) | -1.329***<br>(0.271) | -1.989***<br>(0.225) |
| ATET=ATE                        | -2.62***<br>(0.37)   | -1.49***<br>(0.29)   | -0.92***<br>(0.26)   | -1.33***<br>(0.27)   | -1.99***<br>(0.23)   |
| POM_(E[Y0 t=1])                 | 4.53***<br>(0.330)   | 3.25***<br>(0.26)    | 2.45***<br>(0.25)    | 2.78***<br>(0.26)    | 3.37<br>(0.23)       |
| ATET/POM_(E[Y0 t=1])            | -57.84%              | -45.85%              | -37.55%              | -47.84%              | -59.05%              |
| Industry                        | YES                  | YES                  | YES                  | YES                  | YES                  |
| Year                            | YES                  | YES                  | YES                  | YES                  | YES                  |
| Province GDP per capita         | YES                  | YES                  | YES                  | YES                  | YES                  |
| Observations                    | 2,729                | 2,455                | 2,278                | 1,787                | 1,517                |

Notes:

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

Table 10: General Model over Longer Horizon using Comparable Sample

| Dependent                         | Tobin's Q            |                      |                      |                      |                      |                      |                      |                      |                      |                      |
|-----------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                   | (1)                  | (2)                  | (3)                  | (4)                  | (5)                  | (6)                  | (7)                  | (8)                  | (9)                  | (10)                 |
| Variables                         | Treated<br>1st Year  | Control<br>1st Year  | Treated<br>2nd Year  | Control<br>2nd Year  | Treated<br>3rd Year  | Control<br>3rd Year  | Treated<br>4th Year  | Control<br>4th Year  | Treated<br>5th Year  | Control<br>5th Year  |
| Age                               | -0.014<br>(0.009)    | -0.007<br>(0.007)    | -0.014<br>(0.010)    | -0.013**<br>(0.005)  | -0.013**<br>(0.005)  | -0.017**<br>(0.007)  | -0.012**<br>(0.006)  | -0.013<br>(0.009)    | 0.005<br>(0.006)     | -0.008<br>(0.010)    |
| Log(total asset)                  | -0.140<br>(0.104)    | -0.806***<br>(0.065) | -0.309***<br>(0.087) | -0.649***<br>(0.050) | -0.210**<br>(0.098)  | -0.713***<br>(0.059) | -0.247***<br>(0.069) | -0.908***<br>(0.083) | -0.290***<br>(0.077) | -1.068***<br>(0.093) |
| ROA(%)                            | -0.003<br>(0.014)    | 0.145***<br>(0.015)  | 0.008<br>(0.006)     | 0.139***<br>(0.010)  | 0.006<br>(0.011)     | 0.133***<br>(0.011)  | 0.004<br>(0.011)     | 0.097***<br>(0.011)  | -0.007<br>(0.012)    | 0.066***<br>(0.012)  |
| Sales growth rate(%)              | -0.000<br>(0.001)    | 0.011***<br>(0.002)  | 0.002<br>(0.005)     | 0.006***<br>(0.001)  | 0.003<br>(0.002)     | 0.003*<br>(0.002)    | 0.002**<br>(0.001)   | 0.003**<br>(0.001)   | 0.000<br>(0.001)     | 0.005***<br>(0.002)  |
| Leverage(%)                       | -0.005<br>(0.005)    | -0.005<br>(0.004)    | 0.008<br>(0.005)     | 0.000<br>(0.002)     | 0.005<br>(0.004)     | 0.001<br>(0.003)     | 0.004<br>(0.003)     | -0.002<br>(0.004)    | 0.014**<br>(0.005)   | -0.001<br>(0.004)    |
| Intangible assets ratio(%)        | 0.013**<br>(0.007)   | 0.015***<br>(0.005)  | 0.010*<br>(0.006)    | 0.023***<br>(0.005)  | 0.005<br>(0.005)     | 0.018***<br>(0.006)  | 0.007<br>(0.006)     | 0.013**<br>(0.007)   | -0.000<br>(0.007)    | 0.017**<br>(0.008)   |
| State ownership percentage(%)     | 0.000<br>(0.003)     | 0.008***<br>(0.002)  | 0.000<br>(0.003)     | 0.004***<br>(0.001)  | -0.001<br>(0.003)    | 0.003**<br>(0.002)   | 0.002<br>(0.002)     | 0.002<br>(0.002)     | 0.002<br>(0.004)     | 0.002<br>(0.002)     |
| Independent director ratio(%)     | -0.032***<br>(0.011) | 0.019*<br>(0.010)    | -0.033***<br>(0.010) | 0.012<br>(0.008)     | -0.021***<br>(0.007) | 0.006<br>(0.009)     | -0.010*<br>(0.006)   | 0.012<br>(0.011)     | -0.010<br>(0.006)    | 0.025**<br>(0.012)   |
| CEO=Chairman                      | -0.105<br>(0.214)    | 0.064<br>(0.079)     | -0.171<br>(0.242)    | -0.107<br>(0.067)    | 0.022<br>(0.139)     | 0.004<br>(0.081)     | 0.081<br>(0.129)     | 0.071<br>(0.103)     | 0.137<br>(0.122)     | 0.090<br>(0.110)     |
| Top5 ownership percentage(%)      | -0.020<br>(0.023)    | -0.008**<br>(0.003)  | -0.021<br>(0.026)    | 0.001<br>(0.003)     | 0.006<br>(0.005)     | 0.003<br>(0.003)     | 0.007<br>(0.005)     | 0.002<br>(0.005)     | 0.003<br>(0.008)     | 0.006<br>(0.005)     |
| Controlling shareholders dummy    | -0.124<br>(0.191)    | 0.178**<br>(0.092)   | 0.110<br>(0.215)     | 0.054<br>(0.077)     | 0.099<br>(0.180)     | 0.107<br>(0.097)     | 0.211<br>(0.192)     | 0.053<br>(0.122)     | 0.154<br>(0.232)     | 0.066<br>(0.125)     |
| Import and export ratio(%)        | 0.002<br>(0.003)     | -0.001<br>(0.002)    | 0.003<br>(0.003)     | 0.002*<br>(0.001)    | 0.004<br>(0.003)     | 0.004**<br>(0.002)   | 0.000<br>(0.002)     | 0.001<br>(0.002)     | 0.002<br>(0.004)     | 0.001<br>(0.002)     |
| Strategic investor dummy          | -0.165<br>(0.178)    | 0.159<br>(0.162)     | -0.168<br>(0.172)    | -0.046<br>(0.140)    | -0.071<br>(0.147)    | -0.148<br>(0.164)    | 0.016<br>(0.153)     | 0.060<br>(0.208)     | 0.308<br>(0.207)     | 0.159<br>(0.213)     |
| Foreign reserve growth rate(%)    | -0.020<br>(0.023)    | 0.000<br>(0.009)     | -0.032<br>(0.021)    | 0.011<br>(0.007)     | -0.010<br>(0.010)    | 0.013<br>(0.009)     | -0.004<br>(0.010)    | 0.005<br>(0.010)     | -0.013<br>(0.010)    | -0.018<br>(0.011)    |
| Foreign ownership percentage(%)   | -0.002<br>(0.002)    | 0.007***<br>(0.002)  | -0.003<br>(0.002)    | 0.000<br>(0.002)     | -0.003*<br>(0.002)   | -0.003<br>(0.002)    | -0.003<br>(0.002)    | -0.000<br>(0.003)    | -0.002<br>(0.002)    | 0.004<br>(0.003)     |
| Operating cash flow ratio(%)      | 0.029**<br>(0.013)   | -0.006<br>(0.005)    | 0.030**<br>(0.013)   | 0.003<br>(0.004)     | 0.006<br>(0.004)     | 0.010*<br>(0.006)    | 0.007<br>(0.005)     | 0.018***<br>(0.007)  | 0.011**<br>(0.005)   | 0.020***<br>(0.007)  |
| PE regulation                     | 0.002<br>(0.009)     | -0.059***<br>(0.019) | -0.005<br>(0.007)    | -0.027*<br>(0.016)   | -0.000<br>(0.007)    | 0.027**<br>(0.013)   | 0.002<br>(0.007)     | -0.001<br>(0.017)    | -0.010<br>(0.009)    | -0.021<br>(0.023)    |
| ATET                              | -3.66***<br>(0.40)   | -3.66***<br>(0.40)   | -1.74***<br>(0.35)   | -1.74***<br>(0.35)   | -1.18***<br>(0.40)   | -1.18***<br>(0.40)   | -1.56***<br>(0.48)   | -1.56***<br>(0.48)   | -2.51***<br>(0.40)   | -2.51***<br>(0.40)   |
| POM_(E[Y <sub>0</sub>  t=1])      | 5.57***<br>(0.40)    | 5.57***<br>(0.40)    | 3.49***<br>(0.34)    | 3.49***<br>(0.34)    | 2.71***<br>(0.40)    | 2.71***<br>(0.40)    | 3.01***<br>(0.48)    | 3.01***<br>(0.48)    | 3.93***<br>(0.38)    | 3.93***<br>(0.38)    |
| ATET/POM_(E[Y <sub>0</sub>  t=1]) | -65.71%<br>(0.40)    | -65.71%<br>(0.40)    | -49.86%<br>(0.34)    | -49.86%<br>(0.34)    | -43.54%<br>(0.40)    | -43.54%<br>(0.40)    | -51.83%<br>(0.48)    | -51.83%<br>(0.48)    | -63.87%<br>(0.38)    | -63.87%<br>(0.38)    |
| Industry                          | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| Year                              | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| Province GDP per capita           | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| Observations                      | 576                  | 2,153                | 492                  | 1,963                | 414                  | 1,864                | 356                  | 1,431                | 310                  | 1,202                |

