Heterogeneous Impacts of Finance on Firm Exports: Evidence from Export Deregulation in A Large Developing Country

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Abstract

This paper investigates the heterogeneous effects of finance on firm exports through the lens of differential exporting modes. China's WTO accession leads to an export deregulation, which empowers private domestic firms with low registered capital to export directly. This quasi-natural experiment encourages firms switching from indirect to direct exporting, and thus providing an ideal setting to explore the heterogeneous effects of finance on exports for switchers and non-switchers. Applying the difference-in-differences (DID) approach to a comprehensive survey data on Chinese manufacturing firms, we find that finance improves exports more for firms switching from indirect to direct exporting, relative to continuous indirect exporters. Moreover, we show that the heterogeneous effects of finance on exports for switchers and non-switchers are more pronounced in the post-WTO accession period. The time-varying heterogenous impacts suggest an economic loss caused by the export distortion before China's WTO accession because it prevents productive but financially constrained private domestic firms from direct exporting.

JEL Codes: F13, F14, F61, G20, G28.
Keywords: Finance, Exporting Mode, Export Deregulation, Difference-in-Differences.

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1. Introduction

Both internal and external financial credits are of major importance for a firm's export decisions.[1] Entering export markets typically involves large start-up costs (Arkolakis, 2011; Aw et al., 2011; Dai and Yu, 2013; Chaney, 2016; Bai, et al., 2017), as firms need to collect and analyze information on foreign markets, adapt products and packaging to fit foreign preferences, learn local bureaucratic procedures for market access, set up distribution networks and advertise for marketing penetration. Firms that directly export their products to foreign consumers (***direct exporters***) have to pay the economically significant start-up costs. In contrast, firms that export through intermediaries (***indirect exporters***) can avoid a considerable fraction of the start-up costs.[2] Differential exporting modes could even generate disparity in both costs and benefits for exporters (Bai et al., 2017). As such, financial credits may exhibit heterogeneous effects across firms. In this paper, we attempt to investigate the differential effects of financial credits on continuous indirect exporters and exporters that switch their exporting mode from indirect to direct exporting.

With the availability of micro firm-level data, a growing body of recent literature examines the link between financial credits and firm-level export performance (e.g., Campa and Shaver, 2002; Greenaway et al., 2007; Berman and Héricourt, 2010; Minetti and Zhu, 2011; Manova, 2013; Manova et al., 2015; Channey, 2016). Greenaway et al. (2007), for example, find that financial health has a trivial effect on firm-level export participation decision in the UK, while a firm's export participation decision can significantly improve this firm's financial health. Berman and Héricourt (2010), to the contrary, document that firm-level external and internal

[1]Here, "financial credits" refers to the resources that a firm could rely on to finance for a broad range of economic activities, such as investment, working capital, and entry of international markets. The credits could be either internal, like firms' retained earnings, or external, like loans from outside creditors.

[2]Following Bai et al. (2017), we refer to exporting through intermediaries as indirect exporting mode.

financial health enhances firms' export through the extensive margin, although the effect on the intensive margin is negligible. Minetti and Zhu (2011) find that financial rationing reduces firm-level exports on both extensive and intensive margins by employing data from the Italian manufacturing sector. The conflicting conclusions may be due to the heterogeneous influence of financial credits on different firms. Manova et al. (2015) show that financial constraints have a more pronounced impact on low-productivity firms, and firms belonging to financially vulnerable sectors. Jarreau and Poncet (2014) indicate that the export performance of foreign-owned firms and joint ventures relies more on their own financial credits than private domestic firms in China.

We add to the existing literature by exploring the heterogeneous effects of finance on firms that engage in different exporting modes (indirect exporting against direct exporting). We quantify the heterogeneous effects through a difference-in-differences (DID) estimation, where we define the switching from indirect to direct exporting as the treatment while labeling continuous indirect exporters as the control group. The heterogeneous treatment effects induced by finance in the DID estimation are the differential effects of finance across exporting modes. Furthermore, we exploit how the heterogeneous treatment effects vary over time due to changes in export deregulation on direct exporting rights upon China's WTO accession.

