Does Access to Equity Promote Trade?
Evidence from IPO Approvals in China[*]

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[Preliminary; Please Do Not Circulate]

Abstract

This paper investigates the understudied impact of equity financing on firms' export performance. We leverage the unique institutional context of initial public offering (IPO) in China, where firms must obtain formal approval from the regulatory agency for their public listing. Our empirical strategy compares firms that have undergone the IPO approval process, using successful and unsuccessful IPO firms as treatment and control groups, respectively. To sharpen the identification, we exploit the IPO review meeting records to exclude rejections citing clauses indicative of conditions that directly impact a firm's export outcomes. Our difference-in-differences analysis reveals that IPO approval leads to a significant increase of more than 40% in the export value of firms over the subsequent six years. Notably, in contrast to existing research on debt financing, we find that equity financing primarily operates through the extensive margin, with firms expanding into more destination-product markets while making minimal changes to their average exports per market. Furthermore, we identify the acceleration of intangible capital accumulation, such as technology stocks and consumer bases, as well as the alleviation of informational and reputational frictions, as the mechanisms through which equity financing positively affects trade. We also utilize natural language processing (NLP) tools to conduct textual analysis on firms' IPO prospectuses and find supportive evidence for the proposed channels.

Keywords: Firm Exports, IPOs, Chinese Economy, Equity Financing
JEL Codes: F10, G10

1 Introduction

Financial markets play a crucial role in international trade. Studies have shown that financial institutions contribute significantly to a country's comparative advantage (Chor 2010; Ju and Wei 2011; Nunn and Trefler 2014), as demonstrated by financially developed countries specializing in financially vulnerable sectors (Beck 2002; Manova 2013). Recent studies based on micro-level data have also revealed that firms' export patterns depend on the availability of bank loans (Paravisini et al. 2015) and trade credit (Ahn, Amiti and Weinstein 2011; Antràs and Foley 2015). Despite these findings, empirical evidence on the effect of equity financing on firm exports remains scarce.

Equity financing can potentially impact a firm's export activities through a distinct set of channels compared to debt financing. While equity capital can be used to finance a company's working capital and physical investments in export-related activities, similar to bank lending or trade credits (Feenstra, Li and Yu 2014; Cingano, Manaresi and Sette 2016), it can also be utilized to support activities involving high risks, agency costs, and a lack of collateral. Examples of such activities include innovation (Brown, Fazzari and Petersen 2009) and the establishment of sales networks to penetrate foreign markets (Arkolakis 2010). Given that successful export activities often necessitate substantial intangible investments in technology and consumer bases, which debt capital may be unwilling or unable to fund (Carpenter and Petersen 2002; Brown, Fazzari and Petersen 2009; Bates, Kahle and Stulz 2009; Falato et al. 2022), equity financing could emerge as a critical source of funding for exporters. This distinction highlights the importance of examining the impact of equity financing on firms' export performance.

One of the most significant events for a firm to gain access to equity from public investors is an initial public offering (IPO). During an IPO, a firm raises equity capital by selling its stocks to the public for the first time and becomes publicly traded. Various empirical studies have found that an IPO not only reduces firms' cost of capital (Brav 2009; Saunders and Steffen 2011) and hence stimulates investment (Kim and Weisbach 2008), but also leads to increased employment (Benmelech, Bergman and Seru 2015; Borisov, Ellulb and Sevilirc 2021) as well as influencing R&D and innovation activities (Kim and Weisbach 2008; Brown, Fazzari and Petersen 2009; Bernstein 2015; Cong and Howell 2021). However, identifying the causal effect of IPOs on export performance proves challenging due to the endogenous nature of firms' IPO decisions and the potential alignment with specific life-cycle stages for firms (Pastor, Taylor and Veronesi 2009).

In this study, we exploit a unique setting of China's public equity market - the IPO approval system of the China Securities Regulatory Commission (CSRC) - to gauge the impact of accessing public equity through IPOs on firms' export activities and investigate the channels through which IPOs affect firm exports. Unlike the disclosure-oriented and registration-based IPO system in the United States, the IPO system in China is largely controlled by administrative approval (e.g. Zhang 2013; Piotroski and Zhang 2014; Shi, Sun and Zhang 2018). Firms in China seeking to go public must go through a highly regulated multi-step process overseen by the CSRC. After fulfilling a set of compliance requirements and submit-

ting an application to the CSRC, the applicant firm, together with its underwriters, must attend a review meeting held by the Stock Issuance Examination and Verification Committee (SIEVC) of the CSRC. During the meeting, seven members from the SIEVC will discuss and vote on whether to approve or reject the IPO application based on the materials submitted by the applicant and the Q&A responses. The approval criteria for approval not only include strict financial requirements related to profit, revenue, and assets but also involve the review committee's subjective assessments. As a result, there is a significant level of uncertainty regarding the examination outcomes for IPO applicants due to the discretionary decisions made by the SIEVC.

We investigate the impact of IPO approvals on Chinese firms' export activities by comparing firms whose IPO applications were approved to those whose applications were rejected in review meetings. Based on IPO review meeting records, we introduce a novel identification strategy that excludes rejections citing revenue- or profitability-related clauses. These types of rejections are indicative of the presence of unobserved factors that directly impact a firm's export outcomes. We also argue that other clauses, such as independence and internal control, are unlikely to have direct relationships with firms' export performance. We show that firms with approved and rejected applications reviewed in the same year exhibit similar levels and trends of export activities prior to the review meetings, and their IPO application outcomes are difficult to predict based on firms' *ex-ante* export performance and planned IPO characteristics after implementing our identification strategy. Employing a difference-in-differences framework, we document that IPO approvals increase a firm's export value by over 40% in the subsequent six years after the review meeting. Furthermore, we find that the effect of IPO approvals manifested mainly in the extensive rather than the intensive margin of exports: firms significantly expand the number of destination-product markets they export to, rather than increase the average export value per destination-product market. The results corroborate our conjecture that public equity plays a distinct role in financing firm exports compared to debt financing, for which studies such as Paravisini et al. (2015) document that bank credits mainly impact the intensive margin of firm exports.

We examine the potential channels through which IPO approvals affect firm exports. Our analysis uncovers intriguing findings that challenge a simplistic theory suggesting that access to equity solely alleviates financial constraints, as does debt financing. Specifically, we find that the impact of IPO approvals on firm exports is attenuated for firms with higher levels of financial leverage (measured by the debt-to-asset ratio) and lower short-term liquidity. Furthermore, we discover a strong correlation between the export-promoting effect of IPO approvals and firms' investment in intangible capital. This relationship is supported by the observation of a more substantial impact on firms with a higher number of ex-ante patent filings and greater selling expense intensity. Additionally, we find that firms with fewer years of export experience exhibit a stronger effect following their IPO approvals, suggesting a reduction in informational barriers for less experienced exporters.

In addition, we extend our analysis to the firm-product level to investigate the role of product heterogeneity in mediating the impact of IPO approvals on firm exports. Consistent with our earlier findings based on firm heterogeneity, we uncover that products with lower tangi-

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bility, higher R&D intensity, and greater advertising intensity experience more substantial export growth and/or expansion into new destinations following IPO approvals. This further supports our hypothesis that IPOs facilitate trade by providing funding for intangible investments in technology stocks and consumer bases.

Furthermore, we observe that the effect of IPO approvals is stronger for differentiated products, which face more pronounced informational frictions in international trade, as discussed in (Rauch 1999). This suggests that equity financing plays a crucial role in overcoming the informational barriers associated with exporting differentiated products. Additionally, we examine the composition of export destinations at the firm-product level and find that IPO approvals lead to an increase in the share of destinations with lower levels of Chinese import penetration and similar accounting standards. This finding implies that IPOs enable firms to access and expand into markets that may be considered more risky or associated with higher informational barriers by other Chinese exporters while aligning with similar financial reporting practices.

To further bolster our proposed channels, we conduct a textual analysis of IPO prospectuses from approved firms. These prospectuses contain valuable information regarding firms' future business goals and utilization of funds. Using topic modeling techniques on the relevant textual data, we identify two prominent patterns. First, we observe that firms extensively discuss competitiveness and marketing strategies when outlining their plans for international market expansion. Second, we find a significantly positive correlation between firms' post-IPO export growth and the frequency of topics related to marketing or the global market in their IPO prospectuses. These findings align with our hypothesis that IPO firms allocate resources towards intangible assets, particularly in building consumer bases, as part of their strategies to penetrate foreign markets following the approval of their IPOs.

Our study contributes to several strands of existing literature, particularly in the context of financial markets and their impact on international trade. Earlier theoretical literature establishes that an imperfect capital market can affect patterns of international trade (Kletzer and Bardhan 1987; Matsuyama 2005). More recent works by Manova (2013), Feenstra, Li and Yu (2014), and Chaney (2016), drawing on Melitz (2003)'s framework, have further explored how financial constraints can affect firms' fixed and variable export costs. Empirical evidence using macro-level data across different countries has corroborated that patterns of international trade flows depend on trading countries' financial development (Beck 2002; Manova 2008, 2013; Chan and Manova 2015; Crinò and Ogliari 2016). At the micro level, prior studies such as Berman and Héricourt (2010); Minetti and Zhu (2011); Muûls (2015); Antràs and Foley (2015); Paravisini et al. (2015) have thus far focused on the impact of bank loans or trade credit on firm exports. However, there has been limited exploration of the role of equity financing.[1] Our study is among the first to fill this gap by explicitly examining how access to equity through an IPO event affects firm exports based on micro-

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[1]Another related strand of literature examines how financial markets contributed to the "great trade collapse" in 2008, such as Levchenko, Lewis and Tesar (2010); Amiti and Weinstein (2011); Bricongne et al. (2012); Chor and Manova (2012); Paravisini et al. (2015); Iacovone et al. (2019). However, few of these studies examine the relationship between equity financing and exports during the financial crisis.

level evidence. Our findings demonstrate that IPOs have a significant positive effect on firm exports by expanding firms' reach into new destination markets and broadening their product offerings. This finding stands in contrast to the effect of bank credit, which mainly affects the intensive margin of exports but has little impact on firms' entry or exit to new destination-product markets (Paravisini et al. 2015).[2] Our study therefore provides additional insights into the question of financial market development and international trade, and holds significant policy implications, particularly for developing countries that aim to promote their export activities while grappling with underdeveloped equity markets.

Secondly, we introduce a novel identification strategy that capitalizes on China's IPO approval system. This approach draws inspiration from the "narrative approach" widely used in macroeconomic literature (Romer and Romer 1989, 2023). The narrative approach addresses the issue of omitted variable bias by using the narrative record on the motivations for monetary policy actions to exclude monetary actions influenced by factors affecting output. Similarly, we leverage the IPO review meeting records to identify and exclude IPO rejections citing revenue- and profitability-related clauses. These rejections serve as proxies for factors (unobservable for econometricians) that directly impact firms' export activities. By excluding these cases, we can mitigate omitted variable bias in estimating the effects of IPOs on firm exports. Our approach complements previous studies that have employed alternative empirical strategies. Some studies have used prior market returns (Bernstein 2015; Larrain et al. 2021) or industry-level underwriter concentration Gao, Harford and Li (2013); Abdulla, Dang and Khurshed (2017, 2020) as instruments for firms' IPO decisions. However, these empirical strategies are primarily applicable to markets such as the US and Europe, where registration-based IPO systems are commonly adopted. By introducing this innovative identification strategy, we contribute to the methodological literature on studying the effects of IPOs on firm exports. Our approach allows us to address the challenges of omitted variable bias and provides a more robust estimation of the IPO effects in the context of China's unique IPO approval system. Moreover, our research opens avenues for future studies to explore similar strategies in other emerging markets with approval-based IPO systems, including South Korea, India, and Indonesia, broadening the understanding of IPO effects across different institutional contexts.

Lastly, our study provides novel empirical evidence that expands the understanding of the potential channels through which financial markets, particularly public equity markets, can influence firm exports. Previous studies of Feenstra, Li and Yu (2014) and Manova, Wei and Zhang (2015) have highlighted that exporters rely on different forms of external finance to cover upfront expenses in trade, fulfill working capital needs, and provide trade insurance. Our study explores alternative channels that extend beyond the traditional financial constraints associated with bank lending and trade credit. Drawing on insights from the extensive corporate finance literature (e.g. Brown, Fazzari and Petersen 2009; Hall and Lerner

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[2] A related work by (Minetti and Zhu 2011) finds that credit rationing reduces both the probability that a firm exports (which they call "extensive margin") and firm-level exports conditional on exporting (which they call "intensive margin"). Different from their definition, intensive and extensive margins in our study refer to the average exports across existing destination-product markets and the number of destination-product markets.

), we argue that public equity plays a crucial role in firm exports by financing intangible capital, such as technology and sales networks. Unlike debt capital, equity financing can better support the development of these intangible assets, which often face risks, agency costs, and lack of collateral value that make them less suitable for debt financing. Our empirical findings, supported by firm-level and firm-product level heterogeneity analysis, as well as textual analysis of IPO prospectuses, provide robust evidence of the linkage between IPO approvals and export growth for firms and products that heavily rely on intangible capital. Our study thus contributes to the literature by highlighting the unique role of public equity markets in promoting firm exports through the intangible capital channel and complements the existing discussion on the channels through which external financing affects firm exports.

The remainder of the paper is organized as follows. Section 2 introduces the institutional context and data. Section 3 outlines the empirical specification and identification strategy. Section 4 presents the baseline effects of IPO approvals on Chinese firms' exports. Section 5 presents results from heterogeneity analysis and textual analysis and discusses the underlying mechanisms. The last section concludes.

2 Data and Institutional Context

2.1 Institutional Background

There were two major boards in China's stock market before 2018: the Main Board and the Growth Enterprises Market (GEM) Board, also known as the Second Board or ChiNext. The Main Board was established in the early 1990s as a part of the Reform and Opening policies. The Main Board primarily served the state-owned enterprises (SOEs), but consisted of a growing share of non-SOEs during the 2000s due to market reforms and an expansion of the private sector. The GEM Board was introduced in 2009 after a prolonged period of preparation. It aims to provide public equity financing to smaller firms with growth potentials that cannot fulfill the full listing requirement of the Main Board.

While the listing requirements in the Main Board and the GEM Board differ in many aspects, the IPO process in the two boards is very alike. Unlike the disclosure-centric and registration-based IPO system in the United States and many European countries, until most recently, China's approval-based IPO process is tightly regulated by the China Securities Regulatory Commission, henceforth CSRC.[3] As the first step of the IPO process, the applicant (IPO issuing firm) must restructure and establish itself as a qualified stock share limited company. The issuing firm is also required to conduct due diligence and receive "tutoring" from financial professionals to meet compliance requirements. The applicant and the securities intermediaries then jointly file and submit an application package containing financial and nonfinancial information to the CSRC, which is reviewed on a first-come, first-served basis. The Stock Issuance Examination and Verification Committee (SIEVC), appointed and administered by the CSRC, holds regular meetings to review the applica-

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[3]Starting from February 17, 2023, the CSRC and stock exchanges issued rules for the full implementation of the registration system for stock issuance, effective from the date of issuance.

tions, which the applicant and its underwriters also attend. Seven members from the SIEVC will discuss and vote on whether to approve or reject the IPO application based on the applicant's submitted materials and Q&A responses. Only applications receiving no less than five votes will be approved. Once approval has been granted, the applicant must complete the listing process within a certain period of time.[4] The whole IPO process is lengthy and costly for the applicant: it usually takes about three years; if the application is rejected, the applicant needs to wait for at least six months after the initial rejection to re-apply, and re-application normally requires considerable resources (Chen et al. 2017). [5]

The IPO review process aims to ensure only healthy firms gain access to China's public equity markets. To achieve this goal, the CSRC not only sets strict listing requirements on net profit, revenue, and assets for firms engaging in IPO applications, but also retains discretion and uses judgment throughout the application process, especially during the review meetings (Piotroski and Zhang 2014).[6] For example, firms with declining or volatile sales records, fragmented lines of businesses, or transactions with direct or indirect shareholders and other related parties are more likely to be denied approval despite meeting the "hard" listing requirements. In fact, most of the rejection cases are due to the qualitative instead of quantitative requirements (Long and Zhang 2014). Starting in 2010, the CSRC disclosed detailed reasons for rejecting an IPO application for both the Main Board and the GEM Board, based on which our identification strategy is implemented.