Notes:

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

**Table 11: Comparing the Valuations under Different Approaches**

| Tobin's Q         | At IPO   |          |              | 1st Day  |          |              | 1st Year |          |              | 2nd Year |          |              | 3rd Year |          |              | 4th Year |          |              | 5th Year |          |              |
|-------------------|----------|----------|--------------|----------|----------|--------------|----------|----------|--------------|----------|----------|--------------|----------|----------|--------------|----------|----------|--------------|----------|----------|--------------|
|                   | mainland | overseas | discount     | mainland | overseas | discount     | mainland | overseas | discount     | mainland | overseas | discount     | mainland | overseas | discount     | mainland | overseas | discount     | mainland | overseas | discount     |
| Raw data mean     | 4.53     | 2.84     | <b>-1.69</b> | 6.25     | 3.27     | <b>-2.98</b> | 4.05     | 1.91     | <b>-2.14</b> | 3.23     | 1.75     | <b>-1.48</b> | 3.25     | 1.53     | <b>-1.72</b> | 3.44     | 1.45     | <b>-1.99</b> | 3.63     | 1.38     | <b>-2.25</b> |
| OLS               | 4.76     | 2.84     | <b>-1.92</b> | 6.58     | 3.27     | <b>-3.31</b> | 4.28     | 1.91     | <b>-2.37</b> | 3.44     | 1.75     | <b>-1.69</b> | 3.01     | 1.53     | <b>-1.48</b> | 3.06     | 1.45     | <b>-1.61</b> | 3.36     | 1.38     | <b>-1.98</b> |
| Simple model      | 5.08     | 2.84     | <b>-2.24</b> | 7.28     | 3.27     | <b>-4.01</b> | 4.53     | 1.91     | <b>-2.62</b> | 3.25     | 1.76     | <b>-1.49</b> | 2.45     | 1.53     | <b>-0.92</b> | 2.78     | 1.45     | <b>-1.33</b> | 3.37     | 1.38     | <b>-1.99</b> |
| Generalized model | 4.42     | 2.83     | <b>-1.59</b> | 6.42     | 3.27     | <b>-3.15</b> | 5.57     | 1.91     | <b>-3.66</b> | 3.49     | 1.75     | <b>-1.74</b> | 2.71     | 1.53     | <b>-1.18</b> | 3.01     | 1.45     | <b>-1.56</b> | 3.93     | 1.42     | <b>-2.51</b> |

**Table 12: H-Share Discounts for A-H Dual Listed Stocks**

|                    | (1)            | (2)                  | (3)            | (4)                  | (5)            | (6)                  | (7)            | (8)                  | (9)            | (10)                 |
|--------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|
| samples            | AH dual-listed | only overseas listed | AH dual-listed | only overseas listed | AH dual-listed | only overseas listed | AH dual-listed | only overseas listed | AH dual-listed | only overseas listed |
|                    | 1st Year       | 1st Year             | 2nd Year       | 2nd Year             | 3rd Year       | 3rd Year             | 4th Year       | 4th Year             | 5th Year       | 5th Year             |
| Valuation discount | -22%           | -58%                 | -24%           | -46%                 | -28%           | -38%                 | -36%           | -48%                 | -40%           | -60%                 |
| Number of firms    | 29             |                      | 30             |                      | 31             |                      | 38             |                      | 35             |                      |

**Table 13: 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%                      |
| <b>Average</b> |                   |                   |              |                        | <b>6.26</b>                      | <b>1.80</b>                       | <b>-71.32%</b>               |
| <b>Median</b>  |                   |                   |              |                        | <b>5.33</b>                      | <b>0.96</b>                       | <b>-82.04%</b>               |

**Table 14: Policy Shocks and Valuation Discounts**

| Dependent                                    | Tobin's Q                        |                                    |                                    |                                    |                                    |
|--|----------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
|  | (1)                              | (2)                                | (3)                                | (4)                                | (5)                                |
| VARIABLES                                    | Capital control                  | Exchange rate                      | IPO suspension                     | PE restriction                     | All distortions                    |
| Age  | -0.005<br>(0.006)                | -0.005<br>(0.006)                  | -0.008<br>(0.007)                  | -0.006<br>(0.006)                  | -0.007<br>(0.007)                  |
| Log(total asset)                             | -0.540***<br>(0.069)             | -0.529***<br>(0.068)               | -0.514***<br>(0.067)               | -0.540***<br>(0.068)               | -0.523***<br>(0.065)               |
| ROA(%)                                       | 0.063***<br>(0.014)              | 0.061***<br>(0.014)                | 0.059***<br>(0.014)                | 0.057***<br>(0.013)                | 0.056***<br>(0.014)                |
| Sales growth rate(%)                         | 0.006***<br>(0.002)              | 0.006***<br>(0.002)                | 0.007***<br>(0.002)                | 0.006***<br>(0.002)                | 0.007***<br>(0.002)                |
| Leverage(%)                                  | -0.006*<br>(0.003)               | -0.007**<br>(0.003)                | -0.008**<br>(0.003)                | -0.008**<br>(0.003)                | -0.008**<br>(0.003)                |
| Intangible assets ratio(%)                   | 0.017***<br>(0.004)              | 0.017***<br>(0.004)                | 0.016***<br>(0.004)                | 0.017***<br>(0.004)                | 0.016***<br>(0.004)                |
| State ownership percentage(%)                | 0.004***<br>(0.002)              | 0.004***<br>(0.002)                | 0.004**<br>(0.002)                 | 0.005***<br>(0.002)                | 0.004***<br>(0.002)                |
| Independent director ratio(%)                | -0.005<br>(0.007)                | -0.008<br>(0.007)                  | -0.008<br>(0.007)                  | -0.006<br>(0.007)                  | -0.012<br>(0.008)                  |
| CEO=Chairman                                 | 0.082<br>(0.080)                 | 0.088<br>(0.081)                   | 0.085<br>(0.082)                   | 0.067<br>(0.080)                   | 0.059<br>(0.081)                   |
| Top5 ownership percentage(%)                 | -0.006<br>(0.005)                | -0.007<br>(0.005)                  | -0.007<br>(0.005)                  | -0.005<br>(0.005)                  | -0.006<br>(0.005)                  |
| Controlling shareholders dummy               | 0.156*<br>(0.092)                | 0.125<br>(0.091)                   | 0.137<br>(0.090)                   | 0.134<br>(0.092)                   | 0.106<br>(0.088)                   |
| Import and export ratio(%)                   | -0.002<br>(0.001)                | -0.001<br>(0.001)                  | -0.002<br>(0.001)                  | -0.001<br>(0.001)                  | -0.001<br>(0.001)                  |
| Strategic investor dummy                     | 0.106<br>(0.134)                 | 0.112<br>(0.135)                   | 0.085<br>(0.136)                   | 0.147<br>(0.133)                   | 0.129<br>(0.136)                   |
| Foreign reserve growth rate(%)               | -0.000<br>(0.008)                | -0.013<br>(0.008)                  | 0.005<br>(0.008)                   | 0.006<br>(0.008)                   | -0.003<br>(0.008)                  |
| Foreign ownership percentage(%)              | 0.003*<br>(0.002)                | 0.003<br>(0.002)                   | 0.003<br>(0.002)                   | 0.002<br>(0.002)                   | 0.002<br>(0.002)                   |
| Operating cash flow ratio(%)                 | 0.012*<br>(0.007)                | 0.013*<br>(0.007)                  | 0.012*<br>(0.007)                  | 0.012*<br>(0.007)                  | 0.013*<br>(0.007)                  |
| PE regulation                                | -0.025**<br>(0.012)              | -0.026**<br>(0.012)                | -0.022*<br>(0.013)                 | -0.004<br>(0.011)                  | 0.003<br>(0.011)                   |
| Overseas listing                             | -2.737***<br>(0.376)             | -2.439***<br>(0.384)               | -2.340***<br>(0.432)               | -2.088***<br>(0.381)               | -1.808***<br>(0.508)               |
| Capital control                              | 1.021***<br>(0.363)              |                                    |                                    |                                    | 1.106***<br>(0.360)                |
| <b>Overseas listing*Capital controls</b>     | <b>-0.667*</b><br><b>(0.399)</b> |                                    |                                    |                                    | <b>-1.671***</b><br><b>(0.582)</b> |
| Exchange rate reform                         |                                  | -0.275<br>(0.195)                  |                                    |                                    | 0.176<br>(0.277)                   |
| <b>Overseas listing*Exchange rate reform</b> |                                  | <b>-1.293***</b><br><b>(0.312)</b> |                                    |                                    | <b>-2.153***</b><br><b>(0.564)</b> |
| IPO suspension                               |                                  |                                    | 0.271<br>(0.275)                   |                                    | 0.339<br>(0.394)                   |
| <b>Overseas listing*IPO suspension</b>       |                                  |                                    | <b>-1.683***</b><br><b>(0.327)</b> |                                    | <b>-2.373***</b><br><b>(0.533)</b> |
| PE restriction                               |                                  |                                    |                                    | -0.806<br>(0.504)                  | -1.252**<br>(0.563)                |
| <b>Overseas listing*PE restriction</b>       |                                  |                                    |                                    | <b>-0.987***</b><br><b>(0.202)</b> | <b>0.327</b><br><b>(0.447)</b>     |
| Industry                                     | YES                              | YES                                | YES                                | YES                                | YES                                |
| Year   | YES                              | YES                                | YES                                | YES                                | YES                                |
| Province GDP per capita                      | YES                              | YES                                | YES                                | YES                                | YES                                |
| Observations                                 | 2,729                            | 2,729                              | 2,729                              | 2,729                              | 2,729                              |