Specifically, direct exporters, who engage in frequent contact with foreign buyers, have more opportunities to improve their productivity and demand stock (e.g. Egan and Mody, 1992; Bai et al., 2017).[3] This may suggest a more efficient utilization of financial credit among direct exporters.[4] As such, relative to continuous indirect exporters, we expect a larger positive impact of financial credits on exporters that switch their exporting mode from indirect to direct

[3]Egan and Mody (1992) demonstrate that a collaborative suppler-buyer relationship, on the one hand, improves exporters' learning-by-exporting efficiency; on the other hand, the buyers are less likely to change suppliers, which make investment in demand stock more effective.

[4]Facing more opportunities to improve export profitability, direct exporters have a higher incentive to invest in reputation building, consumer information collecting, foreign distribution system constructing, etc. This may suggest that direct exporters have a higher efficiency in finance utilization.

exporting. Besides, exports in developing countries are generally plagued by massive distorted policies and resource misallocation. Clarke (2015) looks at factors that affect the export performance of manufacturing enterprises in eight African countries, and find that firms are less likely to export in countries with restrictive trade policies. Khandelwal et al. (2013) also indicate that in China, the gains from trade mainly arise from the elimination of trade quotas and resource misallocation. If export licenses were also misallocated before China's WTO accession, the promoting effect of finance on exports ~~for~~ switchers would be even stronger in the post-WTO accession period due a reduction in trade policy distortions.[5]

China offers an ideal setting to conduct this research in two respects. First, it relaxed regulation on firms' manner of trade, especially exporting modes to fulfill its WTO membership commitment during 2001-2004. More specifically, before China joined the WTO, small firms (mainly private domestic enterprises) with low registered capital had to rely on state-owned exporting intermediaries to export (***indirect exporting***) due to the regulation on direct trading rights. When China became a member of the WTO, the accession clauses required that all firms should be permitted to export directly (***direct exporting***). Hence, we observe a rising share of private domestic firms in the pool of all direct exporters in **Figure 1**. The export deregulation in China encouraged firms switching from indirect to direct exporting, which also inspires us to divide firms into two groups: the treatment and control groups. The former contains firms that switch from indirect to direct exporting, and the latter includes continuous indirect exporters. Second, like most developing countries, severe export distortion and resource misallocation exist (Hsieh and Klenow, 2009; Khandelwal et al., 2013) in China. The export deregulation induced by China's WTO accession offers a quasi-natural experiment to examine the degree of

[5] If export licenses were misallocated before China's WTO accession, the switchers in the post-WTO accession period would exhibit higher export expanding potential through finance as they are more productive but more financially constrained, and hence, they can better utilize financial credits to support their expanding in product scope, production capacity or R&D investment.

export distortion through the time-varying heterogeneous effects of finance on firm exports. [6]

Using a comprehensive dataset on Chinese manufacturing firms, we find supporting evidence. First, in the DID estimation, we find that a 10% increase in firm-level internal (resp. external) finance will on average lead to a 4.42% (resp. 2.95%) more increase in switchers' (treatment group) export values~~,~~ relative to continuous indirect exporters (control group). Second, to examine the time-varying heterogeneous impacts of financial credits on exports for switchers, we divide the benchmark sample into pre-WTO and post-WTO periods to examine the differential promoting effects of financial credits over periods. The results demonstrate that conditioning on a firm switching from indirect to direct exporting, a 10% increase in firm-level internal (resp. external) finance will on average lead to a 3.10% (resp. 8.44%) more increase in export values after China's WTO accession. The main findings remain when we use instrumental variable methods to account for potential endogeneity issues associated with firms' switching in exporting modes, as well as the reverse causality issues associated with financial credits.[7]

We further examine the channel through which financial credits manifest heterogeneous influences on exports for switchers and non-switchers. The results show that firms switching from indirect to direct exporting have a higher efficiency in finance utilization than continuous indirect exporters.[8] One consequence of the higher financial utilization efficiency is that financial credits have a stronger promoting effect on productivity ~~for~~ switchers. This higher

[6] As our paper discusses the role of finance in the context of switching exporting modes (either indirect or direct exporters), we are excluded from talking about the extensive margin of exports (such as selection into exporting, product scope, number of destinations, and sales within each destination-product market). Thus, only the intensive margin of trade is investigated in this paper.