There are two advantages of using the IPO approval setting for identification. First, the review committee composition is determined about one week before the review date by the SIEVC, which attempts to ensure similar review quality across IPO applications so that an IPO applicant would have limited influence on the committee decisions. Second, it remains difficult for IPO applicants to predict the review date since the IPO application process normally takes two to three years and the review meetings are held on a first-come, first-served basis. It is possible, however, that the review decisions are associated with certain characteristics of the applicants. For example, Chen and Yuan (2004), Zhang (2013), and Chen et al. (2017) document that the likelihood of a firm receiving IPO approval is influenced by the strength of political connections of the firm, the auditing agent, and the underwriter. In section 3.2.1, we discuss how these concerns may potentially affect the validity of our empirical strategy.

[Figure 1]

Figure 1 displays the number of IPO applications and approval rates on both the Main Board (2004-2016) and the GEM Board (2009-2016). The approval rate for listings on the Main Board is 84%, and the approval rate for listings on the GEM Board is 86%, both of which exhibit significant variations across years.[7] Approval rates for listings on the Main

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[4]The IPO approval is only valid for 6 months before 2013, and 12 months after 2013.

[5]An official document (in English) by the Shenzhen Stock Exchange (SZSE) can be found in http://www.szse.cn/English/listings/process/index.html.

[6]There are six aspects of listing criteria: qualification, independence, compliance, finance and accounting, utilization of proceeds, and information disclosure.

[7]Year 2004 and 2012 have very low or 0 IPO cases due to IPO suspensions.

Board before 2008 were volatile, possibly due to the multiple stock market reforms (such as the Split-share Structure Reform, as studied in Li et al. (2011)) that occurred during that period. Prior to 2012 and particularly from 2010 to 2012, IPO applications on both boards had a much lower probability of being approved than in subsequent years. This trend is related to CRSC's efforts to implement more decentralized and market-oriented regulatory practices.[8]

2.2 Data Construction

The foundation of our data comes from two sources: Wind IPO Examination Database (WIND) and the Chinese Customs Trade Statistics (CCTS). The WIND data covers the universe of IPO applications on the Main Board, the GEM Board, and other boards in China. It provides information on meeting dates, applicant identities, the composition of SIEVC committee members in each review meeting, and application outcomes. In addition, the data provides detailed descriptions of reasons for rejections starting from 2010. For each rejection case starting from 2010, the data provides a summary by the SIEVC that describes the reasons for rejections and cites the relevant clauses from the official documents. Our identification strategy utilizes the cited clauses to exclude rejections due to revenue- and profitability-related issues, likely to manifest unobserved characteristics affecting the firm's export performance.

The CCTS data provides information on the universe of import and export transactions of Chinese firms from 2000 to 2016, including transaction values, quantities, and trade types (ordinary, processing, and assembly trades) for each HS6 product by destination country pair of each exporter. The data also discloses the identity of the importing and exporting firms, including their names, addresses, and contact information.

We construct a novel linkage between the WIND data and the CCTS data by manually matching IPO applicants, both successful and unsuccessful ones, in the WIND data with exporters in the CCTS data using their names and location information. Given that a considerable number of IPO applicant firms change their names during the restructuring phase, we conduct the name-matching process for both the historical and current names of IPO applicants. Additionally, we supplement the data with the Annual Survey of Industrial Enterprises (ASIE) and textual data from prospectuses of IPO firms. Out of the $2,099$ IPO applicants on the Main Board and GEM Board from 2004 to 2016, of which $1,396$ are manufacturing firms, we successfully matched $1,139$ of them to the CCTS data.

We impose several restrictions on our sample of firms. We first limit our analysis to firms that applied for listings on the Main Board or the GEM board before 2016. We also exclude IPO review meetings that occurred prior to the 2006 stock market reform, during which the IPO review system was formalized, as well as those that took place just before the two significant IPO suspensions in 2008 and 2012, as per Cong and Howell (2021). We focus solely on the

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[8]See: SSE's research report on "IPO audit passes, reasons for rejection and trend analysis in previous years" (in Chinese: www.sse.com.cn/aboutus/research/report/c/4306286.pdf).

manufacturing sector, as is customary in the trade literature, and exclude pure-assembly trade flows, which involve only the assembly process with inputs and distribution provided by a foreign party (Manova and Yu 2016).

2.3 Summary Statistics

Table 1 displays summary statistics for the CCTS-WIND matched firm-year observations. On average, an IPO applicant firm has an export volume of 23.67 million RMB, equivalent to approximately 3.5 million USD, using the 2010 exchange rate. It exports 6.83 HS4 products to 19 different destinations and participates in over 40 destination-product markets, with an average trade volume exceeding 1 million RMB or 148 thousand USD in each market. The IPO approval rate for the matched sample is approximately 84%, which is consistent with the overall approval rate of all IPO applicants between 2004 and 2016.

[Table 1]

It is worth noting that IPO exporters in China differ significantly from ordinary exporters. On average, compared to the median exporter in the full sample of Chinese exporters, an IPO exporter engages in a 37 times larger volume of export activities, participates in 6 times more destination-product markets, and maintains 16 times higher average exports per market. Therefore, despite the relatively small sample size, the IPO firms are industry leaders and pioneers in export markets. Studying this set of firms is of significant economic importance, as they play a crucial role in driving export growth and shaping the competitive landscape of the export industry in China.

3 Empirical Strategy

3.1 Empirical Specification

We employ the following interacted difference-in-differences (DiD) specification to estimate the impact of IPO approvals on firm exports:

$$y_{it} = \sum_{k=-4}^{k=6} \beta_k \cdot \mathbb{1}(t - \tau(i) = k) \cdot \mathbb{1}(\text{IPO\_Approval}_i = 1) + \alpha_i + \kappa_{\tau(i),t} + \lambda_{s(i),t} + \mu_{b(i),t} + \epsilon_{it}, \ (1)$$

where i denotes each IPO applicant firm and t denotes each calendar year from 2000 to 2016. y_{it} represents an export outcome for IPO applicant firm i in year t, which includes log export value, log number of destination-product markets, and log average export value per market. The firm fixed effects, α_i, control for time-invariant unobserved firm characteristics. $\kappa_{\tau(i),t}$ are calendar year fixed effects that vary by IPO review meeting year cell $\tau(i)$ (applicant cohort). Intuitively, the cohort-year fixed effects restrict the comparison to approved and rejected IPO applicants reviewed in the same year, before and after the timing of the review meetings. The HS2 sector-by-year fixed effects, $\lambda_{s(i),t}$, control for time-varying industry-level shocks, and the trading board-by-year fixed effects, $\mu_{b(i),t}$, control for the time-varying effects

of stock market fluctuations in each trading board.[9] $\mathbb{1}(t - \tau(i) = k)$ is an indicator for the difference between year t and firm i's IPO review meeting year, $\tau(i)$, being k, and the event window spans from four years prior to the IPO review meeting to six years after it.[10] The variable $\mathbb{1}(\text{IPO\_Approval}_i = 1)$ is an indicator for whether the IPO application is approved. Of primary interest are the coefficients $\{\beta_k\}_{k \in \{-4,\ldots,6\}}$, which summarize the differences of mean outcomes for approved and rejected IPO applicant firms by time relative to the review meeting years.

It is important to note that our empirical setup addresses potential endogenous issues due to self-selection into IPOs, as it only focuses on exporters that have filed IPO applications and proceeded to IPO review meetings. Our specification also accounts for potential endogenous IPO timing issues by including the IPO review meeting cohort-by-year fixed effects. This approach effectively compares IPO applicants that attend IPO review meetings in the same year (and hence are likely to initiate and go through the several stages of IPO applications at the same time and face similar macroeconomic circumstances after their IPO application outcomes). Furthermore, the estimation is not subject to biases due to treatment effect heterogeneity in the standard staggered DiD approach (Baker, Larcker and Wang 2022). The IPO review meeting cohort-by-year fixed effects ensure that only units treated (reviewed by the SIEVC committee) in the same year are compared so that past treated units will not be used as effective comparison units.

To estimate the heterogeneous effect of IPO approvals on exports of products across different product categories, which have distinct export dynamics and market characteristics, we introduce a similar DiD specification at the firm-HS4 product level:

$$y_{ijt} = \sum_{k=-4}^{k=6} \beta_k^p \cdot \mathbb{1}(t - \tau(i) = k) \cdot \mathbb{1}(\text{IPO\_Approval}_i = 1) + \alpha_{ij} + \kappa_{\tau(i),t} + \lambda_{j,t} + \mu_{b(i),t} + \epsilon_{ijt}, \quad (2)$$

where i denotes each IPO applicant firm, j denotes each HS4 product in firm i's export portfolio, and t denotes each year. y_{ijt} is a firm-HS4 product level outcome variable, which includes log exports, log number of destinations, and log average exports per destination market. The firm-by-product fixed effects, α_{ij}, account for time-invariant firm-product characteristics, while the HS4 product-year fixed effects, $\lambda_{j,t}$, control for time-varying foreign product market shocks. The coefficients of interest are $\{\beta_k^p\}_{k \in \{-4,\ldots,6\}}$, which estimate the dynamic effects of IPO approvals at the HS4-product level. In our product heterogeneity analysis, we apply the specification to different sets of products and draw inferences for the potential mechanisms underlying the overall effect of IPO approval on firm exports.

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[9]Our sample includes three trading boards: Shanghai Stock Exchange (SSE) Main Board, Shenzhen Stock Exchange (SZSE) Main Board, and Shenzhen Stock Exchange (SZSE) GEM board.

[10]The base year is set as $k = -1$, one year before the IPO review meeting year.

3.2 Identification

The remaining threat to our empirical strategy is that a candidate firm's IPO application outcome may be correlated with unobserved factors that also affect the firm's export performance. For instance, if an applicant fails to improve its technology to compete with its international competitors, it may have a higher likelihood of being rejected for an IPO, while simultaneously experiencing worsened performance in the international market. This could lead to a spurious positive correlation between IPO approval and export performance (a positive selection bias), as an IPO rejection is not necessarily the direct cause of the applicant's export performance, but rather a symptom of the underlying unobserved factors.

To address the above endogenous concerns, we introduce a novel identification strategy by exploiting the IPO review meeting records and excluding rejections based on reasons likely also to affect a firm's export performance. Specifically, we restrict the sample to IPO applications in or after 2010 (during which explicit reasons for rejections are disclosed) and exclude rejections citing Clause 37 in the *Administrative Measures for Initial Public Offering and Listing of Shares* for Main Board listings and Clause 14 in the *Interim Measures for the Administration of Initial Public Offering of Shares and Listing on GEM* for GEM Board listings (henceforth "the restricted sample").[11] The two clauses include various circumstances in which a firm's revenue or profitability might be negatively affected (Appendix B.1). For example, there has been or will be a material change in the business model, product or service mix of the issuer (37.1), the issuer relies on suppliers or customers with significant uncertainties (37.2), or the issuer's net profit for the most recent year was mainly derived from its non-core businesses (37.3). Those circumstances are likely to be directly related to a firm's fundamentals, such as operational efficiency and growth potential, which may directly impact the firm's export outcomes.

On the contrary, there is no clear relation between other commonly cited clauses in rejections and potential unobserved applicant characteristics that might affect the applicant's export performance. These clauses include Clause 19 (Main)/Clause 18 (GEM): operational independence; Clause 24 (Main)/Clause 21 (GEM): internal control; Clause 41 (Main)/Clause 27 (GEM): investment project feasibility. Clause 19 (Main)/Clause 18 (GEM) are often cited when a firm has competition and transactions with direct or indirect shareholders and related parties. These circumstances are unlikely to directly affect a firm's export performance because they have no direct linkage with firm's own fundamentals and most of the concerned competition or transaction relationships occur in the domestic markets. Clause 24 (Main)/Clause 21 (GEM) refers to problems associated with financial reporting reliability and regulatory compliance. In practice, they are normally petty misdemeanors are common among public firms. Clause 41 (Main)/Clause 27 (GEM) are based on evaluations of the market prospects and profitability of future fund-raising investment projects, which are unrelated to any current operations of the issuer. Furthermore, since a rejection can cite

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[11]The original documents (in Chinese) can be found at: www.gov.cn/gongbao/content/2007/content_678934.htm (Main Board) and www.csrc.gov.cn/csrc/c105889/c1015337/content.shtml (GEM Board). Although the two documents are used as listing criteria for different boards, they share a high degree of similarity in terms of their contents, including most of the listed clauses.

multiple clauses, if any of the above circumstances directly affect the applicant's revenue or profitability, Clause 37 (Main)/Clause 14 (GEM) are also likely to be included.[12] Therefore, rejection without citing Clause 37 (Main) or Clause 14 (GEM) is unlikely to be driven by concerns about the applicant's fundamentals, which are most likely to have a simultaneous impact on the applicant's export activities. Appendices B.2 and B.3 offer several detailed examples of rejections based on Clause 37/Clause 14, or other relevant clauses, respectively.

[Figure 2]

Figure 2 displays the frequencies of the top five most commonly cited clauses in IPO rejections for the main board and the GEM board, respectively, based on our sample. Among the rejected applications, clauses related to revenue and profitability, specifically Clause 37 (Main) and Clause 14 (GEM), are the most frequently cited reasons for rejection. Clause 37 (Main) appears in 42% of the rejection cases for the main board, while Clause 14 appears in 57% of the rejection cases for the GEM board. Clauses related to internal control issues, namely Clause 24 (Main) and Clause 21 (GEM), are the second most common reasons for rejection on the main board and the third most common on the GEM board. Notably, there are also significant differences in the focus of rejections between the two boards. Clause 41: Project Feasibility (Main) is more frequently cited in rejections on the main board, while it rarely appears in rejections on the GEM board. On the other hand, Clause 18: Independence (GEM) ranks second in rejections on the GEM board, but Clause 15: Independence (Main) only ranks fifth in rejections on the main board.

[Table 2]

To validate our empirical strategy, we examine whether the IPO application outcomes correlate with the issuer's ex-ante characteristics. We regress the IPO application outcome indicator on the issuer's *ex-ante* export performance, including log exports, log number of destination-product markets, log average exports per market, all averaged three years before IPO review meetings, and the issuer's planned IPO characteristics, including log expected fundraising size and log expected public offering price (POP). The regression results are shown in Table 2. While IPO outcomes are uncorrelated with export variables in all columns in the full sample, they are indeed positively correlated with planned IPO size and negatively correlated with expected POP after controlling for sector and board fixed effects. On the contrary, IPO outcomes are uncorrelated with either export variables or IPO characteristics regardless of whether the aforementioned fixed effects are controlled for the restricted sample. The results of the balanced tests suggest that the unsuccessful IPO applicant exporters with rejections unrelated to revenue or profitability factors are unlikely to be different from the successful applicants in their unobserved characteristics that may affect their export performance.

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[12]For instance, in the rejection case of Nanjing Baose Co., both Clause 14 (GEM) and Clause 18 (GEM) were included, because the company "is materially dependent on the affiliated companies in terms of supply of raw materials, sales of products and funds (including guarantees provided by the affiliated companies for the company's borrowings, etc.)."

3.2.1 Political Connections

While our identification strategy is designed to mitigate bias from positive selection, whereby firms with better fundamentals have a higher likelihood of being approved for an IPO, negative selection bias may also be present, particularly in the context of political connections.