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. Exchange rate reform==1 if firms submit IPO application during 2015 and 2016.
5. IPO suspension==1 if firms submit IPO application during 2013 and 2014.
6. PE restriction==1 if firms go IPO during 31 March 2014 and 30 June 2020.



**Table 15: Firm Heterogeneities and Valuation Haircuts**

| Dependent Variables                            | Tobin's Q                         |                                    |                                    |                                    |   |
|--|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|---|
|  | (1)<br>SOE                        | (2)<br>Foreign ownership           | (3)<br>Operating risk              | (4)<br>All firm heterogeneities    | (5)<br>Heterogeneities + policy distortions |
| Age  | -0.007<br>(0.006)                 | -0.007<br>(0.007)                  | -0.008<br>(0.007)                  | -0.009<br>(0.007)                  | -0.010<br>(0.007)                           |
| Log(total asset)                               | -0.546***<br>(0.069)              | -0.540***<br>(0.068)               | -0.539***<br>(0.066)               | -0.548***<br>(0.066)               | -0.551***<br>(0.064)                        |
| ROA(%)   | 0.063***<br>(0.014)               | 0.062***<br>(0.013)                | 0.063***<br>(0.014)                | 0.062***<br>(0.014)                | 0.055***<br>(0.014)                         |
| Sales growth rate(%)                           | 0.006***<br>(0.002)               | 0.007***<br>(0.002)                | 0.007***<br>(0.002)                | 0.007***<br>(0.002)                | 0.007***<br>(0.002)                         |
| Leverage(%)                                    | -0.006*<br>(0.003)                | -0.007**<br>(0.003)                | -0.006*<br>(0.003)                 | -0.006*<br>(0.003)                 | -0.008**<br>(0.003)                         |
| Intangible assets ratio(%)                     | 0.016***<br>(0.004)               | 0.017***<br>(0.004)                | 0.018***<br>(0.004)                | 0.017***<br>(0.004)                | 0.016***<br>(0.004)                         |
| State ownership percentage(%)                  | 0.002<br>(0.002)                  | 0.004**<br>(0.002)                 | 0.005***<br>(0.002)                | 0.003<br>(0.002)                   | 0.004*<br>(0.002)                           |
| Independent director ratio(%)                  | -0.005<br>(0.007)                 | -0.006<br>(0.007)                  | -0.009<br>(0.007)                  | -0.009<br>(0.007)                  | -0.014*<br>(0.007)                          |
| CEO=Chairman                                   | 0.084<br>(0.081)                  | 0.086<br>(0.082)                   | 0.059<br>(0.081)                   | 0.055<br>(0.080)                   | 0.016<br>(0.077)                            |
| Top5 ownership percentage(%)                   | -0.007<br>(0.005)                 | -0.008<br>(0.005)                  | -0.009*<br>(0.005)                 | -0.010*<br>(0.005)                 | -0.009*<br>(0.005)                          |
| Controlling shareholders dummy                 | 0.163*<br>(0.092)                 | 0.166*<br>(0.093)                  | 0.166*<br>(0.090)                  | 0.189**<br>(0.091)                 | 0.143<br>(0.089)                            |
| Import and export ratio(%)                     | -0.002<br>(0.001)                 | -0.002<br>(0.002)                  | -0.002<br>(0.001)                  | -0.002<br>(0.002)                  | -0.002<br>(0.001)                           |
| Strategic investor dummy                       | 0.111<br>(0.136)                  | 0.104<br>(0.137)                   | 0.042<br>(0.141)                   | 0.054<br>(0.139)                   | 0.089<br>(0.128)                            |
| Foreign reserve growth rate(%)                 | 0.003<br>(0.008)                  | 0.004<br>(0.008)                   | 0.003<br>(0.007)                   | 0.004<br>(0.007)                   | -0.001<br>(0.008)                           |
| Foreign ownership percentage(%)                | 0.003*<br>(0.002)                 | 0.002<br>(0.002)                   | 0.002<br>(0.002)                   | 0.002<br>(0.002)                   | 0.002<br>(0.002)                            |
| Operating cash flow ratio(%)                   | 0.013*<br>(0.007)                 | 0.012*<br>(0.007)                  | 0.012*<br>(0.007)                  | 0.012*<br>(0.006)                  | 0.013**<br>(0.007)                          |
| PE regulation                                  | -0.025**<br>(0.012)               | -0.029**<br>(0.012)                | -0.027**<br>(0.012)                | -0.029**<br>(0.012)                | -0.004<br>(0.011)                           |
| Overseas listing                               | -2.787***<br>(0.385)              | -2.173***<br>(0.463)               | -2.091***<br>(0.428)               | -1.632***<br>(0.502)               | -0.558<br>(0.452)                           |
| SOE dummy                                      | 0.005<br>(0.150)                  |                                    |                                    | 0.081<br>(0.151)                   | 0.043<br>(0.149)                            |
| <b>Overseas listing*SOE dummy</b>              | <b>0.716***</b><br><b>(0.236)</b> |                                    |                                    | <b>0.099</b><br><b>(0.259)</b>     | <b>0.065</b><br><b>(0.236)</b>              |
| High foreign ownership percentage              |                                   | 0.306**<br>(0.140)                 |                                    | 0.316**<br>(0.141)                 | 0.265*<br>(0.136)                           |
| <b>Overseas listing*High foreign ownership</b> |                                   | <b>-0.917***</b><br><b>(0.253)</b> |                                    | <b>-0.908***</b><br><b>(0.286)</b> | <b>-0.837***</b><br><b>(0.260)</b>          |
| High operating risk                            |                                   |                                    | 0.395***<br>(0.082)                | 0.374***<br>(0.083)                | 0.400***<br>(0.084)                         |
| <b>Overseas listing*High operating risk</b>    |                                   |                                    | <b>-0.726***</b><br><b>(0.189)</b> | <b>-0.646***</b><br><b>(0.198)</b> | <b>-0.844***</b><br><b>(0.198)</b>          |
| Capital control                                |                                   |                                    |                                    |                                    | 1.093***<br>(0.355)                         |
| <b>Overseas listing*Capital control</b>        |                                   |                                    |                                    |                                    | <b>-1.477***</b><br><b>(0.548)</b>          |
| Exchange rate reform                           |                                   |                                    |                                    |                                    | 0.060<br>(0.270)                            |
| <b>Overseas listing*Exchange rate reform</b>   |                                   |                                    |                                    |                                    | <b>-1.855***</b><br><b>(0.545)</b>          |
| IPO suspension                                 |                                   |                                    |                                    |                                    | 0.170<br>(0.386)                            |
| <b>Overseas listing*IPO suspension</b>         |                                   |                                    |                                    |                                    | <b>-2.049***</b><br><b>(0.512)</b>          |
| PE restriction                                 |                                   |                                    |                                    |                                    | -0.865<br>(0.550)                           |
| <b>Overseas listing*PE restriction</b>         |                                   |                                    |                                    |                                    | <b>-0.099</b><br><b>(0.458)</b>             |
| Industry                                       | YES                               | YES                                | YES                                | YES                                | YES   |
| Year   | YES                               | YES                                | YES                                | YES                                | YES   |
| Province GDP per capita                        | YES                               | YES                                | YES                                | YES                                | YES   |
| Observations                                   | 2,729                             | 2,729                              | 2,698                              | 2,698                              | 2,698                                       |

