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# Preferential Liberalization: China's foreign investment regulation reform and its post-WTO-accession export surge*

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**Abstract**

To gain membership in the World Trade Organization in 2001, China substantially modified its regulation of foreign trade and investment. These reforms coincided with rapid changes in the composition of capital inflows, as the dominant entry mode shifted from joint venture to wholly foreign owned affiliate. Foreign-invested enterprises contributed a rising share of China's rapidly growing exports, especially those directly linked to global value chains (GVCs). We investigate how much China's foreign ownership liberalization contributed to these observed trends in capital inflows and Chinese exports. Accounting for both the set of activities from which it removed foreign equity caps as well as those into which it newly encouraged investment, we estimate the impact of China's reforms on foreign firm entry and exports using a difference-in-differences estimator. To eliminate bias resulting from heterogeneous and dynamic treatment effects, we also apply novel dynamic difference-in-differences estimators. We find that removal of foreign equity caps induced entry of wholly foreign owned firms, especially in R&D-intensive and skill-intensive activities. Concurrently, new incentives for investment in favored activities also induced foreign entry, particularly joint ventures, and increased processing exports linked to GVCs. Reduced-form calculations imply that FDI policy changes explain almost 9% of the increase in exports from foreign-invested firms over the decade studied. The effect was larger in sectors identified as "high-tech industries" by the Chinese government, as they contribute most of the estimated policy-driven export growth from foreign-invested firms.

**Keywords:** exports, entry mode, foreign investment, FDI policy, China, dynamic difference-in-differences estimates

**JEL Codes:** *D23, F14, L22*

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# 1 Introduction

To gain membership in the World Trade Organization, China substantially revised its regulation of inward foreign investment. Export performance and domestic content requirements were removed to align with the Agreement on Trade-Related Investment Measures, while foreign equity caps were lifted from a wide variety of manufacturing activities. These reforms coincided with rapid changes in the composition of capital inflows, as the dominant entry mode for foreign direct investment (FDI) into China shifted from joint venture to wholly foreign owned affiliate. Foreign-invested enterprises increased their already high share of China's surging exports, especially those directly linked to global value chains.[1]

This study assesses the extent to which changes in foreign investment regulation contributed to the surge in foreign firm entry and exports, especially in high-tech sectors, that followed China's WTO accession. Although often described solely as ownership liberalization, changes in Chinese foreign investment policy at the time of WTO entry reflect more than acquiescence to external demands for greater freedom for multinationals structuring Chinese operations. We show that as China removed restrictions on foreign equity shares and foreign firm performance, it designated most of the same activities as eligible for investment incentives. Our empirical analysis measures foreign firm entry induced by China's altered mix of incentives and restrictions, whether entry took the form of an international joint ventures (JV) or as a wholly foreign owned enterprise (WFOE), and how these policy changes affected the value and composition of Chinese exports.

Developing countries have long sought to attract foreign investment as a catalyst for domestic growth. Beginning in the 1980s, many developing countries significantly liberalized rules governing direct investment inflows (Rodrik, 1992), a trend that continued until the Global Financial Crisis of 2007-08.[2] Although international institutions advocate for sector-neutral "sound fundamentals" to attract investment, countries tend to adopt FDI policies – both restrictions and preferences – that are targeted to specific activities.[3] FDI restrictions shelter sensitive sectors while promoting

[1] The share of total Chinese exports originating in foreign-invested enterprises (FIEs) rose from 44% in 1998 to 57% in 2007, as China's total exports grew to be more than five times larger. The FIE share of processing exports, one measure of GVC trade, rose even further, from 32% in 1998 to 64% in 2007.

[2] UNCTAD's Investment Policy Hub indicates that between 2000 and 2007, an average of 67 countries introduced 128 new FDI policies each year, most of which liberalized investment rules. Indeed, five liberating changes were enacted during the period for every new restriction added. After the Global Financial Crisis of 2007-08, however, liberalization slowed substantially relative to new restrictions (UNCTAD, 2021, p.109) .

[3] Advocacy of fundamental reforms to attract investment has a long history. OECD (2002) provides the consen-

technology sharing through formation of partnerships with local firms. FDI incentives funnel investment into desired sectors, with the potential to shift supply chains.[4] Not surprisingly, targeted policies raise concerns about unfair trade, quid pro quo conditions for market access, performance requirements inconsistent with global trade rules, and forced technology transfer (Andrenelli et al., 2019).

Foreign investment regulation remains an active area of policymaking. In 2020, 67 countries introduced 152 new measures of which 50 restricted foreign participation or added new obligations (UNCTAD, 2021). Among developing countries, most new measures encourage inflows with investment incentives, even as significant restrictions on foreign participation remain in place (OECD, 2020), most commonly limits on foreign control and mandated pre-establishment screening. The policies and experiences of China, the largest developing economy recipient of foreign investment, inform decisions taken by others seeking infusions of foreign technology and links to global value chains.[5]

Our empirical results indicate that changes in the number and export activity of foreign owned firms are systematically related to cross-industry variation in 2002 investment regulation reforms. Our analysis leverages revisions to China's FDI policies made in the context of its WTO entry (Branstetter and Lardy (2008); Sheng and Yang (2016)). The reforms provide plausibly exogenous policy shifts that allow us to assess the role of FDI preferences and restrictions on the entry and performance of foreign enterprises in China.

Using a difference-in-differences analysis, we find strong support for the view that Chinese FDI reforms were effective in shaping and promoting firm entry and exports. Preferential treatment of foreign investment promotes entry of foreign firms and raises export values in the targeted in-

sus view that FDI benefits local economies, "given the appropriate host-country policies." Almost twenty years later, the World Bank (2019) surveys the benefits of developing country participation in multinationals' global value chains, stressing that participation is determined by "fundamentals," broadly grouped into factor endowments, market size, trade costs, and institutional quality.

[4] A recent survey finds that more than half of developing countries deploy one or more fiscal incentives to invest in specific sectors, most commonly favoring the highly fragmented IT and electronics, machinery and equipment, and transportation sectors (Andrenelli et al., 2019)

[5] The promise of positive spillovers to the domestic economy provides justification for governments to shape inward investment flows – influencing who invests, into which sectors, and in what form. We do not investigate whether such spillovers arise, focusing instead on the response of foreign firms to regulatory changes. Existing studies suggest that spillovers may appear but are conditioned by local factors. Harrison and Rodríguez-Clare (2010) and Keller (2010), among others, find evidence of technology transfers from foreign to domestic firms. Other studies stress the contingent nature of benefits for domestic firms (Crespo and Fontoura, 2007). Foreign-invested enterprises benefit local firms with appropriate absorptive capacity (Blalock and Gertler, 2009) while other firms may be negatively affected by increased competition (Aitken and Harrison, 1999).

dustry. Moreover, we find that targeting an activity with investment incentives promotes entry of new joint ventures, rather than entry of wholly foreign affiliates. Noting that we do not observe the concessions offered to individual firms upon entry, this response is consistent with incentives given to those able and willing to transfer technology by taking a local partner, even in the absence of *de jure* constraints on mode of entry. We also examine the effect of removing restrictions that force foreign investors to form a JV partnership as a condition for market access. We find that lifting these mandates leads to entry of wholly foreign owned firms, promotes processing (in contrast to ordinary) exports, and expands exports in R&D-intensive and skill-intensive industries. Thus, ownership liberalization raised foreign investment in more advanced activities and increased Chinese participation in global value chains.

Calculations based on these estimates suggest that changes in FDI policies (encouraging and restricting combined) stimulated $38.1 billion more Chinese exports originating in FIE firms in 2007 than we would otherwise predict. These policy-induced exports account for 8.7% of the increase in 2007 FIE exports over their 1998 levels. Encouraging policies raised JV exports by $10.3 billion, and ownership liberalization raised WFOE exports by $27.8 billion. These effects were largely concentrated in high-tech sectors, especially those that contribute the largest share of Chinese total exports.

The Two-way fixed effects (TWFE) methods we use are common to the literature, and we draw upon detailed micro data to implement these analytical techniques. To examine the common trends assumption implicit in the method, we observe export entry and volumes both before and after changes in FDI policy. Trends for industries subject to regulatory changes show no discernible difference ahead of reforms when compared to those industries without such changes. In our policy analysis, we triple difference the data to guard against results driven by general export promotion policies or changes in China's comparative advantage. We also consider the possibility of alternative explanations for exporter entry during the period, including reductions in uncertainty stemming from the US granting of permanent normal trade relations (PNTR) to China. While we find that PNTR status increases foreign firm entry and export volumes, its inclusion in our regressions has no impact on the magnitude of the regulatory policy effects that we identify. In addition, we employ a new estimator proposed by Callaway and Sant'Anna (2020) to expunge potential biases arising in the standard TWFE estimator with staggered treatment adoption in the presence

of dynamic heterogeneity in the treatment effects. Here, we explicitly select never adopters as the counterfactuals for each policy-changing industry to estimate our treatment effect and event study coefficients. A comparison of Callaway-Sant'Anna estimates to those generated via TWFE models will allow us to further assess the degree to which heterogeneous dynamic treatment effects are an important source of bias. Finally, to further explore the implications of policy changes on trade flows, we employ detailed China Customs data on processing and ordinary exports and on exports to different destinations.

We center our study on the period 1998-2007, which spans major changes to FDI policy implemented by the Chinese government in 2002. This period covers the rapid rise in Chinese exports, itself the focus of much research related to the impact of China's WTO entry on advanced economies. Prominent explanations for China's export surge include the rapid growth of China's private sector (Autor et al., 2013), the resolution of uncertainty arising from the granting of PNTR to China by the US (Handley and Limão, 2017), and currency undervaluation (Bergsten and Gagnon, 2017). Our work highlights the underappreciated role of changes in Chinese foreign investment policy and the response of multinational firms in fueling China's rapid export growth.

This study contributes to our understanding of the effectiveness of FDI regulation and promotion in shaping global production sharing, as predicted by the product cycle model of Antràs (2005). Sheng and Yang (2016) theoretically and empirically assess the impact of China's 2002 policy reforms on the extensive margin of exports, defined as the number of products exported by wholly foreign owned affiliates to different destinations. They find that the variety of processing exports expands in provinces that improve local court efficiency and open special economic zones and in sectors liberalized and encouraged at the national level. Our analysis differs from Sheng and Yang's because we estimate the effect of national FDI policy reforms on entry of both wholly foreign owned affiliates and joint ventures and changes in both processing and ordinary export values.

Because our analysis finds that China's preferential policies attract foreign investors willing to form partnerships with local firms, it also relates to recent work by Jiang et al. (2018), who provide evidence of technology transfer from foreign to domestic JV partners as well as to unrelated firms through backward and horizontal spillovers. Estimated spillovers from wholly foreign owned affiliates are smaller than those from joint ventures, leading them to conclude that WTO-related

ownership liberalization (and the subsequent shift away from JV entry) had mixed implications for the overall extent of foreign technology transfers to China.[6] Our findings suggest that Chinese policymakers recognized these implications and used investment incentives to encourage continued JV entry in sectors from which JV mandates were removed.

Our work also relates to new studies exploring how commitments to market liberalization can be undermined by policy responses that limit access to the domestic market. Garred (2018) finds that after WTO accession China partially replicated its pre-membership tariffs by adjusting export restrictions, and that these actions were coordinated across more than one instrument. He presents suggestive evidence that export restrictions on raw materials reduced China's direct sales of these products but increased exports of downstream products. Garred's observation, that multilateral agreements might succeed in part by constraining countries to relatively less appealing policy instruments, also applies to our findings, which suggest that costly investment incentives were used as substitutes for JV mandates removed to meet WTO accession demands.

Tan and Davis (2020) also investigate the Chinese response to tariff cuts undertaken for WTO entry. They demonstrate that tariff cuts had a larger effect on private sector imports than those of state-owned enterprises, but that this difference is confined to strategic goods targeted by industrial policy. Their findings suggest that China used WTO membership to increase external pressure for market-oriented reforms, but at the same time used industrial policy to protect state firms from global competition.

The rest of the paper is organized as follows. Section 2 provides institutional detail for Chinese foreign investment policy and regulatory reforms. Here, we show that China met WTO-accession demands for ownership liberalization by substantially reducing the number of restricted industries in 2002, while simultaneously making most of the same activities eligible for investment incentives. Second 3 presents our conceptual framework and empirical approach while providing an extended discussion of our identification strategies. Section 4 explains the data used to produce the regression results presented and discussed in Section 5. Section 6 summarizes the implications of our results and embeds them in the context of current concerns about forced technology transfer.

[6] Eppinger and Ma (2021) also exploit China's WTO-related FDI policy changes to assess gains from liberalization of firms' ownership structure, finding that ownership restructuring induced both output and productivity gains.

# 2 Chinese Policies toward Foreign-Invested Enterprises

## 2.1 Importance of FIEs for technology transfer and exports

While direct investment into China in the 1980s was dominated by Hong Kong and Taiwan-based investors engaged in export processing, significant investment flows from other regions began in the 1990s.[7] In addition to China's natural advantages as a site for labor-intensive production, investors were attracted by its development zones, which offered exemptions from some tax and regulatory burdens, and by ongoing infrastructure improvements and tariff reform. Although drawn by these factors and the growing domestic market, by the late 1990s many investors were disillusioned by rising costs for specialized resources, difficulties with local joint venture partners, and unexpectedly low returns (Branstetter and Lardy, 2008). As foreign investment inflows flattened, the Chinese government negotiated terms for WTO accession that expanded the freedom of foreign firms to operate in China.

Reviving inward direct investment was important because it played an unusually important role in China's development.[8] According to Naughton (2017, p.432), foreign-invested enterprises "were the largest source of new technology in China through the turn of the century." Not only did these firms bring new production methods, they propelled China's rapid integration into world markets, particularly electronics supply chains.[9] Even after its WTO accession, China sought foreign investment to modernize its agricultural sector, introduce advanced techniques to transform traditional manufacturing, improve environmental protection, and develop western provinces (Long, 2005).

WTO negotiations resulted in the granting of greater freedom for investors to operate in more sectors as a WFOE rather than only as a JV with a Chinese partner.[10] Moreover, in its accession agreements, China agreed not to condition investment approval on a 'quid pro quo' exchange of

[7] Branstetter and Lardy (2008, p.643) provide the value of inward FDI by source country.

[8] FIEs played an outsized role in the development of China's high-tech sector. In 2000, almost 85% of exports from this sector were produced by foreign-invested enterprises, including those from Hong Kong, Macau, and Taiwan (Lovely and Huang, 2018).

[9] Following a decade of investment in low-tech, labor-intensive production, foreign firms began to move labor-intensive stages of high technology production to the mainland in the late 1990s. This process, and the domestic firm growth accompanying it, transformed China's export profile in just a decade. In 1995, textiles and apparel together accounted for the largest share of Chinese exports, 28 percent. By 2005, these sectors were eclipsed by exports of office and computing machinery and communications equipment, which together comprised 31 percent of China's manufacturing exports (Dean and Lovely, 2010).

[10] China also permitted foreign investment in the form of contractual joint ventures and share companies with foreign investment. In 2002, these two forms combined accounted for less than 6% of all realized FDI inflows. See Jiang et al. (2018), which provides the number of JVs in each 2-digit manufacturing sector during the sample period.

market access for technology transfer. At the same time, China expanded the set of activities for which it would offer preferential terms of entry.

These policy changes were met by increased exports from foreign firms operating in China. During the period associated with the so-called "China Shock," 1995-2007, exports from FIEs expanded at an average annual rate of 25.5 percent, faster than the 15.6 average annual expansion of exports from domestic firms.[11] As shown in Table A1, in 2000 FIEs provided 48% of Chinese exports to all destinations. Surprisingly, given the dynamic nature of China's domestic private sector documented by Brandt et al. (2017), the share of exports originating in a foreign enterprise rose to 58% in 2005-06.