Prior research on China's IPO process has extensively examined how pre-existing political connections can influence an applicant's IPO application decisions and outcomes, as well as its post-IPO performance. Piotroski and Zhang (2014) show that impending political promotion is positively associated with accelerated rate of IPO filings in the region, revealing political motives underlying IPO decisions; Yang (2013) document that the political connections of audit firms reduce IPO rejection risks of their clients, but those of non-top tier audit firms are also associated with worse post-IPO performance of their clients; and Chen et al. (2017) find that the political connections of underwriters also improve IPO approval rates while reducing post-IPO performance. These empirical findings suggest that negative selection is possible in since low-quality applicants (as indicated by their post-IPO underperformance) have higher chances to be approved when political connections are present. A more recent study by Li and Lei (2022) point out that provincial governments can influence the CSRC's IPO examination decisions by retaining information related to certain non-financial requirements, such as the transfer of state-owned shares, environmental protection, and tax, which substantially overlaps with the non-revenue-/profitability-related clauses included in our restricted sample. Therefore, our estimates using the restricted sample should be viewed as lower bounds for the effect of IPO approvals on firms' export performance.

In the robustness tests, we examine one particular form of political connections — the political connections of audit firms (Yang 2013). The baseline estimates remain statistically significant and slightly larger in magnitude after excluding applicants whose audit firms have partners that serve as SIEVC members during the applicant's IPO application period, suggesting that political connections of audit firms may not significantly bias our estimates.

4 Effects of IPO Approvals on Firm Exports

4.1 Time Trends of Exports

Prior to presenting the regression estimates, we provide a visual representation of the raw export growth for both approved and rejected IPO applicants before and after their respective IPO review meetings. Specifically, we calculate export value of firm i in year t relative to its base period level (i.e., export value in the year preceding the IPO review meeting) using the following formula:

$$\widetilde{Export_{it}} = \frac{2(Export_{it} - Export_{i\tau(i)-1})}{(Export_{it} + Export_{i\tau(i)-1})}, \tag{3}$$

where $\tau(i)$ denotes the year of firm i's IPO review meeting. We then calculate the average relative exports in each pre- and post-period cell, $k = t - \tau(i)$, for the approved and rejected groups respectively.

[Figure 3]

Figure 3 displays the time trends of average relative exports for both the approved and rejected groups. In the pre-period ($k \in \{-4, -3, -2, -1\}$), the relative exports of both groups grow rapidly along similar paths for both the full and restricted samples. However, for the full sample, the trends diverge immediately after the IPO review meeting, while for the restricted sample, the divergence occurs in period 3. In both samples, the relative exports of approved firms continue to grow steadily in the first three periods after the review meeting, experience a moderate decline between periods 3 and 5, and then recover in year 6. In contrast, the relative exports of rejected firms either remain stagnant (in the full sample) or decline sharply in the later periods (in the restricted sample). These patterns suggest that IPOs may be crucial for an applicant to sustain superior long-run export performance over its export life-cycle.

4.2 Baseline Results

Figure 4 plots the coefficients $\{\beta_k\}_{k \in \{-4,\ldots,6\}}$ from Equation 1 for the main export outcome variable, log exports, on the full sample (Panel A) and the restricted sample (Panel B), respectively. The estimated coefficients illustrate that for both the full sample and restricted sample, exporters whose IPO applications are approved exhibit trends in log exports similar to those whose applications are rejected in the years prior to the IPO review meetings. However, log exports of the approved firms experience a significant increase following IPO approvals, particularly three years or more after the review meetings, compared to the rejected firms. The effect is statistically significant in the full sample in years 1, 3, 4, and 5, with a peak of 73.8% in year 4. In the restricted sample, the effect is statistically significant in year 3 and grows to 104.0% in year 6. Overall, the event studies show that IPO approvals have a positive and persistent impact on firm exports.

[Figure 4]

Next, we analyze the effect of IPO approvals on the extensive and intensive margins of firm exports. The extensive margin corresponds to the number of destination-product markets in which an exporting firm is active, and the intensive margin corresponds to the log average value of exports in each destination-product market. Figure 5 plots the event study estimates from Equation 1 for the log number of destination-product markets in Panel A and the log average exports per market in Panel B, for both the main sample and the restricted sample. Panel A reveals that firms' range of destination-product markets expands significantly following IPO approvals and remains at elevated levels thereafter: for the full sample, the estimated effects are statistically significant since year 1 and rise from 21.3% in year 1 to 48.0% in year 5; for the restricted sample, the estimated effect is also statistically significant since year 1 and rise from 35.4% in year 1 to 71.6% in year 6.[13] By contrast, Panel B suggests that the intensive margin response to an IPO approval is muted, as the event study estimates are small in magnitude and statistically indistinguishable from 0 for almost all years after the review meetings.

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[13]Figure A1 provides further evidence that the impact of IPO approvals on the extensive margin of firm exports is a result of both an increase in product scope and an expansion of destination countries.

Table 3 presents the standard DiD regression estimates of the interaction between the IPO approval dummy and a $Post_{t,\tau(i)}$ indicator, which equals to 1 if year t is the IPO review meeting year $\tau(i)$ or later, to gauge the average effect of IPO approvals on firm exports and on the extensive and intensive margins of exports. Panel A reports the estimates for the full sample of IPO firms, while Panel B reports the estimates for the restricted sample. Consistent with the event study estimates, an IPO approval improves a firm's exports by 45.9% for the full sample (Column 1a) and 44.7% for the restricted sample (Column 1b), and both estimates are statistically significant at a minimum of 5% level. Furthermore, an IPO approval expands a firm's range of destination-product markets by around 30% for both samples (Columns 2a and 2b), and the estimates are significant at the 1% level. On the contrary, the estimates are small in magnitude and statistically significant for average exports per market (Columns 3a and 3b). Nonetheless, it is possible that IPO approvals lead firms to reallocate their mix of products and skew their existing export sales toward their best-performing markets (Mayer, Melitz and Ottaviano 2021). To test this possibility, we examine how firms' exports in their top destination-product markets respond to IPO approvals. We define a destination-product market as a firm's primary export market if the firm's export value to that market is the highest among all markets in the four years leading up to the IPO review meeting, up until one year prior to the meeting. As shown in Columns 4a and 4b, the effects of IPO approvals on firms' exports in their top destination-product markets are statistically insignificant, although the magnitude becomes larger compared to the estimated effect on average exports per market for the restricted sample.

The findings suggest that IPO approvals significantly promote firms' export activities. Moreover, our results that IPO approvals mainly affect firm exports through the extensive instead of the intensive margin differ from Paravisini et al. (2015), which finds that the effect of credit supply on trade is mainly channeled through the intensive margin. This difference may embody the distinctive effect of equity in financing risky activities such as innovation (Brown, Fazzari and Petersen 2009) or entering into new export markets. Theoretically, our findings are still consistent with models of heterogeneous and multi-product firms such as Melitz (2003) and Bernard, Redding and Schott (2011), among others. Our results suggest that access to public equity is related to reductions in the entry and fixed costs of exporting.

4.3   Robustness Tests

We perform several robustness tests to confirm the validity of our baseline results. Firstly, although our restricted sample excludes rejections based on revenue/profitability-related clauses, there may still be concerns that other clauses related to the firm's financial performance could reflect firms' unobserved characteristics that affect their international market activities. To address this concern, we create an alternative restricted sample that excludes rejections based on any clauses from Chapter 4: Finance and Accounting (Main Board) or its equivalent for the GEM Board, which includes Clause 37/Clause 14 as well as a broader set of finance-related clauses. Although this alternative sample contains a small number

of rejected cases, the event study estimates, as shown in Figure A2 remain consistent with our baseline findings, indicating that IPO approvals enhance firm exports and expand their market spans but have little effect on the intensive margin of exports.

Another concern over our findings is that the *ex-nate* planned IPO characteristics might also be related to firms' *ex-post* export performance. As shown in Table 2, successful IPO applicants tend to have larger fundraising sizes and lower public offering prices (POPs). To address this issue, we run regressions in Figure A3 that control for planned IPO characteristics (log expected fundraise and log expected POP) interacted with year dummies. The event study estimates of the effects of IPO approvals on firm exports are quantitatively similar for both the full and restricted samples after controlling for the time-varying effects of planned IPO characteristics.

Next, we assess to what extent political connections may affect our baseline estimates. Following Yang (2013), we identify IPO applicants in our sample whose audit firms also have partners serving as SIEVC members during the review meeting period. Presumably, those applicants may gain advantages in the IPO review process through obtaining internal information or lobbying. As a consequence, low-quality applicants with politically connected audit firms may have a higher chance of being approved by the review meetings, leading to negative bias in our estimates. We exclude exporters with politically connected audit firms (around 16% in our sample) and re-estimate the event-study coefficients for both the full sample and the restricted sample. As shown in Figure A4, the post-period estimates remain statistically significant and are quantitatively similar compared to our baseline estimates in Figure 4.

A natural expansion of our current analysis is to investigate the impact of IPO approvals on firms' participation in foreign markets. To this end, we expand our sample to a balanced panel and estimate Equation 1 with an indicator for export participation as the dependent variable, as shown in Figure A5. The event study estimates reveal that IPO approvals have a positive but statistically insignificant effect on firms' export participation, for both the full and restricted samples. This lack of significance may be attributed to the already high levels of foreign market participation among IPO applicants, with over 86% of firms exporting in all years during the sample period. As our sample includes the largest and most productive exporters in China, who are already active in the global marketplace, it is unlikely that IPOs will have a substantial impact on their decisions regarding export participation.

Finally, we conduct nonparametric permutation tests (Chetty, Looney and Kroft 2009) for the DiD estimate to address concerns that standard errors of difference-in-differences estimators might be biased due to serial correlation in outcomes (Bertrand, Duflo and Mullainathan 2004). We randomly assign "fake" IPO approval status to IPO applicants and re-estimate the DiD specification. Figure A6 displays the empirical CDF of estimates resulting from permuting treatment status 500 times, and the vertical lines represent the "true" estimates in Table 3. For both the full and restricted samples, the implied p-values of the "true" estimates of the DiD coefficients are well below 0.05, confirming our baseline findings that IPO approvals significantly improve firm exports.

5 How Do IPO Approvals Affect Exporters' Activities?

5.1 Potential Channels

Access to public equity through IPOs can impact firm exports through both financing and non-financing channels. Funds raised through IPOs can be used to directly finance working capital or physical capital investments necessary for export activities, such as fulfilling liquidity needs in trade or expanding production capacity to serve foreign markets. This role of external financing provision is often found for bank credits (Amiti and Weinstein 2011; Feenstra, Li and Yu 2014; Cingano, Manaresi and Sette 2016). Meanwhile, equity financing plays a distinct role in financing investments in the intangible capital crucial in international trade, such as technology stocks (Brown, Fazzari and Petersen 2009; Hall and Lerner 2010) or consumer capital (Arkolakis 2010; Gourio and Rudanko 2014). Previous studies have found extensive evidence that firms rely on equity and retained earnings, instead of bank credits, to finance investments in intangible capital (Carpenter and Petersen 2002; Brown, Fazzari and Petersen 2009; Bates, Kahle and Stulz 2009; Falato et al. 2022) due to risks, agency costs, and lack of collateral value. Therefore, IPO approvals may promote firm exports by accelerating their accumulation of intangible capital in addition to financing working capital and physical capital investments.[14]

Apart from the financing channel above, IPO approvals may impact firm exports through various non-financing channels. First, IPO may facilitate information disclosure of firms and their products (Stoughton, Wong and Zechner 2001; Demers and Lewellen 2003; Chemmanur and Yan 2009) or provide financial intermediary certification (Hsu, Reed and Rocholl 2010), thereby reducing informational or reputational frictions in international trade (Allen 2014; Chaney 2014; Macchiavello and Morjaria 2015; Chen and Wu 2021). Additionally, IPOs allow firms to diversify risks in the public equity market (Bodnaruk et al. 2008; Chod and Lyandres 2011), enabling them to adopt riskier and more aggressive foreign market expansion strategies. Finally, the monitoring role of external shareholders may improve the corporate governance and managerial efficiency of IPO firms (Holmström and Tirole 1993; Shleifer and Vishny 1997).

This section comprises firm-level and firm-product-level heterogeneity analyses to examine the channels discussed above. We also offer suggestive evidence on how IPO approvals affect firms' export-related performance based on the ASIE-matched sample. Finally, we conduct a textual analysis of the IPO prospectuses of exporting firms to identify topics related to their export activities.

5.2 Firm Heterogeneity

We examine several sources of firm heterogeneity in the effect of IPO approvals in this subsection. The analysis separates the restricted sample of IPO applicants into pairwise subsamples by whether each of their *ex-ante* characteristics is above or below the median

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[14]Appendix C provides a conceptual framework to illustrate how access to equity capital is associated with exporters' intangible investments and affects the intensive and extensive margins of export.

within each application-year cohort group and estimates a DiD version of Equation 1. The results are presented in Table 4.

[Table 4]

Following Manova and Yu (2016), we construct two measures of firms' financial health based on their balance sheet information from ASIE: financial leverage and liquidity. Financial leverage is measured as the average debt-to-asset ratio in the three years preceding the firm's IPO review meeting, while liquidity is measured as the difference between firms' current assets and current debts scaled by total assets, averaged over the same period. Firms with higher ex-ante financial leverage face more immediate financial obligations and, consequently, more stringent financial constraints. Similarly, firms with lower liquidity have less cash flows available and are more financially constrained in the short term. The results of the subsample analysis are presented in Columns 1 to 4. As shown in Columns 1 and 2, the export-promoting effect of IPO approvals is evident only for firms with low ex-ante financial leverage, as exports of the subsample firms grow by around 101% on average following IPO approvals. In contrast, the effect is statistically insignificant and negligible in magnitude (-8%) for firms with high ex-ante financial leverage. Likewise, Columns 3 and 4 reveal that approved firms with more abundant liquidity experience significantly higher export growth following IPO approvals. The estimated effect is 79% and statistically significant at 10% levels for firms with high *ex-ante* liquidity, whereas the effect is only 24% and statistically insignificant for the low liquidity counterparts. In summary, IPO approvals enhance the export growth of less financially constrained firms.

Next, we construct three proxies to represent firms' *ex-ante* tangible and intangible investment activities. Firms' *ex-ante* investment in fixed assets is measured using physical investment scaled by total sales averaged over the three years preceding the firm's IPO review meeting.[15] Firms' *ex-ante* investment in technology is measured using the total number of invention patent applications filed in the China National Intellectual Property Administration (CNIPA) during the same time frame. Firms' *ex-ante* investment in consumer base using firms' selling expenses scaled by total sales, as in Gourio and Rudanko (2014), averaged over the same time period. As shown in Columns 5-10, the effect of IPO approvals is quantitatively larger and more statistically significant for firms exhibiting more *ex-ante* physical investment (91.3%), a greater number of invention patents (93.4%), or higher selling expenses (78.7%). The effect on firms with less investment, fewer patents, or lower selling expenses, although remaining positive, is smaller in magnitude and statistically insignificant. The export-promoting effect of IPO approvals is hence positively associated with firms' *ex-ante* tangible and intangible investment activities.

Lastly, we employ firms' export tenure at the time of their IPO review meetings as a proxy for ex-ante informational frictions encountered by IPO applicants, in accordance with previous

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[15]Since capital expenditure and depreciation variables are missing for certain years in the ASIE data, we apply a 10% depreciation rate as common in the literature and compute physical investment in year t as $FA_t - (1 - 10\%)FA_{t-1}$, where FA is the total fixed assets.

studies such as Albornoz et al. (2012). As illustrated in Columns 11-12, exporters with less export experience exhibit a greater increase in export growth of 80.1% following IPO approvals when compared to their more experienced counterparts, for which the estimated effect is only 24.2% and statistically insignificant.

