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Internal Capital Markets and the Transmission of Exchange-Rate Shocks

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Keywords: Internal Capital Market, Corporate Governance, Collateral Constraint, Exchange Rates, Export Pricing, China.

JEL Classification: G32, G34, G38, F12, F14, F31.

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Abstract

Liquidity-constrained large shareholders often reallocate capital within business groups to finance their own projects, imposing credit constraints on other group members. Using microdata from Chinese customs, we study the impact of this negative externality on the transmission of exchange-rate shocks through exporters' pricing behavior. We exploit an exogenous regulatory shock in China that differentially increases group owners' borrowing capacity through a *collateral channel* and, as a result, reduces their demand to use intragroup trade credit to transfer resources out of publicly listed firms. Exporting subsidiaries of less "tunneled" public firms stabilize local-currency export prices more in response to exchange-rate fluctuations in the destination-market currency. Our estimate indicates small exporting subsidiaries will price to market 45%-50% less if large shareholders demand 1% of a public firm's total assets. Subsidiaries also have access to less credit from tunneled firms. We rationalize our empirical findings in a static model of export pricing.

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In February and July 2009, Wuliangye, Yibin Co. Ltd, a famous liquor producer and exporter in China, made two separate announcements to cut related party transactions with its group parent and export companies. As shown by its 2009 interim financial reports, the public firm's gross margin significantly increased. Analysts said such an observation is consistent with a long-standing, market-wide conjecture of "tunneling" by large shareholders before 2009 (translation our own). Securities Daily (September 10, 2009)

1 Introduction

Exporters face more stringent capital constraints relative to domestic producers (Foley and Manova, 2015; Manova, 2008, 2013; Chaney, 2016; Ru and Yang, 2022). Often-cited reasons include higher upfront costs, extra working capital, and increased risk associated with transnational operations. The most compelling piece of evidence comes from the collapse of exports relative to output following a deterioration of banking health (Amiti and Weinstein, 2011; Chor and Manova, 2012). The collapse called the public's attention to the role of banks in trade finance.¹

One important question is relatively unexplored: How financial frictions adversely impact trade outcomes when small exporters might not have a direct access to bank loans? It is known that an overwhelming majority of firms in emerging countries are organized into business groups and, hence, rely heavily on internal capital markets to finance their projects (Morck, Wolfenzon, and Yeung, 2005; Khanna and Yafeh, 2007). The weakness of legal institutions for corporate governance implies the borrowing constraints of group owners have important implications for the within-group reallocation of capital, which impacts the financial condition of exporters in the *same* group and therefore the transmission of international shocks into home countries.

In this paper, we study the macroeconomic effects of internal capital markets in emerging countries through a micro channel, namely, exporters' price adjustment to exchange-rate shocks. Our empirical setting is China. As in the *Securities Daily* quote above, like firms in other East Asian countries, Chinese publicly listed firms heavily rely on business groups to operate, but liquidity-constrained group owners often expropriate minority shareholders through "tunneling"

¹The International Monetary Fund expected the total volume of global trade to shrink by 2.8% in 2009, the first contraction since 1982 ("Trade finance shrivels, pushing downturn deeper," Carter Dougherty, *New York Times*, March 3, 2009).

à la Johnson, La Porta, Lopez-de Silanes, and Shleifer (2000). A striking pattern is that Chinese subsidiaries are much more export-oriented than their publicly listed parents. Their exporting activities are therefore supposed to be financed by the domestic sales of public firms (Chaney, 2016). By expropriating public firms' domestic sales, business-group owners can impose credit constraints on exporting subsidiaries.²

Our key empirical finding is that exporting subsidiaries of less “tunneled” public firms price to market more — they reduce local-currency export prices more when domestic currency appreciates and increase prices more when it depreciates. Our point estimations indicate (small) exporting subsidiaries of a publicly listed firm will price to market 45%-50% less if controlling shareholders (of public firms) transfer out 1% of the public firm's assets. To rationalize this result, we analytically show that our findings most validate the extension of Melitz and Ottaviano (2008) to include exchange-rate movements (see Section 2). In a static model of export pricing, an exporter's elasticity of demand increases with the price consumers face. When exporters benefit from controlling shareholders' refrain from demanding for intragroup financing, exporters' marginal costs fall and their price elasticity of demand also falls. An exporter's marginal cost could fall through two possible channels. First, the exporter can borrow more from its less tunneled public parents, rather than from a commercial bank, to finance the working capital. Second, the exporter sources products made by less tunneled public firms at cheaper prices. As a result, exporters of less tunneled public firms price to market more.

Our empirical analysis starts with the match of three datasets: transaction-level customs data, public firms and their related parties, and highly granular intragroup trade credit.³ An important feature of our Chinese setting is that we can access customs data that provide information for each bilateral transaction at the monthly frequency, including values (in US dollars), quantities, product descriptions, and destination countries. As documented by Manova and Zhang (2012), one prominent feature of the data is that export prices vary considerably

²We do not have financial data for most of the exporting subsidiaries. We match subsidiaries of public firms to the Orbis Asia-Pacific, which collects companies' filed accounts from the Chinese Administration of Industry and Commerce, the National Tax Bureau, and the National Bureau of Statistics of China (NBSC). On the sample period of 1999-2012, the average subsidiary has 6.9 million RMB total assets and 906 employees.

³As discussed by Chen et al. (2017), under China's accounting standards and tax rules, group owners prefer to use short-term intragroup loans to reallocate capital. A news article in the ninth issue of *People's Daily* revealed that, as of the end of 2002, among 703 firms listed on the Shanghai Stock Exchange, 36.5% of them provided their controlling shareholders with trade credit. Large shareholders appropriated public firms by about 33.9 billion RMB, which is about 3.31% of the total net assets of all the public firms.

across Chinese producers selling in a given country and good, highlighting the extent of firm heterogeneity.⁴ Combined with financial data from publicly listed firms, the customs dataset allows us to conduct a within-firm and -product-destination comparison of the effects of trade financing on export pricing across exporters.

To establish causality, our identification strategy is to exploit the impact of an exogenous regulatory shock in China on controlling/large shareholders' demand for intragroup financing supplied by other group members, a subset of which are export-related firms. In April 30, 2005, the state eagerly implemented the share-split structure reform, mandating all public firms convert their previously non-tradable shares into tradable ones as soon as possible. The reform was initiated under regulators' strong determination. After launching two batches of pilot companies within two months, Shang Fulin, chairman of China's Securities Regulatory Commission (CSRC), conveyed through a *People's Daily* news article that China would complete the reform within "a relatively short time."⁵ Failing the reform would subject firms to delisting risks.⁶ Because the supply of previously non-tradable shares would cause prices of tradable shares to plummet, the success of the reform crucially depended on how non-tradable shareholders compensated for tradable shareholders. Individual firms, especially state-owned enterprises (SOEs), had limited flexibility to time the reform, because of interventions from local government,⁷ bureaucracies of the State-Owned Assets Supervision and Administration Commission (SASAC),⁸ and the negotiation process between nontradable shareholders and institutional investors for compensation.

The reform increased the liquidity and therefore the value of non-tradable shares pledged by large shareholders to lenders during the pre-reform period. Prior to the reform, nearly 35% of publicly listed firms had large shareholders pledging their ownership to lenders. The average value of these collateralized shares, measured by the public firm's book value, was 188 million (RMB).⁹ Because providing banks with the option to liquidate pledged shares *ex post* eases

⁴Export prices also vary considerably across trade partners within a given exporter.

⁵See "China determined to complete stock market reform in short time" (*People's Daily*, June 28, 2005).

⁶According to a *People's Daily* article dated on August 16, 2005, the CSRC warned that it "cannot exclude the possibility that firms that fail to reform would be subject to delisting."

⁷See "Shandong province plans to complete the reform by three batches within six months" (*China Securities Journal*, November 25, 2005).

⁸See "The centralization of Shenzhen SASAC, 18 local public firms are finally approved to take the share-split structure return" (*National Business Daily*, July 20, 2005).

⁹Section 3.3 discusses the background of the practice of share-pledge agreements in China.

financing *ex ante*, pledging shareholders' borrowing capacity was expected to increase afterwards. The mechanism has been well documented by existing empirical studies (Gan, 2007; Chaney, Sraer, and Thesmar, 2012; Schmalz, Sraer, and Thesmar, 2017; Catherine, Chaney, Huang, Sraer, and Thesmar, 2021). Consistent with these studies, we verify that controlling/large shareholders can borrow larger loans by pledging the *same* number of shares after the reform relative to before.

We show the reform constituted a positive shock to pledging controlling/large shareholders' borrowing capacities. We find publicly listed firms provided less trade credit to parties that are economically related to group owners, if these owners had pledged more non-tradable shares before the reform. We argue that an expanded borrowing capacity reduced controlling shareholders' demand for intragroup financing for the following three reasons. First, firms, including state-owned enterprises (SOEs), faced potential regulatory sanctions, especially after China's amendment of Securities Law in 2005. We identified 274 cases in which publicly listed firms were involved in tunneling scandals, and about 40% were SOEs (D'Acunto, Weber, and Xie, 2019).¹⁰ Second, ample anecdotes suggest returning the siphoned money to public firms largely increased the chance that shareholders would approve the reform proposal.¹¹ Third, large shareholders forgo dividends they are entitled to claim from the tunneled firm.

In our main empirical analysis, we carry out the instrumental variable (IV) estimation analysis on the sample period of 2005-2006. Our instrument is the amount of non-tradable shares pledged by large shareholders to lenders several years prior, measured immediately prior to the reform announcement by firms. The *exclusion restriction* is that the cross-sectional distribution in the amount of collateralized shares several years prior to the pre-reform period is uncorrelated with errors of export pricing at the level of firm-destination-product. Moreover, we focus on exporters at the level of subsidiaries of publicly listed firms. These export units were not directly targeted by the reform and were located at least several levels away from the controlling chain of the pyramidal structure.

Our data and empirical approach allow us to obtain point estimates of the impact of

¹⁰We untabulated statistics show that our measure of intragroup financing successfully predicts events in which Chinese regulatory authorities punish publicly listed firms for tunneling-related reasons.

¹¹See "Share-split structure reform forced large shareholders to reduce tunneling" (*International Finance News, People's Daily*, September 22, 2005).

intragroup credit reallocation on the price elasticity of goods, exported by subsidiaries of tunneled firms, to exchange-rate changes.¹² Our IV estimations show an increase in the supply of trade credit by public firms to controlling/large shareholders (and other entities owned by these shareholders), substantially increases export prices charged by subsidiaries of tunneled firms. The results are in line with the notion that financial constraints create an incentive for firms to raise prices (Chevalier, 1995; Gilchrist, Schoenle, Sim, and Zakrajšek, 2017). The results strongly support the premise of our theoretical framework.

Next, we document a negative elasticity of local-currency export price to the real exchange rate, suggesting exporters in our sample price to market. The estimated elasticity is about -0.20 for all goods, including those exported by public firms, and -0.35 for goods exported only by subsidiaries of public firms. The number implies a one-unit increase (decrease) in the real exchange rate leads to a 0.2- to 0.35-unit decrease (increase) in export price (in RMB). Our finding is in contrast to Li, Ma, and Xu (2015) but is more in line with Berman, Martin, and Mayer (2012). The former authors document a complete pass-through on the universe of customs data including all Chinese exporters from 2000 to 2007. One possible explanation is that our empirical design selects the most productive exporters into the sample.¹³

Our IV estimations yield the following main results: For our preferred sample, following a 10% exchange-rate appreciation, the average exporting subsidiary of public firms cuts its export price by 3.5%. A one-standard-deviation increase in the supply of credit by public firms to controlling shareholders (1.5% of the public firm's total assets) reduces this number to 1.7%. On the other hand, the average exporting subsidiary increases its export volumes by around 3.5%, but this elasticity increases to 7.4% when credit supply increases by one standard deviation. Therefore, intragroup financing affects the volume elasticity with a larger economic magnitude but in an opposite direction.

In particular, estimates from our weighted regressions suggest larger firms absorb more exchange-rate variations in their markups and that intragroup financing has a larger marginal impact on larger firms' pricing-to-market. We first weight regressions by the public firm's total

¹²The exchange rate in our paper is defined as the price of the home currency [renminbi (RMB) in China] in units of the foreign currency. A decrease in the exchange rate implies a depreciation of the domestic currency or an appreciation in the destination-market currency. An increase in the exchange rate implies the opposite.

¹³Li et al. (2015) also find productivities explain the heterogeneous pricing-to-market across firms.

assets. The estimated price elasticity ranges from -0.38 to -0.40, and a one-standard-deviation increase in intragroup credit reduces the elasticity to -0.22. We also report a much larger magnitude when the export-price regression is weighted by the volume of each bilateral transaction.

As an important robustness check, we exclude exporters that simultaneously import intermediate goods from the same destination country. We conclude our findings are not driven by time-varying changes in exchange rates having offsetting effects on marginal costs (Amiti, Itskhoki, and Konings, 2014).

Worth special mention is that we find a much stronger effect of group owners' tunneling behavior on price elasticities for exporters affiliated with the state-owned business groups, which counts for 79% of the sample. This finding is somehow surprising given that exporters with an SOE background receive government subsidizations.¹⁴ Our findings are consistent with SOE owners misallocating resources. For a variety of political reasons, including employment rate and social stability, state-owned business groups tend to transfer resources from units with better investment opportunities to those with worse opportunities; by contrast, private business groups do the opposite exactly because of high costs of external financing (Chen, Jiang, Ljungqvist, Lu, and Zhou, 2017; Zhu, 2018). Thus, less tunneling better alleviates credit constraints faced by SOE export units.

The last question is whether subsidiaries of expropriated public firms are indeed more financially constrained. We provide strong evidence that tunneling crowds out "propping credit," which is measured as intragroup credit supplied by publicly listed firms to their own subsidiaries.

2 A Simple Model

We present a static model of export pricing to guide our empirical analysis. We analytically show how the exporter's external financial constraints affect responses of export prices to exchange-rate movement. Trade finance mainly involves borrowing using trade credit (accounts receivable) as collateral. Exporters obtain working capital loans, credit lines, discounted prepayments, or credit guarantees provided by the importer's bank (Ahn, Amiti, and Weinstein, 2011). Costs

¹⁴For example, see "China halts export-subsidy program after U.S. challenge" (*Wall Street Journal*, April 14, 2016).

of this external financing, however, can be reduced by either of the following reasons. First, an exporting subsidiary can directly borrow from less tunneled public firms, rather than from banks. Second, an exporting subsidiary can borrow from a bank under the guarantee of a less tunneled public firm.

In a similar vein as Berman et al. (2012), we extend Melitz and Ottaviano (2008) and include exchange-rate movement and the firm's heterogeneity in financial constraints. For simplicity, external financial constraints are introduced through the working-capital channel. Firms must borrow a fraction of labor bill θ_i with an interest rate r up-front, before production takes place. The larger the fraction they need to borrow up-front, the more financially constrained they are. Therefore, the marginal cost of the firm is given by

$$mc_i = w(1 + \theta_i r),$$

where w is unit labor cost. Without loss of generality, the marginal cost is rewritten as $mc_i = \frac{w}{\varphi_i}$, where $\varphi_i = \frac{1}{1 + \theta_i r}$, which implies a firm with better financial conditions will have a higher φ_i and therefore a lower marginal cost. Furthermore, firms are assumed to be indexed by financial-constraint parameter φ_i .