After China's WTO accession and accompanying reforms, however, the entry mode for direct investment rapidly shifted toward wholly foreign owned affiliates, as seen in Figure 1. These trends in entry mode were matched by rapid changes in exporting firms, as shown in the second and third columns of Table A1, with the share of exports from JVs falling to 18 percent on the eve of the Global Financial Crisis.[12] At the same time, the share of exports from WFOEs rose steadily, reaching 39 percent by 2007.

### 2.2 China's FDI policy regime

Since its opening to foreign investors, the Chinese government actively targeted specific activities and constrained investors' entry mode. Foreign investment inflows must be approved by the central government.[13] The first regulations guiding foreign investment were issued in 1995, the *Interim Provisions on Guiding Foreign Investment and the Catalogue for the Guidance of Foreign Investment Industries*. This "Catalogue" has been updated regularly since its introduction and it provides broadly defined constraints and opportunities for foreign investors. China's targeted approach to FDI policy is evident in the nature of the guidance, which classifies investment in specific activities as encouraged, neutral, restricted, or prohibited. Prohibited sectors are those in which no foreign investment is allowed, such as nuclear energy. Neutral is a residual category; it includes activities

[11] Export growth by firm type calculated by authors using data from China's National Bureau of Statistics.

[12] The share of exports qualifying for special Customs treatment as "processing exports," implying that they are produced with significant shares of imported materials, was 60% in 2000 and fell ever so slightly over the period.

[13] Approval of only small projects is delegated to a local authority. During the sample period, China's foreign investment approval process generally involved eight different types of approvals, though the process varies by industry, project size, and locale. For details on the approval process for inbound FDI, see U.S. Chamber of Commerce (2013).

that are not prohibited, restricted, or encouraged.

Our main interest lies with those industries where the Chinese state chooses to encourage or restrict foreign participation. Investment into restricted sectors requires approval, and then usually only in the form of a joint venture with a Chinese partner. Foreign investors in a joint venture are expected to transfer advanced technology and management know-how to their Chinese partners (Long (2005); Lu et al. (2017)). Joint Venture Regulations applicable during our study period impose an examination and approval process for any JV technology transfer agreement.[14] The Regulation limits the duration of such agreements to no longer than 10 years and stipulates that the importing party retains the right to use the transferred technology after the expiration of the agreement. These regulations impose contract constraints that investors claim unfairly discriminate against foreign intellectual property (IP) holders.[15]

Figure 2 shows the share of all four-digit industries that are encouraged or restricted over our analysis period. Foreign investment into only 25 percent of industries was encouraged in 1995, rising to 36 percent in 2002. Both groups experience only minor adjustments thereafter. The share of industries with foreign equity restrictions declined substantially with the 2002 Catalogue. The share of restricted industries dropped from 15 to 8 in 2002.

A deeper look into the 2002 policy changes is provided in Table 1. The top panel presents the incidence of FDI restrictions and preferences for all 480 4-digit industries. A pattern of policy substitution clearly appears. In 1997 China's FDI catalog placed restrictions on entry into activities in 70 manufacturing industries. With accession to the WTO, the number of industries subject to restrictions fell to 39, a reduction of 31 industries. At the same time, the number of industries in which foreign investment was encouraged rose from 113 to 173, a net increase of 60. Importantly, of the 31 industries on which restrictions were removed, 24 were listed as encouraged and thus eligible for investment incentives.

[14] Until replaced by the Foreign Investment Law in 2020, China maintained separate regulations for JVs and WFOEs. Our use of the term "JV Regulation" refers to the *Regulations or the Implementation of the Law of the People's Republic of China on Chinese-Foreign Equity Joint Ventures.*

[15] Andrenelli et al. (2019) provides a summary of various survey responses of foreign firm regarding pressure to transfer technology in their Chinese operations. Lee (2020) identifies the JV approval process as a key location for forced technology transfer, while noting that such arrangements are not uncommon in developing countries. Alleging that the JV Regulation imposes discriminatory restrictions on the rights of foreign IP holders, the European Union requested consultations with China in 2018, the first step in a WTO dispute settlement procedure (WTO, 2018). This request was joined by Japan in 2019. Claims of forced technology transfer through JV requirements were fundamental to the US Section 301 case used to justify tariffs on Chinese imports in 2018-19.

The bottom panel of Table 1 presents the incidence of FDI restrictions and preferences for a subset of sectors, the 152 high-technology industries.[16] Prior to WTO accession, China restricted foreign investment into 29 of these industries while encouraging investment into 59, about one-third of the total. With accession to the WTO, the number of high-tech industries subject to restrictions fell to 8, a reduction of 21 industries. The number of industries in which foreign investment was encouraged rose from 59 to 77, a net increase of 18, placing half of all high-tech industries among those for which investment incentives were available. Importantly, of the 21 high-tech industries on which restrictions were removed in 2002, 18 were moved to the revised "encouraged" list. In short, almost all high-tech industries where foreign investors were granted "ownership liberalization" in 2002 became eligible for special government incentives.

There are many policy tools available to Chinese government officials to shape investment in encouraged sectors. Central leaders identify preferred activities but delegate to provincial governments many aspects of implementation. Local and provincial officials, motivated by employment and growth objectives, compete for foreign investment in encouraged activities with incentive packages that make it easier and cheaper for investors to enter and manufacture in China. Granting access to sites within special economic zones, industrial parks, or science and technology parks reduces the cost of entry. Local government officials may offer desired foreign investors expedited approval as well as exemption from some costly and cumbersome rules.

The exact nature of incentives and subsidies provided to foreign companies in encouraged activities is rarely made public.[17] The limited information available suggests that China's efforts to lure foreign manufacturers can be lavish when conditions are right. Provincial and local governments provide subsidies in many forms, particularly for investments that introduce technologies new to China, locate in less developed areas, or provide significant employment.

Production and assembly of cellular phones was long encouraged by China's foreign investment regime. In 2016, the New York Times provided a rare glimpse into China's efforts to shape inward investment when it revealed the "hidden bounty of benefits" offered to Foxconn to locate a factory in Zhengzhou. With communication equipment a sector in which the central government

[16] Designation of high-tech industries is based on the "High-tech Industry (Manufacturing) Classification" issued by the Chinese National Bureau of Statistics. http://www.stats.gov.cn/tjsj/tjbz/201812/t20181218_1640081.html

[17] On the lack of transparency of Chinese subsidies Barboza (2016) finds that "In China, the competition for companies is secretive and rarely exposed to public scrutiny or debate," while also noting that China is not alone in offering non-transparent concessions to attract foreign investment.

encouraged foreign investment, the local government doled out more than $1.5 billion to Foxconn to build large sections of its factory and nearby employee housing (Barboza, 2016). These subsidies clearly lowered the fixed cost of entry for Foxconn and likely had an influence on the company's location decision.

The extent to which Chinese investment incentives come with strings attached is not known, although given their prevalence in high-tech activities, it is likely that technology transfer is expected in return for entry subsidies. Although there are many pathways for technology spillovers from wholly foreign owned affiliates to the domestic economy, the extent of technology transfer is larger when the foreign company takes a local partner, as shown by Jiang et al. (2018). Therefore, it is plausible that some incentives were contingent on the formation of a joint venture with a domestic partner. While China's WTO accession agreement prohibits the conditioning of investment approval on technology transfer, it does not rule out explicitly the use of investment subsidies for this purpose.

## 3 Theoretical Framework and Empirical Strategies

Our empirical approach is informed by the two-country, two-stage global sourcing model of Antràs (2015)). This framework is readily adapted to study a Northern firm's decision to invest and manufacture in a Southern host country, and if so whether to enter as a wholly foreign owned firm or by forming a JV with a local partner.

### 3.1 Theoretical framework

The Antràs (2015) model posits Northern firms who combine two stages to produce a differentiated good for the world market. These two stages can be performed in different locations: Northern "headquarter services," which encompass R&D, brand development, financial operations, and other non-manufacturing activities, can be combined with either Northern or Southern manufacturing. This model captures the role China plays in global value chains and we use it to explore how sourcing and investment decisions of final-good producers are influenced by exogenous changes in Southern FDI policy.

The model posits a continuum of heterogeneous firms that combine headquarter services and

manufacturing activity in a Cobb-Douglas technology. A firm is distinguished by its productivity level, which as in Melitz (2003), is revealed upon paying a fixed entry cost. The South has very low productivity in headquarter services, so all entry and headquarter services provision occurs in the North. An industry is distinguished by the weight placed upon headquarter services in production of the final good. This weight indicates the "headquarters intensity" of the industry, a characteristic that Antras (2016) proxies by R&D, skill, and physical capital intensity in his empirical work.

Firms must pay a fixed cost for setting up a manufacturing facility, with the fixed cost higher if they set up in the South than if they set up in the North. Despite a higher set-up cost, manufacturing in the South may be attractive because production worker wages are lower there than they are in the North. We assume that if a firm manufactures in the North, it does so within it's organizational boundaries.[18] If they choose entirely domestic operations, the total cost of production reflects the fixed cost of setting up production at home, the firm's productivity level, and the labor costs associated with both headquarter services and manufacturing at the Northern wage rate.

If Northern firms manufacture in the South, they may choose between two organizational forms: establishment of a joint venture with a Southern supplier or, if permitted by the Southern government, establishment of a wholly foreign owned affiliate.[19] There is a fixed cost associated with each entry option, reflecting the investment needed to establish a joint venture with a local manufacturing firm or to build a manufacturing plant and hire a local manager.

The number of active producers is large enough to treat the final-good market as characterized by monopolistic competition. We assume that firms take global demand for the final good and wages as given. If the firm chooses domestic operations, its expected profit rises with its productivity level. https://www.overleaf.com/project/621fd68996094548160bcc64 The total cost of producing q units of the final good if the firm chooses to manufacture in the South depends on the firm's chosen organizational form and its productivity. We assume that the fixed cost of entry is lower if the Northern firm forms a joint venture with a Southern partner. Consequently, if contracts were complete and fully enforced, Northern firms will always want to form a local joint venture if

[18] We do not consider the choice between domestic outsourcing and domestic integration, implicitly assuming the latter form dominates the former. Because our focus is on the organizational form chosen in China, the form chosen in domestic operations is irrelevant.

[19] We assume that outsourcing at arm's length is dominated by one or more of the remaining organizational forms. Implicitly, this assumption implies that there is no profitable way that final-goods producers can prevent an unaffiliated Southern partner from refusing to trade once investments are sunk.

they manufacture in the South.

Essential determinants of multinationals' internalization decisions in China during out study period, however, are incomplete contracts and weak contract enforcement. We portray contracts between foreign firms and Chinese domestic firms as "totally incomplete" in that no aspect of the contract is perceived to be enforceable.[20] In this environment, when a Northern firm begins operation, it must decide on the location for manufacturing activity and the contractual inefficiencies that will arise if it forms an offshore joint venture. Timing is such that once contracts are signed, investments in headquarters and manufacturing facilities are made by relevant parties. After these commitments are fulfilled, renegotiation and bargaining takes place between joint venture partners, but are unnecessary if the Northern firm wholly owns its operations. In the last stage, the final good is produced and sold. [21]

We consider first the case where entry is restricted to only those Northern firms willing to form a joint venture for offshore manufacturing. As in Antràs (2015), we assume that Southern partners are drawn from a competitive fringe of candidates with a reservation wage of 0. The chosen partner pays part of the fixed cost of setting up the production facility and it decides on the level of manufacturing effort, $m$.[22] Once investments by both partners are made, it is costly for each partner to separate. With this lock-in of partners and incomplete contracts, division of ex-post gains is determined after investments are sunk. Thus, if a joint venture is formed, it suffers from two-sided hold-up: the possibility of disagreement over terms and separation implies that each side has a lower incentive to exert effort than in the complete contracting case.

We assume symmetric Nash bargaining, which we associate with equal up-front capital contributions, and zero outside options.[23] Each party anticipates receiving a payoff equal to half of sales revenue and, thus, chooses the level of effort that maximizes revenue net of its labor input costs.

[20] As noted by Antràs and Yeaple (2014), treating contracts as totally incomplete is a strong assumption, and it can be relaxed. Despite its simplicity, however, the model captures the essential feature of the environment, which is that an initial contract cannot fully discipline the behavior of agents during the production stage.

[21] This framework adopts the transaction-cost approach to global sourcing in its assumption that Northern firms can fully control effort in and transfer net surplus from their Southern operations. The alternative property-rights approach incorporates endogenous transaction costs within a vertically integrated firm. Antràs and Yeaple (2014) provide a concise comparison of the two approaches.

[22] We treat decision making and control within a joint venture as the same as those of an outsourcing relationship, as do Sheng and Yang (2016). Inefficiencies in both forms derive from an inability of the foreign firm to set and enforce its Southern partner's effort level.

[23] Chinese JV regulations require profits to be split in proportion to the capital contribution of each partner. Many foreign partners take the maximum stake in their Chinese joint ventures, typically 49% or 50%.

The Northern firm may also demand an ex-ante transfer from its Southern partner. This familiar framework provides a benchmark from which we explore the effects of Southern JV mandate, limits on ex-ante transfers, and investment subsidies.

Antràs (2015, p.104) provides a compact representation of the ex-ante problem facing the final goods producer if it chooses to form a joint venture in the South, incorporating incentive compatibility constraints for the Northern and Southern partners. He derives the foreign firm's profit from forming a joint venture increases linearly with firm productivity at a rate dependent on the level of contractual inefficiencies.

As discussed earlier, China constrains the terms of partnership contracts. JV regulations limit technology sharing agreements to no longer than ten years, after which the domestic partner may freely use transferred knowledge. We interpret these constraints as limiting the ex-ante transfer that Northern partners can demand of their Southern partners in the initial contract. Unconstrained ex-ante transfers allow the Northern partner to reduce the share of ex-post revenue received by the Southern party, including that arising from unintended IP transfers, to the minimum needed to ensure Southern participation. Restrictions on ex-ante transfers funnel a larger share of revenue to the Southern partner, reducing the Northern partner's ability to extract the full value of its investment.

We assume that the government limits ex-ante transfers to a fraction of the share demanded in the unrestricted case.[24] Antràs (2015) shows that limits on ex-ante transfers exacerbate contractual inefficiencies, reducing the expected profit from investing in the South through a local joint venture. Importantly, government constraints on ex-ante transfers have a larger impact on firms in industries with high headquarter intensity. Headquarter services are complementary to manufacturing services so the more headquarter-intensive the activity, the larger are the rents that the Southern partner receives in ex-post bargaining and the larger the reduction in expected profits for the Northern partner caused by limits on ex-ante transfers. Thus, JV mandates raise the hurdle for offshoring manufacturing, limiting such investment to higher productivity firms and to activity with relatively lower headquarter-intensity, ceteris paribus.

How would removal of the JV mandate influence Northern firm's chosen ownership structure?

[24]The US Trade Representative issued two reports in 2018 (US Trade Representative (2018a,b)) alleging that China required foreign firms to engage in JVs with local companies, resulting in below-market technology transfer from US intellectual property–holders.

In this event, the Northern firm is free to decide if the manager of its Chinese operations is its employee or if the manager is a joint-venture partner. If the firm establishes a wholly owned affiliate, it can make all relevant decisions regardless of the contracting environment. This control, as in Antràs (2015), results in "governance costs" for the parent in operating its foreign affiliate, proportionally raising the marginal cost of manufacturing in the South. These costs may include monitoring activities needed to prevent involuntary transfer of the foreign firm's property through unauthorized side sales of the final goods or by other means. Consequently, the profit expected from establishing a wholly owned affiliate increases linearly with firm productivity at a rate dependent on the level of governance costs.