5.3 Foreign Market Expansion by Product Characteristics

In this subsection, we examine firm-HS4 product-level export activities and exploit the heterogeneity of IPO approval effect across industries and products. Following the specification of Equation 2, the analysis includes both the firm-product log value of exports and the log number of destinations as dependent variables, and control for firm-product fixed effects and product-year fixed effects in addition to the IPO review meeting cohort-by-year fixed effects and trading board-by-year fixed effects as in the firm-level analysis. As before, we use the restricted sample of IPO firms to address potential endogeneity concerns. Table 5 shows the results.

[Table 5]

Column 1 examines the overall impact of IPO approvals on firm-product exports and destination span. The estimates suggest that obtaining an IPO approval leads to a 40% increase in firm-product exports and a 22% increase in the number of destinations, both statistically significant at 5%. Columns 2-7 separate our sample into subgroups using three commonly used industry-level measures of financial vulnerability (Rajan and Zingales 1998; Kroszner, Laeven and Klingebiel 2007; Manova and Yu 2016): external finance dependence, liquidity needs, and asset tangibility.[16] While all subsamples experience growth in the number of export markets in the wake of IPO approvals (Columns 2b to 7b), only exports in industries with high external finance dependence, high liquidity needs, and low asset tangibility significantly expand in value, as shown in Columns 2a, 4a, and 7a. The effect of IPO approvals on exports in less financially vulnerable industries is statistically insignificant, and the coefficients turn much smaller or even negative in magnitude for industries with low liquidity needs and high asset tangibility.

In Columns 8-11, we divide our sample based on product-level measures of R&D intensity and advertising intensity, as constructed by Ma, Tang and Zhang (2014). Columns 8 and 9 indicate that the effects of IPO approvals on both export value and the number of export destinations are more prominent in R&D-intensive industries. The estimates for non-R&D-intensive industries are statistically insignificant and only approximately half in magnitude compared to those for R&D-intensive industries. Columns 10 and 11 further reveal that the IPO approval effect is also more pronounced for advertising-intensive industries. Although the span of destination countries significantly expands for both advertisement-intensive and non-advertising-intensive industries, the value of exports only significantly improves for advertising-intensive industries. In contrast, exports in non-advertising-intensive

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[16]We divide the sample into high and low groups based on whether each of the three measures of the HS4 product is above or below the median of all HS4 products.

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industries experience a minimal increase following IPO approvals.

Lastly, Columns 12 and 13 compare the subsample of differentiated products versus non-differentiated products, following the classification by Rauch (1999).[17] The estimates reveal that both export growth and destination expansions following IPO approvals are predominantly focused on differentiated products. On the contrary, the effects are negligible and statistically insignificant for non-differentiated products. In additional unreported analyses, we employ alternative definitions of product differentiation, such as those proposed by Levchenko (2007), and observe similar outcomes.

5.4   Other Dimensions of Firm Outcomes

In addition to export activities, we further examine the impact of IPO approvals on other dimensions of firm outcomes using the ASIE database. However, there are two caveats to consider before presenting our ASIE-based findings. Firstly, the ASIE data is available only up to 2013, limiting the length of the post-period in the DiD analysis to a maximum of 3 years for the restricted sample, which covers IPO applicants with review meetings held in or after 2010. Secondly, the ASIE data post-2007 is known to suffer from several sampling and data reliability issues (Nie, Jiang and Yang 2012; Brandt, Van Biesebroeck and Zhang 2014). Consequently, the findings in this section should be interpreted as suggestive evidence.

[Table 6]

In Panel A of Table 6, we investigate the response of exporting firms' operational outcomes, including log sales, log employment, and operating profit (calculated as EBIT divided by sales), to IPO approvals. Our findings indicate that while IPO approvals have a limited influence on firms' employment and profit margins, they do significantly enhance overall sales by 18.8%. These results partially align with Larrain et al. (2021), which reports a post-IPO increase in sales per employee. However, unlike their study, we did not observe a robust impact on firm profitability.

Panel B of Table 6 displays the impact of IPO approvals on various expense categories for firms, including selling expenses, management expenses, and accounting expenses, all deflated by sales. Selling expenses cover the various expenses incurred in the process of selling goods and materials, such as advertisement and packaging. Management expenses refer to the costs incurred by an enterprise in organizing and managing its production operations, such as the compensation of non-production workers. Accounting costs mainly consist of costs incurred in fundraising processes. Our findings reveal that IPO approvals notably increase exporting firms' selling expenses by 1.61%. While the estimated effect on management expenses is of a similar magnitude, it is not statistically significant. Accounting expenses

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[17]We define differentiated HS6 products as those that are neither traded on an organized exchange nor listed in reference-price volumes (Rauch 1999). We aggregate the indicator at the HS4 level and classify an HS4 code as a differentiated product if more than 50% of the HS6 sub-codes are classified as differentiated.

exhibit minimal changes in response to IPO approvals.

Panel C's regressions examine the effect of IPO approvals on the financial outcomes of exporting firms. We measure the overall size of firms' financial assets using log total assets, their capital structure using financial leverage (calculated as the ratio of total liability to total assets), and the short-term availability of cash flows using liquidity (calculated as the difference between firms' current assets and current debts, scaled by total assets). Our findings reveal that, after IPO approvals, firms experience a significant increase of approximately 50% in total assets and a notable decrease of 12.4% in the leverage ratio. This implies an increase in the proportion of external equity financing within firms' capital structure. Additionally, firms obtain 13.7% higher liquidity following IPO approvals, indicating an alleviation of their short-term financial constraints.

Finally, in Panel D of of Table 6, we analyze the impact of IPO approvals on exporting firms' investment and innovation activities. We measure firms' physical investment intensity as physical investment scaled by total sales. To assess firms' innovation activities, we use both the number of invention patent applications and the combined number of invention and utility model patent applications. Following Cohn, Liu and Wardlaw (2022), we employ Poisson-pseudo maximum likelihood (PPML) models in Columns 2 and 3 to estimate the effect of IPO approvals on firms' patent applications, avoiding estimation bias due to "log1plus" transformations. Our findings indicate that IPO approvals result in a positive, yet statistically insignificant, increase in physical investments. The effect of IPO approvals on firms' invention patent applications is also positive but statistically insignificant. However, the impact on firms' combined invention and utility model patent applications is statistically significant at the 10% level, suggesting an increase in overall innovation activities of IPO firms.

5.5 Discussion

The findings in this section primarily indicate that obtaining public equity through IPOs can potentially alleviate both short-term and long-term financial constraints in firms' export activities. This is directly evident by firm exports in industries with high external finance dependence and high liquidity needs exhibiting a more pronounced response to IPO approval events, as demonstrated in Columns 2-7 of Table 5. Moreover, Panel C of Table 6 offers suggestive evidence that firms can expand their financial assets by raising equity financing, as well as enhance their short-term balance, in the wake of IPO approvals.

Meanwhile, the empirical evidence also suggests that equity financing plays a distinct role in supporting firm exports compared to debt financing. In addition to our finding that IPO approvals mainly affect firm exports through the extensive margin, which is different from Paravisini et al. (2015) on bank credits, we also find that IPO approvals mainly enhance exports for less *ex-ante* financially constrained firms, as illustrated in Table 4. This indicates poor substitutability between equity and debt when financing export activities: firms facing higher short-term and long-term credit constraints are less likely to utilize public equity raised from IPOs as an effective alternative source for financing exports.

Internal and external equity finance play a vital role in R&D investment due to factors such as information asymmetry, riskiness, and lack of collateral value (Brown, Fazzari and Petersen 2009). Analogously, our findings demonstrate that IPO approvals boost export activities through financing intangible investments. While Table 4 reveals that firms with higher *ex-ante* physical investment and those with higher *ex-ante* intangible investment both exhibit more pronounced export growth following IPO approvals, this growth is primarily focused on industries with low asset tangibility, high R&D intensity, and high advertisement intensity at the firm-product level, as shown in Table 5. Furthermore, the findings in 6 suggest that IPO approvals may contribute to exporters' accumulation of intangible capital, particularly through an increase in selling expenses that expand the consumer base.

IPO approvals appear to reduce informational friction in export activities, as supported by two empirical findings: Columns 11 and 12 of Table 4 demonstrate that IPO approvals primarily enhance exports for less experienced exporters, who likely face more stringent informational barriers in exporting due to incomplete information about foreign demand (Albornoz et al. 2012); Columns 12 and 13 of Table 5 indicates that IPO approvals mainly increase export volume and expand destination markets for differentiated products, which experience high informational and search barriers (Rauch 1999). The reduction of informational friction can be achieved either through firms' enhanced selling and marketing activities in foreign countries to build up consumer base (Arkolakis 2010; Eaton et al. 2021; Fitzgerald, Haller and Yedid-Levi 2023) and to learn foreign market demand (Albornoz et al. 2012; Schmeiser 2012; Ruhl and Willis 2017), or through post-IPO information disclosure and reputation building.

While we do not pinpoint the specific mechanism between the two, Table A3 examines changes in firms' composition of foreign markets following IPO approvals and provides additional evidence of IPO's role in mitigating informational frictions in trade. For each continuous destination characteristic, including geographic distance to China, GDP per capita, and Chinese import shares, we compute the median of the values across destination countries and then calculate the share of destinations with values above the median for each firm-product. We find that IPO approvals do not increase the share of destinations with higher physical trade costs, such as those with long geographic distances and non-WTO members. Instead, IPO approvals significantly increase the share of high-income countries with larger consumer bases for high-quality products (Fajgelbaum, Grossman and Helpman 2011), and the share of markets with low Chinese import penetration, which indicates more market risks and higher informational barriers for Chinese exporters to enter. Furthermore, IPO approvals significantly increase the share of destinations that adopt the International Financial Reporting Standards (IFRS), which are similar to the accounting standards in China. Consistent with the financial disclosure mechanism, this finding suggests that foreign buyers in countries with similar financial reporting standards are better equipped to assess the quality of Chinese public exporters. Finally, we examine whether IPOs allow exporters to bear more foreign market risks by examining whether IPO approvals increase

the share of markets with high sales volatility.[18] The coefficient is statistically insignificant and close to zero in magnitude, indicating that the risk-taking motive is not the main driver of destination composition adjustment.

5.6 Textual Analysis

To provide supplemental evidence on the mechanisms through which IPOs might be related to firm exports, we conduct a textual analysis of IPO firms' prospectuses, which provide detailed information on firms' business, financial performance, and risks for potential investors during the public offering process. We collect all IPO prospectus documents of approved firms on the Main Board and GEM Board from 2007 to 2016. We then extract textual data of Business Development Goals (BDG) and Usage of Raised Funds (URF), two sections in each IPO prospectus that specifically outline an IPO firm's future business plans and intended fund usage.[19]

We preprocess the textual data in the following steps. First, we separate the text into sentences and remove punctuation and special characters. Next, we apply "jieba," a widely-used tokenizer for processing Chinese textual data, to group characters into words. We then remove stopwords such as "and," "or," and "this," as well as words that appear in fewer than 50 sentences or more than 20% of all sentences in a given section. Based on the preprocessed textual information, we create a bag of words to vectorize sentences in each section.

We apply the Latent Dirichlet Allocation (LDA) algorithm, a standard topic modeling method, to the textual data of each section to generate and assign topics. We also use coherence scores to determine the optimal number of topics. Ultimately, the LDA algorithm generates 12 topics for both the BDG and URF sections. For each topic, we create a list of 10 representative words to interpret its meaning.[20] We further assign each of the 102,485 sentences in the BDG section and the 319,178 sentences in the URF section to their most

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[18]To measure sales volatility for each destination-product market, we compute the coefficient of variation of each Chinese exporter's market-specific export flows across time and then compute its average at the destination-product level. We then define a destination-product market as having high sales volatility if its sales volatility is above the median of all markets and compute the share of high-volatility destinations for each firm-product.

[19]The Business Development Goals section includes: medium- and long-term strategic planning; measures taken to achieve the strategic objectives and their implementation; measures planned for the future; assumptions for the formulation of strategic objectives and specific plans; and possible difficulties in implementation. The Usage of Raised Funds section includes: Management for the investment and use of raised funds; the contribution of the proceeds to the issuer's main business, the impact on the issuer's future business strategy, and its role in the issuer's innovation; investment direction and arrangement for the use of the raised funds; relationship between the fund-raising investment projects and the main business and core technology; and disclosure of usage of proceeds based on materiality principle.

[20]The 12 topics, as interpreted by the authors, generated from BDG text are: Competitiveness, Innovation, Talent, Client, Fundraising, Marketing, Uncertainty, Revenue, Board, Liquidity, Assets, and Management. The 12 topics generated from URF text are: Competitiveness&Innovation, Production line, Client, Market Potential, Capacity, Fixed Assets, Liquidity, Environment, Global Market, Land use, Fundraising, and Board. The word cloud of each topic, which visualizes the representative words and their frequencies, is shown in Figures A7–A10.

related topic, respectively.

The purpose of the textual analysis is to describe the topics that IPO firms discuss regarding the international market and how the related discussions are related to firms' export activities. To this end, we begin by comparing the distribution of assigned topics in sentences related to the international market to that of other sentences. We define a sentence as international market-related if it contains the following keywords: international, global, world, foreign, export, or import. We then calculate the share of each topic in international market-related content and in other content in each section of every IPO prospectus document.

[Figure 6]

As illustrated in Panel A of Figure 6, the discussions in the BDG section primarily focus on market and technology-related topics, such as *competitiveness*, *marketing*, and *innovation*. In contrast, finance-related topics like *fundraising*, *liquidity*, and *assets* constitute a smaller proportion of BDG texts. Notably, the shares of *competitiveness* and *marketing* topics are significantly higher in international market-related sentences compared to other sentences in the BDG text. Similar patterns also hold for the URF text, as depicted in Panel B of Figure 6. Market and technology topics, such as *competitiveness/innovation*, *demand*, and *global market*, appear more frequently in the URF section than finance-related topics like *fixed assets*, *liquidity*, and *fundraising*. International market-related sentences also tend to contain more discussions on *competitiveness/innovation*, *demand*, and *global market*. Corroborating our previous heterogeneity analysis, the topic modeling results suggest that marketing and innovation activities are the primary focus of IPO firms, particularly concerning their foreign market strategies.

Next, we examine whether the topics discussed in IPO prospectuses are associated with firms' post-IPO export performance. As our textual data only includes firms that obtained IPO approvals and went public successfully, we calculate the difference between each firm's average annual export growth before and after IPO approval to measure their post-IPO export performance. We then regress this difference on the shares of the top five most frequent topics in the BDG and URF sections, respectively, while controlling for cohort fixed effects.

[Figure 7]

Figure 7 demonstrates that firms' post-IPO export growth is significantly associated with the share of the *marketing* topic in the BDG section and the share of the *global market* topic in the URF section. The share of the *competitiveness* topic in the BDG section also displays a positive correlation with changes in export growth, but the correlation is marginally insignificant. Interestingly, the correlation between post-IPO export performance and the shares of the *innovation* topic in BDG and *competitiveness/innovation* topic in URF is visually close to zero. Although the evidence can only be interpreted as correlations, it suggests a strong link between IPO firms' marketing and foreign expansion strategies and post-IPO export performance.

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6 Concluding Remarks

This paper examines the impact of access to public equity through initial public offerings (IPOs) on firm exports, using a newly merged dataset of Chinese exporters. We exploit the approval-based IPO system in China to compare the export performance of firms that succeeded in their IPO applications with those that failed. To mitigate potential endogeneity concerns, we exclude firms that were rejected based on revenue- or profitability-related clauses, which may be motivated by unobservables that directly affect firms' export performance. Employing a difference-in-differences strategy, we find that IPO approvals lead to a significant increase in firm exports, by more than 40% over the subsequent six years following firms' IPO review meetings. The export growth is concentrated on the extensive margins of export, namely expansions in product scope and range of export destinations, while the intensive margin, or average export growth of each destination-product pair, does not significantly respond to IPO approvals.