Following Melitz and Ottaviano (2008) and Berman et al. (2012), the inverse demand function for variety produced by firm i exported to destination country d is

$$p_{id} S_d = a - b x_{id} - k X_d, \tag{1}$$

where p_{id} is the export price in home currency and S_d is the nominal exchange rate between the home country and destination country d , which is the price of the domestic currency in terms of the currency of country d . Hence, a rise in S_d implies the appreciation of domestic currency. x_{id} is the consumption demand in country d for variety produced by firm i , and X_d is the consumption demand in country d over all varieties. $a, b, \text{ and } k$ are positive parameters. The individual firm will maximize the following profit function:

$$\max_{p_{id}} (p_{id} - mc_i) x_{id}.$$

This optimization problem yields

$$p_{id} = \frac{1}{2} \frac{w}{\varphi_i} + \frac{(a - kX_d)}{2S_d}. \quad (2)$$

Substituting equation 2 into the profit function, we can show a threshold φ_d^* exists for which operating profits are zero. For the firm with zero operating profit, we have the following conditions:

$$\frac{w}{\varphi_d^*} = \frac{(a - kX_d)}{S_d}.$$

Given the demand function in equation 1, only those firms that cover their marginal cost (have better financial access such that $\varphi_i > \varphi_d^*$) can survive and produce. All other firms exit the industry. Surviving firms maximize their profits. The threshold φ_d^* summarizes the effects of both the average price and number of firms on the performance measures of all firms.

Using this condition, we can rewrite the optimal export price for firm i as below:

$$p_{id} = \frac{w}{2} \left(\frac{1}{\varphi_i} + \frac{1}{\varphi_d^*} \right).$$

Denoting the real exchange rate $q_d = \frac{S_d P}{P_d}$, where P is the CPI of domestic country and P_d is the CPI price of destination country d . Firms will take P , P_d , and w as given. We can derive the elasticity of export price to the real exchange rate as

$$e(p_{id}) = \frac{d \ln(p_{id})}{d \ln(q_d)} = \frac{-\varphi_i}{\varphi_i + \varphi_d^*} < 0. \quad (3)$$

The relation between the elasticity of export price to the real exchange rate $e(p_{id})$ and financial condition (φ_i) can be expressed as follows:

$$\frac{\partial e(p_{id})}{\partial \varphi_i} < 0. \quad (4)$$

Equations 3 and 4 suggest the export price (in domestic currency) increases when the real exchange rate depreciates (a decrease in S_d) and firms with better financial conditions increase their export price more. Similarly, in the face of a real appreciation, firms that are less financially constrained will decrease their export price more in order to stabilize the demand. In other words, firms with a better financial condition can “price to market” more. We summarize

the first prediction we bring to the data:

Prediction 1: *As a firm becomes more (less) financially constrained, the elasticity of the export price in home currency to a real exchange-rate change increases (decreases).*

The export price in the destination (local) currency, or the currency of country d , is given by $p_{id}^* = p_{id}S_d$. Then the elasticity of the export price in terms of destination-country currency to the real exchange rate can be defined as

$$e(p_{id}^*) = \frac{d \ln(p_{id}^*)}{d \ln(q_d)} = \frac{\varphi_d^*}{\varphi_i + \varphi_d^*} > 0.$$

The better the financial condition (the smaller θ_i is or the higher φ_i is), the lower the exchange-rate pass-through to the price of home variety i in country d . In other words, for firms that are less financially constrained, the price of export good i in destination country d will be more stabilized because better financial conditions improve their ability to “price to market.”

For the trade volume, we have

$$x_{id} = \frac{wS_d}{2b} \left(\frac{1}{\varphi_d^*} - \frac{1}{\varphi_i} \right) \quad (5)$$

$$e(x_{id}) = \frac{d \ln(x_{id})}{d \ln(q_d)} = \frac{-\varphi_d^*}{\varphi_i - \varphi_d^*} < 0. \quad (6)$$

Note $\varphi_i - \varphi_d^* > 0$, which implies the elasticity of trade volume to the real exchange-rate change is negative. More important, the value of the volume elasticity increases with the financial condition φ_i :

$$\frac{\partial e(x_{id})}{\partial \varphi_i} > 0. \quad (7)$$

The result in equation 5 shows that when the real exchange-rate depreciates, the trade volume will increase. This effect is easy to understand because the home goods become cheaper after the real depreciation. Nevertheless, as illustrated by equation 7, when firms are facing different financial conditions, the export volume of those firms that are less constrained will increase less because their prices are more stabilized. Similarly, in the face of a real appreciation, demand for home goods will fall. But demand for goods produced by less financially constrained firms will decrease less. We therefore make the following predictions:

Prediction 2: *As a firm becomes more (less) financially constrained, the elasticity of the export*

volume to a real exchange-rate change decreases (increases).

Discussion: In sum, firms with better financial conditions price to market more to stabilize their export price in the destination/local market. For these firms, the exchange-rate pass-through to export price (in destination currency) will be lower (lower elasticity of export price in local currency to exchange-rate changes); the exchange-rate pass-through to trade volume will also be lower (less negative elasticity of trade volume to exchange-rate changes).

The intuition is simple. As in Melitz and Ottaviano (2008) and Berman et al. (2012), a linear demand system with horizontal product differentiation implies the price elasticity of demand increases with prices faced by consumers, which is in contrast to the case of constant elasticity of substitution (CES) demand.¹⁵ When all exporters in the home country benefit from a decrease in the relative cost of production (a real exchange-rate depreciation with respect to a specific destination), prices faced by consumers fall, so the price elasticity of demand falls.

This effect implies exporters can increase their markup to maximize their profits in the face of a real depreciation. We can define the markup of export price to marginal cost as μ_{id} . From equation 2, we can get:

$$\mu_{id} = \frac{p_{id}}{w} = \frac{1}{2} + \frac{a - kX_d}{2S_d} \frac{\varphi_i}{w} = \frac{1}{2} \left(1 + \frac{\varphi_i}{\varphi_d^*} \right). \quad (8)$$

Equation 8 implies $\frac{\partial \mu_{id}}{\partial S_d} < 0$; that is, when an exchange rate depreciates, the markup μ_{id} increases. The reason is that $\frac{\partial \mu_{id}}{\partial S_d} < 0$, and exporters react by increasing their markup in this destination so that pricing to market and incomplete pass-through of exchange-rate changes into prices faced by consumers occur. Furthermore, because firms with better financial access have a lower marginal cost and thus charge a lower price, they face a lower demand elasticity. This implies that when a real exchange rate depreciates, less financially constrained firms can increase their markup more than others, or $\frac{\partial \mu_{id}^2}{\partial S_d \partial \varphi_i} < 0$ indicated by equation 8. Similarly, when a real appreciation occurs, price faced by consumers increases and exporters respond by decreasing their markups, and less financially constrained firms will decrease more.

¹⁵Note that other theories, such as the nested CES demand system under imperfect competition in Helpman and Krugman (1985), the dynamic demand-side effect emphasized by Froot and Klemperer (1989), translog preference proposed by Bergin and Feenstra (2001), and the distribution cost in terms of non-tradable goods suggested by Corsetti and Dedola (2005) can also generate firms' pricing-to-market behavior and variable markup.

3 Institutional Background

We introduce institutional backgrounds relevant to our empirical setting. Section 3.1 discusses China's exchange-rate regime. Section 3.2 discusses the background for the split-share structure reform. Section 3.3 discusses the background for collateral shares.

3.1 China's Exchange-Rate Regimes

Before July 2005, China followed a fixed-exchange-rate regime with the RMB pegged to the US dollar. On July 21, 2005, the State Administration of Foreign Exchange launched a movement from a fixed to a managed floating exchange-rate regime. Under the new regime, based on market supply and demand, exchange rates of RMB against USD were set with reference to a basket of foreign currencies.

Figure 1 plots the time series of monthly nominal and real exchange rates of RMB against USD from January 2001 through December 2006. Before July 2005, nominal exchange rates between RMB and USD did not change. Nominal rates started to fluctuate only after the regime shift. Real exchange rates, however, had fluctuated over the entire sample period. The increasing trend after July 2005 implies an appreciation of RMB.

3.2 Split-Share Structure Reform

The opening of the Shanghai Stock Exchange and the Shenzhen Stock Exchange in the early 1990s facilitated the privatization of SOEs. To retain the government's control over the economy, policymakers created a unique ownership structure by splitting total initial public-offering shares into those that are not allowed to be traded, including state and legal shares, and A or B shares that can be freely traded by both domestic and foreign investors.

Under this ownership structure, controlling shareholders' incentives are at odds with those of the minority shareholders, because large shareholders cannot gain security benefits by selling their shares on the stock market. Moreover, such a structure puts public investors in an inferior position relative to controllers in making investment and dividend policies.

To address the prevailing governance problems, the Chinese government implemented the split-share structure reform. The idea of introducing the reform was, as early as February 2, 2004, addressed in the Several Opinions of the State Council on Promoting the Reform, Liberalization, and Stable Development of the Capital Market (known as the Nine Provisions

of the State Council). On April 30, 2005, the CSRC instituted a plan entitled “Directive on Problems in Trying to Solve the Split-Share Structure of Listed Companies.” The plan mandated that non-tradable shares be freely tradable.

Four listed companies served as a pilot project, and 42 large corporations were subsequently chosen to undertake the reform.¹⁶ After the two pilot programs, the CSRC submitted the formal plan to the State Council of People’s Republic of China, seriously rolling out the reform. According to a *People’s Daily* article dated on August 16, 2005, the CSRC warned that it “cannot exclude the possibility that firms that fail to reform will be subject to delisting.” the CSRC set the end of 2006 as the target deadline. By July 18, 2007, 84.3% of the 1,250 firms listed on the Shanghai Stock Exchange and the Shenzhen Stock Exchanges had undertaken the reform. Figure 2 shows the timeline of the reform. It illustrates the general case in Panel A and a case study of Shanghai Baoshan Iron & Steel. We refer to the “post-reform period” as the time period after the announcement of the start of the reform.

The reform took place in batches. For firms in the same batch, the announcement of the start of the reform took place on the same day. For each batch, the name list of focal firms was publicly announced through the *China Securities Journal*. Individual firms had less flexibility in choosing the timing of reform for several reasons. First, local government coordinated the timing among firms from the same province. Second, SOEs had to apply to the SASAC for approval. Figure 3 presents the distribution of export-related firms over reform months. Export-related firms are public firms that export either directly or through their subsidiaries. The figure shows the occurrences of share-split structure reform were concentrated between late 2005 and early 2006.

3.3 Collateral Shares

Chinese shareholders are allowed to pledge shares in companies they own as collateral to lenders, including commercial banks and trust companies. By doing so, large shareholders bear three types of costs. First, they are entitled to receive dividends only after debt is paid off. Second, the CSRC mandates that a firm make a public announcement about the details of collateralized shares. Stock prices usually plunge following such an announcement, because it signals to investors that the pledgers, usually the company’s controlling shareholders, are in deep

¹⁶The reform plan mandated a one-year lock-up period for holders of formerly non-tradable stocks. After the expiration of the lock-up period, the holders of non-tradable A shares who held more than 5% of outstanding shares were allowed to sell no more than 5% in the first 12 months and no more than 10% in the first 24 months.

financial trouble. Third, and most important, the foreclosure of collateral involves the transfer of ownership to commercial banks. As such, unless they are extremely financially constrained, the large shareholders of a Chinese public company are less willing to borrow using their own shares as collateral.

One issue is how to evaluate collateral shares, especially when they are not tradable. Before 2005, commercial banks required very high collateral-to-debt ratios for two reasons. The first is that non-tradable shares are illiquid and, if borrowers default, banks must sell the shares at huge discounts outside the stock market. Thus, the value of non-tradable, collateralized shares assessed by lenders is much lower than the market value of the stock.¹⁷ In the 2003-2011 sample period, Zheng et al. (2014) document a strongly positive relationship between collateral shares and tunneling among Chinese public firms. In our data, untabulated statistics report similar results.

4 Data and Descriptive Statistics

We use three datasets: the Chinese customs data for Chinese exporters and importers; data on intragroup credit (i.e., related-party transactions), ownership information, and financial data collected from the China Stock Market and Accounting Research (CSMAR) database; and country-level macro data collected from DataStream.

4.1 Customs Data

One of our major data sources is information on Chinese firms that entered into bilateral trade relations with the rest of the world from 2000 to 2006. The data are collected and made available by the Chinese Customs Office. For each monthly transaction, the data report the USD-denominated free-on-board values of firm exports and imports by product and trade partner for 243 destination or source countries and more than 7,500 different products in the 6 digit Harmonized System. The dataset also provides information about the quantities traded in one of 13 different units of measurement (e.g., kilograms, square meters, etc.). In addition, the dataset provides contact information for the firms, types of enterprises, and customs regimes.¹⁸

¹⁷On July 4, 2000, China Construction Bank issued guidance to standardize the procedure involved with loans against which non-tradable shares are pledged. However, how to determine the value of collateralized, non-tradable shares remains a controversial issue. The current consensus has been to determine the value based on the book value of net assets or to impose a discount rate on stock price to reflect the illiquidity.

¹⁸Examples include ordinary trade, import-and-assembly processing trade, and pure assembly processing trade.

To match the customs data with public firms, we create an algorithm to match the firm names in the customs data with the names of public firms and their subsidiaries in the CSMAR database. During the 2000-2006 period, among the 277,595 distinct names for exporting or importing firms that appear in the customs dataset, we identify 606 Chinese publicly listed firms that either directly export or export through a total of 877 subsidiaries. The number of export-related firms is about 50% of the total number of firms listed on Shanghai and Shenzhen Stock Exchanges during our sample period.

Figure 4 lists the top-10 destination countries and 4-digit Harmonization Code products, respectively. The ranks are formed based on the total free-on-board exported values (in millions of USD) in each country or product on the sample of exporting subsidiaries during the post-reform period. Figure 5 describes the spatial distribution of the number of subsidiary-product-destination-shipment-month observations in our sample (see Table 1). The unit in the map is destination country. The darker a country, the higher frequency with which a destination country enters into our sample.

4.2 Intragroup Trade Credit

To track the direction and amount of intragroup credit provided to, or received by, public firms, we rely on highly disaggregated related-party transaction data. Chinese public companies have been required to disclose related-party transactions since 1997. Most firms report in a special footnote to their financial statements the identity of their related parties, the relation with these parties (e.g., percentage of shares held), and the types and amounts of related-party transactions.¹⁹

The great advantage of China's mandatory disclosure of related-party transactions is that public firms must break out intragroup trade credit involving related parties at a highly granular level. Although the borrowing and lending activities among related parties occur on a daily basis, Chinese public firms are required to report receivables claimed to each related party at an annual frequency. As a result, we observe the outstanding balance of intragroup receivables between a public firm and each of its related parties.

In our main analysis, intragroup receivables include several items disclosed by public firms in their financial statements. We measure the intragroup trade credit in a spirit similar to Li, Sun, and Wang (2004), Jiang, Lee, and Yue (2010), and Chen et al. (2017). To compute the

¹⁹This disclosure was incomplete and irregular in the first year but more systematic thereafter (Yuan, 1998).

outstanding balance of intragroup credit (in RMB), we collect from the related-party transaction data accounts receivable, other accounts receivable, notes receivable, and accounts prepaid. These four items represent the major types of trade credit occurring between public firms and their various related parties.

4.3 Collateralized Shares and Other Financial Data

We use the share-split structure-reform database from CSMAR, which provides detailed characteristics for firms embarking on the reform agenda, to obtain the collateral shares pledged by large shareholders to lenders (e.g., commercial banks and investment banks). For each public firm, the CSMAR provides the total number of nontradable shares pledged by all large shareholders to lenders before the reform.

We also collect financial and stock price data from the CSMAR: total assets, total liabilities, net income, monthly and daily stock prices, total tradable shares outstanding, distress identification (coded as “ST” firms), and cross-listing information. We manually check the public firm managers’ resumes to identify whether a chief executive officer (CEO) was promoted from within the business group. We exclude ST firms to address the concern that corporate restructuring is driving the flow of intragroup credit associated with these firms. We also exclude firms cross-listed on a B- or H-share market, because the reform only targeted previously non-tradable A shares.