Equilibrium sorting of firms into the three different forms of production – domestic only, North-South joint venture, and a wholly owned foreign affiliate – depends on the model parameters. We assume that the fixed cost of entry paid by Northern firms is highest if they set up production as a wholly owned enterprise in the South, lower if they share costs by forming a joint venture, and lower still if they product at home. If contractual inefficiencies and governance costs are low enough and North-South wage differentials are high enough, some firms sort into each of the three forms. Low productivity firms manufacture domestically. For firms with productivity levels above a cut-off level, the cost savings from manufacturing in the South outweigh contractual inefficiencies and the higher fixed cost of setting up a joint venture. Firms with the highest productivity choose to set up a wholly owned affiliate in the South because with sufficient scale lower variable costs in manufacturing outweigh the higher fixed costs of establishing an independent plant offshore.

Other sorting configurations are possible. Of particular relevance is the case where no firm chooses to form a joint venture. This outcome would result from contractual inefficiencies that are large relative to international wage differences, all else equal. Similarly, if the governance costs of internalizing Southern operations are large, no firm would choose to invest in a wholly owned affiliate.

Many industries from which JV mandates were removed in 2002 were placed on the list of activities for which investment incentives may be offered. Available evidence suggests that incentives used to encourage FDI include measures that reduce the fixed costs of offshoring for Northern firms. Subsidies that reduce the fixed cost of setting up offshore manufacturing raise the expected profit of engaging in the subsidized activity in the South, regardless of the firm's productivity level.

If subsidies are offered to investors regardless of whether they form a JV or a wholly owned affiliate, the measure of firms opting for offshoring increases. If, however, incentives are offered only to firms willing to form a joint venture, then making investment incentives available to an industry will increase the measure of firms entering as JVs and reduce the measure of firms entering as WFOEs.

To summarize the implications of the theory for our empirics, we note the following:

1. Removing a JV mandate will induce entry in the form of wholly owned foreign affiliates.

2. Removing a JV mandate will have a bigger effect on organizational choice in industries where production is intensive in the use of headquarter services, such as intellectual property, provided by the Northern partner.

3. Incentives for entry will increase the number of firms forming Southern manufacturing affiliates. If Southern incentives are contingent upon forming a joint venture, they will increase the number of investors taking a local partner and decrease the number forming a wholly owned affiliate.

### 3.2 Empirical specification

To test these implications of Chinese FDI policy changes on entry and exports, we exploit variation in FDI regulation across industries and time using the following generalized difference-in-differences (DD) specification:

$$\ln Y_{jt} = \alpha + \beta_1 Encouraged_{jt} + \beta_2 Restricted_{jt} + \mu_j + \eta_t + Z_{jt}\Gamma + \epsilon_{jt},,$$

where $\ln Y_{jt}$ indicates the log of three different outcomes: ln(number of firms) as firm entry, ln(number of exporters) as exporter entry, and ln(export values) of industry $j$ in year $t$. $Encouraged_{jt}$ indicates whether the industry $j$ has any encouraged activities in the FDI catalogue in year $t$. $Restricted_{jt}$ indicates whether the industry $j$ has any restricted activities in the FDI catalog in year $t$. The left out neutral category includes all the industries that are neither encouraged nor restricted. The parameters of interest are $\beta_1$ and $\beta_2$. $\beta_1(\beta_2)$ measures the effect of FDI encouragement (restriction) on the series of outcomes for foreign-invested enterprises.

This baseline specification includes industry and year fixed effects $(\mu_j, \eta_t)$ to capture time-invariant industry-specific unobserved heterogeneity, such as the attractiveness of sectors for investment, as well as temporal changes in factor prices or other national conditions common to all industries. We estimate the equation separately for all foreign-invested enterprises and the three subsets of FIEs, joint-venture enterprises (JVs), and wholly foreign-owned enterprises (WFOEs). All regressions employ two-way clustering at the four-digit SCIC industry level to avoid upward bias when estimating standard errors.

We enhance our baseline specification by also including $Z_{jt}$, which is a vector of industry-by-year controls that includes the weighted average import tariff, export tariff, non-tariff barriers, and the PNTR gap.[25]

### 3.3 Discussion of identification assumptions

Our empirical strategy uses both the industrial and temporal variation in foreign investment policies to identify their effects on industry-level entry and export decisions. Identification relies on the standard DD assumption that industries with and without policy changes would have similar trends of outcome variables.[26] The primary threat to this "no pre-trend" assumption is policy endogeneity. If FDI policy changes are driven by unobservable industry characteristics that correlate with outcomes, the estimates will be biased. For example, exogenous technological change within a global industry may make China a more attractive location for production over time. If Chinese officials respond to the enhanced investment environment by encouraging firm entry in that activity, FDI policy is endogenous to firm behavior.[27]

To address this issue, we explore our panel data framework and examine whether policy endogeneity produced different pre-trends for industries with and without policy change using the following staggered event study framework:

[25] The PNTR gap affects Chinese exports only to the US but it has consequences for all investment into China. The gap is measured as the difference between the US rates to which tariffs would have risen if annual Congressional renewal had failed and the MFN tariff rates that were locked in by the granting to China of Permanent Normal Trade Relations.

[26] To probe the robustness of our results, we also relax this assumption by including industry-specific time trends, which allow each industry to have a differential linear trend. Estimation results are provided as Table A3. Our baseline results are not sensitive to this computational demanding exercise.

[27] Exogeneity of FDI policy changes is also claimed by Sheng and Yang (2016) and Jiang et al. (2018). Both studies argue that WTO entry led to changes that were plausibly exogenous because they were the outcome of multilateral negotiations and necessary to comply with TRIMs. Our examination of pre-trends in the data supports this view.

$$\ln Y_{jt} = \alpha + \sum_{t=-3, t\neq -1}^{3} \beta_{1t} Encouraged_{jt} + \sum_{t=-3, t\neq -1}^{3} \beta_{2t} Restricted_{jt} + \mu_j + \eta_t + \epsilon_{jt},$$

where (logged) outcome variables are still: number of firms as firm entry, number of exporters as exporter entry, and export values in log format for foreign-invested enterprises of industry $j$ in year $t$. The explanatory variables include policy-by-year dummies, $Encouraged_{jt}$ and $Restricted_{jt}$, which denote leads and lags of the respected policy variables before and after the change of the policy. The coefficients of interest, $\beta_{it}$, $(i = 1, 2)$, measure how the outcome variables evolve over time.[28]

Figure 3 graphically summarizes the event-study results. There are no significant trends in any of the outcomes before the change of FDI policy. As such, the coefficient $\beta$ captures the differential change in outcomes between the treatment and comparison industries for period $t$. Thus, the results suggest parallel trends for treated and control industries and the timing of FDI policy changes can be thought of as plausibly exogenous. Treatment effects can be identified through the differential timing of FDI policy implementation across industries. These event-study estimates for years following a policy change also indicate the dynamic effects of FDI policy changes, aiding our understanding of how treatment effects may vary with time since the treatment exposure.

While most of the policy changes in our study frame occur in 2002, there are a few additional adjustments in the FDI catalogues in 2004 and 2007. Our use of industry-by-time variation for identification is informed by the large literature on DD with staggered treatment timing. Recent advances in this topic (e.g., Goodman-Bacon (2021); Callaway and Sant'Anna (2020); Sun and Abraham (2021); Borusyak et al. (2021)) highlight the potential pitfalls of staggered event-study designs that compare later-treated groups with early-treated groups when the treatment effect is time-varying. For instance, earlier treated industries with dynamic time-varying treatment effects would cause downward bias to the estimate if they are used as controls. This issue, based on the recent literature on dynamic time-varying treatment, is not a major concern in our paper since the rollout of FDI policy changes mainly occurred in 2002.[29] This one-time major policy change provides a clear cutoff for us to identify the treated industries and control industries in our approach,

[28] Period 0 denotes the year of policy change. In the regression analysis, the year before the policy change is left out as the baseline.

[29] All recent literature suggests that if a majority of policy changes happen in one year, the likelihood of introducing bias is small.

which means that our results are less likely to be biased even with the presence of time-varying treatment effect.

To check this, in Figure 4, we use the estimator proposed by Callaway and Sant'Anna (2020) to eliminate the bias due to heterogeneous dynamic treatment effects for firm entry. We use "never-treated" industries as the pool of counterfactuals, and the average FDI policy effect on all three ownership types yields qualitatively similar results, consistent with our TWFE estimates. This result is not surprising given that a Goodman-Bacon decomposition places the majority of the weight of the TWFE estimator on "ever vs. never" adopters (good comparisons). Just 3 percent of the weight of the TWFE estimator was comprised of the potentially problematic comparison of "later vs. earlier" adopters. Finally, we re-estimate the baseline specification using data three years before and after 2002 and our results stay robust to this sample truncation.[30]

### 3.4 A triple difference (DDD) strategy

The DD and the event study framework help us identify the effect of FDI regulation through industry-by-year changes in FDI policy. A remaining concern, however, is that FDI policy changes are correlated with time-variant, industry-specific unobserved factors. Such policy endogeneity would create a correlation between FDI policy and foreign firms' entry. These concerns are important, and we address them with a triple difference approach that makes use of the fact that FDI policy affects only foreign firms and not domestic firms. If technological innovation makes China a more attractive location for a particular industry, both foreign and domestic firms should be affected by it. In this case, even though the government encourages foreign firm entry, we should observe entry by both foreign and domestic firms.

The triple difference model uses domestic firms as a within-industry control group, so we estimate the following specification:[31]

$$\begin{aligned}\ln Y_{ijt} = \alpha &+ \beta_1 Encouraged_{jt} \times FIE_i + \beta_2 Restricted_{jt} \times FIE_i \\ &+ \gamma_1 Encouraged_{jt} + \gamma_2 Restricted_{jt} + FIE_i \times \mu_j + FIE_i \times \eta_t \\ &+ FIE_i + \mu_j + \eta_t + \epsilon_{jt},\end{aligned}$$

[30] The results of this estimation are provided in Table A4.

[31] Domestic firms are defined as all private firms and state-owned enterprises that have not received foreign investment in any form.

where $i$ indexes the ownership type (1 if FIE, JV, WFOE or 0 if Domestic), $j$ indexes industries, and $t$ indexes years. Three main outcomes are the same as before. The analogy to the DD specification is straightforward. Besides the key triple interaction term of FDI policy variables and Foreign status, we include Foreign-by-year dummies, Foreign-by-industry dummies, and Foreign dummies. The coefficients of interest are $\beta_1$ and $\beta_2$, which identify the differential impacts of FDI policy on the outcomes for foreign and domestic firms. Again, we separately estimate the equation for FIEs and its subsets, JVs, and WFOEs.

## 4 Data Sources

As discussed above, foreign investment approval is guided by the Chinese government's Catalog for the Guidance of Foreign Investment Industries (NDRC, various years), which was first published in 1995 and revised subsequently in 1997, 2002, 2004, and 2007. To characterize FDI policy changes, we draw upon the bespoke coding by Sheng and Yang (2016) of the foreign investment Catalogue text for all 480 four-digit SCIC sectors from 1998 to 2007.

This study also requires detailed information on the number and export behavior of manufacturing firms operating in China. The main source of annual data on manufacturing firms is the annual survey of industrial enterprises (ASIE), which includes information for all state-owned firms and non-state-owned firms with sales above 5 million RMB. The dataset is collected through annual surveys by the National Bureau of Statistics (NBS) of China. The aggregated value of exports, output, employment, sales, and capital for these firms are nearly equal to totals reported annually in China's Statistical Yearbook. Compared to the universe of firms observed in the 2004 China Economic Census, the sample of above-scale industrial firms represents most industrial production in China. As discussed in detail by Brandt et al. (2014), firms in the ASIE data account for 91 percent of gross output, 71 percent of employment, 97 percent of exports, and 91 percent of total fixed assets in the 2004 census survey year.

Our sample includes firms in all four-digit Standard Chinese Industry Classification (SCIC) manufacturing industries as surveyed annually from 1998 to 2007. During the sample period, the SCIC codes were updated to a new version (GB/T4754-2002). Appropriately, we convert the old version (GB/T4754-1994) of SCIC codes to the more recent nomenclature using a concordance

table for years before 2002.

We employ information on firm's registration status (variable dengji zhuce) to identify firms' ownership types.[32] Following Brandt et al. (2017), we also further refine ownership type using information on the largest ownership share in registered capital. Thus, firms' ownership types can be classified into four categories: state, private, foreign, and Hong Kong, Macao or Taiwan (HKMT). Foreign firm-type includes both wholly foreign owned enterprises (WFOEs) and joint ventures with local partners (JVs). For our analysis, we aggregate the firm-level data to industry level to acquire the total number of firms, exporters, and aggregated export values for each ownership type.

As noted above, we also include a robust set of industry-specific controls. This set includes import and export tariffs at the SCIC 4-digit level, which we obtain from the online appendix of Brandt et al. (2017) and Garred (2018).[33] Import tariffs are created as the weighted average of output tariffs using industry shares from the Chinese 2002 Input-Output table.

To ensure that our estimates are not confounded by investment incentives created by the US granting of PNTR to China, we control for the industry NTR gap, calculated by the difference between ad valorem equivalent NTR and non-NTR tariff rates and taken from Pierce and Schott (2016).[34] We use the NTR gap for 1999, the year before the passage of PNTR in the US, in our regression analysis. Our results are qualitatively robust to using the NTR gaps for any available year.

To push our analysis further, we explore the relationship between FDI policy changes and exports to specific destinations and by trade type. If policy changes lead to export upgrading and increased domestic content, we should observe a boost in sales to advanced economies as well as a shift to ordinary exports. We obtain export flows by destination country and trade type (ordinary or processing trade) from China's Custom Records for the period 1996-2013.[35] These records provide the value and quantity of every transaction that passes through Chinese customs at the 6-

[32] Stipulations on how to distinguish firm ownerships between registered types can be found on the website of China's NBS: http://www.stats.gov.cn/tjsj/tjbz/200610/t20061018_8657.html

[33] Tariffs are available at https://feb.kuleuven.be/public/N07057/CHINA/appendix/.

[34] Data for computing NTR gap from 1989 to 2001 are from Feenstra, Romalis, and Schott (2002).

[35] Fernandes and Tang (2012) use China Customs Records to explore a further ownership differences within processing trade activities. Their focus is the ownership of imported materials and the extent of foreign ownership of plants engaged in export-processing activities.

digit Harmonized System (HS) product level.[36] To match our industry-level analysis, we apply the HS-SCIC concordance table constructed by the NBS and extended further by Brandt et al. (2017) to obtain export flows by trade type and by destination country at 4-digit SCIC level. Summary statistics on four-digit SCIC industry-level dependent variables, policy variables, and controls can be found in Table A2.

# 5 The Effect of FDI Policy Changes on Foreign Firm Entry and Export Performance

## 5.1 Difference-in-differences analysis

Difference-in-differences analysis identifies the effect of FDI policy changes from both cross-sectional and time-series variation in policy designations. We expect that preferential policy, captured by the "encouraged" dummy, reduces the cost of entry for foreign firms and, thus, promotes entry, exporting, and export volumes. The details of the policy are important to note, however, as investors into encouraged sectors may be required *de jure* or *de facto* to form a joint venture to receive potential entry subsidies. To capture this possibility, we also analyze separately the impact of encouraged policy status on the entry and exporting of WFOEs and JVs.

We also expect that restrictions on investment, captured by the "restriction" dummy, reduce entry of foreign firms and the value of their exports. Since restrictions typically cap the equity share of foreign investors, we also examine the effect of restriction on the entry and exporting of WFOEs and JVs separately. We expect that removal of restrictions encourages the entry of WFOEs, while diminishing JV entry.