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 16: Valuation Equation in the Simple Model across different sample**

| Dependent                        | Tobin's Q                           |                                |  |  |
|----------------------------------|-------------------------------------|--------------------------------|--|--|
|                                  | (1)<br>1st Year<br>Benchmark sample | (2)<br>1st Year<br>+Restricted | (3)<br>1st Year<br>+Restricted &<br>Prohibited | (4)<br>1st Year<br>+Negative list &<br>Unqualified firms |
| Age                              | -0.006<br>(0.007)                   | -0.005<br>(0.006)              | -0.004<br>(0.005)                              | -0.007<br>(0.005)  |
| Log(total asset)                 | -0.530***<br>(0.068)                | -0.483***<br>(0.066)           | -0.453***<br>(0.064)                           | -0.438***<br>(0.065)                                     |
| ROA (%)                          | 0.062***<br>(0.014)                 | 0.052***<br>(0.013)            | 0.045***<br>(0.011)                            | 0.003<br>(0.012)   |
| Sales growth rate (%)            | 0.006***<br>(0.002)                 | 0.007***<br>(0.002)            | 0.007***<br>(0.002)                            | 0.009***<br>(0.002)                                      |
| Leverage (%)                     | -0.007**<br>(0.003)                 | -0.008**<br>(0.003)            | -0.009***<br>(0.003)                           | -0.008**<br>(0.004)                                      |
| Intangible assets ratio (%)      | 0.017***<br>(0.004)                 | 0.017***<br>(0.004)            | 0.016***<br>(0.004)                            | 0.024***<br>(0.005)                                      |
| State ownership percentage (%)   | 0.004***<br>(0.002)                 | 0.003**<br>(0.002)             | 0.003*<br>(0.002)                              | 0.001<br>(0.002)   |
| Independent director ratio (%)   | -0.007<br>(0.007)                   | -0.004<br>(0.006)              | -0.002<br>(0.006)                              | 0.011<br>(0.008)   |
| CEO=Chairman                     | 0.090<br>(0.085)                    | 0.082<br>(0.077)               | 0.061<br>(0.075)                               | 0.099<br>(0.078)   |
| Top5 ownership percentage (%)    | -0.007<br>(0.005)                   | -0.006<br>(0.005)              | -0.006<br>(0.005)                              | -0.005<br>(0.004)  |
| Controlling shareholders dummy   | 0.146<br>(0.092)                    | 0.159*<br>(0.092)              | 0.180**<br>(0.091)                             | 0.184*<br>(0.098)  |
| Import and export ratio (%)      | -0.002<br>(0.002)                   | -0.002<br>(0.001)              | -0.002<br>(0.001)                              | -0.003*<br>(0.001)                                       |
| Strategic investor dummy         | 0.084<br>(0.141)                    | 0.097<br>(0.127)               | 0.143<br>(0.123)                               | 0.119<br>(0.126)   |
| Foreign reserve growth rate (%)  | 0.003<br>(0.007)                    | 0.002<br>(0.007)               | 0.001<br>(0.007)                               | -0.004<br>(0.008)  |
| Foreign ownership percentage (%) | 0.003<br>(0.002)                    | 0.003**<br>(0.001)             | 0.004***<br>(0.001)                            | 0.005***<br>(0.002)                                      |
| Operating cash flow ratio(%)     | 0.012*<br>(0.007)                   | 0.012**<br>(0.006)             | 0.013**<br>(0.005)                             | 0.014***<br>(0.005)                                      |
| PE regulation                    | -0.027**<br>(0.013)                 | -0.023**<br>(0.009)            | -0.021**<br>(0.009)                            | -0.020**<br>(0.009)                                      |
| Overseas listing                 | -2.621***<br>(0.370)                | -2.733***<br>(0.281)           | -2.884***<br>(0.235)                           | -3.128***<br>(0.330)                                     |
| ATET=ATE                         | -2.62***<br>(0.37)                  | -2.73***<br>(0.28)             | -2.88***<br>(0.24)                             | -3.13***<br>(0.33)                                       |
| POM_(E[Y0 t=1])                  | 4.53                                | 4.64                           | 4.84   | 5.33   |
| ATET/POM_(E[Y0 t=1])             | -57.84%                             | -58.84%                        | -59.50%  | -58.72%  |
| Industry                         | YES                                 | YES                            | YES  | YES  |
| Year                             | YES                                 | YES                            | YES  | YES  |
| Province GDP per capita          | YES                                 | YES                            | YES  | YES  |
| Observations                     | 2,729                               | 2,857                          | 2,913  | 3,072  |

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 17: Valuation Effects in the Generalized Endogeneous Treatment Model Across Sample**

| Dependent                         | Tobin's Q            |                      |                      |                      |                             |                             |  |  |
|-----------------------------------|----------------------|----------------------|----------------------|----------------------|-----------------------------|-----------------------------|--|--|
|                                   | (1)                  | (2)                  | (3)                  | (4)                  | (5)                         | (6)                         | (7)                                      | (8)                                      |
|                                   | Treated<br>1st Year  | Control<br>1st Year  | Treated<br>1st Year  | Control<br>1st Year  | Treated<br>1st Year         | Control<br>1st Year         | Treated<br>1st Year                      | Control<br>1st Year                      |
| Variables                         | Benchmark<br>Sample  | Benchmark<br>Sample  | +Restricted          | +Restricted          | +Restricted &<br>Prohibited | +Restricted &<br>Prohibited | +Negative list<br>& Unqualified<br>firms | +Negative list<br>& Unqualified<br>firms |
| Age                               | -0.014<br>(0.009)    | -0.007<br>(0.007)    | -0.011<br>(0.007)    | -0.007<br>(0.007)    | -0.008<br>(0.006)           | -0.007<br>(0.007)           | -0.011*<br>(0.006)                       | -0.007<br>(0.007)                        |
| Log(total asset)                  | -0.140<br>(0.104)    | -0.806***<br>(0.065) | -0.151<br>(0.097)    | -0.804***<br>(0.063) | -0.114<br>(0.093)           | -0.797***<br>(0.063)        | -0.223**<br>(0.101)                      | -0.810***<br>(0.063)                     |
| ROA(%)                            | -0.003<br>(0.014)    | 0.145***<br>(0.015)  | -0.005<br>(0.011)    | 0.145***<br>(0.014)  | -0.004<br>(0.010)           | 0.145***<br>(0.014)         | -0.026*<br>(0.014)                       | 0.142***<br>(0.014)                      |
| Sales growth rate(%)              | -0.000<br>(0.001)    | 0.011***<br>(0.002)  | 0.001<br>(0.001)     | 0.011***<br>(0.002)  | 0.001<br>(0.001)            | 0.011***<br>(0.002)         | 0.005*<br>(0.003)                        | 0.011***<br>(0.002)                      |
| Leverage(%)                       | -0.005<br>(0.005)    | -0.005<br>(0.004)    | -0.006<br>(0.004)    | -0.004<br>(0.004)    | -0.006<br>(0.004)           | -0.004<br>(0.004)           | 0.001<br>(0.006)                         | -0.003<br>(0.004)                        |
| Intangible assets ratio(%)        | 0.013**<br>(0.007)   | 0.015***<br>(0.005)  | 0.014**<br>(0.008)   | 0.015***<br>(0.005)  | 0.012**<br>(0.005)          | 0.017***<br>(0.005)         | 0.021***<br>(0.006)                      | 0.018***<br>(0.005)                      |
| State ownership percentage(%)     | 0.000<br>(0.003)     | 0.008***<br>(0.002)  | -0.001<br>(0.002)    | 0.008***<br>(0.002)  | -0.001<br>(0.002)           | 0.008***<br>(0.002)         | -0.001<br>(0.002)                        | 0.008***<br>(0.002)                      |
| Independent director ratio(%)     | -0.032***<br>(0.011) | 0.019*<br>(0.010)    | -0.021***<br>(0.008) | 0.020**<br>(0.009)   | -0.015**<br>(0.007)         | 0.022**<br>(0.009)          | 0.002<br>(0.009)                         | 0.021**<br>(0.009)                       |
| CEO=Chairman                      | -0.105<br>(0.214)    | 0.064<br>(0.079)     | -0.152<br>(0.187)    | 0.075<br>(0.080)     | -0.178<br>(0.181)           | 0.083<br>(0.080)            | -0.098<br>(0.185)                        | 0.084<br>(0.079)                         |
| Top5 ownership percentage(%)      | -0.020<br>(0.023)    | -0.008**<br>(0.003)  | -0.013<br>(0.017)    | -0.008**<br>(0.003)  | -0.011<br>(0.016)           | -0.008**<br>(0.003)         | -0.008<br>(0.013)                        | -0.008**<br>(0.003)                      |
| Controlling shareholders dummy    | -0.124<br>(0.191)    | 0.178**<br>(0.092)   | -0.067<br>(0.161)    | 0.177**<br>(0.090)   | -0.050<br>(0.150)           | 0.183**<br>(0.090)          | 0.113<br>(0.203)                         | 0.179**<br>(0.089)                       |
| Import and export ratio(%)        | 0.002<br>(0.003)     | -0.001<br>(0.002)    | 0.001<br>(0.003)     | -0.001<br>(0.002)    | 0.002<br>(0.003)            | -0.001<br>(0.002)           | -0.003<br>(0.003)                        | -0.001<br>(0.002)                        |
| Strategic investor dummy          | -0.165<br>(0.178)    | 0.159<br>(0.162)     | -0.112<br>(0.137)    | 0.176<br>(0.161)     | -0.051<br>(0.134)           | 0.207<br>(0.161)            | -0.007<br>(0.148)                        | 0.239<br>(0.163)                         |
| Foreign reserve growth rate(%)    | -0.020<br>(0.023)    | 0.000<br>(0.009)     | -0.017<br>(0.019)    | -0.000<br>(0.009)    | -0.017<br>(0.018)           | -0.001<br>(0.009)           | -0.019<br>(0.017)                        | -0.001<br>(0.009)                        |
| Foreign ownership percentage(%)   | -0.002<br>(0.002)    | 0.007***<br>(0.002)  | -0.001<br>(0.002)    | 0.007***<br>(0.002)  | -0.000<br>(0.002)           | 0.007***<br>(0.002)         | -0.000<br>(0.002)                        | 0.008***<br>(0.002)                      |
| Operating cash flow ratio(%)      | 0.029**<br>(0.013)   | -0.006<br>(0.005)    | 0.023***<br>(0.008)  | -0.006<br>(0.005)    | 0.024***<br>(0.007)         | -0.006<br>(0.005)           | 0.019**<br>(0.008)                       | -0.006<br>(0.005)                        |
| PE regulation                     | 0.002<br>(0.009)     | -0.059***<br>(0.019) | 0.008<br>(0.006)     | -0.058***<br>(0.018) | 0.010<br>(0.006)            | -0.057***<br>(0.018)        | 0.012*<br>(0.007)                        | -0.058***<br>(0.018)                     |
| ATET                              | -3.66***<br>(0.40)   | -3.66***<br>(0.40)   | -3.66***<br>(0.42)   | -3.66***<br>(0.42)   | -3.84***<br>(0.41)          | -3.84***<br>(0.41)          | -3.26***<br>(0.40)                       | -3.26***<br>(0.40)                       |
| POM_(E[Y <sub>0</sub>  t=1])      | 5.57***<br>(0.40)    | 5.57***<br>(0.40)    | 5.58***<br>(0.40)    | 5.58***<br>(0.40)    | 5.79***<br>(0.38)           | 5.79***<br>(0.38)           | 5.47***<br>(0.38)                        | 5.47***<br>(0.38)                        |
| ATET/POM_(E[Y <sub>0</sub>  t=1]) | -65.71%<br>(0.40)    | -65.71%<br>(0.40)    | -65.59%<br>(0.40)    | -65.59%<br>(0.40)    | -66.32%<br>(0.38)           | -66.32%<br>(0.38)           | -59.60%<br>(0.38)                        | -59.60%<br>(0.38)                        |
| Industry                          | YES                  | YES                  | YES                  | YES                  | YES                         | YES                         | YES                                      | YES                                      |
| Year                              | YES                  | YES                  | YES                  | YES                  | YES                         | YES                         | YES                                      | YES                                      |
| Province GDP per capita           | YES                  | YES                  | YES                  | YES                  | YES                         | YES                         | YES                                      | YES                                      |
| Observations                      | 576                  | 2,153                | 704                  | 2,153                | 760                         | 2,153                       | 917                                      | 2,155                                    |