5 Collateral Shocks and Intragroup Financing

We demonstrate that, via the collateral channel, the share-split structure reform reduces large shareholders’ demand for intragroup financing.

5.1 Intragroup Financing

For the following two reasons, we measure intragroup financing provided by Chinese publicly listed firms to entities that are economically related to the group parent. First, as extensively discussed by Chen et al. (2017), the way group owners reallocate capital within a business group varies across countries based on accounting standards, stock market listing rules, and the tax code. China’s rules favor short-term intra-group loans; other ways, such as transfer pricing,

dividends, or equity investments, are uncommon.²⁰ Second, ample anecdotes also suggest group owners could indirectly “tunnel” resources out of public firms by first transferring resources to other related parties or even seemingly unrelated parties.²¹

For each year across various related parties, we take the sum of the four items of receivables (as described in section 4.2) claimed by public firms to the collection of future cash from entities that are economically related to the group parent. These entities include (1) group parents themselves, (2) other firms (excluding public firms’ own subsidiaries) controlled by the same parent group, (3) key investors and managers, (4) the family members of key investors and managers, and (5) entities controlled by either key investors and managers or their family members.

For each public firm, we aggregate the granular data of intragroup receivables to calculate the outstanding balance as follows:

$$IntragroupCredit_{j,t} = \sum_{i=1}^n Receivables_{i,j,t}, \quad (9)$$

where $Receivables_{i,j,t}$ is the sum of the four items of receivables claimed by publicly listed firm j to related party i as of the end of fiscal year t . Thus, $IntragroupCredit$ is the outstanding balance of receivables (in RMB) claimed by public firms from borrowers (1)-(5) as discussed above. We then calculate the change in the outstanding balance of receivables (as in equation 9) from year $t-1$ to t and scale the change by lagged total assets:

$$\Delta IntragroupCredit_{j,t}\% = (IntragroupCredit_{j,t} - IntragroupCredit_{j,t-1})/Assets_{j,t-1}. \quad (10)$$

A positive value of $\Delta IntragroupCredit_{j,t}\%$ indicates that public firm j increases intragroup lending to large shareholders in year t relative to year $t-1$, and vice versa. We do not calculate net trade credit by subtracting payables from receivables, because borrowing terms by public firms from related parties could be very different from lending terms. Examples of these terms include maturities and default rates, which are unobservable in the data.²²

²⁰To illustrate, prices charged internally diverge from arms-length prices by less than 5%. Less than 3% of publicly listed firms had provided either loans or guarantees for their controlling shareholders over our sample period. About 75% of public firms, however, experienced non-zero changes in the four types of receivables, as we discussed in section 4.2.

²¹A notice issued by CSRC on January 6, 2004, revealed the prevalence of the issue. The notice was entitled “CSRC Notice 2004/No.1 on Further Improvements to Listed Company Financial Reporting Quality.” In the notice, CSRC urged auditors to pay particular attention to usual transactions that “seem to be arm’s length.”

²²As a robustness check, we also use net credit and our results survive.

5.2 Collateral Shocks and Credit Supplied by Public Firms to Group Parents

Descriptive Statistics: Panel A of Table 1 presents descriptive statistics for characteristics of export-related firms in the year in which public firms announced the start of the reform. These firms either directly export or export through subsidiaries. On average, each public firm in our sample owns two exporting subsidiaries. Sixty-two percent of firms are SOEs. The outstanding balance of receivables claimed by public firms to group owners (and their economically related entities) amounts to 1.1% of total assets. Eighty-four percent of sample firms are associated with non-zero percentage changes in *IntragroupCredit*. Although the mean of $\Delta IntragroupCredit\%$ is around 0, the standard deviation is around 0.032.

Panel B of Table 1 compares the export-related firms in Panel A with the rest of the CSMAR firms in several dimensions. The two groups of firms are not statistically different in the change in intragroup credit around the reform, the percentage of collateralized shares, and profitability. Compared to remaining firms, export-related firms are of a larger size and are more leveraged. Panel A of Figure 6 plots the frequency distribution of collateralized shares across publicly listed firms. Panel B of the figure compares the frequency distribution of changes in tunneling behavior ($\Delta IntragroupCredit\%$) around the reform between publicly listed firms with and without pledging shareholders.

Regression Results: Figure 7 visualizes the necessary condition for identification (the parallel-trends assumption), which states that the evolution of intragroup credit supplied by treated firms and control firms would have followed common trends before and after the share-split structure reform, had the reform not happened. Consistent with our conjecture, treated firms had provided more credit than control firms prior to the reform but the difference disappeared after the announcement of the reform.

We lay out the following regression model. Equation 11 is not our first stage of the IV estimation. Rather, this regression tells us the impact of collateral shares on tunneling on the sample of firm-year observations.

$$\Delta IntragroupCredit\%_j = \alpha + \beta \times Collateral\%_j + \gamma \times X_j + \theta_k + \theta_m + \theta_s + v_{j,t}, \quad (11)$$

where *Collateral%* is the number of non-tradable shares, as a percentage of total shares, pledged by all large shareholders of public firm j several years prior to the announcement of the share-

split structure reform. Public firm j is mandated to disclose *Collateral%* during the reform announcement. We also replace *Collateral%* with a dummy variable equal to 1 if a public firm is associated with collateral shares before the reform, and zero otherwise. A third measure is $\ln(\textit{Collateral Value})$, where *Collateral Value* is the number of collateralized shares multiplied by the net assets per share (measured immediately prior to the reform).²³ X_j is a vector of characteristics for public firm j in the reform year. These observables are the size of public firms (total assets), leverage ratio, and return on total assets (ROA). We also control for industry fixed effects (θ_k), province fixed effects (θ_m), and reform-year-month fixed effects (θ_s). The standard errors are clustered at the industry level.

Estimation results in Table 2 indicate that in the reform year, the change in tunneling credit is strongly negatively correlated with collateralized shares. Panel A presents the results on the sample of export-related public firms. In column (1) of Panel A, the point estimate on the regression is -0.042. This number implies that a one-percentage-point increase in the fraction of collateralized shares is associated with a reduction in tunneling credit by 4.2 percent of the public firm's total assets. In column (2), we regress the indicator of *Collateral* on $\Delta\textit{IntragroupCredit}\%$, and the point estimate is -0.01, which is about one-thirds of one standard deviation of the dependent variable. In column (3), we report similar effects of $\log(\textit{Collateral Value})$.

Next, we perform two placebo tests to check whether the results reported in columns (1)-(3) are spurious. First, we create pseudo measures of collateralized shares by drawing random numbers from a normal distribution in which the mean and standard deviation are estimated from firms with either non-zero *Collateral%* or non-zero *Collateral Value*. Columns (4)-(6) of Panel A show the effect of pseudo collateral shares is zero. Second, conditioning on export-related public firms, we randomly draw 15% of observations from the entire sample of firm-year observations. Changes in tunneling credit are calculated from $t-1$ to t , where t is any year. We then regress collateral shares on $\Delta\textit{IntragroupCredit}\%$. Columns (7)-(9) indicate collateral shares do not constrain tunneling activities during pseudo reform years.

Panel B presents the results on the entire sample of CSMAR firms. Compared to estimates in Panel A, coefficients in columns (1)-(3) of Panel B are less economically significant but more statistically significant. We also perform the same placebo tests in Panel B.

²³The net assets per share immediately before the reform is collected by the database for share-split structure reform in CSMAR, not from balance sheets. Several firms in our sample have missing values.

5.3 Large Shareholders' Loan-to-Collateral Ratio

In this section, we verify that, given the *same* number of shares pledged to lenders, the reform indeed increased large shareholders' borrowing amount. We collect data from the Wind Datafeed Service. This dataset provides detailed information about 12,131 loans against which collateral shares have been pledged by large shareholders.²⁴ We calculate the book value of collateral shares based on public firms' net assets as of the beginning of the year.

The loan-to-collateral ratio is large shareholders' borrowing amount divided by the book value of a public firm's shares pledged by large shareholders.²⁵ An increase in the loan-to-collateral ratio implies firms can borrow more using the *same* number of shares. We employ the following OLS regression specification to verify the conjecture:

$$\ln(\text{Loan-to-Collateral}_{j,s}) = \alpha + \beta \times \text{Post-Reform}_{j,s} + X_{j,t-1} + \theta_j + \epsilon_{j,s}, \quad (12)$$

where $\text{Post-Reform}_{j,s}$ is a dummy variable indicating whether the loan is borrowed by large shareholders of public firm j in month s after the reform. $X_{j,t-1}$ includes the debt ratio and logarithm of total assets for firm j as of the beginning of year t in which loan contracting took place. We also control for firm fixed effects (θ_j). Standard errors are clustered at the industry level.

Table 3 presents the estimation results. In columns (1)-(2), we set the sample period to 2000-2014. The logarithm of the loan-to-collateral ratio is significantly higher after the reform, regardless of whether we exploit within-firm variation. In columns (3)-(4), we restrict our sample period to be 2000-2007, and the results are very similar.

6 Intragroup Credit and Pricing-to-Market

The sections for our main findings are organized as follows. Section 6.1 presents descriptive statistics on our customs-CSMAR matched samples. Sections 6.2 – 6.5 focus on the main

²⁴Each loan contains the following details: public firm name and stock code, the start and end dates of the loan, and the number of shares pledged. One limitation of this dataset is that only 10% of loans have the exact amount borrowed by pledging shareholders in footnotes. We manually read the footnotes and collected transactions with the available borrowing amount.

²⁵Note that book value is not the true collateral value accessed by lenders. Rather, lenders will adjust the assessed value by multiplying the book value with a factor, which is unobservable to an econometrician. However, if lenders indeed discount the value of collateralized, non-tradable shares due to illiquidity, they would multiply the book value by a smaller factor during the pre-reform period. In other words, we expect the ratio to increase after the reform.

findings. Section 6.6 deals with the issue concerning exporters that are simultaneous large importers. Section 6.7 compares the effects of intragroup credit on exchange-rate pass-through between SOE and non-SOE exporting subsidiaries. Section 6.8 verifies the adverse effect of intragroup financing on subsidiaries' access to financing.

6.1 Descriptive Statistics

Exports: Public Firms vs. Subsidiaries: Table 4 compares the frequency, scope, and value of exports between public firms and their subsidiaries on the sample period from January 2000 through December 2006. We identify 3,248 firm-year observations for public firms that are included by the Chinese customs data either because they directly export or because they export through subsidiaries.²⁶

A striking pattern emerges: Subsidiaries export by a greater scope and achieve more export revenues than their publicly listed parents. In each year, we calculate the total value of exports for both public firms and their subsidiaries, and scale export values by the *public firm's sales*. Foreign sales only consist of 4.5% of public firms' revenues, suggesting they mainly focus on domestic product markets. Surprisingly, subsidiaries bring in three times more export revenues than public firms. Compared with public firms, subsidiaries deliver two times more shipments, ship two times more products abroad, and sell goods to a greater number of destination countries.

The pattern in Table 4 indicates exporting activities by subsidiaries are highly likely to be financed by domestic sales made by their publicly listed parents. Given the average size of less than 10 million RMB, subsidiaries have difficulty raising enough capital externally.

CSMAR-Customs Matched Sample: Table 5 presents descriptive statistics for the customs-CSMAR matched sample. The sample unit is at the firm-product-destination-shipment-month level. Panel A presents summary statistics for export price and volume for goods either directly exported by publicly listed firms or indirectly exported through their subsidiaries. We restrict the timing of shipment to be after the announcement of the reform but within the reform year. Eight-four percent of observations are associated with non-zero $\Delta Tunnel\%$. About 30% of observations have non-tradable shares pledged by large shareholders, and, conditioning on non-zero collateral shares, the collateralized ownership is about 18.4%.

In Panel B, we compare exports between customs-CSMAR matched firms/subsidiaries and

²⁶We separately calculate export-related metrics for public firms and their subsidiaries. If several exporting subsidiaries are owned by the same public firm, we sum these metrics across these subsidiaries in the same year. Metrics are set to zeros if an entity does not export in a particular year.

the rest of Chinese exporters. The sample period is from June 2005 through December 2006. Compared with other exporters, exporters entering into our sample have larger export values, export to more destination countries, use more shipments, and sell more products, consistent with the intuition that publicly listed firms are more productive.

6.2 Regression Specification

We outlay the regression model using the following empirical specification. The regression specification is spiritually spirit to those employed to study domestic-price settings in which firms pass-through inflation shocks onto consumers (e.g., Borenstein, Cameron, and Gilbert, 1997; Xie, 2020; Gu and Xie, 2021; Li, Xie, and Zhang, 2021).

$$\begin{aligned} \ln(p_{j,p,d,q,s}) = & \alpha + \mu \cdot \ln(RER_{s,d}) + \phi \times \ln(RER_{s,d}) \times \Delta IntragroupCredit\%_j + \\ & \rho \times \Delta IntragroupCredit\%_j + \theta \times X_j + \kappa \times Z + \epsilon_{j,p,d,q,s}, \end{aligned} \quad (13)$$

where $\ln(p_{j,p,d,q,s})$ represents the logarithm of the RMB price of product p exported by firm j to destination country d in shipment q as of month s . Month s is between the month in which the reform is announced and the end of the reform year. The Chinese Customs Office reports the f.o.b. value of export in USD. We convert the currency for value per unit into RMB.²⁷ When we study the response of volume, the dependent variable in equation 13 becomes $\ln(q_{j,p,d,q,s})$, the logarithm of volume of product p exported to destination country d by subsidiary i of public firm j in shipment q as of month s .

The right side of equation 13 contains several sets of variables. The first set includes our main independent variables of interest: the logarithm of the real exchange rate, changes in tunneling in the reform year, and their interactions. The real exchange rate of destination country d as of month s is defined as

$$RER_{s,d} = ER_{s,d} \times CPI_s / CPI_{s,d}. \quad (14)$$

$ER_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (RMB) in terms of the foreign currency of country d as of month s . For example, $ER_{s,US}$ was 0.125 in 2006; that is, one Chinese RMB was worth 0.125 USD in 2006. Therefore, an increase in $ER_{s,d}$ implies an appreciation of the RMB. CPI_s and $CPI_{s,d}$ represent the monthly consumer price index of

²⁷See Manova and Zhang (2012) for similar discussions.

China and that of the corresponding destination country d , respectively. We are interested in estimating, separately, the effects of tunneling credit on the elasticity of export price and volume in month s to the real exchange rate in the same month.

X_j is the same set of control variables as in equation 11. We control for X_j to capture unobserved heterogeneity that potentially affects exporting subsidiary i 's pricing decisions, including marginal costs, managerial abilities, firm technologies, and geographical factors. Because our sample period spans less than two years, the most powerful control is the firm fixed effect. However, we control for X_j in specifications in which we cannot include firm fixed effects, which fully absorb variations in the main independent variable of interest ($\Delta IntragroupCredit_j\%$).

Z is a vector of characteristics for the exported product, including a dummy variable indicating ordinary trade, product-destination fixed effects, firm fixed effects, and year fixed effects. In two alternative specifications, we include either *public-firm* or *subsidiarity* fixed effects.

Year fixed effects absorb the time-varying, macroeconomic shocks that all exporters face. We do not control for year-month fixed effects, because they fully absorb variations in exchange rates at the monthly frequency. The main coefficient of interest (ϕ), however, is not changed by alternative specification of time fixed effects.

6.3 OLS Estimation

In Panel A of Table 6, we present the ordinary least square (OLS) estimations. The OLS estimate, however, corresponds to a regression of export price on the interaction between exchange rate and *total* intragroup credit variation, induced by all factors including those that are correlated with errors in equation 13. For example, the controlling shareholders might want the subsidiary to maintain optimal export pricing in line with the group-wide capital costs and just siphon off excess cash that otherwise would be paid as dividends to shareholders. Compared with OLS results, our IV-estimation coefficients indeed suggest large shareholders' endogenous choice of credit allocation biases the OLS estimates.