Table 2 provides our baseline results, using four-digit industry fixed effects and year dummies as controls. To account for possible correlation among industries that received treatment at the same time (Cameron and Miller, 2015), we cluster standard errors at the industry-by-treatment year level.

The top panel provides results for our analysis of firm entry. As can be seen from the first row of the panel, designating an industry as encouraged raises the number of foreign firms in the treated

[36]Since HS code versions were updated in 1996 (H1), 2002 (H2) and 2007 (H3) during the sample period, we use concordances obtained from the World Bank's WITS dataset to convert HS codes in each year to the H1 version.

industry by 0.237 log points, an effect that is statistically significant in the full sample and for both FIE subsamples, JV and WFOE. The estimated effect is larger for JV entry than for WFOE entry: 0.244 log points versus 0.110 log points. That investment preferences induce JV entry is particularly interesting, given that by 2002 firm entry increasingly took the form of wholly owned affiliates, as shown in Figure 2. Designating an industry for special preferences leads to a robust response in the form of new joint venture formation.

Restrictions on foreign investors reduce their presence in a sector, as shown in the top panel, with an estimated reduction in the number of WFOEs by 0.179 log points in treated industries. Our results indicate that this designation has no significant effect on the number of JV entrants. The implication of these findings is that the removal of equity caps leads to entry by investors who want to fully control their Chinese operations.

The second panel provides results for DD analysis of the number of firms that export. The estimates imply significant responses by foreign investors to encouraging policies, with the number of FIE exporters rising by an estimated 0.214 log points when an industry is so designated. The estimated effect is again significant for JV exporter entry.

Designation as a restricted activity significantly decreases the number of WFOE exporters, with an estimated reduction of 0.218 log points in their number. Restrictions have no significant effect on the number of JV exporters.

The bottom panel examines the response of export values to policy changes. The findings suggest that encouraging investment policies raise sectoral exports by an average of 0.231 log points in treated industries, with a larger point estimate and statistically significance only for joint ventures. This effect is notably large and we will explore it further in the following sections, where we add additional controls to our analysis. Turning to industries in which foreign ownership is restricted, we find that an equity limit reduces exports from WFOEs by 0.454 log points in treated industries.

Other studies suggest that several aspects of trade policy influenced China's export surge. The first of this is the granted of PNTR to China by the United States in 2001. Since this policy change occurred at the same time as a significant revision of Chinese FDI regulations, we control for it. We also include as controls the import tariff, export tariff, and non-tariff barriers, all of which have been identified as important for trade flows by previous research.

For our purposes, the important implication of the results shown in Table 3 is that the addition

of this set of controls does not change the conclusions one can draw from Table 2.[37] Indeed, estimated magnitudes change only slightly. Designation as an encouraged industry raises the number of FIEs, the number of FIE exporters, and the value of exports originating in foreign-owned firms. Again we find that designation as an encouraged activity has a positive and significant effect on JV export values, while ownership restrictions have a negative and significant effect on WFOE export values.

Our baseline and extended regression results are summarized in Figure 5, which displays point estimates and 95% confidence intervals for a range of specifications. Two features of Figure 5 are consistent with the strong, arguably causal effects of changes in foreign investment policies on the likelihood of entry and exporting decisions that are shown in the previous tables. First, the point estimates of encouraging policies on entry and exporting are universally positive, with those results mainly driven by JVs. Secondly, the point estimates of restrictive policies consistently support their presence as hurdles for WFOE firm entry and exporting hurdles across all specifications.

To push our data harder, we generalize our approach further by allowing each industry to have its own time trend. This exercise relaxes the common trend assumption by allowing separate time trends for each broadly defined two-digit industry directly. Appendix Table A3 summarizes results of the DD analysis with the inclusion of two-digit industry-specific year trends. Including these trends does not affect either the size or the significance of our estimated effects, except for FDI restrictions, which are estimated to have large and significant deterrence effects on all forms of entry and exports. The estimated impact of encouraged status on entry and exports when we allow for industry-specific year trends is similar to our baseline estimates. In particular, the estimated effect on the number of JVs is changed very little and remains highly significant. We also find that our point estimate for the effect of FDI encouragement on the number of FIE exporters and export values are little changed, again with the estimates for JV exporter entry highly significant.

Moreover, we also explore the robustness of our findings to changes in the functional form of the specification (i.e., using levels rather than logs of the outcomes), treatment of zeros (i.e.,

[37] Results for the newly added controls are interesting. PNTR is positively associated with the number of FIEs and the number of FIEs that export in treated industries, with point estimates that are highly significant. We interpret these estimates as confirmation of the mechanisms identified by Pierce and Schott (2016), even though we do not find a significant effect on export values for WFOEs. Higher import tariffs are associated with higher FIE exports, mainly driven by WFOEs, which engage heavily in duty-free processing activity. Lastly, our results suggest that lower export tariffs lead to higher numbers of WFOE exporters and export values, although the coefficients on export values are not statistically significant.

adding 5th percentile values vs. recoding them as one), and use of a fixed effects Negative Binomial specification.

### 5.2 Triple difference analysis

To guard against the possibility that policy changes are correlated with unobservable factors that influence the general level of entry and exporting in an industry, we estimate the impact of FDI policy on foreign firms by treating domestic firms in the same sector as a control group. These triple difference results are shown in Table 5. The entries provide estimated coefficients that measure the impact of FDI policy changes on foreign firms relative to their domestic counterparts. As controls, we include industry and year fixed effects, as well as additional variables that allow ownership specific levels and trends - ownership-by-industry, ownership-by-year, and ownership fixed effects.

The triple-differenced results support inferences drawn from the DD analysis. Encouraging policy raises the number of FIEs relative to the number of domestic firms in the same industry by 0.148 log points overall, with significant effect for only the JV subsample. Again, we find that restrictions reduce WFOE entry relative to the number of domestic firms, with designation as a restricted sector associated with a 0.159 log points reduction in wholly owned FIEs, with dropped significance level. Panel B provides estimates that support the finding that encouraging policy increases the number of FIE exporters relative to domestic exporters, with a highly significant point estimate of 0.307 log points. This outcome appears to be driven by the entry of JV exporters. Finally, Panel C provides strong evidence that FDI policy influences export values. Relative to their domestic peers, designation as an encouraged sector raises FIE export values by a 0.236 log points, with strong and significant responses found in the JV subsample. WFOE exports in restricted sectors are much lower than those from domestic firms, with an estimated 0.396 log points reduction in WFOE export values relative to domestic firms, again with a slight drop in the significance level.

### 5.3 The margins of exporting: evidence from China Customs Records

The impact of policy changes on overall foreign entry and export decisions could mask important heterogenous effects by trade mode (processing vs. ordinary) or by destination (export to high-income, Southeast Asian, or other countries). Reflecting the Chinese leadership's objective of

industrial upgrading, we would expect that preferential policies would promote ordinary exports (with their higher domestic content) and the ability of Chinese firms to break into advanced markets. Access to rich transaction-level China Customs Records allows us to test the heterogenous treatment effects of policy changes in the following DD specifications for the intensive margins (export values).

First, we examine the heterogeneous effects on processing trade and ordinary exporting. We estimate the following DD specification:

$$\begin{aligned} lnY_{ijt} = \alpha \ &+ \beta_1 Encouraged_{jt} \times Ordinary_i + \beta_2 Restricted_{jt} \times Ordinary_i \\ &+ \gamma_1 Encouraged_{jt} + \gamma_2 Restricted_{jt} + Ordinary_i + \mu_j + \eta_t + \epsilon_{jt}, \end{aligned}$$

In this equation, $Ordinary_i$ is a dummy variable which equals 1 if the trade mode is ordinary, while other notation and variables remain as defined previously.

Secondly, we explore heterogeneity in treatment effects across different Chinese export destinations. We calculate the total numbers of exporters and total export values for three different region groups, high-income, southeast Asian countries (SEA), and other countries. We then bring the data to the following specification:

$$\begin{aligned} lnY_{ijt} = &\alpha \ + \beta_1 Encouraged_{jt} \times High\ Income_i + \beta_2 Restricted_{jt} \times High\ Income_i \\ &+ \beta_3 Encouraged_{jt} \times SEA_i + \beta_4 Restricted_{jt} \times SEA_i + \gamma_1 Encouraged_{jt} + \gamma_2 Restricted_{jt} \\ &+ High\ Income_i + SEA_i + \mu_j + \eta_t + \epsilon_{jt}, \end{aligned}$$

$High\ Income_i$ and $SEA_i$ are dummies for country groups.[38] $Encouraged_{jt}$ and $Restricted_{jt}$ policy variables are interacted with both group dummies.

Using detailed China Customs Records (CCR) serves two purposes here.[39] First, we investigate the effect of FDI policy changes on the various margins of exporting and explore heterogeneity in the treatment effects. Second, CCR documents the entire universe of exporters, covering the exporting behavior of smaller firms that fall below the ASIE cutoff. Therefore, this additional data

[38] High income countries include Australia, Austria, Belgium, Canada, Denmark, Finland, Germany, Iceland, Ireland, Italy, Netherlands, Norway, Spain, Switzerland, UK, and USA. SEA represents Southeast Asian countries/regions which include Japan, Korea, Taiwan, Singapore, Thailand, Indonesia, Malaysia, Philippine, Laos, and Vietnam.

[39] Using the CCR also allows us to extend the timeframe of our analysis, covering the period 1996-2013.

source helps assess the validity of our assessment across the full size distribution of foreign firms.

Because the CCR contains export records, we estimate the effect of FDI policy only on export values. Compared to those obtained using the ASIE, we expect smaller estimated effects because of the inclusion of smaller firms, which may be younger firms gaining a foothold in foreign markets. The estimates will also differ because it is not possible to separate HKMT firms from foreign (primarily OECD) firms and, in unpublished results using the ASIE, we find FDI policy effects to be less potent drivers of HKMT behavior.[40]

Regression results using the CCR to explore heterogeneity by trade type are shown in Table 6. Columns (1) to (3) report results for the log of export values by sample. Processing exports are those produced with intermediate inputs imported tariff-free on the condition that they not be sold domestically. Focusing on the top two rows of Table 5, encouraged industries export significantly more through processing arrangements than as ordinary exports, and this is true for all firm types. Indeed, we estimate that the intensive margin of ordinary exports is diminished when the sector is encouraged, while processing exports in encouraged sectors are enhanced. This finding suggests that FDI incentives encouraged deeper integration of China into global value chains, not higher domestic content.

FDI restrictions, on the other hand, significantly reduce export values for all firm types. Interestingly, this depressing effect is smaller for ordinary exports than for processing exports, again for the full FIE sample and for JV and WFOEs separately.[41] One possible explanation is that industries where foreign participation was restricted tended to be those in which production was less fragmented and more likely to sell to the domestic market. Removing restrictions, then, led to entry of firms more deeply engaged in processing than ordinary trade.

Turning to Chinese exports to different sets of countries or regions, presented in Table 7, we find that encouraging policies promote exports but appear to have a lesser effect on exports to high-income countries. As much of these flows are processing exports, it is interesting to note that encouraged sectors exports more to Southeast Asian nations, significantly so for WFOEs. These patterns suggest that encouraged sectors deepen China's foothold in East Asian production network.

[40] These results are available from the authors upon request.

[41] These results compliment those of Sheng and Yang (2016) who find that ownership liberalization increased the extensive margin of processing exports in China during the period 1998-2007.

Equity restrictions are associated with reduced trade flows to all regions, significantly so to high-income destinations. One implication is that removing equity caps increases trade with advanced countries, perhaps by permitting the production of more technologically sophisticated goods.

These finding suggest that China's use of preferential policy induced entry of firms willing to take a local partner and embed it into global supply chains via processing activities. They also suggest that equity restrictions had the desired effect of limiting the entry of wholly foreign-owned firms but also restrained Chinese exports in these sectors, particularly those created under processing arrangements.

We turn to our data again to ask if the export promoted by these policies are associated with systematic industrial upgrading, which we define as advancing Chinese exports in R&D intensive or skill intensive sectors. We rely on the 2004 Industrial Census to calculate the average of R&D expenditure per RMB gross industrial output and the average share of college trained workers in each industry.

Table 8 presents the results of interacting these industry characteristics with the FDI policy indicators. As seen in the top panel, encouraging policies do not promote exports in R&D intensive sectors any more strongly than they do the average sector. Restrictions on equity shares, however, do appear to skew trade flows. Specifically, restrictions reduce exports from WFOEs in R&D intensive sectors, a finding consistent with the theoretical global sourcing model, which suggests that JV constraints deter entry and exports of foreign firms in activities with high HQ intensity, measured here by R&D intensity.

The bottom panel displays the results when we interact skill intensity with the FDI policy indicators. Again, we do not find encouraging policies promote exports from skill-intensive sectors any more than they do the average sector. Consistent with the top-panel results, we find that equity restrictions deter exports from WFOEs in skill-intensive industries, another measure of HQ intensity.

### 5.4 Quantifying the economic significance for China's exports

We show above that many activities from which JV mandates were removed were then added to the list of encouraged activities. To evaluate the impacts of these policy changes on China's exports, we

rely on a partial-equilibrium aggregation based on our baseline reduced-form estimates in Table 2. While we note that FDI policy changes may also affect the average flows of investment and, thus the values of estimated coefficients on year or industry dummies, we believe such general equilibrium effects to be small enough to make our analysis of value. Following the approach of Acemoglu et al. (2016) counterfactual FIE export values are computed as the FIE export flow that would have occurred in the absence of changes in FDI policy. Therefore, the implied change in FIE exports in year t can be written as:

$$\Delta \text{Export}_t = \sum_j X_{jt}(1 - e^{(\beta_1 \cdot \mathbb{1}Encouraged_{jt} + \beta_2 \cdot \mathbb{1}Restricted_{jt})}),$$

where $\beta_1, \beta_2$ are coefficient estimates of Encouraged and Restricted policy dummies from our baseline regression. $\mathbb{1}Encouraged_{jt}$ (or $\mathbb{1}Restricted_{jt}$) represent whether industry $j$, has experienced a change in encouraged status (or a change in restricted status) or not during our sample period. $X_{jt}$ is the foreign export value for industry $j$ in year $t$. Hypothetically, this equation calculates the difference between the actual and counterfactual exports from FIEs in year $t$. We take a conservative approach to estimating the partial equilibrium policy effects. We use only statistically significant coefficients from our baseline results in Table 2 and estimate the impact on JV flows and WFOE flows separately.

Compared to 1998, exports from Sino-Foreign JVs were $120.3 billion higher in 2007, while exports from WFOEs were $320.2 billion higher, for a total increase in FIE exports of $440.5 billion. Calculations based on parameter estimates from Table 2 suggest that changes in FDI policies (encouraging and restricting combined) stimulated $38.1 billion more Chinese exports originating in FIE firms in 2007 than we would otherwise predict. These policy-induced exports account for 8.7% of the increase in 2007 FIE exports compared to 1998 FIE exports.[42] Encouraging policies raised JV exports by $10.3 billion, and ownership liberalization raised WFOE exports by $27.8 billion

FIE high-tech exports rose from a relatively small contribution to Chinese 1998 exports, $19.1 billion, to $332.5 billion in 2007. This growth fundamentally changed the composition of China's export bundles, as high-tech industries provided 53% of China's overall 2007 export value. High-tech activities were the target of most of the 2002 policy changes, therefore most of our estimated

[42]The calculation for each indicated percentage increase is based on the significant baseline coefficients from table 2.

policy impact comes from these industries. Removing equity restrictions and encouraging high-tech production combined contribute 8.6% of the increase in FIE high-tech exports. Because the high-tech bundle is so large, the value of these induced exports is large, $26.7 billion, or 70% of the estimated policy-induced export value. Most of these induced exports result from the removal of ownership limits on restricted high-tech sectors, leading to entry of WFOE exporters.