We delve deeper into the potential mechanisms by which IPO approvals may impact firm exports. Our analysis of firm heterogeneity reveals limited substitutability between external equity financing and debt financing, as less credit-constrained firms experience higher export growth following IPO approvals. Additionally, we find that the effect of IPO approvals is more pronounced for firms with higher levels of ex-ante innovation and selling expense intensity, which indicates a connection between IPO approvals and intangible investments that facilitate firm exports. We also observe that the effect of IPO approvals is more concentrated among less experienced exporters, suggesting that IPO approvals may alleviate the informational or reputational frictions in export activities. Our product heterogeneity analysis corroborates the role of equity financing in facilitating exporters to invest in intangible capital, demonstrating that IPO approvals enhance destination expansion and/or export growth of less tangible, more R&D-intensive, and more advertising-intensive products. The findings that IPO approvals mainly improve the export growth of differentiated products (Rauch 1999) and raise the share of destinations with higher informational barriers also suggest that IPO approvals may mitigate informational/reputational frictions by information disclosure or brand building. Lastly, our textual analysis of IPO prospectuses reveals that IPO firms focus on competitiveness and marketing-related topics when discussing international markets, and firms with more discussion on marketing and global market-related topics realize higher post-IPO export growth.

The paper opens several avenues for future research. Although the current empirical setup primarily focuses on firms applying for listing in domestic financial markets, we can extend it to include listings in the Hong Kong stock market or stock markets in the United States to gain further insight into the connection between listings in foreign exchanges and firms' export expansion. Additionally, our research design can be adapted to study global value chain relationships: by utilizing more detailed data on supplier-buyer relationships and employing a similar empirical strategy, researchers can investigate how IPO events impact the formation and expansion of global value chains.

The paper has significant implications for policymakers, particularly financial regulators in

China and other developing countries that have adopted similar IPO systems. Our research can assist the China Securities Regulatory Commission (CSRC) in evaluating the pros and cons of registration-based IPO systems versus approval-based systems. This is especially relevant as China has implemented a registration-based IPO system across the board in its recent IPO reform. Additionally, our study can help policymakers who set industrial policies to understand how financial markets can impact the effectiveness of export-promoting policies.

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Figure 1: Number of IPO Applications and Approval Rates
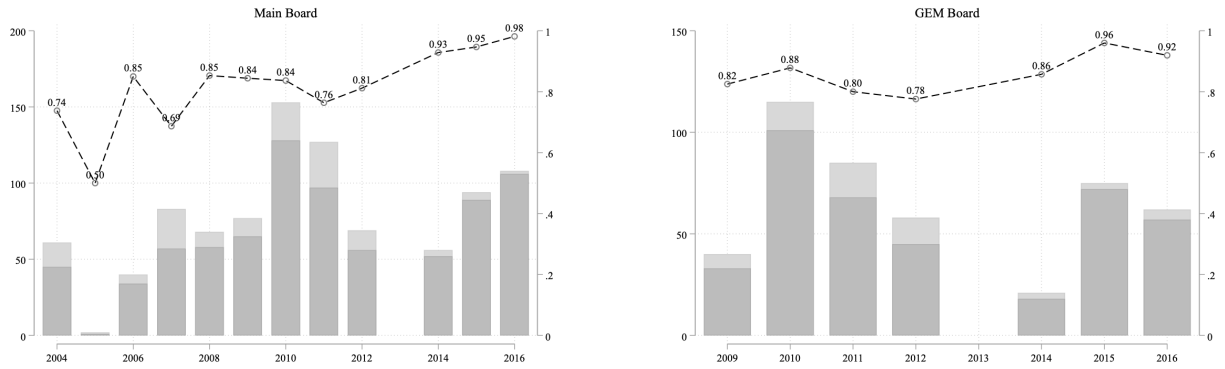
Note: The figure illustrates the number of approved and rejected IPO applications and the corresponding shares of approved applications on the Main Board from 2004 to 2016 (Panel A) and on the GEM Board from 2010 to 2016 (Panel B). The dark bars represent the number of approved IPO cases, while the light bars represent the number of rejected IPO cases. The dashed line displays the shares of approved IPO cases.

Figure 2: Shares of Most Cited Clauses in Rejections
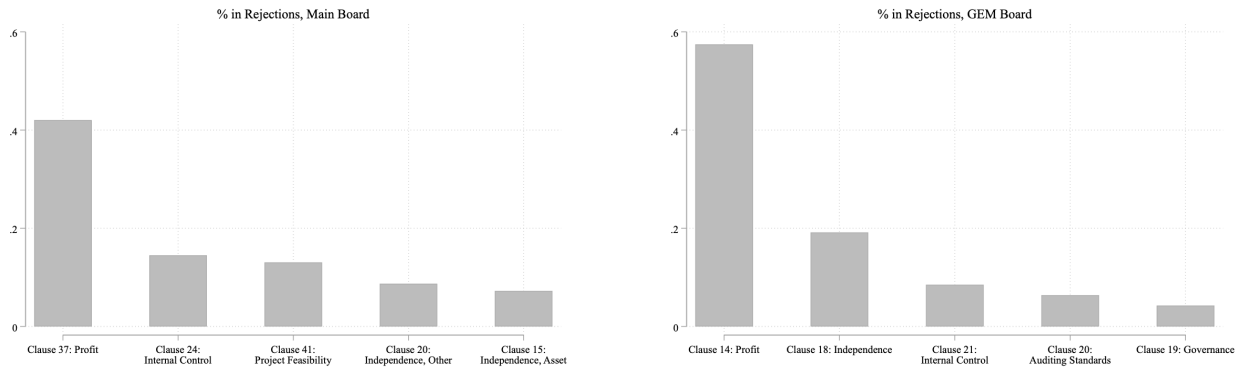
Note: The figure displays the distribution of the most commonly cited clauses in rejection cases for both the Main Board and the GEM Board from 2010 to 2016. The total number of rejections on the Main Board is 69, and on the GEM Board is 47.

Figure 3: Time Trend of Average Exports Relative to the Base Period
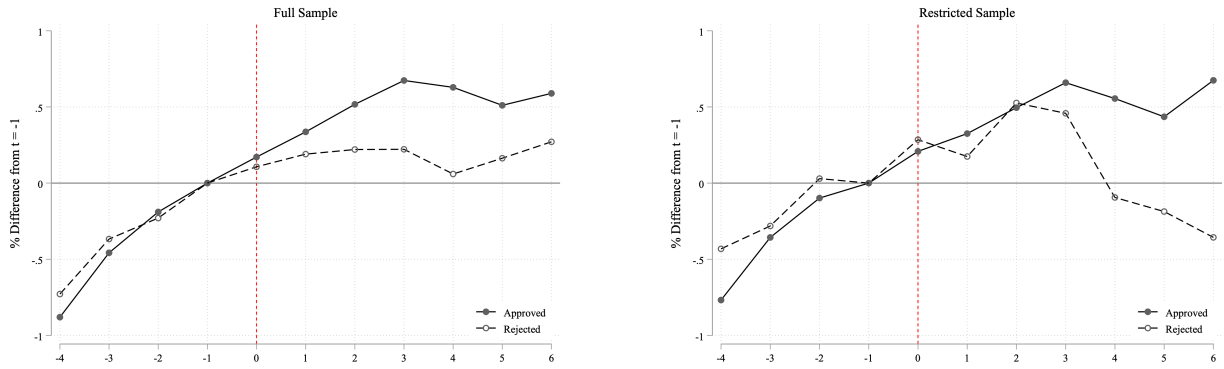
Note: The figure plots the time trends of the average firm exports (relative to the base period, or one year before the IPO review meeting). Specifically, the relative exports for firm i in year t is computed as $2 * (Export_{it} - Export_{i\tau(i)-1})/(Export_{it} + Export_{i\tau(i)-1})$, where $\tau(i)$ denotes the year of firm i's IPO review meeting. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases.
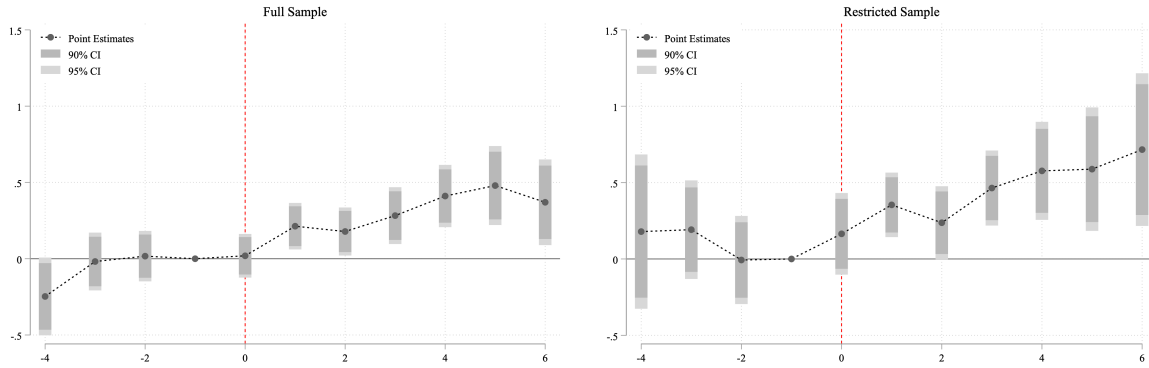
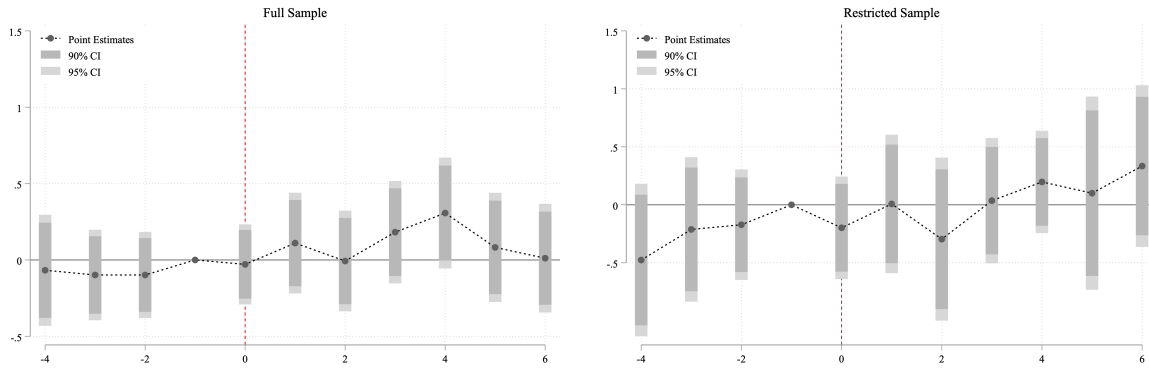Figure 4: Effect of an IPO Approval on Firm Exports
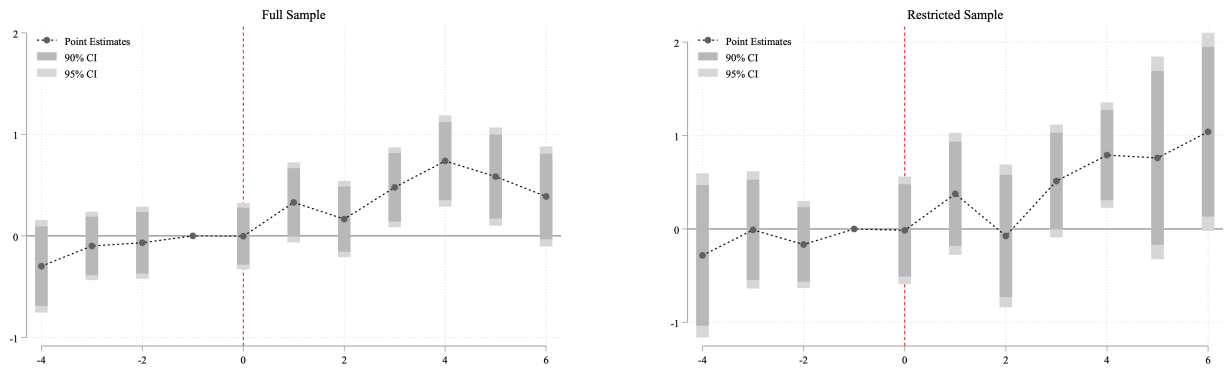
Note: The figure plots the event study coefficients for the difference-in-differences specification that estimates the effect of IPO approval on log exports. The underlying regressions control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases. Robust standard errors are clustered at the firm level.

Figure 5: Extensive and Intensive Margins

### Panel A. Effect of an IPO Approval on # Destination-Product Markets

### Panel B. Effect of an IPO Approval on Average Exports per Market

Note: The figure plots the event study coefficients for the difference-in-differences specification that estimates the effect of IPO approval on log number of destination-product markets (Panel A) and log average exports per market (Panel B). The underlying regressions control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases. Robust standard errors are clustered at the firm level.

Figure 6: Topic Distribution of International Market-Related Sentences and Other Sentences

Panel A. Average Share of Topics in BDG
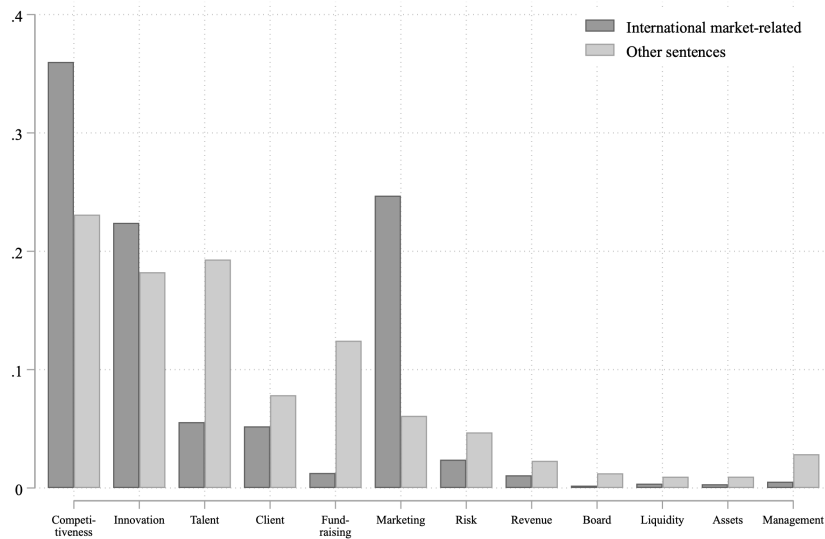
Panel B. Average Share of Topics in URF
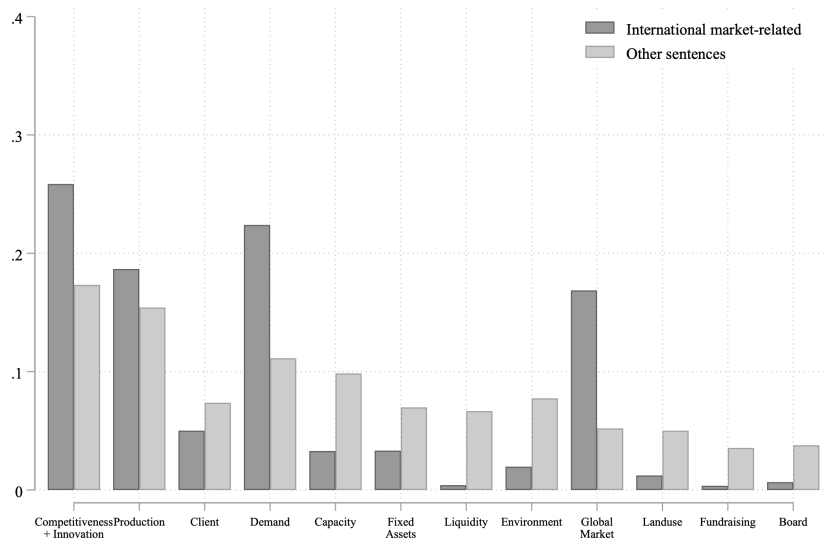
Note: The figure shows the average shares of the top 6 topics in international market-related sentences and other sentences in the BDG and the URF sections of IPO prospectuses of approved firms on the Main Board and GEM board from 2007 to 2016. The shares are computed as the number of international market-related (other) sentences with the focal topic as the dominant topic divided by the total number of international market-related (other) sentences in the BDG/URF section of each firm's IPO prospectus. A sentence is defined as international market-related if it contains the following keywords: international, global, world, foreign, export, and import. The topics are categorized based on the LDA algorithm.