Notes:

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

**Table 18: 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                             | 0.051***<br>(0.012)  | -0.065**<br>(0.033)  | -0.005<br>(0.006)    | 0.057***<br>(0.011)  | -0.092***<br>(0.028) | -0.005<br>(0.006)    |
| Log(total asset)                | -0.153*<br>(0.088)   | -0.269<br>(0.173)    | -0.455***<br>(0.063) | -0.183**<br>(0.086)  | -0.155<br>(0.152)    | -0.445***<br>(0.062) |
| ROA(%)                          | 0.057***<br>(0.012)  | 0.044**<br>(0.017)   | 0.044***<br>(0.012)  | 0.067***<br>(0.011)  | 0.026<br>(0.017)     | 0.044***<br>(0.011)  |
| Sales growth rate(%)            | 0.014***<br>(0.003)  | 0.022***<br>(0.004)  | 0.007***<br>(0.002)  | 0.013***<br>(0.002)  | 0.021***<br>(0.003)  | 0.007***<br>(0.002)  |
| Leverage(%)                     | 0.044***<br>(0.005)  | 0.022**<br>(0.010)   | -0.009***<br>(0.003) | 0.043***<br>(0.006)  | 0.023***<br>(0.009)  | -0.009***<br>(0.003) |
| Intangible assets ratio(%)      | 0.033***<br>(0.008)  | 0.052***<br>(0.009)  | 0.015***<br>(0.004)  | 0.027***<br>(0.007)  | 0.043***<br>(0.009)  | 0.016***<br>(0.004)  |
| State ownership percentage(%)   | -0.000<br>(0.004)    | -0.392***<br>(0.112) | 0.003*<br>(0.001)    | 0.004<br>(0.004)     | -0.048**<br>(0.022)  | 0.003*<br>(0.001)    |
| Independent director ratio(%)   | 0.107***<br>(0.013)  | 0.153***<br>(0.020)  | -0.003<br>(0.005)    | 0.133***<br>(0.014)  | 0.118***<br>(0.016)  | -0.004<br>(0.006)    |
| CEO=Chairman                    | 0.599***<br>(0.154)  | 0.690**<br>(0.295)   | 0.053<br>(0.081)     | 0.621***<br>(0.151)  | 0.584**<br>(0.282)   | 0.057<br>(0.075)     |
| Top5 ownership percentage(%)    | 0.056***<br>(0.012)  | -0.055***<br>(0.010) | -0.008*<br>(0.005)   | 0.015*<br>(0.008)    | -0.000<br>(0.011)    | -0.006<br>(0.005)    |
| Controlling shareholders dummy  | 0.416**<br>(0.175)   | 0.300<br>(0.343)     | 0.169*<br>(0.089)    | 0.566***<br>(0.172)  | -0.019<br>(0.296)    | 0.167*<br>(0.092)    |
| Import and export ratio(%)      | -0.003<br>(0.003)    | -0.001<br>(0.008)    | -0.002<br>(0.001)    | -0.002<br>(0.003)    | -0.008<br>(0.010)    | -0.002<br>(0.001)    |
| Strategic investor dummy        | 1.380***<br>(0.222)  | 1.410***<br>(0.497)  | 0.096<br>(0.124)     | 1.274***<br>(0.214)  | 1.743***<br>(0.385)  | 0.127<br>(0.123)     |
| Foreign reserve growth rate(%)  | -0.053***<br>(0.014) | 0.046**<br>(0.024)   | 0.004<br>(0.007)     | -0.026*<br>(0.014)   | -0.029<br>(0.026)    | 0.002<br>(0.007)     |
| Foreign ownership percentage(%) | 0.016***<br>(0.002)  | 0.025***<br>(0.004)  | 0.003**<br>(0.001)   | 0.020***<br>(0.002)  | 0.008*<br>(0.005)    | 0.003**<br>(0.001)   |
| Operating cash flow ratio(%)    | -0.043***<br>(0.009) | -0.012<br>(0.014)    | 0.014**<br>(0.005)   | -0.044***<br>(0.008) | -0.015<br>(0.012)    | 0.013**<br>(0.005)   |
| PE regulation                   | 0.036<br>(0.022)     | 0.040<br>(0.032)     | -0.021**<br>(0.010)  | 0.041*<br>(0.022)    | 0.082***<br>(0.031)  | -0.022**<br>(0.009)  |
| US listing                      |                      |                      | -3.090***<br>(0.429) |                      |                      |                      |
| HK listing                      |                      |                      | -2.662***<br>(0.262) |                      |                      |                      |
| Listing with VIE                |                      |                      |                      |                      |                      | -3.206***<br>(0.362) |
| Listing without VIE             |                      |                      |                      |                      |                      | -2.743***<br>(0.241) |
| Expected relative waiting days  | 0.624***<br>(0.069)  | 0.042<br>(0.173)     |                      | 0.595***<br>(0.067)  | 0.235**<br>(0.117)   |                      |
| Log(relative market index)      | 0.659***<br>(0.191)  | 3.997***<br>(0.754)  |                      | 0.771***<br>(0.194)  | 2.098***<br>(0.456)  |                      |
| POM_A(US listing=1)             |                      |                      | 5.31                 |                      |                      |                      |
| POM_A(HK listing=1)             |                      |                      | 4.57                 |                      |                      |                      |
| POM_A(with VIE=1)               |                      |                      |                      |                      |                      | 5.66                 |
| POM_A(without VIE=1)            |                      |                      |                      |                      |                      | 4.61                 |
| ATET/POM_A (US listing=1)       |                      |                      | -58.19%              |                      |                      |                      |
| ATET/POM_A (HK listing=1)       |                      |                      | -58.21%              |                      |                      |                      |
| ATET/POM_A (with VIE=1)         |                      |                      |                      |                      |                      | -56.71%              |
| ATET/POM_A (without VIE=1)      |                      |                      |                      |                      |                      | -59.44%              |
| Industry                        | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| Year                            | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| Province GDP per capita         | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| $\beta_2$                       |                      |                      | 0.474*<br>(0.272)    |                      |                      | 0.571**<br>(0.264)   |
| No. of obs                      | 2,913                | 2,913                | 2,913                | 2,913                | 2,913                | 2,913                |