To better understand the importance of foreign investment policies at a more granular level, we graphically present the FIE counterfactuals for all Chinese manufacturing two-digit sectors. Figure 6 presents these estimated percentage changes in export values from foreign-invested enterprises due to FDI policy changes for each sector. We highlight sectors contained Chinese-designated high-tech industries in bold text. The figure indicates the estimated increase in 2007 export value attributed to newly encouraged joint-venture enterprises (JVs in "+") and newly unrestricted wholly-foreign-owned enterprises (WFOEs in "×") in comparison to the 1998 base.

One can draw several important implications from the patterns seen in this graph. First, unlike other export-oriented policies that strengthened Chinese traditional comparative advantage in furniture, toys, and textiles, China did not alter FDI policy in these sectors, maintaining policy neutrality toward foreign inflows.

Secondly, one can see in Figure 6 how the composition of China's high-tech exports was affected by FDI policy changes.[43] We estimate the largest percentage increases in exports from three high-tech sectors: chemical fibers, transport equipment, and general machinery. These induced exports are due to both removal of ownership restrictions and designation as encouraged activities. Interesting, investment incentives for encouraged activities and resulting induced JV entry provide more than half of the export boost in chemical fibers, a sector that provides only 0.5% of Chinese 2007 exports, and one in which China may have sought technology transfer. Removal of ownership restrictions provided a bigger boost to exports than did investment encouragement in transport equipment and general machinery.

Thirdly, other industries where encouraging policies lead to relatively large increases in JV exports are not high-tech sectors, but rather sectors where China was seen as having a comparative advantage: beverages; clothing, shoes, and hats; food processing; and rubber products. China may

[43] In this section, we measure the total increase in sectoral FIE exports by comparing 2007 values to the 1998 counterpart.

have viewed FDI into these sectors as a tool to promote manufacturing upgrading in response to rising labor and environmental costs and, thus, used investment incentives to encourage technology transfer through joint ventures.

Finally, we note that three important contributors to China's high-tech export success, communications, computers, and other equipment; electric machinery; and instruments, meters, optical and office machinery were boosted by the removal of restrictions on foreign equity. Communications, computers, and other equipment accounts for the largest share (36%) of China's exports in 2007. We estimate that $15 billion (5.7%) of the additional $263 billion in FIE exports in this sector can be attributed to policy induced WFOE entry, where this entry occurred in more advanced industries within the sector. Entry of new WFOEs was also an important driver of increasing exports in electric machinery, a sector that provided the second largest share (8.2%) of Chinese exports in 2007. We estimate that policy changes led to an increase of $4 billion in exports from this sector, or 11% of the $35 billion increase in exports compared to 1998. The last high-tech sector experiencing a large export boost from removal of equity restrictions is instruments, meters, and optical and office machinery, for which we estimate policy changes increased exports by $2.7 billion.

## 6 Policy Success and Policy Blowback

Our findings indicate that China's efforts to attract investment in desired activities was effective in inducing the entry of foreign multinational exporters. These firms helped to propel China's post-WTO export surge, especially in high-tech industries. Overall, we estimate that 8.7% of the increase in FIE exports between 1998 and 2007 can be attributed to changes in Chinese FDI policy stemming from its WTO accession negotiations.

The removal of restrictions on foreign firm entry had a large and significant effect on the flow of investment into Chinese industries. Removal of equity caps induced foreign entry in the form of wholly foreign owned affiliates, primarily in high-tech sectors. These reforms lead to new foreign investment in R&D-intensive and skill-intensive industries within these sectors. They were particularly effective in promoting Chinese processing exports, deepening China's integration into global supply chains. A simple lesson is that requiring foreign firms to form joint ventures with constrained technology agreements skews investment away from more advanced activities.

These findings relate to concerns expressed by Jiang et al. (2018), who find larger technology spillovers to the domestic economy from JVs than from WFOEs and worry that removal of JV requirements as a consequence of WTO accession will slow China's technological development. In their words, they are concerned that "the move away from international JVs might amplify the negatives and attenuate the positives arising from foreign investment." Our findings suggest that foreign firms delayed entry into China due to JV restrictions and their removal introduced new technologies through WFOE entry. Further research is needed to better understand the balance between slower diffusion but more advanced technology resulting from China's 2002 ownership liberalization.

We also find that China used investment encouragements to induce entry of foreign investors willing to form joint ventures with domestic partners, at a time when investors were more likely to enter as wholly foreign owned affiliates. The high-tech sector relatively most affected by newly encouraged status is chemical fibers, for which FIE exports increased by an estimated 16% due to this policy change alone. However, we also find that making new activities eligible for entry incentives had the largest relative effect on the FIE export performance of sectors in which China is perceived as having a long-standing comparative advantage, and perhaps in need of technological upgrading. It remains to be seen how successful these policies were in raising domestic manufacturing productivity through JV technology spillovers, although it is interesting to note that Jiang et al. (2018) estimate larger JV spillovers after China's WTO accession than before.

Lastly, we note that recent opposition to China's FDI policies, culminating in the 2018-19 US-China trade war, may have their genesis in policies shaped by WTO accession negotiations. Chinese leaders implemented policy changes that liberalized ownership arrangements while simultaneously seeking to shape and harness their impact. Despite eliminating *de jure* equity caps on most sectors in 2002, opposition to Chinese FDI policies deepened over the next 15 years. We again observe that almost all high-tech industries on which restrictions were removed were simultaneously added to the list of encouraged activities. Our results suggest that China's investment incentive policies may have contributed to the sense that technology transfer was needed to obtain entry concessions. They point to the need for greater transparency in industrial subsidies, including those for foreign investors, in resolving issues that continue to plague the global trading system.

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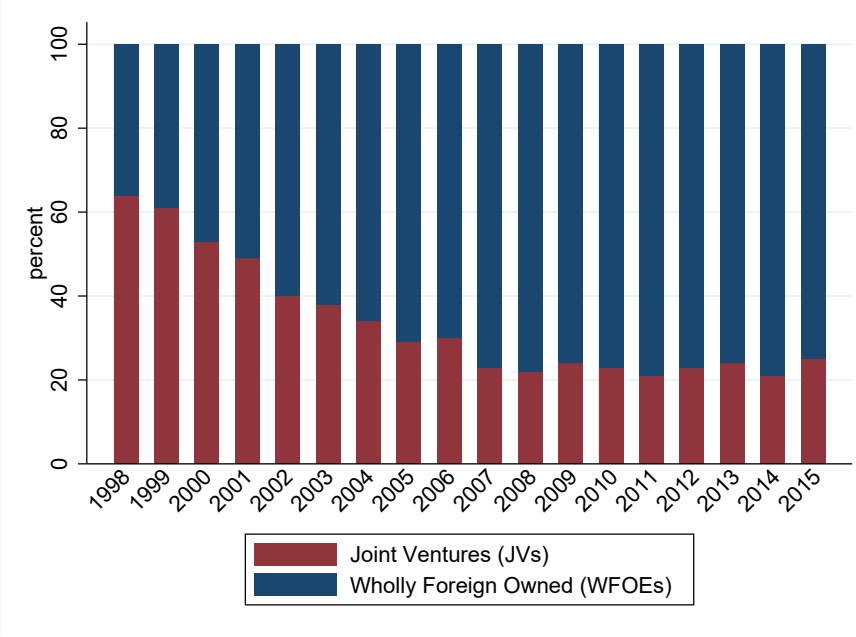
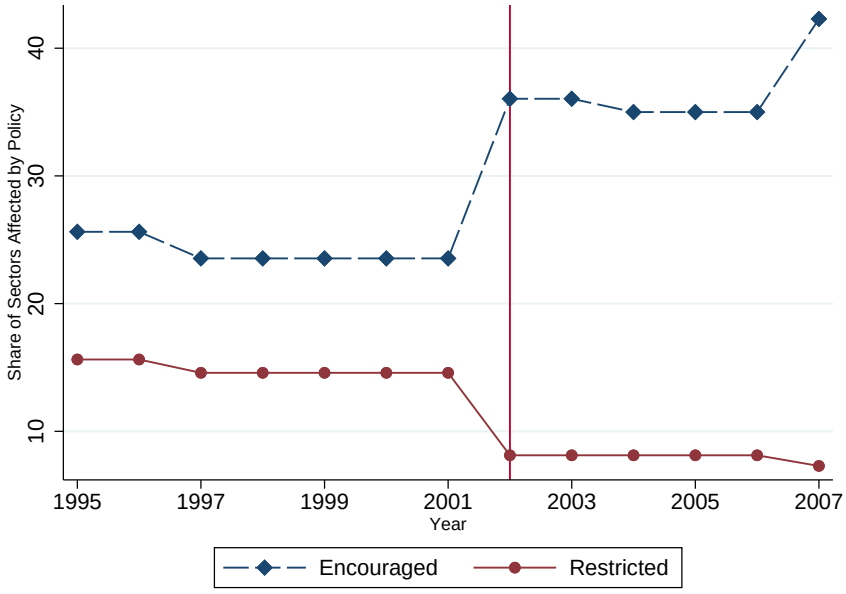
## Figures and Tables

Figure 1: Share of Chinese FDI Inflows by Ownership Type, 1998-2015



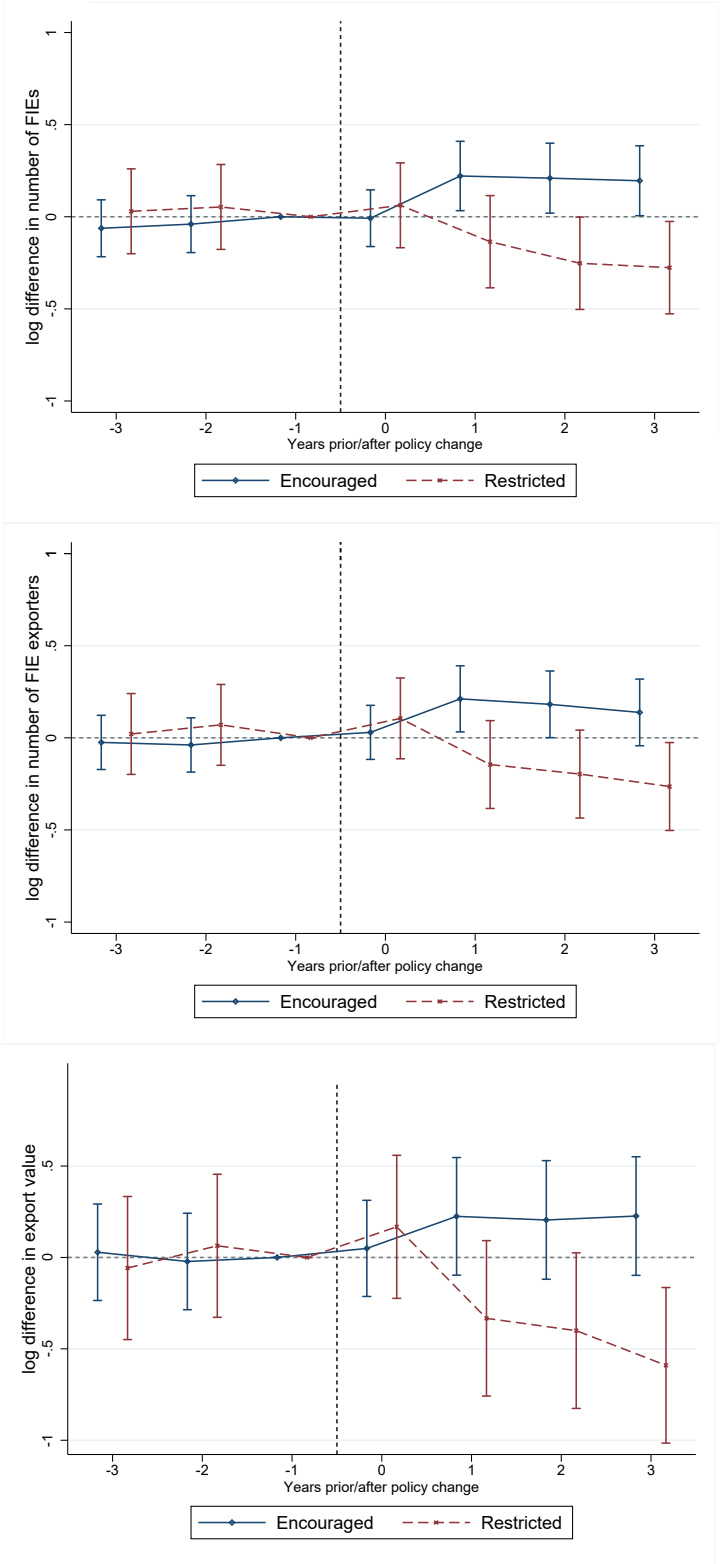

Note: Data taken from China Customs, with calculations by authors.

Figure 2: Share of Manufacturing Sectors Designated Encouraged and Restricted, 1995-2007




Note: Figure shows share of SCIC 4-digit manufacturing sectors subject to each policy designation. Policies taken from various FDI catalogues and coded by Sheng and Yang(2016). Grouping and calculations by authors.

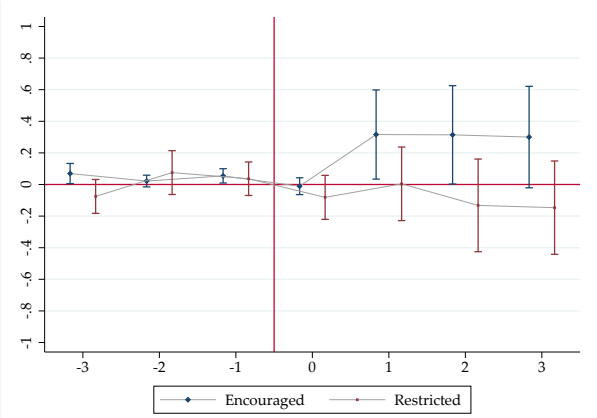
Fi Pre-trends and Post-trends for FDI Policy Changes



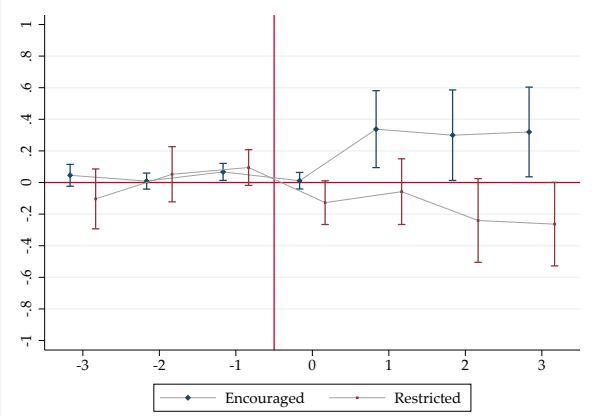

Note: These graphs show estimated coefficient values and confidence intervals from the event-study estimation described in text.