Figure 7: Correlation Between Topic Shares and Export Growth

Panel A. Topic Shares in BDG
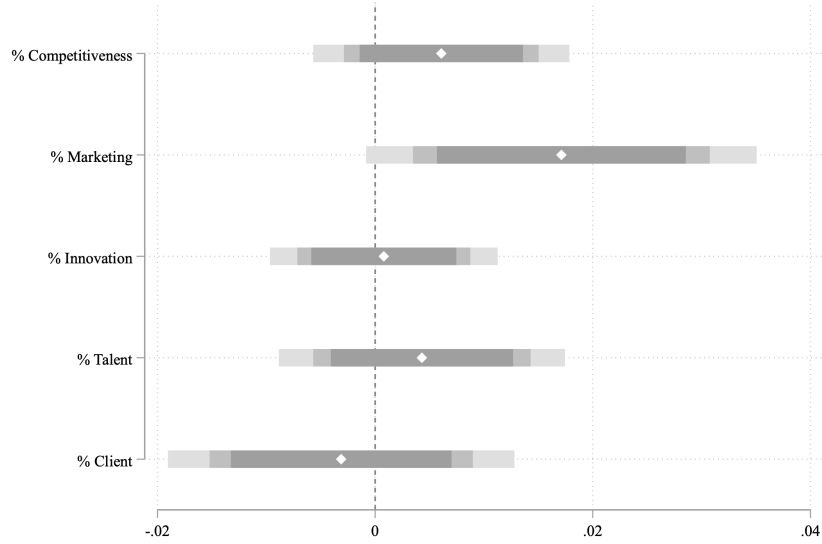
Panel B. Topic Shares in URF
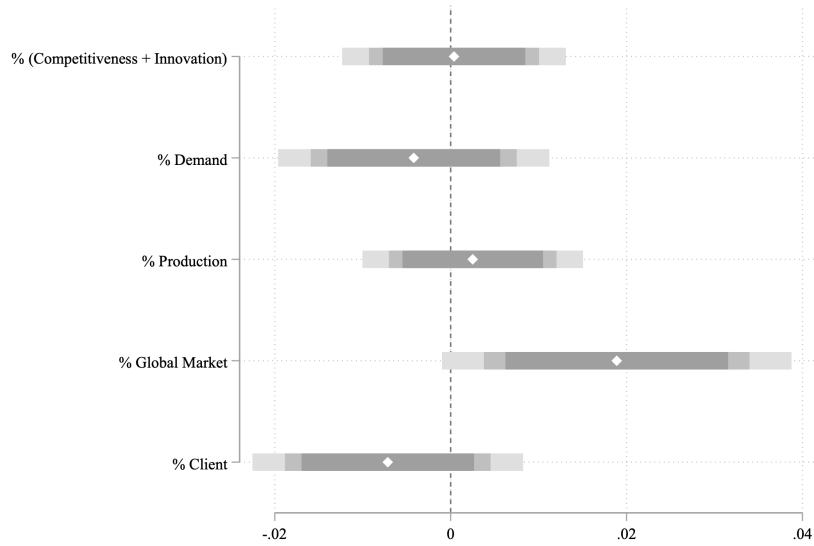
Note: The figure shows the estimated coefficients and their 90%, 95%, and 99% confidence intervals of regressing the difference of each firm's export growth pre- and post-IPO on the shares of the 5 most frequent topics in the firm's IPO prospectus after controlling for cohort fixed effects.

Table 1: Summary Statistics

	Mean	Std. Dev.	25 pct	50 pct	75 pct
Exports (in million RMB)	23.67	58.13	0.77	5.53	22.98
# Products	6.83	10.78	2.00	3.00	7.00
# Destinations	19.00	20.04	4.00	12.00	27.00
# Prod-dest pairs	41.18	79.12	6.00	18.00	44.00
Avg. exports per pair (in million RMB)	1.07	5.88	0.08	0.25	0.69
IPO approval rate	0.84	0.36			
Expected POP (in RMB)	11.88	5.60	8.12	10.75	14.31
Expected fund raised (in million RMB)	429.75	489.46	207.09	300.91	474.60
# Observations			8283		

Note: The table presents the summary statistics of the main firm-level variables used in our analysis, including the value of exports, number of products, destinations, and destination-product pairs, average exports per destination-product pair, IPO approval rate, expected Public Offering Price (POP), and expected funds raised through the IPO. Panel A encompasses all WIND-CCTS-matched firm-year observations, while Panel B excludes IPO filings before 2010 and revenue- or profitability-related IPO rejection cases.

Table 2: Balance Tests

| | IPO application approved | | | |
| | Full sample | | Restricted sample | |
	(1)	(2)	(3)	(4)
log(exports)	0.0132	0.00609	0.0590	0.0632
	(0.0554)	(0.0621)	(0.0612)	(0.0581)
log(# destination-product markets)	-0.0137	-0.0122	-0.0531	-0.0618
	(0.0553)	(0.0625)	(0.0611)	(0.0582)
log(average exports per market)	-0.0186	-0.0102	-0.0535	-0.0599
	(0.0560)	(0.0621)	(0.0613)	(0.0581)
log(expected funds raised)	0.0644***	0.0754***	0.00237	0.0108
	(0.0214)	(0.0280)	(0.0163)	(0.0207)
log(expected POP)	-0.0312	-0.0782**	0.0204	0.0119
	(0.0263)	(0.0332)	(0.0220)	(0.0286)
Cohort fixed effects	No	Yes	No	Yes
HS2 fixed effects	No	Yes	No	Yes
Board fixed effects	No	Yes	No	Yes
# Observations	744	724	588	568
p-value	0.101	0.0785	0.442	0.722

Note: The table reports covariate balance tests for IPO approvals. Columns 1 and 2 encompass all WIND-CCTS-matched firms that filed IPO applications between 2007 and 2016. Columns 3 and 4 include WIND-CCTS-matched firms that filed IPO applications between 2010 and 2016, excluding revenue- or profitability-related IPO rejection cases. The regressors include log exports, log number of destination-product markets, log average exports per destination-product market, log expected funds raised through the IPO, and log expected Public Offering Price (POP). Exports, number of destination-product markets, and average exports per destination-product market are averaged over the four years before each firm's IPO review meeting. Cohort fixed effects, HS2 fixed effects, and Board fixed effects are controlled in Columns 2 and 4. The p-value reports the probability that the covariates measured in the year of application do not influence the probability of an IPO approval.

Table 3: Regression Estimates

Panel A. Full Sample

	log exports (1a)	log des-prod markets (2a)	log avg. exports per market (3a)	log exports top market (4a)
IPO Approval×Post	0.459***	0.300***	0.161	0.109
	(0.158)	(0.0743)	(0.123)	(0.203)
# Observations	6514	6514	6514	4843

Panel B. Restricted Sample

	log exports (1b)	log des-prod markets (2b)	log avg. exports per market (3b)	log exports top market (4b)
IPO Approval×Post	0.447**	0.303***	0.138	0.359
	(0.226)	(0.109)	(0.191)	(0.297)
# Observations	4511	4511	4511	3470

Note: The table reports the effects of IPO approval on firms' export outcomes. The dependent variables include log exports, log number of destination-product markets, log average exports per destination-product market, and log exports of top destination-product market. The variable IPO Approval is an indicator that takes a value of 1 if the firm's IPO application is approved by the SIEVC. The variable Post takes a value of 1 if the year is equal to or after the SIEVC review meeting year. All columns control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. Robust standard errors, clustered at the firm level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 4: Firm Heterogeneity Analysis

Dependent variable: log exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
IPO Approval×Post	-0.0127	1.026***	0.802*	0.290	1.029***	0.264	0.954*	0.237	0.775**	0.0748	0.242	0.801**
	(0.335)	(0.372)	(0.470)	(0.309)	(0.350)	(0.312)	(0.504)	(0.288)	(0.319)	(0.411)	(0.209)	(0.374)
p-value of difference	0.043		0.377		0.111		0.226		0.189		0.203	
Sample	Leverage > p(50)	Leverage <= p(50)	Liquidity > p(50)	Liquidity <= p(50)	Invt% > p(50)	Invt% <= p(50)	# Patents > p(50)	# Patents <= p(50)	SE% > p(50)	SE% <= p(50)	Tenure > p(50)	Tenure <= p(50)
Observations	1769	1752	1708	1795	1720	1824	1468	2130	1795	1733	1961	2366

Note: The table reports the heterogeneous effects of IPO approval on firms' export outcomes. The dependent variable is log exports. The variable IPO Approval is an indicator that takes a value of 1 if the firm's IPO application is approved by the SIEVC. The variable Post takes a value of 1 if the year is equal to or after the SIEVC review meeting year. All columns control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. Robust standard errors, clustered at the firm level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.

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Table 5: Product Heterogeneity Analysis

Panel A. Dependent variable: log exports

	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)	(7a)	(8a)	(9a)	(10a)	(11a)	(12a)	(13a)
IPO Approval×Post	0.400**	0.466***	0.352	0.608***	0.0548	-0.197	0.661***	0.424**	0.263	0.564**	0.0356	0.615***	-0.0820
	(0.199)	(0.182)	(0.329)	(0.186)	(0.361)	(0.299)	(0.197)	(0.192)	(0.349)	(0.271)	(0.521)	(0.235)	(0.245)
p-value of difference		0.700		0.132		0.003		0.594		0.425		0.020	
Sample	All	Ext. dep. > p(50)	Ext. dep. <= p(50)	Liq. need > p(50)	Liq. need <= p(50)	Tan. > p(50)	Tan. <= p(50)	R&D int. > p(50)	R&D int. <= p(50)	Adv. int. > p(50)	Adv. int. <= p(50)	Differentiated	Non-differentiated
Observations	27679	17439	10020	18534	8926	8273	19187	19633	8037	17189	10482	20309	6198

Panel B. Dependent variable: log number of destinations

	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)	(7b)	(8b)	(9b)	(10b)	(11b)	(12b)	(13b)
IPO Approval×Post	0.220***	0.275***	0.158**	0.226***	0.230***	0.209**	0.232***	0.245***	0.126	0.218***	0.212**	0.282***	0.123
	(0.0448)	(0.0509)	(0.0730)	(0.0505)	(0.0885)	(0.0949)	(0.0491)	(0.0510)	(0.0892)	(0.0678)	(0.0993)	(0.0544)	(0.0944)
p-value of difference		0.183		0.970		0.840		0.216		0.968		0.141	
Sample	All	Ext. dep. > p(50)	Ext. dep. <= p(50)	Liq. need > p(50)	Liq. need <= p(50)	Tan. > p(50)	Tan. <= p(50)	R&D int. > p(50)	R&D int. <= p(50)	Adv. int. > p(50)	Adv. int. <= p(50)	Differentiated	Non-differentiated
Observations	27679	17439	10020	18534	8926	8273	19187	19633	8037	17189	10482	20309	6198

Note: The table reports the effects of IPO approval on firm-product level log number of destinations. The variable IPO Approval is an indicator that takes a value of 1 if the firm's IPO application is approved by the SIEVC. The variable Post takes a value of 1 if the year is equal to or after the SIEVC review meeting year. All columns control for firm-product fixed effects, application cohort-year fixed effects, HS4-year fixed effects, and board-year fixed effects. Robust standard errors, clustered at the firm level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.

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Table 6: ASIE Outcomes

Panel A. Operational outcomes

	Log sales (1)	Log employment (2)	Operating profit (3)
IPO Approval×Post	0.190*	-0.0596	0.0104
	(0.102)	(0.229)	(0.0209)
	2708	2708	2708

Panel B. Expenses

	Selling expenses (1)	Mgmt expenses (2)	Acct expenses (3)
IPO Approval×Post	0.0158**	0.0161	-0.00273
	(0.00767)	(0.0108)	(0.00518)
	2708	2708	2708

Panel C. Financial outcomes

	Log assets (1)	Leverage (2)	Liquidity (3)
IPO Approval×Post	0.499***	-0.124***	0.137*
	(0.114)	(0.0443)	(0.0709)
	2708	2708	2708

Panel C. Investment and innovation outcomes

	Invt. intensity (1)	Invention patents (2)	All patents (3)
IPO Approval×Post	0.0429	0.448	0.993*
	(0.0461)	(0.463)	(0.573)
	2702	2142	1729

Note: The table reports the effects of IPO approval on firms' operational, expense, and financial outcomes constructed from the ASIE data. The variable IPO Approval is an indicator that takes a value of 1 if the firm's IPO application is approved by the SIEVC. The variable Post takes a value of 1 if the year is equal to or after the SIEVC review meeting year. All columns control for firm fixed effects, application cohort-year fixed effects, CIC2-year fixed effects, ownership type-year fixed effects, and board-year fixed effects. Robust standard errors, clustered at the firm level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.
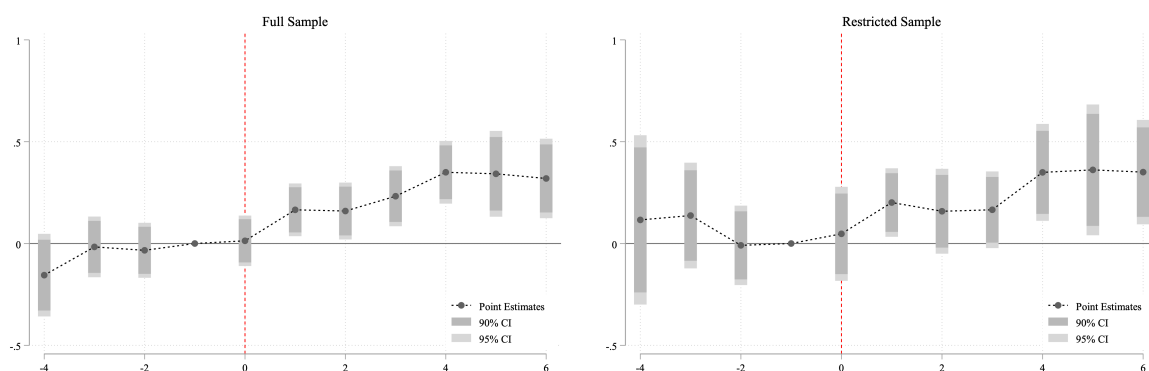
Appendix A   Additional Figures and Tables

Figure A1: Effect of an IPO Approval on Product Scope and Destination Market Span