In columns (1)-(4), we report regression results by including exports either directly exported by public firms or through exporting subsidiaries. In column (1), we estimate the effect of tunneling credit on export price. The estimated coefficient of $\Delta IntragroupCredit\%$ bears a negative sign and is both statistically and economically significant.

In column (2), we report OLS estimates of the elasticity of export price to real exchange rates. The estimated price elasticity is about -0.22, which is both statistically and economically significant. This number suggests firms reduce export prices by 22 cents when RMB appreciates by one Yuan. Therefore, an average exporter in our sample “prices to market.” The interaction term, however, is negative but statistically insignificant. In columns (3)-(4), we focus on the volume elasticity. The OLS estimates show that $\Delta IntragroupCredit\%$ negatively but insignificantly affects export quantity, and tunneling bears zero correlation with the volume elasticity. In columns (5)-(8), we exclude goods directly exported by public firms. We document a much stronger pricing-to-market for exporting subsidiaries. The estimated price elasticity at zero tunneling is about -0.32, the magnitude of which is about 55% larger than that in column (2). The price elasticity, however, is not statistically sensitive to the supply of credit by public firms to group parents.

6.4 IV Estimation

After presenting OLS estimates, we use various measures of collateral shares, pledged by large shareholders of publicly listed firms to lenders several years before the reform, to instrument for large shareholders’ change in tunneling behavior.

The decision to pledge, at both intensive and extensive margins, is made by large shareholders located at least several levels away from exporting subsidiaries along the controlling chain of the business group. The *exclusion restriction* is that the cross-sectional distribution in the amount of collateralized shares during the pre-reform period is uncorrelated with errors in the price regression as in equation 13, where dependent variables are measured during the post-reform period.

Before presenting the second stage of our IV-estimation results, we report in Table 7 the results of the first-stage regression. The F-stat suggests collateral shares are a strong instrument regardless of how we measure it. In odd-numbered columns, $\Delta IntragroupCredit\%$ is instrumented by various forms of collateral shares; in even-numbered columns, $\Delta IntragroupCredit\% \times \ln(RER)$ is instrumented by the interaction between collateral shares and $\ln(RER)$.²⁸

Panel A of Table 8 reports the IV estimates of the effect of intragroup credit supply on the price and volume elasticities, where the instrument is either the number of collateral shares as

²⁸In columns (2), (4), and (6), firm-fixed effects fully absorb the cross-firm variation of $\Delta IntragroupCredit\%$ so the only endogenous variable in these columns is $\Delta IntragroupCredit\% \times \ln(RER)$.

a percentage of total shares (in odd-numbered columns) or the interaction between collateral shares and real exchange rates (in even-numbered columns). Columns (1)-(4) present estimations on all exported goods including those made by publicly listed firms themselves; columns (5)-(8) present estimations on exports solely made by subsidiaries owned by public firms.

In column (1), we report a statistically positive relation between the supply of intragroup credit by public firms to group parents and export prices. The positive coefficient of $\Delta IntragroupCredit\%$ can be consistent with Melitz and Ottaviano (2008) in the sense that tunneled firms face higher marginal costs. In column (2), we report the IV-estimation coefficients with respect to the impact of $\Delta IntragroupCredit\%$ on the price elasticity. The point estimate of the interaction term is 8.98 and is statistically significant at the 1% level. A one standard deviation increase in $\Delta IntragroupCredit\%$ reduces the size of price elasticity by 0.13 (0.015×8.98) — approximate 67% of the size of the elasticity for firms with zero $\Delta IntragroupCredit\%$.

In columns (3)-(4), we report IV estimates for the volume elasticity to the real exchange rates. As reported by column (3), intragroup credit significantly reduces export volume. This finding is consistent with Amiti and Weinstein (2011) and Chor and Manova (2012) that credit constraint hinders exports. In column (4), we document a negative impact of $\Delta IntragroupCredit\%$ on volume elasticity. A one standard deviation increase in $\Delta IntragroupCredit\%$ reduces volume elasticity by 0.18 — approximately 53% of the size of elasticity when $\Delta IntragroupCredit\%$ is set at zero (-0.34).

Columns (5)-(8) report our findings on exports made by exporting subsidiaries. The purpose of doing so, as we mentioned earlier, is to mitigate the concern that economic reasons for large shareholders to pledge shares might be correlated with errors in price (and volume) regressions. As column (5) shows, following a 10% exchange rate appreciation, the average exporting subsidiary cuts export price (in RMB) by 3.5%. More interestingly, we document a more sensitive price, and also volume, elasticity to the supply of credit by publicly listed firms to group parents. As column (6) shows, a one standard deviation increase in $\Delta IntragroupCredit\%$ reduces the magnitude of price elasticity by 0.18 (0.015×12.1), which is about 51% of the size of elasticity with zero $\Delta IntragroupCredit\%$. In column (8), we see a much larger effect on volume elasticity.

In Panel B, we use the discrete version of *Collateral%* as the instrument. In Panel C, we use the book value of collateralized shares as the instrument. Our estimation results are not quantitatively different from those in Panel A, especially on the subsample of goods exported

solely by subsidiaries.

OLS Bias: Credit Demand and Supply: We compare coefficients between OLS and IV estimates. The IV estimate corresponds to a change in price elasticity due to changes in intragroup financing under an exogenous shock to controlling shareholders' *demand* for intragroup finance. The OLS estimate, however, corresponds to a regression of changes in price/volume elasticities on *total* intragroup-credit variation, induced by (1) factors affecting the supply of credit to controlling shareholders and (2) factors affecting the demand of credit by controlling shareholders. Examples of such supply factors include credit suppliers' productivities, their growth prospects, and their financial conditions. These supply factors can bear a negative correlation with export price but a positive correlation with firms' ability to provide intragroup financing to large shareholders.

In the simplest scenario, where credit and demand factors are uncorrelated, credit supply variation is equivalent to measurement error, and the OLS estimate is biased towards zero. In contrast to this scenario, however, what we observe in most columns of Table 6 is that signs of OLS estimates are flipped comparing to those of IV estimates, suggesting that credit demand and supply factors are strongly negatively correlated. It is easy to understand such a bias, if credit supply factors are omitted from the OLS regression model — that is, because firms within the same group are often subject to common shocks, group owners receiving an adverse shock exhibit the highest demand for intragroup financing while other group members receiving the same adverse shock possess the lowest ability to supply financing.²⁹

We illustrate the OLS biases using numbers across columns. Our OLS estimates of the relation between the level of export price and $\Delta IntragroupCredit\%$ (columns (1) and (5)) are also different from IV estimates. In particular, the OLS estimate in column (1) turns out to be negative.³⁰ Therefore, omitted credit supply factors severely bias the coefficient in column (1). Turning to columns (3) and (7), the OLS estimate on the relation between volume and $\Delta IntragroupCredit\%$ carries the same sign as that of IV estimates but goes down a magnitude of factor of 7 and 2.3.

²⁹Using the classic OLS bias formula and equation 6.2, the relation between unbiased and OLS estimates can be expressed as: $\hat{\phi} = \phi + \rho_{X,\epsilon} \times \frac{\sigma_{\epsilon}}{\sigma_X}$, where ϵ corresponds to unobserved credit supply factors and $\rho_{X,\epsilon}$ corresponds to the correlation between credit supply and demand factors.

³⁰In these regression specifications, we do not exploit variations within firms/subsidiaries, because firm- or subsidiary-fixed effects will fully absorb cross-firm variation in $\Delta IntragroupCredit\%$.

6.5 Weighted Regressions

Two reasons justify weighted regressions. First, our sample is not a random sample of all exports made by exporters in China. Weights are necessary to adjust the sample so that it is representative of the entire population of Chinese exporters. Because aggregated trade flows are typically determined by large firms, people might be skeptical of regressions that treat small and large firms as equally informative about exchange-rate pass-through. We therefore weight our regressions by the book value of total assets of the publicly listed firm.

Second, weighted regressions can correct for heteroskedastic error terms. Export prices, our key dependent variable, are unit values and are computed as the ratio of export value divided by export volume. The averages for different groups (bilateral transactions) are computed using highly varying, within-group sample sizes (volume). In such a situation, the group-average error term is heteroskedastic. Therefore, we also weight our regressions by export volume.

Panel A of Table 9 reports the asset-weighted regression results. The regression is weighted by the public firm's total assets as of the beginning of the reform year. As the IV-estimation coefficients suggest, the average exporting subsidiary cuts export prices by 4% in response to a 10% exchange-rate appreciation. The estimation results suggest a price elasticity of -0.4. A one-standard-deviation increase in tunneling credit reduces the number by 0.18, which is 45% of the size of elasticity when $\Delta IntragroupCredit\%$ is held at zero. However, the volume elasticity becomes less sensitive to tunneling.

Panel B of Table 9 presents the IV-estimation coefficients from the volume-weighted regressions. The regression is weighted by the export volume of each bilateral transaction. We only report the price regression. The average exporting subsidiary cuts export price by 58 cents when RMB appreciates by one yuan. A one-standard-deviation increase in tunneling credit reduces the size of the elasticity by 0.55, suggesting exchange-rate fluctuations will be completely passed on to consumers.

6.6 Excluding Large Importers

Our interpretation of results in Table 8 relies on one critical assumption; that is, the movement of the real exchange rate does not affect an exporter's marginal cost. Although we control for product-destination and firm fixed effects, the assumption is valid, strictly speaking, only when firms exporting to a country do not simultaneously import from the same country. In real life, however, the assumption might not be valid. Amiti et al. (2014), for example, find

import-intensive firms, which are also the largest exporters, face offsetting exchange-rate effects on marginal costs and set high markups and actively move them in response to changes in exchange rates.

To address the above concern, we perform the same IV estimation as in Table 8 and 9 by excluding exporters that are simultaneous importers. To exclude “exporters that are simultaneous large importers,” we calculate the value for each exporter’s import from country d as a percentage of exports to d in the same month s . We define exporters as simultaneous large importers if the percentage is greater than either 50%. We also focus on exports made by subsidiaries, because these exports account for more than 80% of the sample size.

Table 10 shows our results are not sensitive to the exclusion of large importers. After excluding simultaneous large importers, our main findings still hold for both equal- and assets-weighted regressions. In fact, export prices become move negatively sensitive to exchange-rate movements. In column (1) of Panel B, for example, the average exporting subsidiary cuts export price by 70 cents when RMB appreciates by one Yuan, a one standard deviation increase in tunneling credit scaled by total assets reduces the size of price elasticity by almost 80%.

6.7 SOE vs. Non-SOE Exporters

In this section, we aim to compare the effects of intragroup financing on price elasticities between exporting subsidiaries affiliated with state- and non-state-owned business groups. The prediction is ex-ante ambiguous. On one hand, SOEs often face soft budget constraints and, as a result, are less financially constrained (Allen, Qian, and Qian, 2005; Kornai, E., and Roland, 2003), in which case we would expect tunneling to have less of an impact on price and volume elasticities for SOE than non-SOE exporters.

On the other hand, however, exporters owned by SOE business groups face more stringent financial constraints due to capital misallocation. By contrast, owners of private business groups more efficiently allocate internal capital because of the high costs of external financing. Chen et al. (2017) document evidence that although private groups allocate more capital to units with better investment opportunities, state groups do the opposite. Zhu (2018) finds resource allocation within a business group of SOEs internalizes the government’s political goal of maintaining social stability at a cost to shareholder value. Both Chen et al. (2017) and Zhu (2018) use a dataset on Chinese related-party transactions that is similar as ours. If the

resources-misallocation story is true, we would expect a decrease in tunneling credit to have a larger impact on elasticities for SOEs.

Starting from 2003, CSMAR discloses the identities for public firms' controlling shareholders and ultimate owners. It also indicates whether the nature of the controlling shareholder, or ultimate owner, is an SOE or a non-SOE. However, CSMAR does not distinguish between companies and state asset-management companies within SOEs or between legal entities and natural persons within non-SOEs. For this reason, we manually read the names of shareholders to further verify their identities and double-check their government or private nature.

Our findings are consistent with owners of state-owned business groups misallocating resources. We also find SOE subsidiaries price to market more relative to non-SOE subsidiaries. As we discuss in section 2, pricing to market is expected to be more pronounced for SOE products sold at high profit margins.

Panel A of Table 11 reports IV estimates from equal-weighted regressions on the two subsamples of exports made by SOE and non-SOE subsidiaries. We only report estimation results for price elasticities. In columns (1)-(2), we report the IV estimates using collateral shares as a percentage of total shares as an instrument. Compared to non-SOEs, SOE exporters price to market more and by larger amounts. The price elasticity is around -0.512 for SOE subsidiaries but only -0.244 for non-SOE subsidiaries. More important, we observe a large effect of tunneling on price elasticities only for SOE and not for non-SOE subsidiaries. We report similar results for SOEs in other columns of the same panel.

Surprisingly, the $\ln(RER) \times \Delta IntragroupCredit\%$ turns out to be negative for non-SOE subsidiaries. This puzzling finding, however, disappears in Panel B, where we use assets of the public firm to weight regressions. In addition, the phenomenon of "pricing-to-market" only exists in SOE-affiliated exporters — following a 10% exchange-rate appreciation, the average subsidiary cuts its export price by 9.5%. A one-standard-deviation increase in tunneling reduces the size of the elasticity by 44%.

6.8 Tunneling Crowds Out Propping of Subsidiaries

In this subsection, we examine whether tunneling by large shareholders crowds out subsidiaries' access to credit from tunneled firms. To do so, we calculate the percentage change in credit supplied by export-related, public firm j to their own subsidiaries, including both exporting and

non-exporting ones, from year $t-1$ to t as follows:

$$\Delta Propping_{j,t}\% = (Propping_{j,t} - Propping_{j,t-1})/Assets_{j,t-1}. \quad (15)$$

Propping is the outstanding balance of receivables claimed by publicly listed firms to the collection of future cash from their own subsidiaries. We outlay the regression model using the following empirical specification:

$$\Delta Propping_{j,t}\% = \alpha + \beta \times \Delta IntragroupCredit\%_{j,t} + \theta \times X_{j,t} + \kappa \times Z + \epsilon_{j,t}, \quad (16)$$

where $X_{j,t}$ is a standard set of controls as in Table 2. Because around 50% of firm-year observations are associated with zeros of $Propping_{j,t}\%$, we create an indicator coded as 1 if a public firm j provides no credit to subsidiaries in year $t-1$, and zero otherwise. We include this indicator in $X_{j,t}$.

Table 12 reports our OLS estimation results. Panel A reports the estimation results for export-related, publicly listed firms in their reform years. Estimation results on this sample are more relevant for the interpretation of our results in previous tables. In columns (1), the dependent variable is the change in propping credit from year $t-1$ to t , scaled by lagged total assets. The estimation coefficient of $\Delta IntragroupCredit\%$ turns out to be strongly negative and economically meaningful. A one standard deviation increase in $\Delta IntragroupCredit\%$ reduces $\Delta Propping\%$ by 0.2 percentage points. Since subsidiaries are very small firms, 0.2% of the public firm's total assets is a sizable shock to credit supply. In columns (2), we replace our dependent variable using an indicator coded as 1 if $\Delta Propping\%$ is greater than zero, and zero otherwise. We then perform linear probability model regressions. A one standard deviation increase in $\Delta IntragroupCredit\%$ reduces the probability of all subsidiaries (owned by a public firm) experiencing a credit expansion (relative to the previous year) by 3.2 percentage points — approximately 17% of the sample mean. In Panel B, we restrict our sample on export-related firms on the sample period of 2004-2008. We arrive at the same conclusion.

7 Conclusion

Do internal capital markets affect exporters' price adjustment to exchange-rate shocks? The question is important for us to understand the implication of exchange-rate fluctuations for

export dynamics during financial crisis. As Gopinath (2013) notes, however, assessing the relation between firms' access to financing and their export-pricing behavior requires both solid theoretical evaluation and careful identification strategies.