Figure 4: Eve udy Analyses for FDI Policies and Foreign Firm Entry, SIE, Callaway and Sant' Anna (2020)

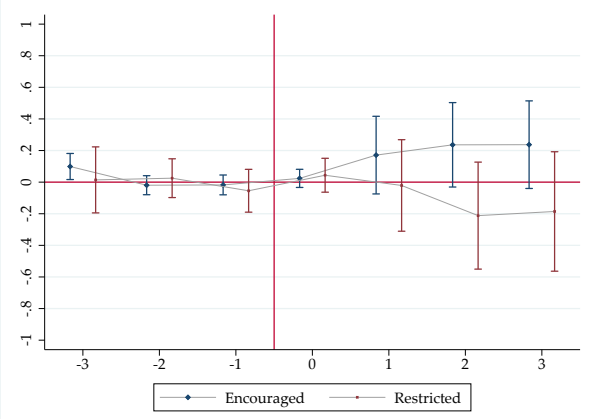
Panel (a): All Foreign Firms




Panel (a): Joint-Venture Firms

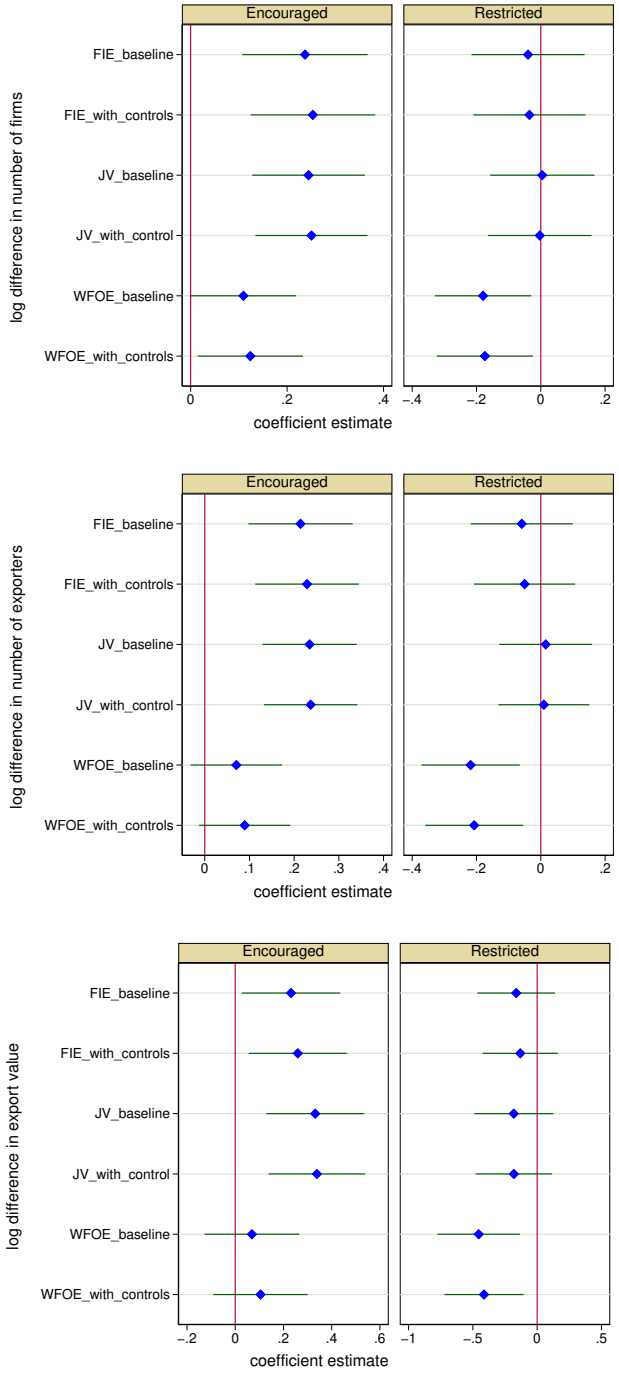



Panel (a): Wholly-Foreign Owned Firms



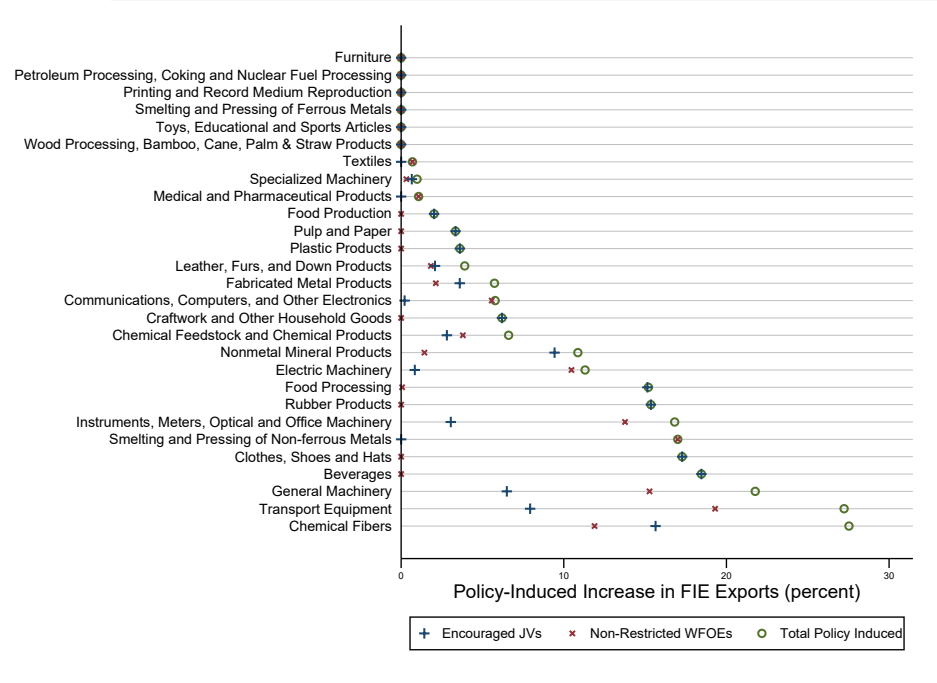

Note: Callaway and Sant'Anna (2020) estimates (and their 95% CIs) are shown above

Figure 5: Estimated Policy Effects on Entry and Export Outcomes, for Alternative Specifications




Note: Full estimation results shown in Tables 2, 3, and A3

Figure 6: Es Percentage Change in Foreign Exports Due to FDI Policy Changes by Industry




Note: See text for method used to calculate estimated partial equilibrium effects of policy changes.

Table 1: Incidence of FDI Restrictions and Preferences, All Industries and High-Tech, 1997 and 2002

| year | total restricted | total encouraged | restricted in 1997 and moved to encouraged in 2002 |
|---|---|---|---|
| | | All 4-Digit Industries | |
| 1997 | 70 | 113 | n.a. |
| 2002 | 39 | 173 | n.a. |
| change | -31 | 60 | 24 |
| | | High-Technology 4-Digit Industries | |
| 1997 | 29 | 59 | n.a. |
| 2002 | 8 | 77 | n.a. |
| change | -21 | 18 | 18 |

Note: Authors calculations from Sheng and Yang (2016) FDI Policy Indicators

Table 2: Difference-in-Differences Estimates of the Effects of FDI Policy

| | (1) FIE | (2) JV | (3) WFOE |
|---|---|---|---|
| (*Panel A: Dependent Variable = ln Number of Firms*) | | | |
| Encouraged | 0.237*** | 0.244*** | 0.110** |
| | (0.066) | (0.060) | (0.056) |
| Restricted | -0.040 | 0.004 | -0.179** |
| | (0.090) | (0.083) | (0.076) |
| (*Panel B: Dependent Variable = ln Number of Exporters*) | | | |
| Encouraged | 0.214*** | 0.235*** | 0.071 |
| | (0.059) | (0.054) | (0.052) |
| Restricted | -0.059 | 0.015 | -0.218*** |
| | (0.081) | (0.074) | (0.078) |
| (*Panel C: Dependent Variable = ln Export Values*) | | | |
| Encouraged | 0.231** | 0.332*** | 0.069 |
| | (0.104) | (0.104) | (0.100) |
| Restricted | -0.163 | -0.182 | -0.454*** |
| | (0.154) | (0.157) | (0.164) |
| Industry Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |
| Observations | 4800 | 4800 | 4800 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. The panel covers 480 industries from 1998 to 2007. Dependent variables are log of indicated quantities in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE. $^{*}\ p < .10$, $^{**}\ p < .05$, $^{***}\ p < .01$

Table 3: Difference-in-Differences Estimates of the Effects of FDI Policy with Additional Controls

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | FIE | | JV | | WFOE | |
| | (*Panel A: Dependent Variable = ln Number of Firms*) | | | | | |
| Encouraged | 0.245*** | 0.253*** | 0.243*** | 0.251*** | 0.118** | 0.124** |
| | (0.066) | (0.066) | (0.059) | (0.059) | (0.056) | (0.056) |
| Restricted | -0.031 | -0.035 | 0.001 | -0.003 | -0.171** | -0.174** |
| | (0.089) | (0.089) | (0.082) | (0.082) | (0.076) | (0.076) |
| | (*Panel B: Dependent Variable = ln Number of Exporters*) | | | | | |
| Encouraged | 0.221*** | 0.229*** | 0.230*** | 0.237*** | 0.082 | 0.089* |
| | (0.059) | (0.059) | (0.054) | (0.053) | (0.052) | (0.052) |
| Restricted | -0.046 | -0.050 | 0.013 | 0.010 | -0.203*** | -0.207*** |
| | (0.080) | (0.080) | (0.072) | (0.072) | (0.078) | (0.077) |
| | (*Panel C: Dependent Variable = ln Export Values*) | | | | | |
| Encouraged | 0.252** | 0.259** | 0.330*** | 0.339*** | 0.098 | 0.105 |
| | (0.104) | (0.103) | (0.102) | (0.102) | (0.100) | (0.100) |
| Restricted | -0.127 | -0.131 | -0.177 | -0.181 | -0.409*** | -0.413*** |
| | (0.150) | (0.149) | (0.152) | (0.152) | (0.157) | (0.157) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Trade Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| PNTR Gap | No | Yes | No | Yes | No | Yes |
| Observations | 4800 | 4800 | 4800 | 4800 | 4800 | 4800 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. The panel covers 480 industries from 1998 to 2007. Dependent variables are log of indicated quantities in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. Trade controls include import tariffs, export taxes, and non-tariff barriers. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE. $^{*}\ p < .10$, $^{**}\ p < .05$, $^{***}\ p < .01$

Table 4: Decomposition of FDI Policy Effects

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | FIE | | JV | | WFOE | |
| | (*Panel A: Dependent Variable = ln Number of Firms*) | | | | | |
| Encouraged (Only) | 0.270*** | 0.279*** | 0.263*** | 0.271*** | 0.135*** | 0.142*** |
| | (0.042) | (0.041) | (0.038) | (0.038) | (0.039) | (0.039) |
| Restricted (Only) | 0.054 | 0.054 | 0.068 | 0.068 | -0.109* | -0.110* |
| | (0.063) | (0.062) | (0.057) | (0.057) | (0.058) | (0.058) |
| Encouraged & Restricted | 0.079 | 0.077 | 0.137* | 0.135* | -0.150* | -0.151* |
| | (0.088) | (0.087) | (0.080) | (0.079) | (0.082) | (0.081) |
| | (*Panel B: Dependent Variable = ln Number of Exporters*) | | | | | |
| Encouraged (Only) | 0.224*** | 0.228*** | 0.243*** | 0.246*** | 0.064* | 0.068* |
| | (0.040) | (0.040) | (0.037) | (0.037) | (0.038) | (0.038) |
| Restricted (Only) | 0.026 | 0.021 | 0.062 | 0.058 | -0.162*** | -0.167*** |
| | (0.060) | (0.060) | (0.055) | (0.055) | (0.057) | (0.057) |
| Encouraged & Restricted | 0.129 | 0.125 | 0.191** | 0.188** | -0.164** | -0.168** |
| | (0.084) | (0.084) | (0.077) | (0.076) | (0.079) | (0.079) |
| | (*Panel C: Dependent Variable = ln Export Values*) | | | | | |
| Encouraged (Only) | 0.285*** | 0.289*** | 0.322*** | 0.326*** | 0.138* | 0.142* |
| | (0.073) | (0.073) | (0.073) | (0.073) | (0.076) | (0.076) |
| Restricted (Only) | 0.025 | 0.019 | -0.114 | -0.119 | -0.288** | -0.294*** |
| | (0.110) | (0.110) | (0.110) | (0.110) | (0.114) | (0.114) |
| Encouraged & Restricted | 0.151 | 0.147 | 0.211 | 0.207 | -0.253 | -0.257 |
| | (0.153) | (0.152) | (0.152) | (0.152) | (0.158) | (0.158) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Trade Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| PNTR Gap | No | Yes | No | Yes | No | Yes |
| Observations | 4800 | 4800 | 4800 | 4800 | 4800 | 4800 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. The panel covers 480 industries from 1998 to 2007. Dependent variables are log of indicated quantities in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. Trade controls include import tariffs, export taxes, and non-tariff barriers. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 5: Triple-Difference Estimates of the Effects of FDI Policy

| | (1) FIE | (2) JV | (3) WFOE |
|---|---|---|---|
| (*Panel A: Dependent Variable = ln Number of Firms*) | | | |
| DDD Enc | 0.148* | 0.155** | 0.020 |
| | (0.078) | (0.078) | (0.088) |
| DDD Res | -0.019 | 0.025 | -0.159 |
| | (0.115) | (0.113) | (0.118) |
| (*Panel B: Dependent Variable = ln Number of Exporters*) | | | |
| DDD Enc | 0.307*** | 0.328*** | 0.164 |
| | (0.104) | (0.096) | (0.104) |
| DDD Res | -0.099 | -0.024 | -0.258* |
| | (0.143) | (0.133) | (0.144) |
| (*Panel C: Dependent Variable = ln Export Values*) | | | |
| DDD Enc | 0.236* | 0.336** | 0.074 |
| | (0.164) | (0.150) | (0.166) |
| DDD Res | -0.104 | -0.123 | -0.396* |
| | (0.208) | (0.205) | (0.229) |
| Industry Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |
| Full Controls | Yes | Yes | Yes |
| Observations | 9600 | 9600 | 9600 |

Note: Table reports results of triple difference-in-differences (DDD) regressions. The panel covers 480 industries from 1998 to 2007. Dependent variables are log of indicated quantities in four-digit CIC industry $j$ for domestic or non-domestic enterprises in year $t$. DDD Enc and DDD Res are triple-difference coefficients indicating the differential effects of FDI policy changes on foreign relative to domestic enterprises. All regressions include industry and year fixed effects. Additionally, all regressions include ownership$\times$industry, ownership$\times$year, and ownership fixed effects. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE.

$^{*}$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$

Table 6: Heterogenous FDI Policy Effects, Processing vs. Ordinary Trade

| | (1) FIE | (2) JV | (3) WFOE |
|---|---|---|---|
| (*Dependent Variable = ln Export Values*) | | | |
| Encouraged | 0.164*** | 0.162*** | 0.113** |
| | (0.057) | (0.053) | (0.050) |
| Encouraged × Ordinary | -0.442*** | -0.383*** | -0.356*** |
| | (0.050) | (0.047) | (0.045) |
| Restricted | -0.369*** | -0.293*** | -0.375*** |
| | (0.082) | (0.076) | (0.073) |
| Restricted × Ordinary | 0.249*** | 0.142* | 0.225*** |
| | (0.080) | (0.074) | (0.071) |
| Industry Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |
| Observations | 17280 | 17280 | 17280 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. The panel covers 480 industries from 1998 to 2015. Dependent variables are log of export values in four-digit CIC industry $j$ in year $t$ for two different trade mode (ordinary and processing). Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. We exploit the China Customs Records, where exports are classified as ordinary trade and processing trade (import-and-assembly or pure assembly). We then aggregate the number of exporters and export values for each trade mode at the industry level. All regressions include trade mode dummies and industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the China Custom Records. $^{*}\ p < .10, ^{**}\ p < .05, ^{***}\ p < .01$

Table 7: Heterogenous FDI Policy Effects, by Country Group

| | (1) FIE | (2) JV | (3) WFOE |
|---|---|---|---|
| (*Dependent Variable = ln Export Values*) | | | |
| Encouraged | 0.200*** | 0.247*** | 0.172** |
| | (0.065) | (0.064) | (0.069) |
| Encouraged × High-Income | -0.077 | -0.139*** | -0.070 |
| | (0.051) | (0.048) | (0.049) |
| Encouraged × SEA | 0.061 | 0.025 | 0.097** |
| | (0.040) | (0.042) | (0.039) |
| Restricted | -0.119 | -0.116 | -0.058 |
| | (0.120) | (0.120) | (0.120) |
| Restricted × High-Income | -0.230*** | -0.197** | -0.325*** |
| | (0.081) | (0.080) | (0.076) |
| Restricted × SEA | 0.019 | 0.019 | -0.063 |
| | (0.076) | (0.077) | (0.074) |
| Industry Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |
| Observations | 24276 | 24276 | 24276 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. The panel covers 480 industries from 1998 to 2015. Dependent variables are log of export values in four-digit CIC industry $j$ in year $t$ for three different destination groups (export to high-income, Southeast Asian, or other countries). The list of high-income countries is adapted from the World Bank. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the China Custom Records.