**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 19: SMM Estimation**

| <b>paramater</b> | <b>estimate</b> | <b>s.e.</b> | <b>targeted moments</b>                 | <b>data</b> | <b>simulated</b> |
|------------------|-----------------|-------------|---|-------------|------------------|
| $\mu_0$          | 1.500           | 0.028       | $E[Y_{i0}]$                             | 4.38        | 4.74             |
| $\mu_1$          | 0.663           | 0.052       | $E[Y_{i1}]$                             | 2.96        | 2.24             |
| $\mu_c$          | 0.322           | 0.085       | $P[t_i = 1]$                            | 0.21        | 0.23             |
| $\sigma_0$       | 0.333           | 0.013       | $E[\varepsilon_{i0}   t_i = 0]$         | -0.11       | -0.12            |
| $\sigma_1$       | 0.540           | 0.037       | $E[\varepsilon_{i1}   t_i = 1]$         | -0.43       | -0.48            |
| $\sigma_c$       | 1.172           | 0.031       | $sd[\varepsilon_{i0}   t_i = 0]$        | 1.71        | 1.57             |
| $\rho_{01}$      | 0.229           | 0.614       | $sd[\varepsilon_{i0}   t_i = 0]$        | 1.82        | 0.98             |
| $\rho_{0c}$      | 0.584           | 0.089       | $corr[v_i, \varepsilon_{i0}   t_i = 0]$ | 0.14        | 0.13             |
| $\rho_{1c}$      | -0.775          | 0.058       | $corr[v_i, \varepsilon_{i1}   t_i = 1]$ | -0.24       | -0.15            |
|                  |                 |             | <b>untargeted moments</b>               | <b>data</b> | <b>simulated</b> |
|                  |                 |             | $E[Y_{i0}   t_i = 0]$                   | 4.05        | 4.62             |
|                  |                 |             | $E[Y_{i1}   t_i = 1]$                   | 1.91        | 1.76             |

**Table 20 A: Counterfactual Simulations**

|                             | $\tau$      | $r$         | $T_0$       | $T_I$       | $d$         | $\mu_c$     | $P(t=1)$     | expected U  | $\Delta$ in U % |
|-----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-----------------|
| factual                     | <b>0.22</b> | <b>0.05</b> | <b>3.33</b> | <b>1.25</b> | <b>0.10</b> | <b>0.32</b> | <b>0.232</b> | <b>1.21</b> | <b>NA</b>       |
| counterfactuals: reduce c   |             |             |             |             |             |             |              |             |                 |
| IPO reform in China to US   | 0.22        | 0.05        | 1.25        | 1.25        | 0.00        | 0.22        | 0.188        | 1.29        | 6.8%            |
| CA liberalization in China  | 0.00        | 0.05        | 3.33        | 1.25        | 0.10        | 0.10        | 0.147        | 1.39        | 14.6%           |
| both reforms                | 0.00        | 0.05        | 1.25        | 1.25        | 0.00        | 0.00        | 0.115        | 1.48        | 22.1%           |
| counterfactuals: increase c |             |             |             |             |             |             |              |             |                 |
| forbidden overseas listing  | 0.22        | 0.05        | 3.33        | 30.00       | -1.33       | -1.12       | 0.003        | 1.12        | -7.8%           |
| complete capital control    | 1.00        | 0.05        | 3.33        | 1.25        | 0.10        | 1.10        | 0.649        | 0.77        | -36.7%          |

**Table 20 B: Decomposition of Welfare Loss**

|                |                  |  |                  |
|----------------|------------------|--|------------------|
| welfare loss   | 18.00%           | 28.50%   | 0%               |
| $\mu_c = 0$    | $U_0 = 1.784$    | $U_0 = 0.610$  | $U_I = 0.300$    |
| identity       | always $t_i = 0$ | $t_i = 0$ if $\mu_c = 0$<br>switchers<br>$t_i = 1$ if $\mu_c = 0.32$ | always $t_i = 1$ |
| $\mu_c = 0.32$ | $U_0 = 1.462$    | $U_I = 0.436$  | $U_I = 0.300$    |
| proportion     | 76.8%            | 11.6%  | 11.5%            |

Note:  home listing       overseas listing

**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                              | -0.013<br>(0.012)    | -0.007<br>(0.007)    | -0.007<br>(0.006)    |
| Log (total asset)                | -0.899***<br>(0.113) | -0.528***<br>(0.067) | -0.529***<br>(0.068) |
| ROA (%)                          | 0.089***<br>(0.023)  | 0.062***<br>(0.014)  | 0.062***<br>(0.014)  |
| Sales growth rate (%)            | 0.010***<br>(0.003)  | 0.006***<br>(0.002)  | 0.006***<br>(0.002)  |
| Leverage (%)                     | 0.039***<br>(0.005)  | -0.007**<br>(0.003)  | -0.007**<br>(0.003)  |
| Intangible assets ratio (%)      | 0.025***<br>(0.006)  | 0.017***<br>(0.004)  | 0.017***<br>(0.004)  |
| State ownership percentage (%)   | 0.005**<br>(0.002)   | 0.004***<br>(0.002)  | 0.004***<br>(0.002)  |
| Independent director ratio (%)   | -0.014<br>(0.014)    | -0.008<br>(0.007)    | -0.008<br>(0.007)    |
| CEO=Chairman                     | 0.099<br>(0.130)     | 0.084<br>(0.082)     | 0.089<br>(0.081)     |
| Top5 ownership percentage (%)    | -0.013<br>(0.009)    | -0.007<br>(0.005)    | -0.007<br>(0.005)    |
| Controlling shareholders dummy   | 0.177<br>(0.130)     | 0.140<br>(0.090)     | 0.144<br>(0.091)     |
| Import and export ratio (%)      | -0.002<br>(0.002)    | -0.002<br>(0.001)    | -0.002<br>(0.001)    |
| Strategic investor dummy         | 0.124<br>(0.232)     | 0.066<br>(0.138)     | 0.075<br>(0.136)     |
| Foreign reserve growth rate (%)  | 0.005<br>(0.011)     | 0.004<br>(0.008)     | 0.004<br>(0.008)     |
| Foreign ownership percentage (%) | 0.004<br>(0.003)     | 0.002<br>(0.002)     | 0.002<br>(0.002)     |
| Operating cash flow ratio(%)     | 0.020*<br>(0.012)    | 0.012*<br>(0.007)    | 0.012*<br>(0.007)    |
| PE regulation                    | -0.044**<br>(0.018)  | -0.027**<br>(0.012)  | -0.027**<br>(0.012)  |
| Overseas listing                 | -3.825***<br>(0.943) | -2.503***<br>(0.395) | -2.558***<br>(0.351) |
| ATET=ATE                         | -3.83***<br>(0.94)   | -2.50***<br>(0.40)   | -2.56***<br>(0.35)   |
| POM_(E[Y0 t=1])                  | 6.28                 | 4.41                 | 4.46                 |
| ATET/POM_(E[Y0 t=1])             | -60.99%              | -56.69%              | -57.40%              |
| Industry                         | YES                  | YES                  | YES                  |
| Year                             | YES                  | YES                  | YES                  |
| Province GDP per capita          | YES                  | YES                  | YES                  |
| Observations                     | 2,729                | 2,729                | 2,727                |