In this paper, we exploit an ownership-structure reform that constitutes a collateral shock differentially, although temporally, reducing large shareholders' economic incentives to tunnel resources out of publicly listed firms. We show this collateral channel largely relaxes financial constraints of subsidiaries owned by tunneled firms, at least within the reform year. We then examine whether exporting subsidiaries tend to stabilize local currency export prices in response to exchange-rate changes. Our IV estimation results show that compared with otherwise similar exporters, those with better access price to market more. We rationalize our findings using a simple static model of export pricing. In the model, the key driver of our empirical results is that price elasticity of demand increases with the price hat consumers face.

Our study only documents temporary effects of share-split structure reform on exchange-rate pass-through, because the reform did not touch the fundamental reason for tunneling. Minority shareholders are generally less protected in civil-law countries than in common-law countries. As Johnson et al. (2000) note, "In civil-law countries, the expropriation of minority shareholders by the controlling shareholder in a transaction within a plausible business purpose is often seen as consistent with directors' duties, especially if the controlling is another firm in the group. Self-dealing transactions are assessed in light of their conformity with statutes, and not on the basis of their fairness to minorities." Our findings extend the list of reasons for better investor protection to a country's comparative advantage in international trade.

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Figure 1: **China's Bilateral Exchange Rates against U.S. Dollar**

This chart plots the monthly nominal and real exchange rates of RMB against U.S. dollars over the sample period of January 2001 through December 2006.

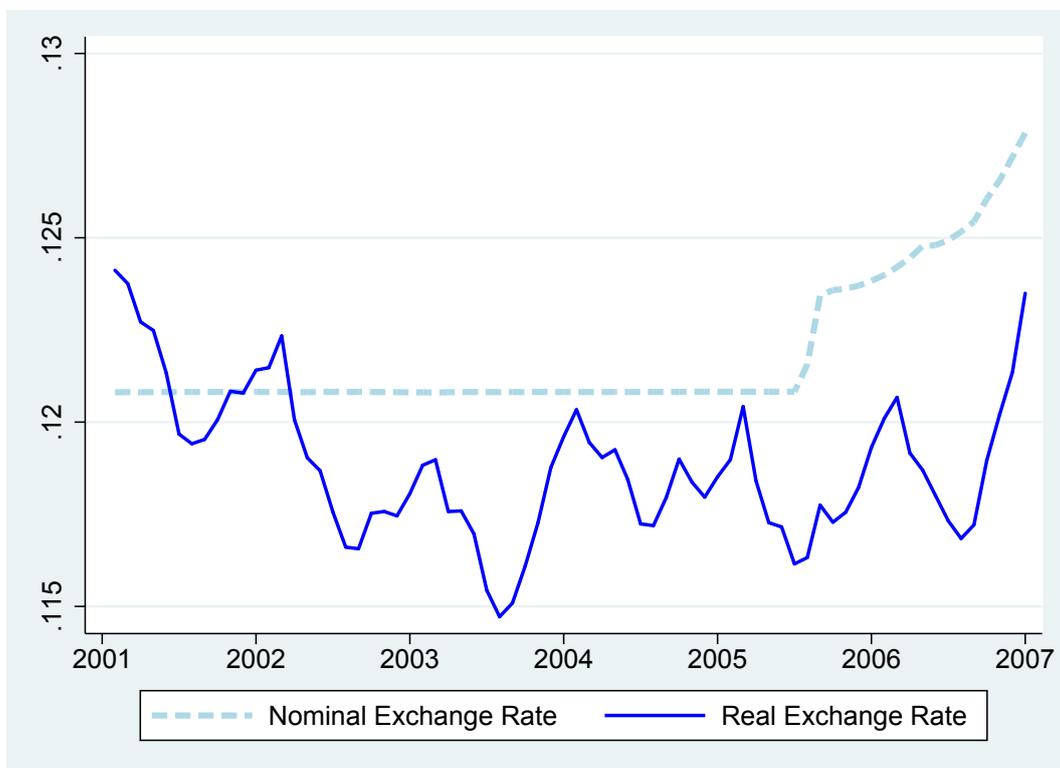


Figure 2: Timeline of China's Share-Split Structure Reform

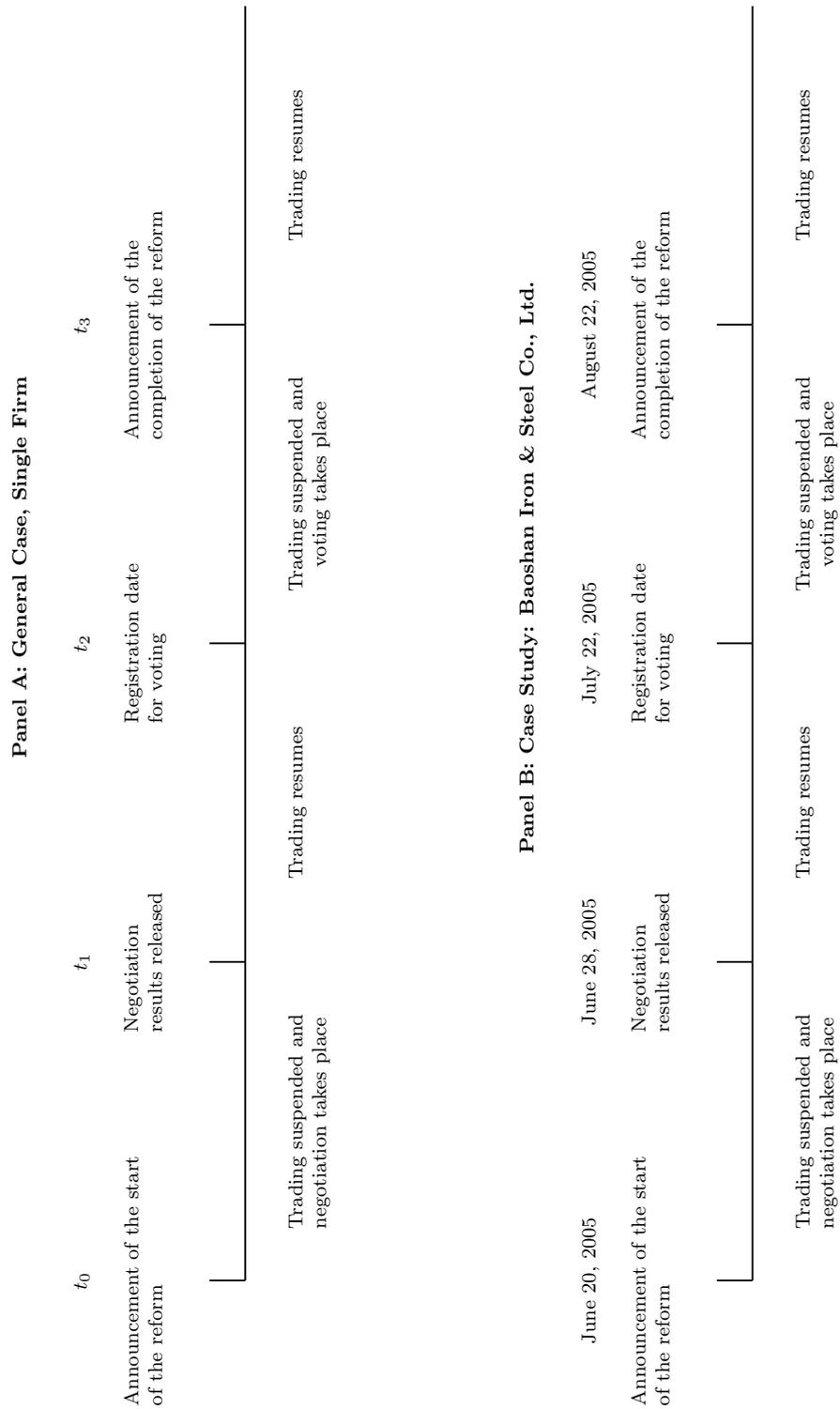


Figure 3: Distribution of Export-Related Firms over Reform Months

This chart plots the distribution of export-related firms over calendar months in which they made reform announcements. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. The light-blue bar represents the number of focal firms. The blue bar represents the number of focal firms whose large shareholders pledged non-tradable shares to lenders before the reform.

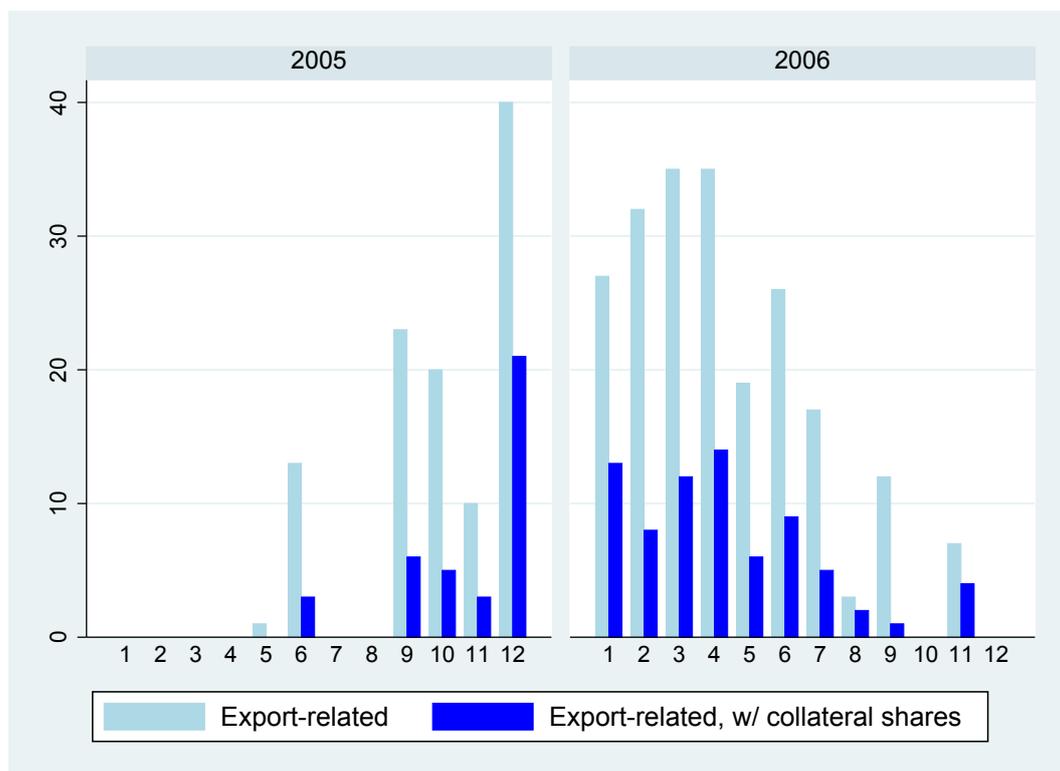
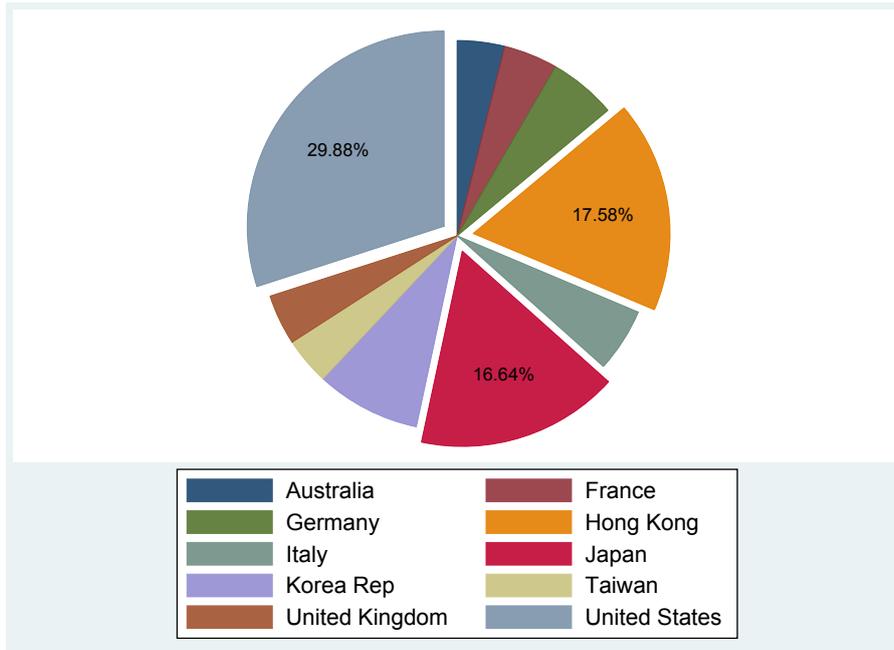


Figure 4: **Top-10 Exports**

This chart plots the top-10 destination countries (Panel A) and 4-digit Harmonization Code products (Panel B), respectively. The ranks are formed based on the total free-on-board exported values (in millions of USD) in each country or product. The sample is the customs-firm matched sample (see Panel A of Table 2). The sample period is from June 2005 through December 2006.