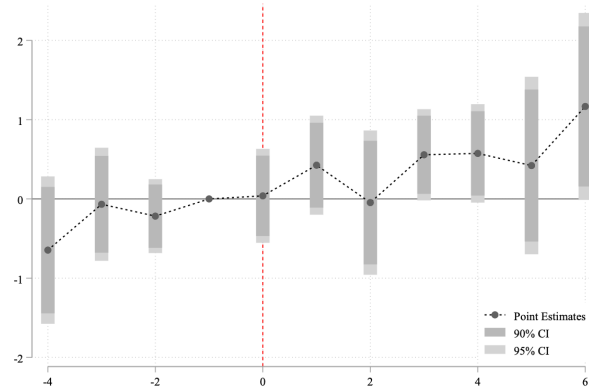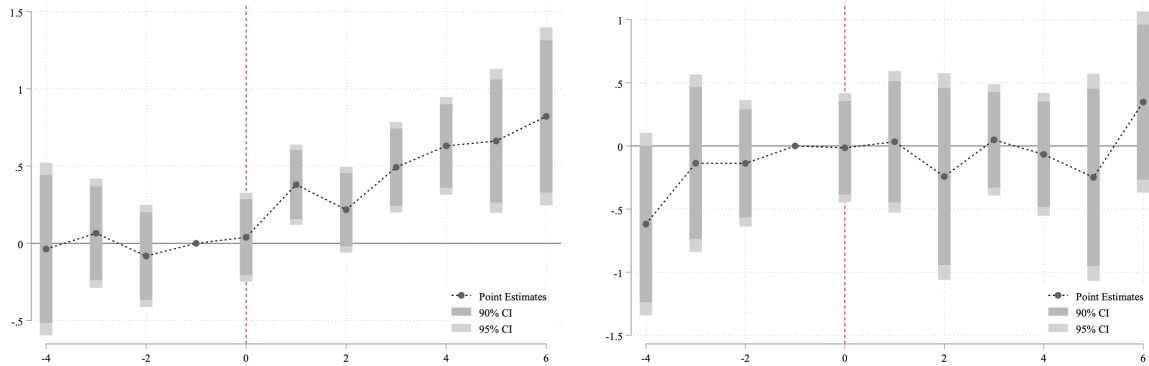### Panel A. Log # Products
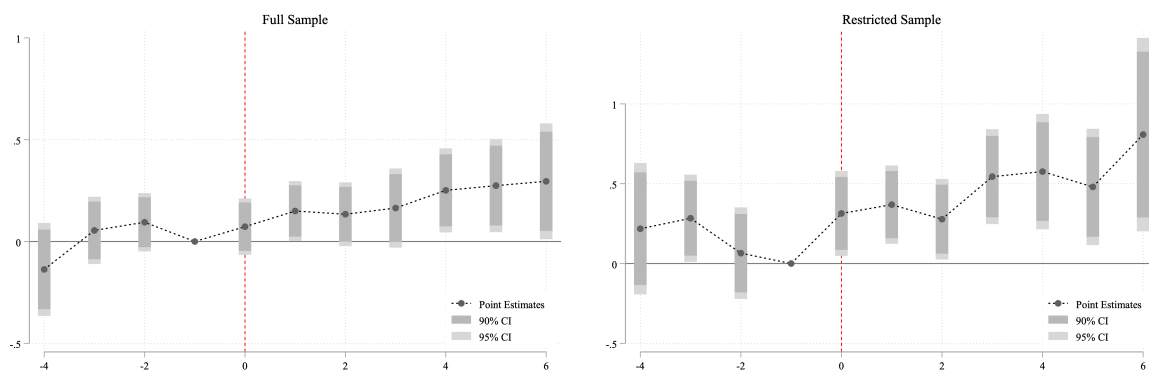
Panel B. Log # Destinations

Note: The figure plots the event study coefficients for the difference-in-differences specification that estimates the effect of IPO approval on the log number of products (Panel A) and log number of destinations (Panel B). The underlying regressions control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases. Robust standard errors are clustered at the firm level.

Figure A2: Event Study Estimates for the Alternative Restricted Sample
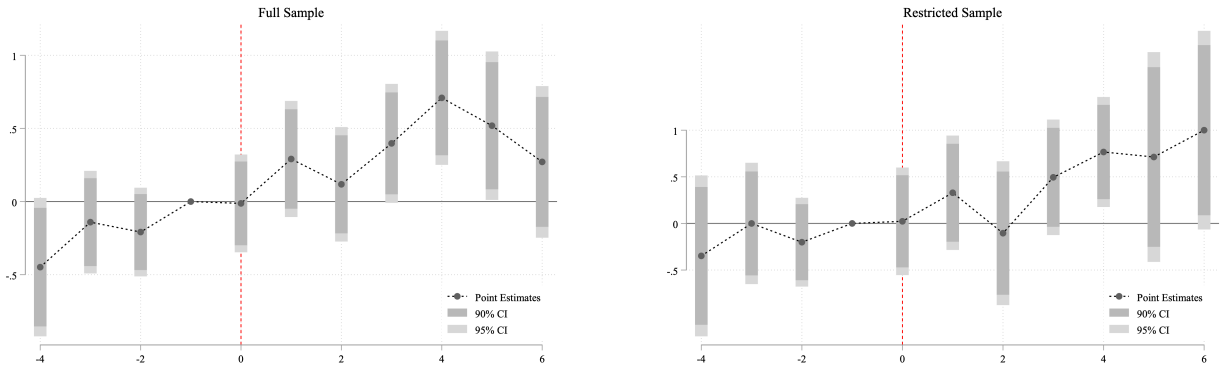
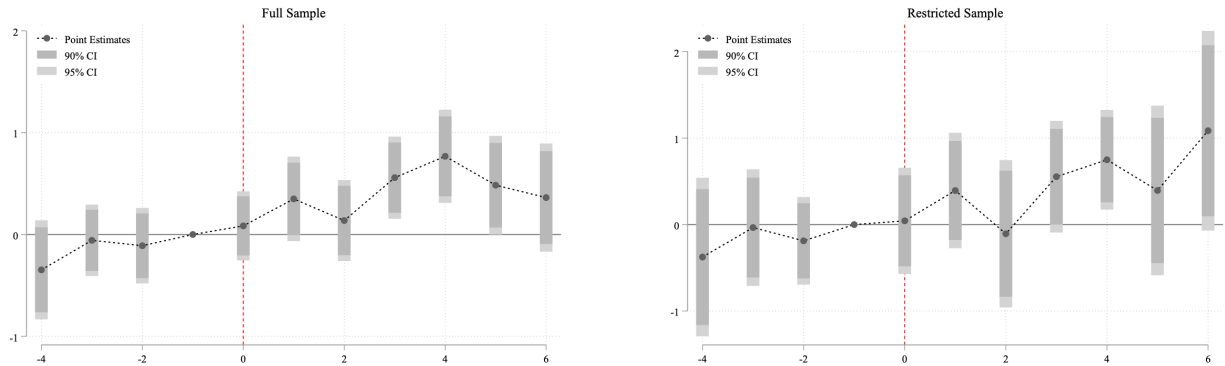Panel A. Log Exports

Panel B. Extensive and Intensive Margins

Note: The figure plots the event study coefficients for the difference-in-differences specification that estimates the effect of IPO approval on log exports (Panel A), log number of destination-product markets, and log average exports per market (Panel B). The underlying regressions control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. The alternative restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and all IPO rejection cases based on Chapter 4 (Main) or its equivalents (GEM). Robust standard errors are clustered at the firm level.

Figure A3: Effect of an IPO Approval on Exports, Controlling for Time-varying Effects of IPO Characteristics

Note: The figure plots the event study coefficients for the difference-in-differences specification that estimates the effect of IPO approval on log exports. The underlying regressions control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, board-year fixed effects, and IPO characteristics interacted with year dummies. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases. Robust standard errors are clustered at the firm level.

Figure A4: Effect of an IPO Approval on Exports, Excluding Clients of Politically Connected Audit Firms

Note: The figure plots the event study coefficients for the difference-in-differences specification that estimates the effect of IPO approval on log exports, after excluding clients of politically connected audit firms. An audit firm is defined as politically connected if any of its partners serves as a SIEVC member during the IPO review meeting period. The underlying regressions control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases. Robust standard errors are clustered at the firm level.
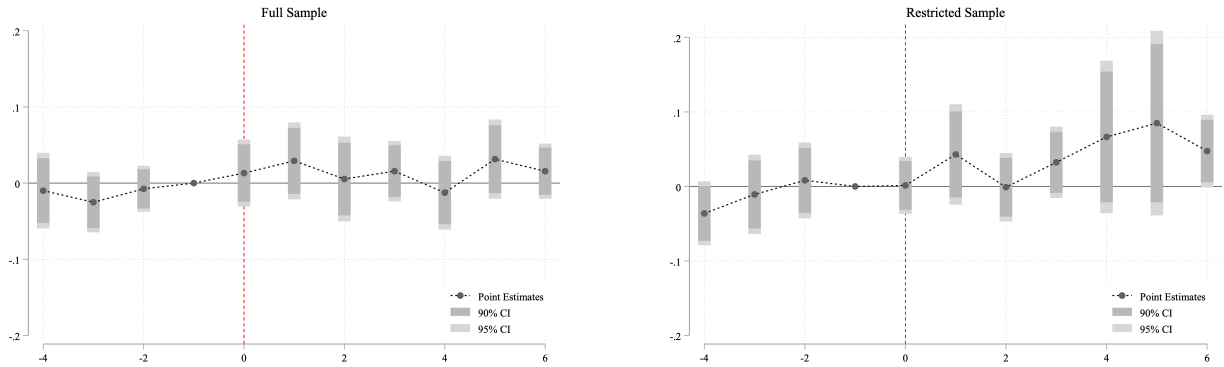
Figure A5: Effect of an IPO Approval on Export Participation

Note: The figure plots the event study coefficients for the difference-in-differences specification that estimates the effect of IPO approval on export participation. The underlying regressions control for firm fixed effects, application cohort-year fixed effects, HS2-year fixed effects, and board-year fixed effects. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases. Robust standard errors are clustered at the firm level.
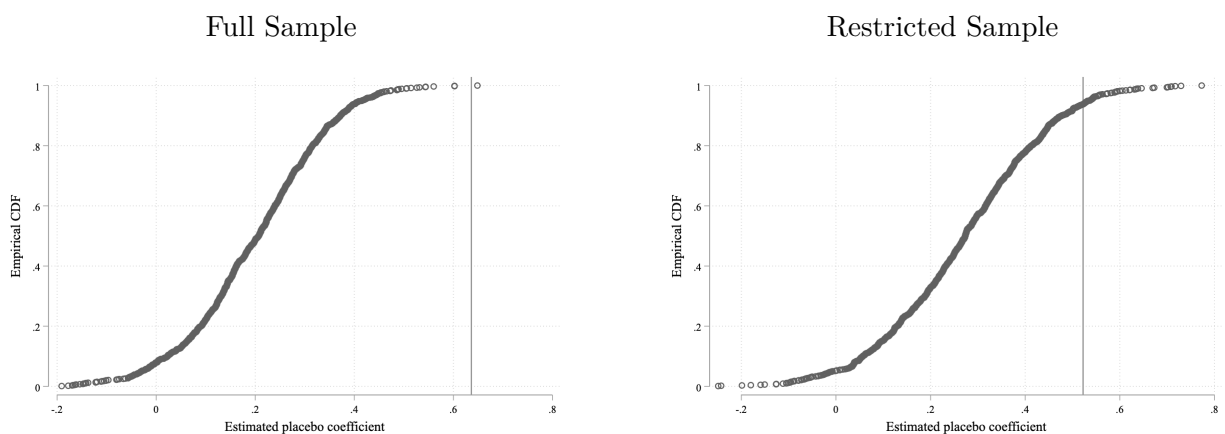
Figure A6: Permutation Tests

<div style="display:flex">

Full Sample

Restricted Sample

</div>

Note: These figures present the empirical distribution of placebo estimates for the difference-in-difference specification examining the effect of IPO on log exports. The full sample refers to all WIND-CCTS-matched firm-year observations. The restricted sample refers to WIND-CCTS-matched firm-year observations that exclude IPO filings before 2010 and revenue- or profitability-related IPO rejection cases. The CDFs are constructed from permuting treatment status to IPO applicant firms 500 times and estimating the corresponding coefficients. Dotted vertical lines represent the true estimates.

Figure A7: Word Cloud: Market/Tech-Related Topics (BDG)

(a) Competitiveness

(b) Marketing

(c) Client

(d) Innovation

Figure A8: Word Cloud: Market/Tech-Related Topics (URF)

(a) Competitiveness + Innovation

(b) Demand

(c) Client

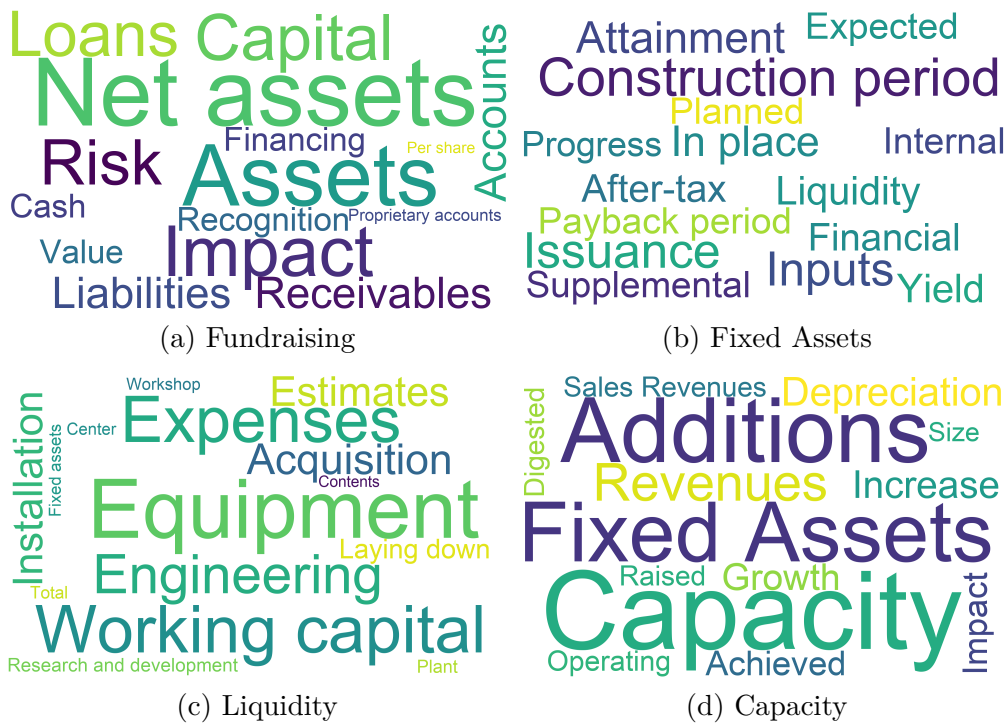(d) Global Market

Figure A9: Word Cloud: Finance-Related Topics (BDG)

(a) Fundraising

(b) Assets

(c) Liquidity

(d) Revenue

Figure A10: Word Cloud: Finance-Related Topics (URF)

(a) Fundraising

(b) Fixed Assets

(c) Liquidity

(d) Capacity

Table A1: Most Frequently Cited Clauses

Clause	# Cases	Percentage	Details of the clause
Panel A. Main board (Administrative Measures for Initial Public Offering and Listing of Shares)			
All	79		
Clause 37	29	36.71	The issuer shall not have the following circumstances affecting the continued profitability
Clause 24	10	12.66	There has been no significant change in the main business and directors and senior management of the issuer and no change in the actual controller in the last three years.
Clause 41	9	11.39	The board of directors of the issuer should carefully analyze the feasibility of the investment projects of the proceeds, be sure that the investment projects have good market prospects and profitability, effectively prevent investment risks and improve the efficiency of the use of proceeds.
Panel B. GEM board (Interim Measures for the Administration of Initial Public Offering of Shares and Listing on GEM)			
All	55		
Clause 14	27	49.09	The issuer should have sustained profitability and not have the following circumstances.
Clause 18	9	16.36	The issuer has complete assets, independent business and personnel, finance and institutions, and has a complete business system and the ability to operate independently directly to the market. There is no competition with the controlling shareholder, the actual controller and other enterprises under their control, as well as connected transactions that seriously affect the independence of the company or are unfair.
Clause 21	4	7.27	The information disclosed by the issuer in accordance with the law must be true, accurate and complete and must not contain false records, misleading statements or material omissions.

Note: The table provides a breakdown of the most frequently cited clauses in rejection cases in the Main Board and the GEM board from 2010 to 2016, including the clause titles, the number of cases, their percentage in all rejected cases, and the specific clause details.