$^{*}$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$

Table 8: FDI Policy Effects and Export Upgrading: R&D Intensity and Skill Intensity

| | (1) FIE | (2) JV | (3) WFOE |
|---|---|---|---|
| (*Panel A: R&D Intensity*) | | | |
| Encouraged | 0.239*** | 0.340*** | 0.077 |
| | (0.071) | (0.069) | (0.073) |
| Encouraged × RD Intensity | -0.076 | -0.092 | -0.040 |
| | (0.068) | (0.067) | (0.071) |
| Restricted | -0.170* | -0.231** | -0.346*** |
| | (0.095) | (0.094) | (0.099) |
| Restricted × RD Intensity | 0.000 | 0.090 | -0.245*** |
| | (0.055) | (0.054) | (0.057) |
| (*Panel B: Skill Intensity*) | | | |
| Encouraged | 0.232*** | 0.334*** | 0.080 |
| | (0.070) | (0.069) | (0.073) |
| Encouraged × Skill Intensity | 0.045 | -0.051 | 0.103 |
| | (0.101) | (0.100) | (0.105) |
| Restricted | -0.137 | -0.188** | -0.313*** |
| | (0.094) | (0.093) | (0.098) |
| Restricted × Skill Intensity | -0.057 | 0.012 | -0.332*** |
| | (0.050) | (0.049) | (0.052) |
| Industry Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |
| Observations | 4800 | 4800 | 4800 |

Note: Dependent variable is the log of export values in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. Industry R&D intensity is computed as a ratio of R&D expenditures undertaken by business enterprises to gross industrial output. Skill intensity is calculated as the share of college-above workers in total employment. Both intensity indexes are measured using the survey year ASIE data in 2004. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE. $^{*}\ p < .10$, $^{**}\ p < .05$, $^{***}\ p < .01$

Table 9: FDI Policy Effects and Export Upgrading: R&D Intensity and Skill Intensity

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Number of Firms | | | Number of Exporters | | |
| | FIE | JV | WFOE | FIE | JV | WFOE |
| (*Panel A: R&D Intensity*) | | | | | | |
| Encouraged | 0.306*** | 0.315*** | 0.154*** | 0.259*** | 0.286*** | 0.113** |
| | (0.049) | (0.045) | (0.046) | (0.047) | (0.042) | (0.044) |
| Enc × Intensive R&D | -0.153* | -0.186** | -0.088 | -0.087 | -0.142** | -0.067 |
| | (0.082) | (0.074) | (0.076) | (0.078) | (0.070) | (0.074) |
| Restricted | -0.012 | 0.053 | -0.151** | -0.028 | 0.052 | -0.154** |
| | (0.069) | (0.062) | (0.064) | (0.065) | (0.059) | (0.062) |
| Res × Intensive R&D | -0.067 | -0.148 | -0.061 | -0.059 | -0.111 | -0.133 |
| | (0.107) | (0.097) | (0.100) | (0.102) | (0.092) | (0.097) |
| (*Panel B: Skill Intensity*) | | | | | | |
| Encouraged | 0.280*** | 0.285*** | 0.100** | 0.232*** | 0.273*** | 0.045 |
| | (0.048) | (0.043) | (0.044) | (0.045) | (0.041) | (0.043) |
| Enc × High Skill | -0.084 | -0.108 | 0.079 | -0.013 | -0.118 | 0.144* |
| | (0.084) | (0.076) | (0.078) | (0.080) | (0.072) | (0.076) |
| Restricted | 0.015 | 0.075 | -0.173*** | -0.070 | 0.013 | -0.234*** |
| | (0.065) | (0.059) | (0.061) | (0.062) | (0.056) | (0.059) |
| Res × High Skill | -0.148 | -0.226** | -0.001 | 0.056 | -0.013 | 0.078 |
| | (0.110) | (0.100) | (0.102) | (0.104) | (0.094) | (0.099) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4800 | 4800 | 4800 | 4800 | 4800 | 4800 |

Note: Dependent variable is the log of export values in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. Industry R&D intensity is computed as a ratio of R&D expenditures undertaken by business enterprises to gross industrial output. A RD-intensive industry is defined as exceeding the 75th percentile of the R&D intensity measure. Skill intensity is calculated as the share of college-above workers in total employment. A skilled industry is defined as exceeding the 75th percentile of the skill intensity measure. Both intensity indexes are measured using the survey year ASIE data in 2004. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE. $^{*}\ p < .10$, $^{**}\ p < .05$, $^{***}\ p < .01$

# Appendix A Appendix Tables

Table A1: China's Exports and Export Shares, 1995-2013

| Year | Total Exports (Billion USD) | FIE Share | JV Share | WFOE Share |
|---|---|---|---|---|
| 1995 | 148.835 | 0.32 | 0.20 | 0.12 |
| 1996 | 151.185 | 0.41 | 0.25 | 0.16 |
| 1997 | 182.877 | 0.41 | 0.24 | 0.17 |
| 1998 | 183.808 | 0.44 | 0.24 | 0.20 |
| 1999 | 194.931 | 0.45 | 0.23 | 0.22 |
| 2000 | 249.211 | 0.48 | 0.24 | 0.24 |
| 2001 | 266.073 | 0.50 | 0.24 | 0.26 |
| 2002 | 325.615 | 0.53 | 0.23 | 0.30 |
| 2003 | 438.469 | 0.55 | 0.22 | 0.33 |
| 2004 | 593.653 | 0.57 | 0.21 | 0.36 |
| 2005 | 762.329 | 0.58 | 0.20 | 0.38 |
| 2006 | 969.334 | 0.58 | 0.19 | 0.39 |
| 2007 | 1218.635 | 0.57 | 0.18 | 0.39 |
| 2008 | 1430.694 | 0.55 | 0.17 | 0.38 |
| 2009 | 1201.610 | 0.56 | 0.16 | 0.40 |
| 2010 | 1577.753 | 0.55 | 0.16 | 0.39 |
| 2011 | 1898.381 | 0.52 | 0.15 | 0.37 |
| 2012 | 2048.714 | 0.50 | 0.15 | 0.35 |
| 2013 | 2209.005 | 0.47 | 0.14 | 0.33 |

Source: China Customs Records, and calculations by authors.

Table A2: Summary Statistics

| | mean | sd | min | max |
|---|---|---|---|---|
| *Dependent Variables* | | | | |
| ln(Num of FIEs) | 2.77 | 1.46 | 0.00 | 7.88 |
| ln(Num of JVs) | 2.32 | 1.31 | 0.00 | 7.19 |
| ln(Num of WFOEs) | 1.96 | 1.39 | 0.00 | 7.19 |
| ln(Num of FIE Exporters) | 2.27 | 1.42 | 0.00 | 7.57 |
| ln(Num of JV Exporters) | 1.77 | 1.23 | 0.00 | 6.87 |
| ln(Num of WFOE Exporters) | 1.65 | 1.33 | 0.00 | 6.88 |
| ln(FIE Exports, Billion RMB) | 3.64 | 2.30 | 0.00 | 11.38 |
| ln(JV Exports, Billion RMB) | 2.90 | 2.10 | 0.00 | 10.12 |
| ln(WFOE Exports, Billion RMB) | 2.87 | 2.30 | 0.00 | 11.38 |
| *Policy Variables* | | | | |
| Encouraged Policy | 0.31 | 0.46 | 0.00 | 1.00 |
| Restricted Policy | 0.11 | 0.31 | 0.00 | 1.00 |
| *Controls* | | | | |
| ln Import Tariff | 2.94 | 0.57 | 0.00 | 4.53 |
| ln Export Tax | 0.01 | 0.24 | -3.18 | 3.18 |
| Non-Tariff Barriers | 0.12 | 0.32 | 0.00 | 1.00 |
| Post PNTR Gap | 20.67 | 18.73 | 0.00 | 79.24 |

Note: Table reports summary statistics for variables from the ASIE dataset, Observation $(N) = 4800 = 480$ industries $\times 10$ years. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. including import tariff, export tariff, PNTR gap, and non-tariff barriers are measured at the industry level.
$^{*}$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$

Table A3: Robustness Check, DD Estimates with Industry-Specific Year Trends

| | (1) FIE | (2) JV | (3) WFOE |
|---|---|---|---|
| (*Panel A: Dependent Variable = ln Number of Firms*) | | | |
| Encouraged | 0.251*** | 0.233*** | 0.109* |
| | (0.071) | (0.065) | (0.060) |
| Restricted | -0.258** | -0.228** | -0.235** |
| | (0.118) | (0.106) | (0.097) |
| (*Panel B: Dependent Variable = ln Number of Exporters*) | | | |
| Encouraged | 0.236*** | 0.229*** | 0.080 |
| | (0.065) | (0.057) | (0.055) |
| Restricted | -0.204** | -0.142 | -0.232*** |
| | (0.098) | (0.087) | (0.084) |
| (*Panel C: Dependent Variable = ln Export Values*) | | | |
| Encouraged | 0.300*** | 0.350*** | 0.124 |
| | (0.110) | (0.109) | (0.105) |
| Restricted | -0.390** | -0.359** | -0.446** |
| | (0.178) | (0.172) | (0.173) |
| Industry Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |
| Industry Specific Year Trends | Yes | Yes | Yes |
| Observations | 4800 | 4800 | 4800 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. Dependent variables are log of indicated quantities in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. All regressions include industry, year fixed effects, and industry-specific linear time trends. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is ASIE.
$^{*}$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$

Table A4: Robustness Check, DD Estimates Using Shortened Time Series, 1999 to 2006

| | (1) FIE | (2) JV | (3) WFOE |
|---|---|---|---|
| (*Panel A: Dependent Variable = ln Number of Firms*) | | | |
| Encouraged | 0.229** | 0.262*** | 0.053 |
| | (0.089) | (0.080) | (0.075) |
| Restricted | -0.083 | -0.027 | -0.225*** |
| | (0.102) | (0.095) | (0.086) |
| (*Panel B: Dependent Variable = ln Number of Exporters*) | | | |
| Encouraged | 0.186** | 0.227*** | -0.005 |
| | (0.080) | (0.073) | (0.070) |
| Restricted | -0.083 | 0.001 | -0.264*** |
| | (0.091) | (0.084) | (0.086) |
| (*Panel C: Dependent Variable = ln Export Values*) | | | |
| Encouraged | 0.231* | 0.348** | -0.004 |
| | (0.139) | (0.137) | (0.135) |
| Restricted | -0.256 | -0.322* | -0.568*** |
| | (0.176) | (0.178) | (0.187) |
| Industry Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |
| Observations | 3840 | 3840 | 3840 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. Dependent variables are log of indicated quantities in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE. * $p < .10$, ** $p < .05$, *** $p < .01$

Table A5: Decomposition of FDI Policy Effects, Shortened Time Series, 1998-2006

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | FIE | | JV | | WFOE | |
| | (*Panel A: Dependent Variable = ln Number of Firms*) | | | | | |
| Encouraged (Only) | 0.270*** | 0.279*** | 0.263*** | 0.271*** | 0.135*** | 0.142*** |
| | (0.042) | (0.041) | (0.038) | (0.038) | (0.039) | (0.039) |
| Restricted (Only) | 0.054 | 0.054 | 0.068 | 0.068 | -0.109* | -0.110* |
| | (0.063) | (0.062) | (0.057) | (0.057) | (0.058) | (0.058) |
| Encouraged & Restricted | 0.079 | 0.077 | 0.137* | 0.135* | -0.150* | -0.151* |
| | (0.088) | (0.087) | (0.080) | (0.079) | (0.082) | (0.081) |
| | (*Panel B: Dependent Variable = ln Number of Exporters*) | | | | | |
| Encouraged (Only) | 0.285*** | 0.289*** | 0.322*** | 0.326*** | 0.138* | 0.142* |
| | (0.073) | (0.073) | (0.073) | (0.073) | (0.076) | (0.076) |
| Restricted (Only) | 0.025 | 0.019 | -0.114 | -0.119 | -0.288** | -0.294*** |
| | (0.110) | (0.110) | (0.110) | (0.110) | (0.114) | (0.114) |
| Encouraged & Restricted | 0.151 | 0.147 | 0.211 | 0.207 | -0.253 | -0.257 |
| | (0.153) | (0.152) | (0.152) | (0.152) | (0.158) | (0.158) |
| | (*Panel C: Dependent Variable = ln Export Values*) | | | | | |
| Encouraged (Only) | 0.224*** | 0.228*** | 0.243*** | 0.246*** | 0.064* | 0.068* |
| | (0.040) | (0.040) | (0.037) | (0.037) | (0.038) | (0.038) |
| Restricted (Only) | 0.026 | 0.021 | 0.062 | 0.058 | -0.162*** | -0.167*** |
| | (0.060) | (0.060) | (0.055) | (0.055) | (0.057) | (0.057) |
| Encouraged & Restricted | 0.129 | 0.125 | 0.191** | 0.188** | -0.164** | -0.168** |
| | (0.084) | (0.084) | (0.077) | (0.076) | (0.079) | (0.079) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Trade Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| PNTR Gap | No | Yes | No | Yes | No | Yes |
| Observations | 4800 | 4800 | 4800 | 4800 | 4800 | 4800 |

Note: Table reports results of OLS generalized difference-in-differences (DD) regressions. The panel covers 480 industries from 1998 to 2007. Dependent variables are log of indicated quantities in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. Trade controls include import tariffs, export taxes, and non-tariff barriers. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE. $^{*}\ p < .10$, $^{**}\ p < .05$, $^{***}\ p < .01$

Table A6: Robustness Check: Sensitivity of the Effects of FDI Policy with Alternative Specifications and Samples

| | (1) Negative Binomial | (2) TWFE | (3) Negative Binomial | (4) TWFE | (5) Negative Binomial | (6) TWFE |
|---|---|---|---|---|---|---|
| | FIE | | JV | | WFOE | |
| | (*Panel A: Dependent Variable = Number of Firms*) | | | | | |
| Encouraged | 0.211*** | 0.210*** | 0.242*** | 0.199*** | 0.058 | 0.103*** |
| | (0.081) | (0.034) | (0.083) | (0.030) | (0.086) | (0.031) |
| Restricted | 0.010 | -0.053 | 0.053 | -0.024 | -0.199* | -0.162*** |
| | (0.106) | (0.044) | (0.107) | (0.039) | (0.114) | (0.041) |
| | (*Panel B: Dependent Variable = Number of Exporters*) | | | | | |
| Encouraged | 0.194** | 0.178*** | 0.270*** | 0.177*** | 0.018 | 0.067** |
| | (0.084) | (0.032) | (0.089) | (0.027) | (0.090) | (0.030) |
| Restricted | -0.008 | -0.071* | 0.084 | -0.015 | -0.253** | -0.184*** |
| | (0.109) | (0.041) | (0.112) | (0.036) | (0.120) | (0.039) |
| | (*Panel C: Dependent Variable = Export Values*) | | | | | |
| Encouraged | 0.149* | 0.153*** | 0.259*** | 0.202*** | 0.013 | 0.055 |
| | (0.082) | (0.052) | (0.088) | (0.049) | (0.089) | (0.053) |
| Restricted | 0.054 | -0.222*** | 0.082 | -0.262*** | -0.286** | -0.360*** |
| | (0.112) | (0.068) | (0.113) | (0.064) | (0.122) | (0.070) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Full Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4800 | 4800 | 4800 | 4800 | 4800 | 4800 |