Panel A: Top-10 Destinations



Panel B: Top 10 Products

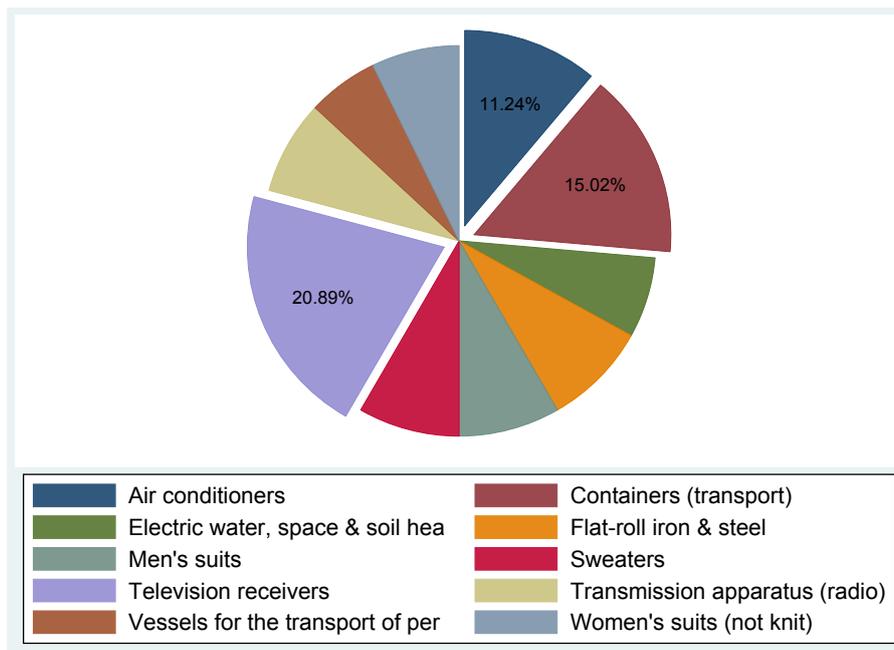


Figure 5: Distribution of Sample Units across Countries

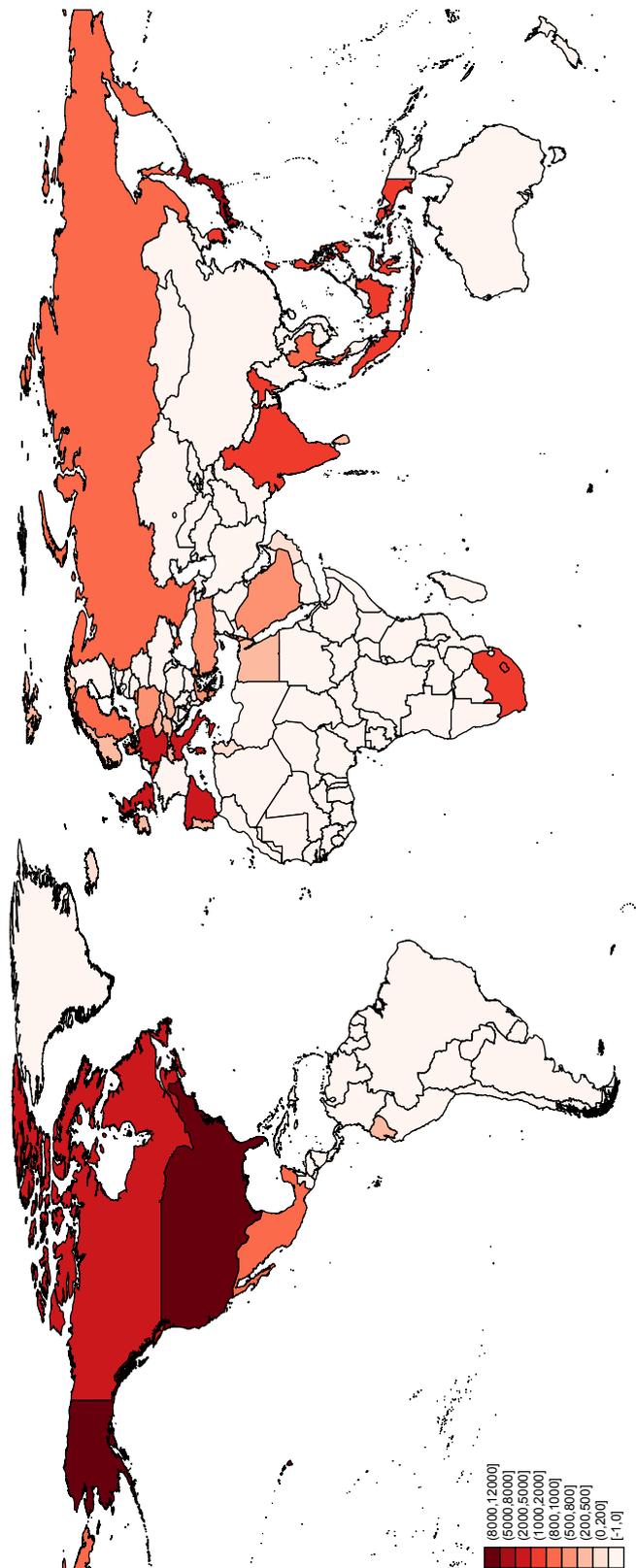
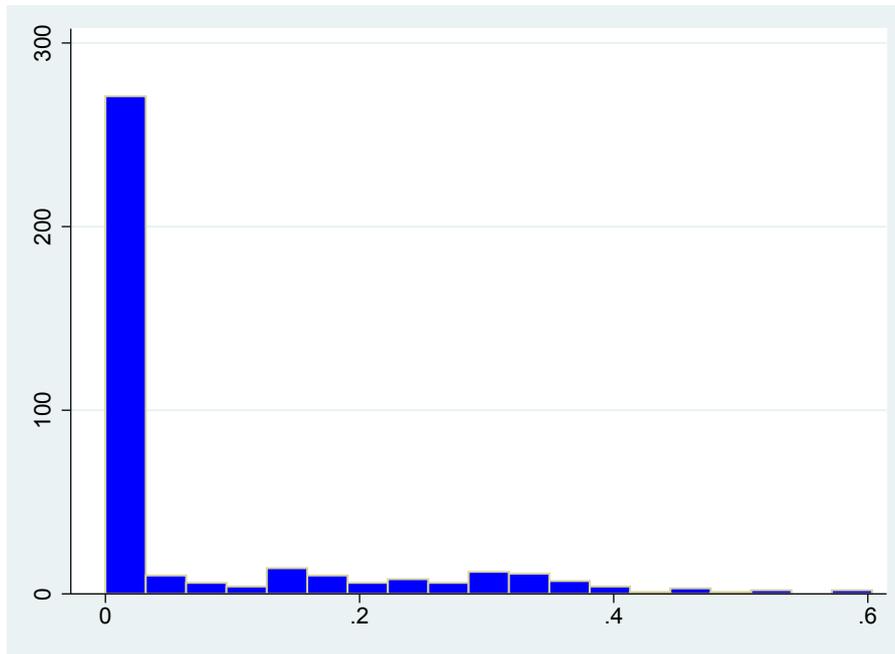


Figure 6: **Firm-level Distribution of Tunneling and Collateral Shares**

Non-export-related public firms are excluded. For each variable, the Y axis represents its frequency and the X axis represents its value. Panel A plots the distribution of collateral shares across Chinese public firms that embarked on the share-split structure reform. Collateral shares (*Collateral%*) is the number of shares pledged by large shareholders to lenders, as a percentage of total shares, immediately prior to the reform. Panel B compares distributions of percent changes in tunneling credit (Δ *IntragroupCredit%*) between public firms with and without collateral shares immediately prior to the reform announcement. Δ *IntragroupCredit%* is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable.

Panel A: Collateral Shares



Panel B: Tunneling

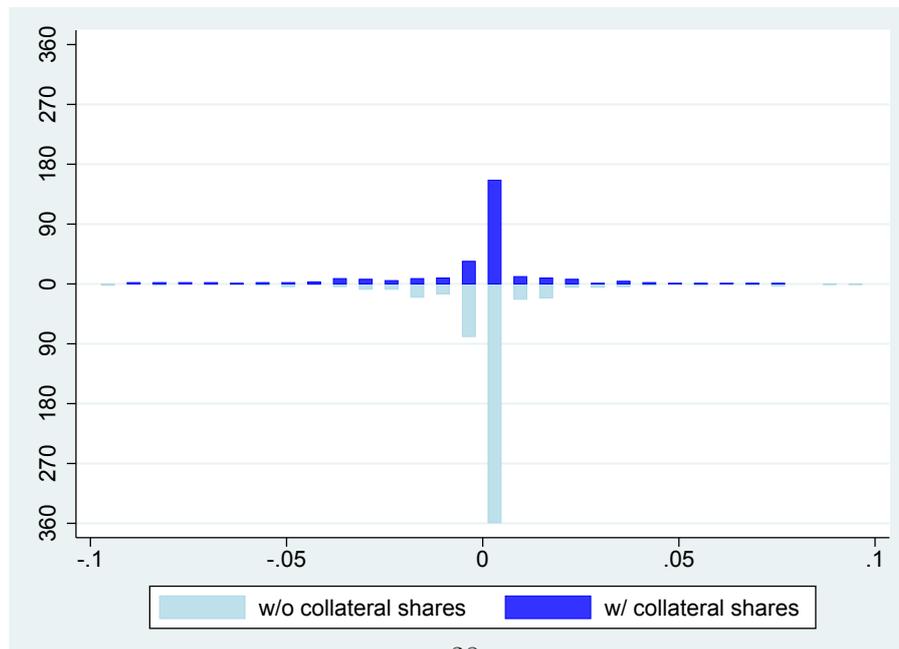


Figure 7: **Parallel Trends**

The figure plots the estimates of β and the 95% confidence intervals from the following ordinary least squares equation:

$$\text{IntragroupCredit}\%_{j,t} = \alpha + \sum_{s=-4}^3 \beta_s \times \text{Collateral}\%_{j,t-s} + \epsilon_{j,t},$$

which includes a set of leads of the interactions between $\text{Collateral}\%_{j,t}$ and event-year fixed effects for the time periods before and after the share-split structure reform. Year -5 is excluded. $\text{Collateral}\%$ is the number of collateralized shares, as a percentage of total shares, immediately prior to the reform. $\text{IntragroupCredit}\%_{j,t}$ is intragroup credit scaled by total assets. Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. Standard errors are clustered at the industry level.

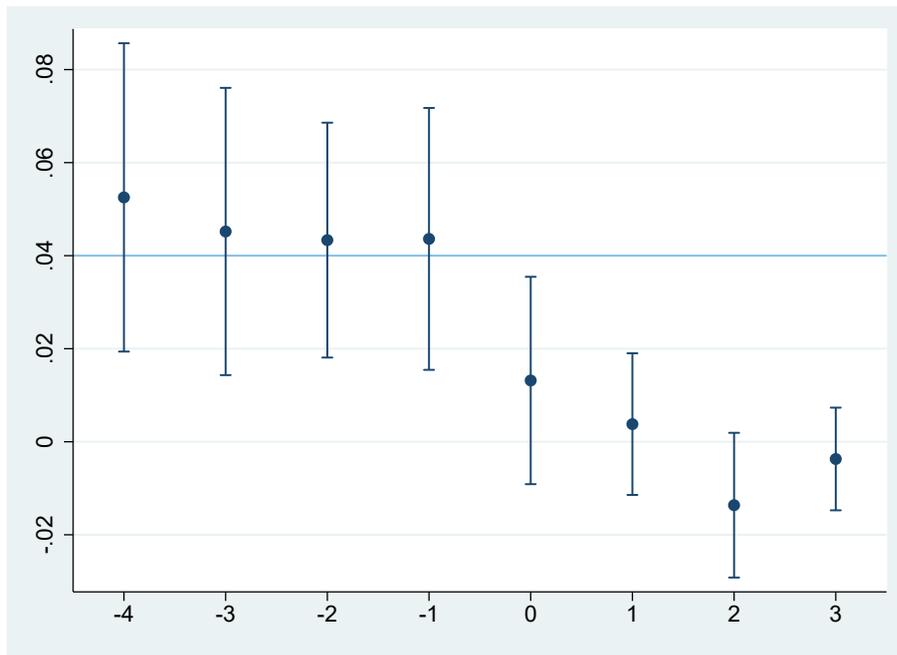


Table 1: **Descriptive Statistics: Export-Related Public Firms**

The sample period is from June 2005 through December 2006. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. Panel A presents descriptive statistics for public firms satisfying two criteria to enter into our regression sample: (1) Firms had announced reforms in the sample period and (2) firms are included by customs data. Panel B compares financial characteristics between firms reported in Panel A and other firms that announced the reform in the same period but are not included by the customs data. No. of Export Sub is the number of exporting subsidiaries owned by each publicly listed firm. Δ IntragroupCredit% is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. IntragroupCredit/At is the intragroup credit in the reform year scaled by lagged total assets. Collateral% is the number of collateralized shares, as a percentage of total shares outstanding, immediately prior to the reform. Collateral is a dummy variable equal to 1 if a public firm has at least one large shareholder pledging shares immediately prior to the reform, and zero otherwise. Collateral Value is the number of collateralized shares multiplied by the net assets per share before the reform. SOE is a dummy variable equal to 1 if the ultimate owner of a business group is either SOE or government or state asset-management companies, and zero otherwise. $\ln(\text{Total Assets})$ is the logarithm of book value of the firm assets in millions of renminbi (RMB). Market-to-Book is the market capitalization over book value. Leverage is total debt over total assets. ROA is the ratio of net income to total assets. Group CEO is a dummy variable equal to 1 if chief executive officers previously worked for group parents, and zero otherwise.

Panel A. Characteristics of Export-Related Firms

	N	Mean	SD	Min	p10	p25	p50	p75	p90	Max
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
No. of Export Sub	320	0.941	2.108	0	0	0	0	1	2	19
Δ IntragroupCredit%	320	-0.001	0.032	-0.032	-0.014	0	0	0.000	0.009	0.019
IntragroupCredit/At	320	0.010	0.032	0	0	0	0.000	0.005	0.028	0.050
Collateral%	320	0.073	0.133	0	0	0	0	0.091	0.301	0.361
Collateral	320	0.350	0.478	0	0	0	0	1	1	1
$\ln(\text{Collateral Value})$	311	6.437	8.839	0	0	0	0	17.911	19.446	19.723
SOE	318	0.613	0.488	0	0	0	1	1	1	1
$\ln(\text{Total Assets})$	320	21.466	0.838	20.203	20.466	20.904	21.416	22.029	22.565	22.848
Market-to-book	320	1.720	0.937	0.776	0.839	1.128	1.469	2.062	2.887	3.642
Leverage	320	0.519	0.165	0.208	0.298	0.430	0.524	0.647	0.716	0.771
ROA	320	0.034	0.059	-0.060	-0.013	0.011	0.032	0.060	0.100	0.131
Group CEO	320	0.853	0.355	0	0	1	1	1	1	1

Panel B. Non-Export-Related vs. Export-Related

	Non-Export-Related			Export-Related			(1)-(4)	
	Mean	SD	N	Mean	SD	N	Dif	t-stat
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ IntragroupCredit%	-0.002	0.002	560	-0.001	0.002	320	0.000	-0.147
IntragroupCredit/At	0.015	0.002	560	0.010	0.002	320	0.005*	1.910
Collateral%	0.065	0.005	560	0.073	0.007	320	-0.007	-0.792
Collateral	0.325	0.020	560	0.350	0.027	320	-0.025	-0.756
$\ln(\text{Collateral value})$	5.859	0.368	560	6.437	0.501	320	-0.578	-0.938
SOE	0.667	0.020	560	0.613	0.027	320	0.054	1.607
$\ln(\text{Total Assets})$	21.349	0.045	560	21.559	0.048	320	-0.210***	-3.033
Market-to-Book	1.921	0.056	560	1.720	0.052	320	0.201**	2.397
Leverage	0.485	0.008	560	0.519	0.009	320	-0.035***	-2.840
ROA	0.040	0.003	560	0.034	0.003	320	0.005	1.222
Group CEO	0.898	0.013	560	0.853	0.020	320	0.045**	1.995

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Collateral Shocks and Tunneling Behavior

This table presents the OLS estimates of the effect of collateralized shares on changes in the supply of intragroup credit by public firms around the year of share-split structure reform. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. The sample period is from June 2005 through December 2006, during which public firms in the sample had announced the share-split structure reform. In Panel A, only export-related firms are included. In Panel B, all firms are included. The dependent variable is Δ IntragroupCredit%, which is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. Collateral% is the number of non-tradable shares, as a percentage of total shares outstanding, pledged by large shareholders to lenders immediately prior to the reform announcement. Collateral is a dummy variable equal to 1 if a public firm is associated with collateral shares immediately prior to the reform announcement, and zero otherwise. Collateral Value (in millions RMB) is the number of collateralized shares multiplied by the net assets per share before the reform. All other financial variables are as of the beginning of the reform year. In columns (4)-(6), Pseudo Treatment is created by drawing random numbers from a normal distribution in which the mean and standard deviation are estimated from firms with non-zero Collateral% in column (1) and Collateral Value in column (3). Pseudo Collateral is defined analogously. In columns (7)-(9), Pseudo Event year is identified by randomly drawing 15% of observations from all firms on the period of 1999-2008. Control variables include $\ln(\text{Total Assets})$, Leverage, and ROA. Please refer to Table 1 for definitions of other variables. Standard errors are clustered at the industry level.