Table A2: Firm-Destination-Product Level Analysis

Panel A. Full Sample

	participation (1a)	log exports (2a)	log quantity (3a)	log price (4a)
IPO Approval×Post	0.0155	0.132	0.161*	-0.0283
	(0.0222)	(0.0861)	(0.0881)	(0.0437)
# Observations	945875	220123	220123	220123

Panel B. Restricted Sample

	participation (1b)	log exports (2b)	log quantity (3b)	log price (4b)
IPO Approval×Post	0.0707***	0.199	0.312*	-0.110
	(0.0225)	(0.144)	(0.163)	(0.102)
# Observations	590286	146628	146628	146628

Note: The table reports the effects of IPO approval on firm-destination-product level export outcomes. The dependent variables include an indicator variable of participation in each destination-product market, log exports, log quantity, and log price at each destination-product market conditional on participation. The variable IPO Approval is an indicator that takes a value of 1 if the firm's IPO application is approved by the SIEVC. The variable Post takes a value of 1 if the year is equal to or after the SIEVC review meeting year. All columns control for firm-destination-product fixed effects, application cohort-year fixed effects, HS4-year fixed effects, destination-year fixed effects, and board-year fixed effects. Robust standard errors, clustered at the firm level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table A3: Composition of Foreign Markets

	% long distance (1)	% non-WTO (2)	% high-income (3)	%low CHN penetration (4)	% IFRS adoption (5)	% high-volatility (6)
Dependent variable: share of destinations						
IPO Approval×Post	0.0167	0.00428	0.0377*	0.0609**	0.0480**	0.00116
	(0.0367)	(0.0177)	(0.0214)	(0.0278)	(0.0230)	(0.0154)
# Observations	27679	27679	27679	27679	27679	27679

Note: The table reports the effects of IPO approval on the firm-product level composition of destination markets. The variable IPO Approval is an indicator that takes a value of 1 if the firm's IPO application is approved by the SIEVC. The variable Post takes a value of 1 if the year is equal to or after the SIEVC review meeting year. All columns control for firm-product fixed effects, application cohort-year fixed effects, HS4-year fixed effects, and board-year fixed effects. Robust standard errors, clustered at the firm level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Appendix B   Additional Information of IPO Rejections

B.1   Circumstances Included in Clause 37 (Main Board) and Clause 14 (GEM Board)

Circumstances included in Clause 37 (Main Board)

1. <u>37.1&37.2</u>: There has been or will be a material change in...

   - the business model, product or service mix of the issuer that has an adverse effect on the continued profitability of the issuer;

   - the issuer's industry position or the industry's business environment that has an adverse effect on the continued profitability of the issuer;

2. <u>37.3</u>: Significant reliance on related parties or customers with significant uncertainties in the issuer's operating income or net profit for the most recent year;

3. <u>37.4</u>: The issuer's net profit for the most recent year was mainly derived from investment income outside the scope of the consolidated financial statements;

4. <u>37.5</u>: Risk of adverse changes in the acquisition or use of important assets or technologies such as trademarks, patents, proprietary technologies and franchises in use by the issuer;

5. <u>37.6</u>: Other circumstances that may have an adverse effect on the continued profitability of the issuer.

Circumstances included in Clause 14 (GEM Board)

1. <u>14.1&14.2</u>: There has been or will be a material change in...

   - the business model, product or service mix of the issuer that has an adverse effect on the continued profitability of the issuer;

   - the issuer's industry position or the industry's business environment that has an adverse effect on the continued profitability of the issuer;

2. <u>14.3</u>: Risk of adverse changes in the acquisition or use of important assets or technologies such as trademarks, patents, proprietary technologies and franchises in use by the issuer;

3. <u>14.4</u>: Significant reliance of the issuer's operating income or net profit on related parties or customers with significant uncertainty in the most recent year;

4. <u>14.5</u>: The issuer's net profit for the most recent year was mainly derived from investment income outside the scope of the consolidated financial statements;

5. <u>14.6</u>: Other circumstances that may have an adverse effect on the continued profitability of the issuer.

B.2 Examples of IPO Rejections Citing Clause 37 (Main Board) or Clause 14 (GEM Board)

Example 1: Chongqing Jinguan Automobile (Main, clause 37; 16 March, 2011)

- Since 2009, your company's product mix and customers have undergone significant changes. Sales to new customers and revenue declined significantly in 2010, which constitutes a major adverse impact on your company's continued profitability.

Example 2: Shenzhen Meikai Electronics (Main, clause 37; 1 November, 2010)

- Your company's leading products include digital TV system equipment, electronic transformers, and power supply products. The three product categories have significant differences in terms of sales channels and customers. The company's business is relatively fragmented and its operation is volatile.

Example 3: Wuxi Shangji Automation (GEM, clause 14; 10 April, 2012)

- Since the second half of 2011, due to the European debt crisis, European countries have reduced subsidies for photovoltaic power generation, which suppressed the overall demand of the industry. Some of your orders have been canceled and delayed, and the fluctuation of demand in the downstream industry will have an adverse impact on your company's operation.

B.3 Examples of IPO Rejections Citing Other Clauses

Example 1: Sinomine Resource Group (GEM, clause 12; 29 September, 2010)

- Your company has competition and transactions with direct or indirect shareholders and other related parties, and it is impossible to judge the fairness of related transactions and whether your company has the ability to operate directly and independently.

Example 2: Shanghai Liangxin Electrical Co., Ltd. (Main, clause 15; 24 December, 2010)

- At present, your company's office and research and development premises are still leased from Nade Electric, with the leased area accounting for 22% of your company's total operating area. In view of the fact that the operating properties have been leased for a long period of time to the related parties in which your company's de facto controller has equity participation, there is a significant deficiency in the integrity of your company's assets.

Example 3: Shanghai Lianming Machinery Co., Ltd. (Main, clause 24; 09 March, 2011)

- Before December 2008, your company's management of waste materials was not standardized, and the income from waste materials was recorded according to the actual amount received, so it was not possible to determine the specific amount of waste materials generated in the year 2008. Based on the above, it is impossible to determine the reliability of your company's financial report for 2008.

Appendix C Conceptual Framework

This section outlines a parsimonious conceptual framework to illustrate how easier access to equity or reduced cost of equity financing affect firm exports. The framework is built on the premise that exporters are subject to borrowing constraints contingent on tangible assets. Therefore, external equity capital is required to fund the fixed costs of intangible investments such as innovation or marketing.

C.1 Setup

Following Arkolakis (2010), we assume that a firm of productivity ϕ from country i can only reach consumers in a destination country j with a certain probability $n_{ij}(\phi)$, and acquiring consumers is costly. The effective demand in destination country j for a firm of productivity ϕ from country i is expressed as:

$$q_{ij}(\phi) = n_{ij}(\phi) \frac{Y_j}{P_j} \left(\frac{p_{ij}(\phi)}{P_j} \right)^{-\sigma}$$

where Y_j is the national income and P_j is the price index of destination country j.

We assume labor is the only factor of production. A firm of productivity ϕ incurs a constant marginal cost of production, w_i/ϕ, and faces an iceberg cost τ_{ij} ($\tau_{ii} = 1$) when exporting to destination country j. For simplicity, we normalize the wage rate in country i to 1 (so that the marginal cost of export is τ_{ij}/ϕ) and drop the subscripts i and j.

Firm production incurs two types of fixed costs: a physical fixed cost, f^P, which represents fixed cost involving investment in tangible assets such as property, plant, and equipment (PP&E); a fixed cost associated with investment in intangible assets such technology stocks and consumer base, $f^M(n)$. The intuition for the latter is that a firm needs to conduct product innovation and customization, as well as marketing and sales network construction to reach more consumers in an export destination. We assume that $\frac{df^M(n)}{dn} > 0$, $\frac{d^2 f^M(n)}{dn^2} > 0$, and $f^M(0) = 0$. [21]

We assume all fixed costs are incurred overhead. Hence, a firm relies on external financing to fund the fixed costs, $f^P + f^M(n)$. Only the tangible fixed costs f^P is collateralizable, so a firm can borrow $D \leq \lambda f^P$ as collateralized loans, where $\lambda \leq 1$. On the other hand, the firm can raise external equity of E by selling $1 - s$ of equity to cover the intangible fixed costs. Debt and equity capital combined cover the total fixed costs: $D + E = f^P + f^M(n)$.

Given a firm's capital structure (D and E), its profit will be divided in the following ways. First, the firm repays the debt holder $R^d D$, where R^d is exogenously given and represents the market borrowing rate. For simplicity, we normalize $R^d = 1$. The firm then retains a share

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[21]A special case of the marketing fixed cost as in Arkolakis (2010) is $f^M(n_j; L_j) = \frac{L_j^\alpha}{\psi} \frac{1-(1-n_j)^{1-\beta}}{1-\beta}$. We abstract from this functional form and show that our results are consistent whenever $f^M(n_j; L_j)$ is increasing and convex.

of s of the residual profits. The equity holders require a rate of $R^e >$ on their investments. We assume that $R^e > R^d = 1$ due to risks, agency costs, tax shields, and other frictions in raising equity funds. Hence, the payoff to the equity holders must be no smaller than $R^e E$.

C.2 Firm Problem

An entrepreneur chooses price p, consumer reach n, external equity E, and the remaining ownership share s for each destination market to maximize her residual profit. The firm's optimal pricing decision is independent of its capital structure choice: $p^*(\phi) = \frac{\sigma}{\sigma-1}\frac{\tau}{\phi}$. We denote the firm's variable profit from each unit of consumer reach as $\pi^*(\phi) \equiv \frac{1}{\sigma}(\frac{\sigma}{\sigma-1})^{1-\sigma}\frac{Y}{P^{1-\sigma}}(\frac{\tau}{\phi})^{1-\sigma}$, so the firm's overall variable profit is $n\pi^*(\phi)$.

The entrepreneur's profit-maximizing problem can be written as:

$$\max_{n,s,E} \quad s(n\pi^*(\phi) - (f^P + f^M(n) - E))$$
$$\text{s.t.} \quad f^P + f^M(n) - E \le \lambda f^P$$
$$R^e E \le (1-s)(n\pi^*(\phi) - (f^P + f^M(n) - E))$$

For exporting firms, both the borrowing constraint and the participation constraint bind. Hence, $D = \lambda f^P$, $E = (1-\lambda)f^P + f^M(n)$, and $s = \frac{n\pi^*(\phi) - \lambda f^P - R^e((1-\lambda)f^P + f^M(n))}{n\pi^*(\phi) - \lambda f^P}$. Furthermore, the "shadow price" of borrowing equals $R^e - 1$ since firms need to raise equity to fund the investment on top of their borrowing limit at an additional cost of $R^e - 1$.

The maximization problem reduces to:

$$\max_n n\pi^*(\phi) - (\lambda f^P + R^e(f^P + f^M(n) - \lambda f^P)) \tag{1}$$

Conditional on exporting to a given destination, the optimal level of consumer reach, n^*, is given by the first-order condition (FOC):

$$R^e \left.\frac{df^M(n)}{dn}\right|_{n=n^*} = \pi^*(\phi) \tag{2}$$

C.3 Exporting Decision

A firm chooses to export if and only if its residual profit in Equation 1 is non-negative. Since the residual profit is increasing in ϕ, there will be a unique $\underline{\phi}$ that fulfills the breakeven condition:

$$n^*(\underline{\phi}; R^e)\pi^*(\underline{\phi}) - \lambda f^P + R^e((1-\lambda)f^P + f^M(n^*(\underline{\phi}; R^e))) = 0, \tag{3}$$

so that firms with productivity draw higher than $\underline{\phi}$ self-select into exporting and firms with productivity draw lower than $\underline{\phi}$ drop out.

C.4 Comparative Statics

The following proposition is directly derived from Equation 2 (FOC):

Proposition 1 (intensive margin). For any given ϕ, the profit-maximizing level of consumer reach, n^*, is decreasing in R^e.

Proof. The implicit functional theorem gives: $\frac{dn^*}{dR^e} = -\left.\frac{df^M(n)/dn}{R^e d^2 f^M(n)/dn^2}\right|_{n=n^*} < 0$.

Figure C1 provides a visual representation of Proposition 1. According to Equation 2, the optimal n^* is determined by the equality of $R^e \frac{df^M(n)}{dn}$ and $\phi^*(\phi)$. The right-hand side of the equation, $\pi^*(\phi)$, depends solely on the firm's productivity, along with the characteristics of the destination market (national income Y and price index P), and remains unaffected by changes in R^e. On the left-hand side, in contrast, an increase in R^e causes the curve $R^e \frac{df^M(n)}{dn}$ to shift upward, resulting in an intersection point with $\pi^*(\phi)$ at a lower level of n^*.

Figure C1: Graphical Illustration of Proposition 1
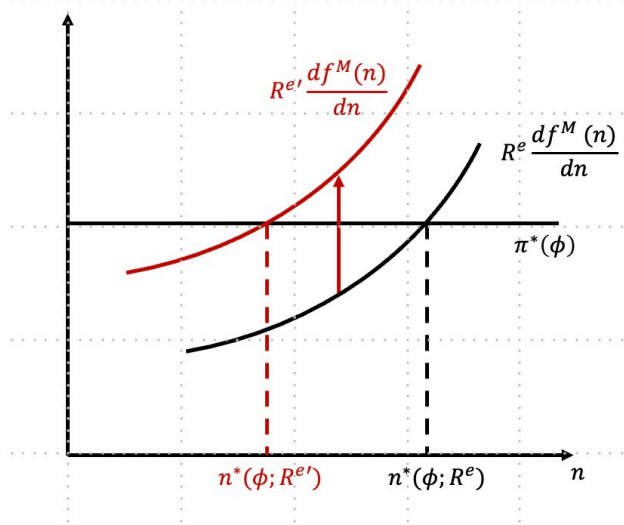
According to Proposition 1, a decrease in the cost of external equity financing (R^e) results in a higher optimal consumer reach (n^*). Therefore, conditional on entering a market, a firm will increase its investment in intangible assets $f^M(n)$ and raise additional equity financing $E = (1 - \lambda)f^P + f^M(n)$ to fund its exports to the market. Consequently, a reduction in R^e leads to an increase in the export value $n^*\pi^*(\phi)$.

A reduction in equity financing cost R^e will also lead to a lower $\underline{\phi}$ and thus encourage more foreign market entry:

Proposition 2. (extensive margin) The cutoff productivity, $\underline{\phi}$, is increasing in R^e.

Proof. The implicit functional theorem gives: $\frac{d\underline{\phi}}{dR^e} = \frac{(1-\lambda)f^P + f^M(n^*(\underline{\phi};R^e))}{n^*(\underline{\phi};R^e)\frac{d\pi^*(\phi)}{d\phi}\big|_{\phi=\underline{\phi}}} > 0.$

Again, we provide a visual representation of Proposition 2 in Figure C2. Rearranging Equation 3 gives $n^*(\underline{\phi};R^e)\pi^*(\underline{\phi}) - R^e f^M(n^*(\phi;R^e)) = (\lambda + R^e(1-\lambda))f^P$. The left-hand side of the equation increases with ϕ but decreases with R^e. The latter occurs because the derivative of the left-hand side with respect to R^e is given by $\pi^*(\phi)\frac{dn}{dR^e}\big|_{n=n^*} - f^M(n^*(\phi;R^e)) - R^e\frac{df^M(n)}{dn}\frac{dn}{dR^e}\big|_{n=n^*}) = -f^M(n^*(\phi;R^e)) < 0$, after substituting Equation 2. The right-hand side of the equation remains constant with ϕ but increases with R^E. Consequently, an increase in R^e causes the curve $n^*(\underline{\phi};R^e)\pi^*(\underline{\phi}) - R^e f^M(n^*(\phi;R^e))$ to shift downward, while shifting the curve $(\lambda + R^e(1-\lambda))f^P$ upward, resulting in a higher level of $\underline{\phi}$.

Figure C2: Graphical Illustration of Proposition 1