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                         |                       |                              |                               |
|-----------------------------------|-----------------------|------------------------------|-------------------------------|
|                                   | (1)                   | (2)                          | (3)                           |
|                                   | Excluding real estate | Excluding financial industry | Excluding technology industry |
| Variables                         | 1st Year              | 1st Year                     | 1st Year                      |
| Age                               | -0.006<br>(0.006)     | -0.003<br>(0.005)            | -0.005<br>(0.007)             |
| Log (total asset)                 | -0.555***<br>(0.075)  | -0.476***<br>(0.049)         | -0.549***<br>(0.067)          |
| ROA (%)                           | 0.061***<br>(0.014)   | 0.072***<br>(0.013)          | 0.059***<br>(0.015)           |
| Sales growth rate (%)             | 0.008***<br>(0.002)   | 0.007***<br>(0.002)          | 0.006***<br>(0.002)           |
| Leverage (%)                      | -0.007*<br>(0.003)    | -0.007**<br>(0.003)          | -0.006*<br>(0.003)            |
| Intangible assets ratio (%)       | 0.018***<br>(0.004)   | 0.017***<br>(0.004)          | 0.013***<br>(0.004)           |
| State ownership percentage (%)    | 0.005***<br>(0.002)   | 0.004**<br>(0.002)           | 0.005***<br>(0.002)           |
| Independent director ratio (%)    | -0.004<br>(0.007)     | -0.006<br>(0.007)            | -0.008<br>(0.007)             |
| CEO=Chairman                      | 0.101<br>(0.082)      | 0.101<br>(0.072)             | 0.130<br>(0.083)              |
| Top5 ownership percentage (%)     | -0.007<br>(0.005)     | -0.003<br>(0.003)            | -0.006<br>(0.006)             |
| Controlling shareholders dummy    | 0.156*<br>(0.094)     | 0.110<br>(0.086)             | 0.093<br>(0.090)              |
| Import and export ratio (%)       | -0.002<br>(0.002)     | -0.001<br>(0.001)            | -0.002<br>(0.001)             |
| Strategic investor dummy          | 0.139<br>(0.138)      | 0.035<br>(0.130)             | -0.037<br>(0.124)             |
| Foreign reserve growth rate (%)   | -0.000<br>(0.008)     | 0.002<br>(0.008)             | 0.003<br>(0.007)              |
| Foreign ownership percentage (%)  | 0.003*<br>(0.002)     | 0.003*<br>(0.001)            | 0.002<br>(0.002)              |
| Operating cash flow ratio(%)      | 0.012*<br>(0.007)     | 0.008*<br>(0.005)            | 0.012*<br>(0.007)             |
| PE regulation                     | -0.053***<br>(0.017)  | -0.026**<br>(0.012)          | -0.011<br>(0.010)             |
| Overseas listing                  | -2.814***<br>(0.335)  | -2.739***<br>(0.274)         | -2.419***<br>(0.412)          |
| ATET=A TE                         | -2.81***<br>(0.34)    | -2.74***<br>(0.27)           | -2.42***<br>(0.41)            |
| POM_(E[Y <sub>0</sub>  t=1])      | 4.59                  | 4.54                         | 4.32                          |
| ATET/POM_(E[Y <sub>0</sub>  t=1]) | -61.22%               | -60.35%                      | -56.02%                       |
| Industry                          | YES                   | YES                          | YES                           |
| Year                              | YES                   | YES                          | YES                           |
| Province GDP per capita           | YES                   | YES                          | YES                           |
| Observations                      | 2,659                 | 2,655                        | 2,525                         |

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)<br>including Factors in FF model<br>Outcome<br>1st Year | (2)<br>excluding pre-IPO firm characteristics<br>Outcome<br>1st Year |
| Age                               | -0.004<br>(0.006)   | -0.005<br>(0.006)  |
| Log (total asset)                 | -0.800***<br>(0.081)  | -0.494***<br>(0.067)   |
| ROA (%)                           | 0.069***<br>(0.014)   | 0.067***<br>(0.012)  |
| Sales growth rate (%)             | 0.006***<br>(0.002)   | 0.006***<br>(0.002)  |
| Leverage (%)                      | -0.006*<br>(0.003)  | -0.009***<br>(0.003)   |
| Intangible assets ratio (%)       | 0.016***<br>(0.004)   |  |
| State ownership percentage (%)    | 0.003**<br>(0.002)  |  |
| Independent director ratio (%)    | -0.001<br>(0.006)   |  |
| CEO=Chairman                      | 0.125<br>(0.079)  |  |
| Top5 ownership percentage (%)     | -0.010**<br>(0.005)   |  |
| Controlling shareholders dummy    | 0.101<br>(0.090)  |  |
| Import and export ratio (%)       | -0.002<br>(0.001)   |  |
| Strategic investor dummy          | 0.054<br>(0.129)  |  |
| Foreign reserve growth rate (%)   | 0.014*<br>(0.007)   |  |
| Foreign ownership percentage (%)  | 0.001<br>(0.001)  |  |
| Operating cash flow ratio(%)      | 0.011*<br>(0.007)   |  |
| PE regulation                     | -0.025**<br>(0.011)   |  |
| Domestic Beta coefficients        | -0.229*<br>(0.122)  |  |
| Oveseas Beta coefficients         | -0.072<br>(0.106)   |  |
| Turnover rate                     | 0.091***<br>(0.014)   |  |
| Log (tradable shares)             | 0.558***<br>(0.068)   |  |
| Overseas listing                  | -2.884***<br>(0.341)  | -2.618***<br>(0.233)   |
| ATET=ATE                          | -2.88***<br>(0.34)  | -2.62***<br>(0.23)   |
| POM_(E[Y <sub>0</sub>  t=1])      | 4.78  | 4.53   |
| ATET/POM_(E[Y <sub>0</sub>  t=1]) | -60.25%   | -62.25%  |
| Industry                          | YES   | YES  |
| Year                              | YES   | YES  |
| Province GDP per capita           | YES   | YES  |
| Observations                      | 2,728   | 2,729  |

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: Valuation Effects of Overseas Listing: Robustness Checks 4**

| Dependent Variables              | Overseas Listing     | Tobin's Q            |                      |                      | Overseas Listing     |
|----------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                  | IV                   | IV                   | IPWRA                | IPWRA                | Matching             |
|                                  | 1st Year             | 1st Year             | 1st Year-treated     | 1st Year-control     | 1st Year             |
| Age                              | 0.005***<br>(0.001)  | 0.004<br>(0.007)     | -0.004<br>(0.005)    | -0.015**<br>(0.007)  | 0.034***<br>(0.006)  |
| Log(total asset)                 | -0.076***<br>(0.007) | -0.675***<br>(0.062) | -0.104<br>(0.079)    | -0.797***<br>(0.064) | -0.154***<br>(0.046) |
| ROA (%)                          | 0.011***<br>(0.001)  | 0.084***<br>(0.009)  | 0.011**<br>(0.005)   | 0.145***<br>(0.013)  | 0.036***<br>(0.006)  |
| Sales growth rate (%)            | 0.000<br>(0.000)     | 0.007***<br>(0.001)  | 0.001<br>(0.001)     | 0.009***<br>(0.002)  | 0.007***<br>(0.001)  |
| Leverage (%)                     | 0.007***<br>(0.000)  | 0.008<br>(0.005)     | 0.004<br>(0.004)     | -0.001<br>(0.004)    | 0.023***<br>(0.003)  |
| Intangible assets ratio (%)      | 0.003***<br>(0.001)  | 0.020***<br>(0.004)  | 0.019***<br>(0.005)  | 0.006<br>(0.004)     | 0.014***<br>(0.004)  |
| State ownership percentage (%)   | 0.000*<br>(0.000)    | 0.005**<br>(0.002)   | -0.001<br>(0.002)    | 0.008***<br>(0.002)  | 0.003<br>(0.002)     |
| Independent director ratio (%)   | 0.012***<br>(0.001)  | 0.015*<br>(0.009)    | -0.008*<br>(0.004)   | -0.006<br>(0.006)    | 0.071***<br>(0.008)  |
| CEO=Chairman                     | 0.037***<br>(0.011)  | 0.158*<br>(0.082)    | -0.049<br>(0.136)    | 0.037<br>(0.076)     | 0.315***<br>(0.084)  |
| Top5 ownership percentage (%)    | 0.001*<br>(0.000)    | -0.005<br>(0.003)    | -0.005<br>(0.008)    | -0.009***<br>(0.003) | 0.007*<br>(0.004)    |
| Controlling shareholders dummy   | 0.045***<br>(0.013)  | 0.236**<br>(0.097)   | -0.162<br>(0.132)    | 0.101<br>(0.088)     | 0.329***<br>(0.095)  |
| Import and export ratio (%)      | -0.000<br>(0.000)    | -0.002<br>(0.002)    | 0.002<br>(0.003)     | -0.000<br>(0.001)    | -0.001<br>(0.001)    |
| Strategic investor dummy         | 0.161***<br>(0.021)  | 0.398**<br>(0.176)   | 0.113<br>(0.120)     | 0.023<br>(0.147)     | 0.693***<br>(0.122)  |
| Foreign reserve growth rate (%)  | -0.004***<br>(0.001) | -0.006<br>(0.008)    | -0.018*<br>(0.011)   | 0.010<br>(0.009)     | -0.011<br>(0.008)    |
| Foreign ownership percentage (%) | 0.002***<br>(0.000)  | 0.007***<br>(0.002)  | 0.003<br>(0.002)     | 0.004***<br>(0.002)  | 0.011***<br>(0.001)  |
| Operating cash flow ratio(%)     | -0.002***<br>(0.001) | 0.008*<br>(0.005)    | 0.020***<br>(0.005)  | 0.002<br>(0.005)     | -0.026***<br>(0.005) |
| PE regulation                    | 0.005***<br>(0.002)  | -0.018<br>(0.011)    | 0.004<br>(0.008)     | -0.069***<br>(0.016) | 0.022*<br>(0.012)    |
| Overseas listing                 |                      | -4.434***<br>(0.564) |                      |                      |                      |
| Expected relative waiting days   | 0.064***<br>(0.005)  |                      |                      |                      | 0.350***<br>(0.040)  |
| Log(relative market index)       | 0.050***<br>(0.012)  |                      |                      |                      | 0.409***<br>(0.101)  |
| ATET                             |                      | -4.43***<br>(0.56)   | -2.598***<br>(0.201) | -2.598***<br>(0.201) | -1.80**<br>(0.74)    |
| POM_(E[Y0 t=1])                  |                      |                      | 4.503***<br>(0.193)  | 4.503***<br>(0.193)  |                      |
| ATET/POM_(E[Y0 t=1])             |                      |                      | -57.78%              | -57.78%              |                      |
| Industry                         | YES                  | YES                  | YES                  | YES                  | YES                  |
| Province                         | YES                  | YES                  | YES                  | YES                  | YES                  |
| Year                             | YES                  | YES                  | YES                  | YES                  | YES                  |
| Cragg-Donald Wald F statistic    | 78.21                |                      |                      |                      |                      |
| Kleibergen-Paap rk LM statistic  | 52.2                 |                      |                      |                      |                      |
| No. of Obs.                      | 2,729                | 2,729                | 2,729                | 2,729                | 2,729                |
| R <sup>2</sup>                   | 0.536                | 0.425                |                      |                      |                      |