Panel A: Export-Related Firms

	True Experiment			Pseudo Treatment			Pseudo Event		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Collateral%	-0.042**			-0.001			0.011		
	(0.016)			(0.014)			(0.022)		
Collateral		-0.010**			0.005			0.002	
		(0.005)			(0.007)			(0.005)	
$\ln(\text{Collateral Value})$			-0.002**			0.000			0.000
			(0.001)			(0.000)			(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reform-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	320	320	311	320	320	320	496	496	479
adj R ²	0.15	0.15	0.15	0.13	0.13	0.13	0.03	0.03	0.04

Panel B: All Firms

	True Experiment			Pseudo Treatment			Pseudo Event		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Collateral%	-0.022**			0.000			-0.004		
	(0.009)			(0.010)			(0.011)		
Collateral		-0.008***			0.001			-0.000	
		(0.002)			(0.003)			(0.003)	
$\ln(\text{Collateral Value})$			-0.002***			-0.000			-0.001
			(0.001)			(0.000)			(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reform-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	879	879	853	879	879	878	1,277	1,277	1,227
adj R ²	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02	0.02	0.02	0.02

standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Large Shareholders' Loan-to-Collateral Ratio

This table presents estimates of the effect of the passage of share-structure split reform on large shareholders' loan-to-collateral ratio. The sample period appears at the top of columns. The sample only includes loans against which non-tradable shares are pledged by large shareholders of publicly listed firms. The dependent variable is the logarithm of the loan-to-collateral ratio. The loan-to-collateral ratio is calculated as the loan amount borrowed by large shareholders divided by the book value of nontradable shares pledged to lenders. The book value of collateralized shares is the number of collateralized shares multiplied by net assets per share of the public firm as of the beginning of the reform year. Post-Reform is a dummy variable equal to 1 if loans are contracted after the share-split reform, and zero otherwise. $\ln(\text{Total Assets})$ is the logarithm of book value of the firm assets in millions of renminbi (RMB). Leverage is total debt over total assets. Financial variables are taken as of the beginning of the year in which loans are contracted. Standard errors are clustered at the industry level.

	2000–2014		2000–2007	
	(1)	(2)	(3)	(4)
Post-Reform	0.631*** (7.12)	0.504** (2.83)	0.687*** (6.45)	0.392* (2.02)
Leverage	0.792** (2.27)	0.623 (1.32)	0.534 (0.93)	2.350** (2.45)
$\ln(\text{Total Assets})$	-0.071 (-1.11)	0.090 (0.72)	-0.016 (-0.18)	-0.292 (-0.83)
Constant	-0.271 (-0.21)	-3.528 (-1.33)	-1.312 (-0.69)	3.711 (0.51)
Public Firm FE	No	Yes	No	Yes
N	606	606	363	363
adj. R^2	0.11	0.24	0.16	0.42

standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Exporting Activities: Public Firms vs. Subsidiaries

This table compares the characteristics of exports between publicly listed firms and their own subsidiaries in the sample period from January 2000 through December 2006. 3428 firm-year observations are identified for public firms. Subsidiaries owned by the same public firm are classified into one group. 3428 group-year observations are identified for subsidiaries. Export characteristics are measured at the firm/group-year level. Value-FOB% is the total free-on-board value of goods exported scaled by annual sales reported by the public firm in the same year. Export values are adjusted to RMB dollars. No. of Shipments, No. of Destinations, No. of Products, and No. of Product Destinations are the number of shipments, the number of destination markets, the number of 6-digit Harmonization Code products, and the number of product-destination markets. For firm- or group-year observations without exports, values are set at zeros.

	Public Firms			Subsidiaries			(1)-(4)	
	Mean (1)	Std (2)	N (3)	Mean (4)	Std (5)	N (6)	Dif (7)	t-stat (8)
Value – FOB%	0.045	0.004	3428	0.161	0.026	3428	-0.116***	-4.384
No. of Shipments	111.795	11.952	3428	346.202	23.534	3428	-234.407***	-8.881
No. of Products	15.173	1.314	3428	42.203	2.252	3428	-27.030***	-10.369
No. of Destinations	3.987	0.158	3428	7.803	0.226	3428	-3.816***	-13.834
No. of Product-Destinations	35.582	3.761	3428	103.562	7.123	3428	-67.980***	-8.440

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: **Descriptive Statistics: Customs-CSMAR Matched Sample**

Panel A presents descriptive statistics on the Customs-CSMAR matched sample. To be matched with the customs data, CSMAR firms have to satisfy two criteria: (1) Firms had announced reforms in the sample period and (2) firms are export-related and are included by customs data. Panel B compares the characteristics of exports between exporting subsidiaries of publicly listed firms (identified in Panel A) and other exporters that are neither public firms nor subsidiaries of any public firms in the sample period. From June 2005 through December 2006, public firms in the sample had announced the share-split structure reform. The sample unit is at the level of firm/subsidiary-product-destination-shipment-month. The timing of shipment is restricted to between the reform announcement and the end of the reform year. $\ln(\text{Price})$ and $\ln(\text{Volume})$ are the logarithms of export price [renminbi (RMB) dollars] and quantity of the exported product. $RER_{s,d}$ is defined as $ER_{s,d} \times CPI_t / CPI_{s,d}$. $ER_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (RMB) in terms of the foreign currency of country d as of month s . CPI_s and $CPI_{s,d}$ represent the monthly consumer price index of China and of the corresponding destination country d , respectively. $\Delta\text{Tunnel}\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. $\text{Collateral}\%$ is the number of collateralized shares, as a percentage of total shares outstanding, immediately prior to the reform. Collateral is a dummy variable equal to 1 if a public firm has at least one large shareholder pledging shares immediately prior to the reform, and zero otherwise. Collateral Value is the number of collateralized shares multiplied by the net assets per share before the reform. Ordinary is a dummy variable equal to 1 if the export is ordinary trade, and zero otherwise. SOE is a dummy variable equal to 1 if the exporter is affiliated to the state-owned business groups, and zero otherwise. $\text{Value - FOB (M US\$)}$ is the total free-on-board value of goods exported in millions of USD. No. of Shipments , $\text{No. of Destinations}$, No. of Products , and $\text{No. of Product Destinations}$ are the number of shipments, the number of destination markets, the number of 6-digit Harmonization Code products, and the number of product-destination markets. Volume (M unit) is the total number of units exported in millions. Other volume categories are defined analogously. Variables describing firm characteristics are taken from CSMAR public firms. Please refer to Table 1 for definitions of other variables.

Panel A: Customs-Firm Matched Sample

	N	Mean	Std	Min	P10	p25	p50	p75	p90	Max
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\ln(\text{Price})$	70,602	3.624	1.961	-4.529	1.676	2.533	3.435	4.406	6.018	18.984
$\ln(\text{Volume})$	70,599	7.656	2.577	0	4.419	6.174	7.774	9.313	10.682	19.454
$\ln(\text{RER})$	70,602	-1.414	1.764	-3.061	-2.767	-2.453	-2.161	-0.603	0.544	4.942
Ordinary	70,602	0.886	0.318	0	0	1	1	1	1	1
$\Delta\text{Tunnel}\%$	70,592	0.000	0.015	-0.208	-0.003	0.000	0	0.001	0.008	0.214
$\text{Collateral}\%$	70,602	0.051	0.118	0	0	0	0	0.006	0.244	0.518
Collateral	70,602	0.282	0.450	0	0	0	0	1	1	1
$\ln(\text{Collateral Value})$	70,602	5.066	8.166	0	0	0	0	15.099	18.751	21.294
$\ln(\text{Total Assets})$	70,602	21.850	0.737	19.537	20.908	21.351	21.786	22.144	22.815	24.886
Market-to-Book	70,602	1.269	0.497	0.573	0.895	1.018	1.177	1.350	1.700	5.029
Leverage	70,602	0.582	0.150	0.078	0.390	0.474	0.610	0.676	0.785	0.817
ROA	70,602	0.036	0.045	-0.202	0.006	0.031	0.038	0.049	0.065	0.238
Group CEO	70,602	0.962	0.191	0	1	1	1	1	1	1
SOE	70,504	0.785	0.411	0	0	1	1	1	1	1

Panel B. CSMAR-Custom Matched vs. Unmatched

	Unmatched			Matched			(1)-(4)	
	Mean	Std	N	Mean	Std	N	Dif	t-stat
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value- FOB (M US\$)	12.68	240.58	199,573	77.77	213.37	412	-65.09***	-5.49
No. of Shipments	184.87	1172.78	199,573	1186.01	140.40	412	-1001.14***	-17.22
No. of Destinations	9.72	13.28	199,573	31.26	31.01	412	-21.54***	-32.76
No. of Products	27.23	70.65	199,573	117.51	224.10	412	-90.28***	-25.67
No. of Product-Destinations	54.62	244.93	199,573	330.36	809.57	412	-275.75***	-22.60
Volume (M Unit)	11.96	302.57	134,020	26.68	97.66	346	-14.71	-0.90
Volume (M Litre)	4.34	47.06	565	39.61	41.67	2	-35.27	-1.06
Volume (M Meter)	1.58	10.71	27,113	4.23	13.42	145	-2.65***	-2.97
Volume (M Square Meter)	0.16	1.17	12,313	0.30	1.20	78	-0.15	-1.11
Volume (M Kilogram)	10.30	403.87	178,673	50.14	313.69	401	-39.84**	-1.97
Volume (M Gram)	8.18	66.72	3,621	2.30	7.82	25	5.89	0.44
Volume (M Cubic Meter)	0.01	0.07	6,990	0.03	0.08	53	-0.02***	-2.24

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Tunneling and Pricing to Market: OLS Estimation (Post-Reform Period)

This table presents the OLS estimates of the effect of the supply of intragroup credit by public firms to large shareholders on the elasticity of export price and volume to exchange-rate changes. From June 2005 through December 2006, public firms in the sample had announced the share-split structure reform. The sample unit is at the level of firm/subsidiary-product-destination-shipment-month. The timing of shipment is restricted to between the reform announcement and the end of the reform year. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. In columns (1)-(4), goods exported by both public firms and their exporting subsidiaries are included. In columns (5)-(8), only goods exported by subsidiaries are included. The dependent variables are the logarithms of export price per unit [renminbi (RMB) dollars] and number of exported units. $ER_{s,d}$ is defined as $ER_{s,d} \times CPI_{s,d}$. $ER_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (RMB) in terms of the foreign currency of country d as of month s . CPI_s and $CPI_{s,d}$ represent the monthly consumer price index of China and of the corresponding destination country d , respectively. $\Delta IntragroupCredit\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. Ordinary is a dummy variable equal to 1 if the export is ordinary trade, and zero otherwise. All other financial variables are measured as of the beginning of the reform year. Please refer to Table 1 for definitions of other variables. Standard errors are clustered at the product-destination and year levels.

	All				Subsidiaries			
	ln(Price) (1)	ln(Price) (2)	ln(Volume) (3)	ln(Volume) (4)	ln(Price) (5)	ln(Price) (6)	ln(Volume) (7)	ln(Volume) (8)
ln(RER)		-0.222*** (0.068)		-0.300*** (0.078)		-0.369*** (0.042)		-0.448 (0.362)
ln(RER) × $\Delta IntragroupCredit\%$		-0.211 (0.781)		0.034 (0.281)		-0.915 (0.933)		0.888* (0.539)
$\Delta IntragroupCredit\%$		-2.645*** (0.629)		-1.414 (1.272)		-0.144 (0.773)		-4.707** (2.126)
ln(Total Assets)		0.018*** (0.003)		0.073*** (0.025)		0.011 (0.007)		-0.002 (0.016)
Market-to-Book		0.085 (0.061)		-0.011 (0.142)		-0.004 (0.026)		0.162*** (0.015)
Leverage		-0.596*** (0.078)		0.109 (0.128)		-0.516*** (0.035)		0.017 (0.132)
ROA		0.347 (0.307)		-1.607*** (0.319)		1.805*** (0.147)		-5.867*** (0.852)
Group CEO		-0.324** (0.127)		0.151*** (0.036)		-0.497** (0.197)		0.200 (0.196)
Ordinary		-0.237***-0.216*** (0.043) (0.051)		-0.056***-0.250*** (0.009) (0.020)		-0.254***-0.255*** (0.060) (0.016)		-0.039***-0.512*** (0.013) (0.107)
Constant		3.907*** 2.286*** (0.226) (0.304)		6.092*** 8.971*** (0.978) (0.534)		4.316*** 3.558*** (0.153) (1.022)		7.314*** 9.965*** (0.713) (1.755)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Public Firm FE	No	Yes	No	Yes	No	No	No	No
Subsidiary FE	No	No	No	No	No	Yes	No	Yes
N	77,519	71,126	77,602	71,201	63,675	58,409	63,674	58,408
adj. R^2	0.86	0.87	0.61	0.62	0.86	0.87	0.59	0.60

standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Tunneling and Pricing-to-Market: IV Estimation, First Stage (Post-Reform Period)

This table presents estimates of first-stage regression of the IV estimation. From June 2005 through December 2006, public firms in the sample had announced the share-split structure reform. The sample unit is at the level of firm/subsidiary-product-destination-shipment-month. The timing of shipment is restricted to between the reform announcement and the end of the reform year. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. In odd-numbered columns, the dependent variable is $\Delta \text{IntragroupCredit}\%$. In even-numbered columns, the dependent variable is $\Delta \text{IntragroupCredit}\% \times \ln(\text{RER}_{s,d})$. $\Delta \text{IntragroupCredit}\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. $\Delta \text{IntragroupCredit}\%$ and $\Delta \text{IntragroupCredit}\% \times \ln(\text{RER}_{s,d})$ are instrumented by Instrument and Instrument $\times \ln(\text{RER})$. Instruments are Collateral% (columns (1)-(2)), Collateral (columns (3)-(4)), and $\ln(\text{Collateral Value})$ (columns (5)-(6)), respectively. Collateral% is the number of collateralized shares, as a percentage of total shares, immediately prior to the reform. Collateral is a dummy variable equal to 1 if a public firm has at least one large shareholder pledging shares immediately prior to the reform, and zero otherwise. $\ln(\text{Collateral Value})$ is the number of collateralized shares multiplied by the net assets per share before the reform. $\text{RER}_{s,d}$ is defined as $\text{RER}_{s,d} = \text{ER}_{s,d} \times \text{CPI}_s / \text{CPI}_{s,d}$. $\text{ER}_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (renminbi) in terms of the foreign currency of country d as of month s . CPI_s and $\text{CPI}_{s,d}$ represent the monthly consumer price index of China and of the corresponding destination country d , respectively. In odd-numbered columns, control variables include $\ln(\text{Total Assets})$, Leverage, ROA, and Ordinary. In even-numbered columns, Ordinary is the only control variable. Ordinary is a dummy variable equal to 1 if the export is ordinary trade, and zero otherwise. All other financial variables are measured as of the beginning of the reform year. Please refer to Table 1 for definitions of other variables. Standard errors are clustered at the product-destination and year levels.

	Collateral%	Collateral	ln(Collateral Value)			
	(1)	(2)	(3)	(4)	(5)	(6)
Instrument	-0.013*** (0.001)				-0.160*** (0.000)	
Instrument $\times \ln(\text{RER})$		-0.016*** (0.003)				-0.263*** (0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Public Firm FE	No	Yes	No	Yes	No	Yes
N	70129	64,755	70,129	64,755	70,129	64,755
adj. R^2	-0.12	0.51	-0.12	0.51	-0.12	0.51
F-stat (weak-instrument test)	114.77	21.48	13.44	25.12	20.59	25.77

standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Tunneling and Pricing-to-Market: IV Estimation, Second Stage (Post-Reform Period)

This table presents the instrument variable (IV) estimates of the effect of intragroup credit on the elasticity of export price and volume to exchange-rate changes. From June 2005 through December 2006, public firms in the sample had announced the share-split structure reform. The sample unit is at the level of firm/subsidiary-product-destination-shipment-month. The timing of shipment is restricted between the reform announcement and the end of the reform year. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. In columns (1)-(4), goods exported by both public firms and their exporting subsidiaries are included. In columns (5)-(8), only goods exported by subsidiaries are included. The dependent variables are the logarithms of export price per unit [renminbi (RMB) dollars] and number of exported units. $RER_{s,d}$ is defined as $ER_{s,d} \times CPI_s / CPI_{s,d}$. $ER_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (RMB) in terms of the foreign currency of country d as of month s . CPI_s and $CPI_{s,d}$ represent the monthly consumer price index of China and of the corresponding destination country d , respectively. $\Delta IntragroupCredit\%$ and $\Delta IntragroupCredit\% \times \ln(RER_{s,d})$ are instrumented by $Instrument$ and $Instrument \times \ln(RER)$. $\Delta IntragroupCredit\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. In Panel A, B, and C, instruments are $Collateral\%$, $Collateral$, and $\ln(Collateral Value)$, respectively. $Collateral\%$ is the number of collateralized shares, as a percentage of total shares, immediately prior to the reform. $Collateral$ is a dummy variable equal to 1 if a public firm has at least one large shareholder pledging shares immediately prior to the reform, and zero otherwise. $Collateral Value$ is the number of collateralized shares multiplied by the net assets per share before the reform. In odd-numbered columns, control variables include $\ln(Total Assets)$, $Market-to-Book$, $Leverage$, ROA , $Group CEO$, and $Ordinary$. In even-numbered columns, $Ordinary$ is the only control variable. $Ordinary$ is a dummy variable equal to 1 if the export is ordinary trade, and zero otherwise. All other financial variables are measured as of the beginning of the reform year. Please refer to Table 1 for definitions of other variables. Standard errors are clustered at the product-destination and year levels.