Note: Negative Binomial estimates are generated in columns 1, 3 and 5, from the Annual Survey of Chinese Enterprises for years 1998 to 2007. In columns 2, 4, and 6, 0 counts are replaced with the 5th percentile values before taking the natural log. Standard errors are clustered at the industry level. Full controls include various trade policy controls: weighted average import tariff, export tariff, non-tariff barriers, and the PNTR gap. All regressions include industry fixed effects and year fixed effects.
$^{*}$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$

Table A7: FDI Policy and Export Intensity

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | FIE | | JV | | WFOE | |
| | (*Dependent Variable = Exports to Gross Output*) | | | | | |
| Encouraged | 2.701** | 2.779** | 2.602* | 2.657* | 1.299 | 1.213 |
| | (1.252) | (1.253) | (1.359) | (1.361) | (1.526) | (1.527) |
| Restricted | -1.102 | -1.143 | -1.438 | -1.468 | 0.191 | 0.237 |
| | (1.403) | (1.401) | (1.409) | (1.407) | (1.954) | (1.959) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Trade Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| PNTR Gap | No | Yes | No | Yes | No | Yes |
| Observations | 4800 | 4800 | 4800 | 4800 | 4800 | 4800 |
| Dep.Var. Mean | 33.35 | 33.35 | 27.84 | 27.84 | 36.99 | 36.99 |

Note: Table reports results of OLS difference-in-differences (DD) regressions. The panel covers 480 industries from 1998 to 2007. Dependent variables are exports to gross output ratio in four-digit CIC industry $j$ in year $t$. Independent variables representing Chinese FDI policy are dummies indicating whether a certain industry is encouraged, restricted, or not. Trade controls include import tariffs, export taxes, and non-tariff barriers. All regressions include industry and year fixed effects. Standard errors corrected for clustering at the industry level are in parentheses. Source of export data is the ASIE.
$^{*}$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$

## Appendix B Modeling Entry Mode

The Antràs (2015) model posits Northern firms who combine two stages, which can be performed in different locations, to produce a differentiated good for the world market. A continuum of heterogeneous firms employs headquarter services, $h$, and manufacturing activity, $m$, in a Cobb-Douglas production technology, distinguished by productivity level $\varphi$,

$$q(\varphi) = \varphi \left(\frac{h}{\eta}\right)^{\eta} \left(\frac{m}{1-\eta}\right)^{1-\eta}.$$

The parameter $\eta$ indicates the "headquarter intensity" of producing the final good. As in Melitz (2003), a firm's productivity is revealed upon paying a fixed entry cost. We maintain the assumption that the South features very low productivity in headquarter services, so all entry and headquarter services provision occurs in the North.

Northern firms can manufacture in the North but pay higher production worker wages than they would by manufacturing in the South. If they choose entirely domestic operations, the total cost of producing $q$ units reflects the fixed cost of setting up production at home, $f_D$, the firm's productivity level, $\varphi$, and the labor costs associated with both headquarter services and manufacturing at the Northern wage rate, $w_N$,

$$C_D = \left(f_D + \frac{q}{\varphi}\right) w_N.$$

We assume that firms take global demand, $B$, for the final good and wages as given in a market characterized by monopolistic competition.[44] If the firm chooses domestic operations, its expected profit rises with its productivity level:

$$\pi_D = (w_N)^{1-\sigma} B \varphi^{\sigma-1} - w_N f_D.$$

If Northern firms manufacture in the South, they may choose between two organizational forms: establishment of a joint venture with a Southern supplier (J) or establishment of a wholly foreign owned affiliate (W). There is a fixed cost associated with each entry option, reflecting the investment needed to establish a joint venture with a local manufacturing firm or to build a man-

[44] As in Antràs (2015), market demand for the final good depends on model parameters and world income.

ufacturing plant and hire a local manager. The total cost of producing q units of the final good depends on the firm's chosen organizational form and its productivity, $\varphi$:

$$C_j(q, \varphi) = f_j w_N + \frac{q}{\varphi}(w_N)^{\eta}(\tau w_S)^{1-\eta},$$

where $j$ =J, W. Headquarter services are produced in the North using workers paid a wage of $w_N$ and manufacturing occurs in the South using labor paid $w_S$. We assume that the fixed cost of entry is lower if the Northern firm forms a joint venture with a Southern partner, so $f_J < f_W$. Consequently, if contracts were complete and fully enforced, Northern firms will always want to form a local joint venture if they manufacture in the South.

We portray contracts between foreign firms and Chinese domestic firms as "totally incomplete" in that no aspect of the contract is perceived to be enforceable. Timing is such that once contracts are signed, investments in headquarters and manufacturing facilities are made by relevant parties. After these commitments are fulfilled, renegotiation and bargaining takes place between joint venture partners, but are unnecessary if the Northern firm wholly owns its operations. In the last stage, the final good is produced and sold.

We consider first the case where entry is restricted to only those Northern firms willing to form a joint venture for offshore manufacturing. As in Antràs (2015), we assume that Southern partners are drawn from a competitive fringe of candidates with a reservation wage of 0. The chosen partner pays part of the fixed cost of setting up the production facility and it decides on the level of manufacturing effort, $m$. Once investments by both partners are made, it is costly for each partner to separate. With this lock-in of partners and incomplete contracts, division of ex-post gains is determined after investments are sunk. Thus, if a joint venture is formed, it suffers from two-sided hold-up.

With symmetric Nash bargaining, each party anticipates receiving a payoff equal to half of sales revenue and, thus, chooses the level of effort that maximizes revenue net of its labor input costs. The Northern firm may also demand an ex-ante transfer from its Southern partner.

Antràs (2015, p.104) provides a compact representation of the ex-ante problem facing the final goods producer if it chooses to form a joint venture in the South, incorporating incentive compatibility constraints for the Northern and Southern partners. He derives the foreign firm's profit from

forming a joint venture as

$$\pi_J = \left( (w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \Gamma_J \varphi^{\sigma-1} - w_N f_J, \tag{1}$$

where $\Gamma_J \leq 1$ captures the contractual inefficiency associated with operating a joint venture. With symmetric bargaining, $\Gamma_J = (\sigma+1)\left(\frac{1}{2}\right)^{\sigma}$. Inspection of this profit function finds that expected profit increases linearly with firm productivity at a rate dependent on the level of contractual inefficiencies.

As discussed in the main text, China constrains the terms of partnership contracts. We interpret these constraints as limiting the ex-ante transfer that Northern partners can demand of their Southern partners in the initial contract. We assume that the government limits ex-ante transfers to a fraction, $\phi < 1$, of the share demanded in the unrestricted case. In this case, the expected profit for the Northern firm is given by (1) where now (see Antràs (2015)) the effect of contractual inefficiencies is given by $\Gamma_J$

$$\Gamma_J = (\sigma + \phi - (\sigma-1)((1-\phi)\eta)\left(\frac{1}{2}\right)^{\sigma}.$$

Importantly, government constraints on ex-ante transfers have a larger impact on firms in industries with high headquarter intensity because, as Antràs (2015) shows, $\Gamma_J$ is decreasing in $\eta$. Headquarter services are complementary to manufacturing services so the higher is $\eta$, the larger are the rents that the Southern partner receives in ex-post bargaining and the larger the reduction in expected profits for the Northern partner caused by limits on ex-ante transfers.

The implications of this analysis for the equilibrium sorting of firms in restricted industries into different organization forms is illustrated by Figure B1. As shown, while firms with productivity levels between $\widetilde{\varphi}_X$ and $\widetilde{\varphi_J}$ manufacture only in the North, firms with productivity above $\widetilde{\varphi_J}$ may form joint ventures and manufacture in the South. The figure depicts two possible JV profit functions, the more steeply sloped function depicting Northern firm profits as a function of firm productivity in low headquarter-intensive activities (low $\eta$), the less steeply sloped depicting Northern profits in more HQ-intensive activities (high $\eta$). With wholly owned affiliates banned, a positive measure of active firms would choose to form a joint venture if restrictions on JV contracts did not increase inefficiencies too severely. When such restrictions reduce expected profits

sufficiently, as they may in sectors with high $\eta$, there will be no joint ventures observed in equilibrium in that activity. Firms in high HQ-intensive industries manufacture at home when contractual inefficiencies in JVs are large relative to relative wage differences.

If the South removes its JV mandate, and the Northern firm chooses to establish a wholly owned affiliate, it can make all relevant decisions regardless of the contracting environment. This control, as in Antràs (2015), results in "governance costs" for the parent in operating its foreign affiliate, raising the marginal cost of manufacturing in the South by a factor $\lambda > 1$. Consequently, if the foreign firm owns its Southern affiliate fully, it will choose inputs $h$ and $m$ optimally and profits will be (Antràs, 2015)

$$\pi_W = \left( (w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \lambda^{1-\sigma} \varphi^{\sigma-1} - w_N f_W.$$

The profit expected from establishing a wholly owned affiliate increases linearly with firm productivity at a rate dependent on the level of governance costs, $\lambda$.

Equilibrium sorting of firms into the three different forms of production – domestic only, North-South joint venture, and a wholly owned foreign affiliate – depends on the model parameters. Figure B1 illustrates the case where contractual inefficiencies and governance costs are low enough so that some firms sort into each of the three forms. The figure embeds the assumed ranking of fixed costs, $f_D < f_J < f_W$, and sufficiently large wage differences across countries. Low productivity firms produce domestically. For firms with productivity levels above $\widetilde{\varphi}_J$, however, the cost savings from manufacturing in the South outweigh contractual inefficiencies and the higher fixed cost of setting up a joint venture. Firms with productivity above $\widetilde{\varphi}_W$ choose to set up a wholly owned affiliate in the South because with sufficient scale lower variable costs in manufacturing outweigh the higher fixed costs of establishing an independent plant offshore.

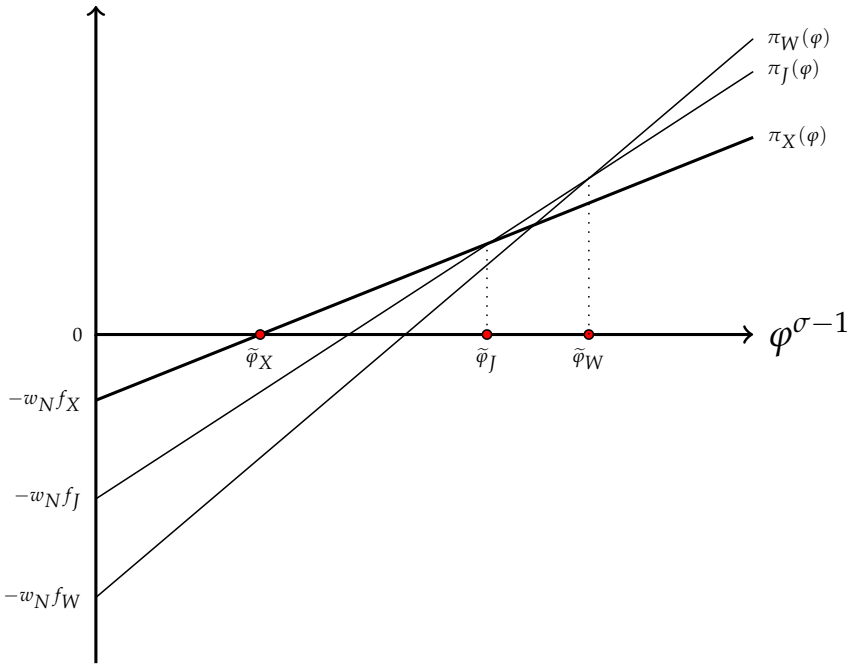
Other sorting configurations are possible, including an outcome in which no firm chooses to form a joint venture. This outcome would result from contractual inefficiencies that are large relative to international wage differences, all else equal. Similarly, if the governance costs of internalizing Southern operations are large, no firm would choose to invest in a wholly owned affiliate.

Most industries from which JV mandates were removed in 2002 were placed on the list of activities for which entry-cost-reducing investment incentives may be offered. It is straightforward

to show that subsidies to fixed costs increase the profit from entry, regardless of the firm's productivity level. If subsidies are offered to investors regardless of whether they form a JV or a wholly owned affiliate, the measure of firms opting for offshoring increases. Such an outcome can be illustrated in Figure B2 as a shift upward in the profit functions for both organizational forms.

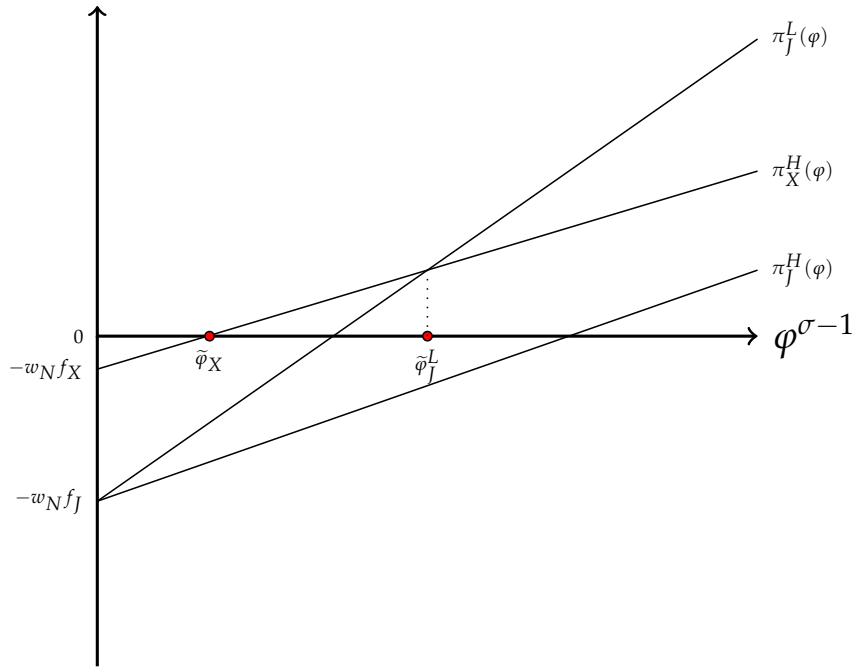
If, however, incentives are offered only to firms willing to form a joint venture, then making investment incentives available to an industry will increase the measure of firms entering as JVs and reduce the measure of firms entering as WFOEs. Such an outcome can be illustrated in Figure 4 as a shift upward in the profit functions for joint ventures only. Because we do not observe the incentives offered to investors, we rely on our empirical analysis for evidence of how encouraging policies affect investor's choice of entry mode.

Figure B1: Equilibrium Sorting with Low Contractual Inefficiencies and Governance Costs




Note: Adapted from Antràs (2015), Figure 6-2.

Figure B2: Equilibrium Sorting with Contractual Inefficiencies in Restricted Industry




Note: $\pi_J^L(\varphi)$ illustrates the expected profit for firms in a low headquarter-intensive activity while $\pi_J^H(\varphi)$ illustrates it in a high headquarter-intensive activity.