Notes:

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

**Table A5: Motives and valuation Effects of Overseas Listing: OLS**

| Dependent Variables              | Overseas listing     | Tobin's Q            |                      |                      |                      |                      |                      |                      |
|----------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                  | 1 year before IPO    | At IPO               | 1st Day              | 1st Year             | 2nd Year             | 3rd Year             | 4th Year             | 5th Year             |
| Age                              | 0.034***<br>(0.006)  | -0.004<br>(0.006)    | -0.013<br>(0.011)    | -0.008<br>(0.006)    | -0.007<br>(0.006)    | -0.007<br>(0.005)    | -0.002<br>(0.006)    | 0.002<br>(0.007)     |
| Log(total asset)                 | -0.154***<br>(0.046) | -0.376***<br>(0.049) | -0.801***<br>(0.095) | -0.527***<br>(0.069) | -0.492***<br>(0.062) | -0.419***<br>(0.055) | -0.566***<br>(0.058) | -0.754***<br>(0.068) |
| ROA (%)                          | 0.036***<br>(0.006)  | 0.175***<br>(0.009)  | 0.212***<br>(0.015)  | 0.061***<br>(0.013)  | 0.049***<br>(0.008)  | 0.057***<br>(0.011)  | 0.046***<br>(0.010)  | 0.035***<br>(0.011)  |
| Sales growth rate (%)            | 0.007***<br>(0.001)  | 0.003*<br>(0.002)    | 0.006**<br>(0.003)   | 0.006***<br>(0.002)  | 0.007***<br>(0.002)  | 0.003*<br>(0.002)    | 0.003**<br>(0.001)   | 0.003***<br>(0.001)  |
| Leverage (%)                     | 0.023***<br>(0.003)  | 0.006**<br>(0.003)   | 0.000<br>(0.005)     | -0.007**<br>(0.003)  | 0.001<br>(0.003)     | -0.004<br>(0.003)    | -0.005*<br>(0.003)   | 0.001<br>(0.004)     |
| Intangible assets ratio (%)      | 0.014***<br>(0.004)  | 0.016***<br>(0.005)  | 0.014**<br>(0.007)   | 0.016***<br>(0.004)  | 0.019***<br>(0.004)  | 0.015***<br>(0.005)  | 0.010**<br>(0.005)   | 0.011**<br>(0.006)   |
| State ownership percentage (%)   | 0.003<br>(0.002)     | 0.004**<br>(0.002)   | 0.011***<br>(0.003)  | 0.004***<br>(0.002)  | 0.002<br>(0.001)     | 0.002<br>(0.002)     | 0.002<br>(0.002)     | 0.003<br>(0.002)     |
| Independent director ratio (%)   | 0.071***<br>(0.008)  | -0.008<br>(0.007)    | -0.008<br>(0.011)    | -0.010*<br>(0.006)   | -0.006<br>(0.005)    | -0.004<br>(0.005)    | -0.003<br>(0.006)    | -0.002<br>(0.007)    |
| CEO=Chairman                     | 0.315***<br>(0.084)  | 0.116<br>(0.080)     | 0.094<br>(0.146)     | 0.079<br>(0.080)     | -0.081<br>(0.074)    | 0.045<br>(0.077)     | 0.123<br>(0.091)     | 0.162*<br>(0.098)    |
| Top5 ownership percentage (%)    | 0.007*<br>(0.004)    | 0.004<br>(0.003)     | -0.005<br>(0.007)    | -0.007<br>(0.005)    | -0.001<br>(0.005)    | 0.005<br>(0.003)     | 0.004<br>(0.004)     | 0.010**<br>(0.004)   |
| Controlling shareholders dummy   | 0.329***<br>(0.095)  | -0.147<br>(0.090)    | -0.088<br>(0.161)    | 0.133<br>(0.093)     | 0.105<br>(0.086)     | 0.091<br>(0.092)     | 0.048<br>(0.115)     | -0.033<br>(0.119)    |
| Import and export ratio (%)      | -0.001<br>(0.001)    | -0.000<br>(0.001)    | 0.003<br>(0.003)     | -0.002<br>(0.002)    | 0.001<br>(0.001)     | 0.003*<br>(0.002)    | 0.000<br>(0.002)     | 0.003<br>(0.002)     |
| Strategic investor dummy         | 0.693***<br>(0.122)  | 0.125<br>(0.169)     | 0.057<br>(0.264)     | 0.044<br>(0.129)     | -0.071<br>(0.111)    | -0.102<br>(0.129)    | 0.026<br>(0.163)     | 0.235<br>(0.187)     |
| Foreign reserve growth rate (%)  | -0.011<br>(0.008)    | 0.002<br>(0.008)     | -0.017<br>(0.015)    | 0.005<br>(0.007)     | 0.001<br>(0.006)     | 0.003<br>(0.007)     | -0.005<br>(0.007)    | -0.015*<br>(0.008)   |
| Foreign ownership percentage (%) | 0.011***<br>(0.001)  | -0.002<br>(0.002)    | 0.001<br>(0.003)     | 0.002<br>(0.001)     | 0.000<br>(0.001)     | -0.001<br>(0.001)    | -0.001<br>(0.002)    | -0.001<br>(0.002)    |
| Operating cash flow ratio(%)     | -0.026***<br>(0.005) | 0.010*<br>(0.006)    | 0.013<br>(0.010)     | 0.013*<br>(0.007)    | 0.020***<br>(0.005)  | 0.012***<br>(0.004)  | 0.018***<br>(0.005)  | 0.020***<br>(0.005)  |
| PE regulation                    | 0.022*<br>(0.012)    | -0.001<br>(0.009)    | -0.005<br>(0.015)    | -0.028**<br>(0.012)  | -0.018*<br>(0.009)   | 0.019**<br>(0.008)   | 0.019**<br>(0.008)   | 0.005<br>(0.012)     |
| Expected relative waiting days   | 0.350***<br>(0.040)  |                      |                      |                      |                      |                      |                      |                      |
| Log(relative market index)       | 0.409***<br>(0.101)  |                      |                      |                      |                      |                      |                      |                      |
| Overseas listing                 |                      | -1.918***<br>(0.146) | -3.314***<br>(0.228) | -2.374***<br>(0.152) | -1.690***<br>(0.121) | -1.476***<br>(0.129) | -1.609***<br>(0.133) | -1.982***<br>(0.149) |
| Industry                         | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| Province                         | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| Year                             | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  | YES                  |
| No. of Obs.                      | 2,729                | 2,675                | 2,675                | 2,729                | 2,455                | 2,278                | 1,787                | 1,517                |
| R <sup>2</sup>                   |                      | 0.666                | 0.568                | 0.476                | 0.412                | 0.407                | 0.425                | 0.421                |

Notes:

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