	All				Subsidiaries			
	ln(Price) (1)	(2)	ln(Volume) (3)	(4)	ln(Price) (5)	(6)	ln(Volume) (7)	(8)
	Panel A: Collateral% as Instrument							
ln(REER)	-0.193*** (0.066)		-0.341** (0.135)		-0.350*** (0.094)		-0.345 (0.255)	
ln(REER) × ΔIntragroupCredit%	8.976*** (0.211)		-12.355*** (2.136)		12.075*** (1.439)		-26.208*** (2.484)	
ΔIntragroupCredit%	21.758*** (1.930)		-16.373*** (3.240)		13.944*** (1.670)		-9.993*** (2.336)	
N	70,129	64,368	70,215	64,446	57,060	52,500	57,061	52,501
	Panel B: Collateral as Instrument							
ln(REER)	-0.198*** (0.065)		-0.346** (0.138)		-0.364*** (0.098)		-0.320 (0.259)	
ln(REER) × ΔIntragroupCredit%	6.025*** (0.946)		-15.682*** (2.315)		16.601*** (2.460)		-34.140*** (4.037)	
ΔIntragroupCredit%	25.232** (11.432)		-14.966 (20.035)		24.008*** (0.553)		-30.945*** (4.224)	
N	70,129	64,368	70,215	64,446	57,060	52,324	57,061	52,325
	Panel C: ln(Collateral Value) as Instrument							
ln(REER)	-0.199*** (0.064)		-0.345** (0.138)		-0.355*** (0.096)		-0.331 (0.257)	
ln(REER) × ΔIntragroupCredit%	5.567*** (0.840)		-15.013*** (2.233)		13.792*** (1.835)		-30.826*** (3.388)	
ΔIntragroupCredit%	25.195*** (9.074)		-11.479 (14.781)		23.893*** (1.171)		-25.992*** (3.532)	
N	70,129	64,368	70,215	64,446	57,060	52,324	57,061	52,325
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Public Firm FE	No	Yes	No	Yes	No	No	No	No
Subsidiary FE	No	No	No	No	No	Yes	No	Yes

standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Tunneling and Pricing to Market: IV Estimation, Second Stage (Weighted Regressions)

This table presents the instrument variable (IV) estimates of the effect of intragroup credit on the elasticity of export price and volume to exchange-rate changes. In Panel A, regressions are weighted by the public firm's total assets as of the beginning of the reform year. In Panel B, regressions are weighted by export volumes of each sample unit. From June 2005 through December 2006, public firms in the sample had announced the share-split structure reform. The sample unit is at the level of firm/subsidiary-product-destination-shipment-month. The timing of shipment is restricted in the reform year, including months both before and after the reform announcement. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. Only goods exported by exporting subsidiaries are included. The dependent variables are the logarithms of export price per unit [renminbi (RMB) dollars] and number of exported units. The name of dependent variables appears at the top of each column. $ER_{s,d}$ is defined as $ER_{s,d} \times CPI_s / CPI_{s,d}$. $ER_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (RMB) in terms of the foreign currency of country d as of month s . CPI_s and $CPI_{s,d}$ represent the monthly consumer price index of China and of the corresponding destination country d , respectively. $\Delta IntragroupCredit\%$ and $\Delta IntragroupCredit\% \times \ln(RER_{s,d})$ are instrumented by Instrument and $Instrument \times \ln(RER)$. $\Delta IntragroupCredit\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. The name of instruments appears at the top of each column. Instruments are Collateral%, Collateral, and $\ln(Collateral Value)$, respectively. Collateral% is the number of collateralized shares, as a percentage of total shares, immediately prior to the reform. Collateral is a dummy variable equal to 1 if a public firm has at least one large shareholder pledging shares immediately prior to the reform, and zero otherwise. Collateral Value is the number of collateralized shares multiplied by the net assets per share before the reform. Ordinary is a dummy variable equal to 1 if the export is ordinary trade, and zero otherwise. All other financial variables are measured as of the beginning of the reform year. Please refer to Table 1 for the definition of other financial variables. Standard errors are clustered at the product-destination and year levels.

Panel A: Assets-Weighted Regressions

	Collateral%		Collateral		Collateral Value	
	ln(Price) (1)	ln(Volume) (2)	ln(Price) (3)	ln(Volume) (4)	ln(Price) (5)	ln(Volume) (6)
ln(RER)	-0.407 *** (0.066)	-0.333 (0.414)	-0.386 *** (0.065)	-0.338 (0.427)	-0.381 *** (0.064)	-0.349 (0.429)
ln(RER) × ΔIntragroupCredit%	11.938 *** (1.408)	-7.580* (4.415)	10.339 *** (1.202)	-7.181* (3.939)	10.000 *** (1.110)	-6.337* (3.792)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes
N	52,500	52,501	52,500	52,501	52,500	52,501

Panel B: Volume-Weighted Regressions

	Collateral%		Collateral		Collateral Value	
	ln(Price) (1)	ln(Volume) (2)	ln(Price) (3)	ln(Volume) (4)	ln(Price) (5)	ln(Volume) (6)
ln(RER)	-0.576 *** (0.056)	-0.575 *** (0.056)	-0.575 *** (0.056)	-0.578 *** (0.056)	-0.578 *** (0.056)	-0.578 *** (0.056)
ln(RER) × ΔIntragroupCredit%	35.423 *** (4.745)	37.266 *** (4.956)	37.266 *** (4.956)	32.288 *** (3.684)	32.288 *** (3.684)	32.288 *** (3.684)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes
N	52,500	52,500	52,500	52,500	52,500	52,500

standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Excluding Simultaneous Importers: Subsidiaries (Post-Reform Period)

This table presents the instrument variable (IV) estimates of the effect of the supply of intragroup credit by public firms on the elasticity of export price to exchange-rate changes by excluding exporters that are simultaneous large importers. Observations about exports are excluded if $Import\%$ is greater than 50%. $Import\%$ is the ratio of total imports over total exports made by the same subsidiary with the same destination country in the same month. In Panel A, regressions are equal-weighted. In Panel B, regressions are weighted by public firm's total assets as of the beginning of the reform year. From June 2005 through December 2006, public firms in the sample had announced the share-split structure reform. The sample unit is at the level of firm/subsidiary-product-destination-shipment-month. The timing of shipment is restricted to between the reform announcement and the end of the reform year. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. Only goods exported by subsidiaries are included. The dependent variables is the logarithms of export price per unit [renminbi (RMB) dollars]. $RE_{s,d}$ is defined as $ER_{s,d} \times CPI_s / CPI_{s,d}$. $ER_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (RMB) in terms of the foreign currency of country d as of month s . CPI_s and $CPI_{s,d}$ represent the monthly consumer price index of China and of the corresponding destination country d , respectively. $\Delta IntragroupCredit\%$ and $\Delta IntragroupCredit\% \times \ln(RE_{s,d})$ are instrumented by $Instrument$ and $Instrument \times \ln(RE_{s,d})$. $\Delta IntragroupCredit\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. In columns (1)-(2), (3)-(4), and (5)-(6), instruments are Collateral%, Collateral, and $\ln(Collateral\ Value)$, respectively. Collateral% is the number of collateralized shares, as a percentage of total shares, immediately prior to the reform. Collateral is a dummy variable equal to 1 if a public firm has at least one large shareholder pledging shares immediately prior to the reform, and zero otherwise. Collateral Value is the number of collateralized shares multiplied by the net assets per share before the reform. All other financial variables are measured as of the beginning of the reform year. Ordinary, the only control variable, is a dummy variable equal to 1 if the export is ordinary trade, and zero otherwise. Standard errors are clustered at the product-destination and year levels.

Panel A: Equal-Weighted Regressions

	Collateral%		Collateral		ln(Collateral Value)	
	ln(Price) (1)	ln(Volume) (2)	ln(Price) (3)	ln(Volume) (4)	ln(Price) (5)	ln(Volume) (6)
ln(RER)	-0.491*** (0.053)	-0.409 (0.257)	-0.527*** (0.062)	-0.489* (0.287)	-0.510*** (0.057)	-0.482* (0.284)
ln(RER) × ΔIntragroupCredit%	29.838*** (6.324)	-29.291*** (3.633)	39.009*** (5.716)	-8.933*** (2.978)	34.550*** (5.299)	-10.727*** (2.333)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes
N	49,608	49,609	49,608	49,609	49,608	49,609

Panel B: Weighted Regressions, Weight=Assets

	Collateral%		Collateral		ln(Collateral Value)	
	ln(Price) (1)	ln(Volume) (2)	ln(Price) (3)	ln(Volume) (4)	ln(Price) (5)	ln(Volume) (6)
ln(RER)	-0.682*** (0.204)	-0.304 (0.359)	-0.643*** (0.169)	-0.395 (0.406)	-0.636*** (0.167)	-0.393 (0.404)
ln(RER) × ΔIntragroupCredit%	35.100*** (12.682)	-19.901*** (8.712)	31.459*** (9.390)	-11.328*** (4.637)	30.831*** (9.459)	-11.603*** (4.739)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes
N	49,608	49,609	49,608	49,609	49,608	49,609

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Tunneling and Pricing to Market: IV Estimation, SOE vs. Non-SOE Subsidiaries (Post-Reform Period)

This table presents the instrument variable (IV) estimates of the effect of intragroup credit on the elasticity of export price and volume to exchange-rate changes on subsamples of exporters affiliated with SOE and non-SOE business groups. In Panel A, regressions are equal-weighted. In Panel B, regressions are weighted by public firm's total assets as of the beginning of the reform year. From June 2005 through December 2006, public firms in the sample had announced the share-split structure reform. The sample unit is at the level of firm/subsidiary-product-destination-shipment-month. The timing of shipment is restricted between the reform announcement and the end of the reform year. Firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. SOE is a dummy variable equal to 1 if the ultimate owner of a business variable is either SOE or government or state asset-management companies, and zero otherwise. Only goods exported by subsidiaries are included. The dependent variable is the logarithm of export price per unit [renminbi (RMB) dollars]. $REER_{s,d}$ is defined as $ER_{s,d} \times CPI_s / CPI_{s,d}$. $ER_{s,d}$ is the nominal exchange rate defined as the price of the domestic currency (RMB) in terms of the foreign currency of country d as of month s . CPI_s and $CPI_{s,d}$ represent the monthly consumer price index of China and of the corresponding destination country d , respectively. $\Delta IntragroupCredit\%$ and $\Delta IntragroupCredit\% \times \ln(REER_{s,d})$ are instrumented by $Instrument \times \ln(REER_{s,d})$. $\Delta IntragroupCredit\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. In columns (1)-(2), (3)-(4), and (5)-(6), instruments are Collateral%, Collateral, and $\ln(Collateral\ Value)$, respectively. Collateral% is the number of collateralized shares, as a percentage of total shares, immediately prior to the reform. Collateral is a dummy variable equal to 1 if a public firm has at least one large shareholder pledging shares immediately prior to the reform, and zero otherwise. Collateral Value is the number of collateralized shares multiplied by the net assets per share before the reform. Ordinary, the only control variable, is a dummy variable equal to 1 if the export is ordinary trade, and zero otherwise. Please refer to Table 1 for definitions of other variables. Standard errors are clustered at the product-destination and year levels.

Panel A: Equal-Weighted Regressions

	Collateral%		Collateral		$\ln(Collateral\ Value)$	
	SOE (1)	Non-SOE (2)	SOE (3)	Non-SOE (4)	SOE (5)	Non-SOE (6)
$\ln(REER)$	-0.512***	-0.244	-0.519***	-0.218	-0.517***	-0.219
	(0.181)	(0.290)	(0.178)	(0.271)	(0.179)	(0.272)
$\ln(REER) \times \Delta IntragroupCredit\%$	20.353***	-2.994	21.268***	-5.530***	20.984***	-5.433***
	(4.879)	(2.456)	(4.516)	(1.223)	(4.745)	(1.255)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes
N	44251	11327	44251	11327	44251	11327

Panel B: Weighted Regressions, Weight=Assets

	Collateral%		Collateral		$\ln(Collateral\ Value)$	
	SOE (1)	Non-SOE (2)	SOE (3)	Non-SOE (4)	SOE (5)	Non-SOE (6)
$\ln(REER)$	-0.945**	-0.086	-0.922**	-0.078	-0.922**	-0.078
	(0.444)	(0.060)	(0.378)	(0.057)	(0.382)	(0.057)
$\ln(REER) \times \Delta IntragroupCredit\%$	28.825	3.497	27.780*	-2.033	27.776*	-1.724
	(17.874)	(8.113)	(14.665)	(2.806)	(14.897)	(3.088)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes	Yes
N	44251	11,327	44,251	11,327	44,251	11,327

standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: **Tunneling and Propping: Export-Related Firms**

This table presents the estimates of the effect of tunneling of publicly listed firms on subsidiaries' access to intragroup credit. Public firms cross-listed on a B- or H-share market or with distress identification (ST) are excluded. Only export-related public firms are included. In columns (1) and (2), the sample period is in the reform year. In columns (3)-(4), the sample period is from 2004 through 2008. In columns (1) and (3), the dependent variable, $\Delta\text{Propping}\%$, is the difference between intragroup credit in year t and $t - 1$ (scaled by lagged total assets), provided by public firms to their own subsidiaries. In columns (2) and (4), the dependent variable is a dummy variable equal to 1 if $\Delta\text{Propping}\%$ is greater than zero, and zero otherwise. $\Delta\text{IntragroupCredit}\%$ is the difference between the intragroup credit in the announcement year and one year before, scaled by total assets as of the beginning of the reform year (see equation 10 for details). Intragroup credit is defined as the sum of four items of receivables claimed by public firms to the collection of future cash from entities that are economically related to the group parent. The four items are accounts receivable, notes receivable, accounts prepaid, and other receivable. Pre-Zero is a dummy variable equal to 1 if the balance of propping credit in year $t-1$ is zero, and zero otherwise. All other financial variables are as of the beginning of the reform year. Please refer to Table 1 for definitions of other variables. Standard errors are clustered at the industry level.

	Reform year		2004-2008	
	(1)	(2)	(3)	(4)
$\Delta\text{IntragroupCredit}\%$	-0.027** (0.011)	-0.461* (0.235)	-0.048** (0.017)	-0.527*** (0.115)
Pre-Zero	0.002 (0.001)	0.543*** (0.054)	0.006*** (0.001)	0.602*** (0.031)
$\ln(\text{Total Assets})$	-0.000 (0.001)	-0.012 (0.011)	0.000 (0.000)	-0.012*** (0.004)
Leverage	-0.002** (0.001)	-0.049 (0.081)	-0.001 (0.002)	-0.022 (0.030)
ROA	0.016** (0.006)	0.166 (0.339)	0.014*** (0.005)	0.066 (0.107)
Constant	0.005 (0.012)	0.281 (0.241)	-0.009** (0.004)	0.258*** (0.072)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	323	323	1,669	1,669
adj. R^2	0.04	0.46	0.06	0.55

standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$