[7] In particular, we instrument the switching in exporting mode variable with the product of firm-level base-year productivity and one-period lagged province-level capital supply shock. In the meanwhile, we proxy the current value of firm-level finance by its one-period lagged value in all baseline estimations. We also follow Manova et al. (2015) ~~constructing~~ industry-level financial credit ratios as a proxy for firm-level financial credits, and all results remain.

[8] Switchers have a higher efficiency in finance usage in terms of a lower current liquidity ratio, a higher inventory turnover ratio, and a shorter operation cycle.

financial utilization efficiency among switchers also offers economic intuitions for our DID results: on the one hand, better finance usage generates a larger promoting effect on exports for switching firms through channels like productivity improvement; on the other hand, less regulation induced by China's WTO accession further enhances financial utilization efficiency of switchers, and thus financial credits manifest an even larger positive impacts on exports for switchers in the post-WTO accession period.

Our work is closely related to Manova (2013) and Manova et al. (2015), in which the authors find a significant impact of financial credits on firm-level export performance. The impact is more pronounced for less productive firms and firms that belong to more financially vulnerable sectors. Unlike Manova (2013) and Manova et al. (2015), we emphasize the heterogeneous influences of financial credits on firms that engage in different exporting modes. Our story is also in line with Bai et al. (2017), which examines how the exporting mode (direct or indirect exporting) affects firm-level export and productivity, and establishes a theoretical foundation for firm-level heterogeneous performance under different exporting modes. Our benchmark DID results ~~provides~~ an interpretation for their claim that export growth favors direct exporters. The argument is that ~~director~~ exporting generates higher efficiency in finance usage, and hence financial credits exhibit a stronger promoting effect for direct exporters than indirect exporters. Furthermore, the time-varying heterogeneous effects of finance relate our study to Khandelwal et al. (2013) and Hsieh and Klenow (2009), who both emphasize the resource misallocation and distortion in developing countries like China, which are of nontrivial influence on welfare. Khandelwal et al. (2013), for instance, show that most gains from trade in China are through the alleviation of distortions.[9] However, most existing models do not account for the effect of trade liberalization on eliminating distortions (especially in developing countries), which could further increase the efficiency of the financial markets.

[9] Gains from trade are only 6% from Arkolakis et al. (2012) and slightly larger in Melitz and Redding (2015).

The rest of the paper is organized as follows. Section 2 reviews the policy and institutional background, especially how the regulation on exporting modes evolved over the period 2001-2004 in China, which also inspires us to propose the hypothesis that we attempt to test in the study. Furthermore, we discuss how to construct the matched dataset and provide some summary statistics in Section 2. In Section 3, we describe the construction of key variables and empirical methodology utilized to conduct statistical inference. Section 4 presents baseline empirical results and robustness checks. Finally, we conclude in Section 5.

2. Background, Hypothesis, and Data

We first present institutional background information on the policy change with regards to restrictions in firm direct exporting rights in China. The policy change inspires us to formally propose the hypothesis on heterogeneous effects of finance that we try to test in this study. It also acts as the source of the time-varying heterogeneous effects of finance on firm exports. We then describe the two data sets we employ in this paper and explain the procedure by which we construct the matched sample that we use for the econometric analysis.

2.1. Background

The policy change that we emphasize here is China's deregulation on firms' direct exporting rights. The international exporting market was highly regulated before China's WTO accession. In 1978, ~~less~~ than 20 specialized Foreign Trade Corporations and around 100 subsidiaries of these corporations dominated Chinese exports with government-issued monopoly export licenses. If a firm wanted to export at that time, it could only go through these Foreign Trade Corporations that acted as exporting intermediaries. It means that only indirect exporting mode was allowed for Chinese firms in that period.

China relaxed the restrictions on direct trading as the reform and opening up policy went into effect. All foreign-owned firms were granted direct exporting rights when the Foreign Trade Law was adopted in 1994. In 1998, the Chinese State Council approved the issuing of direct exporting rights to state-owned and private domestic firms over a threshold size in terms of registered capital or other criteria like sales, net assets, and prospective exporting values (after January 2001, only the registered capital remained as the criterion). Yet, the registered capital requirement was quite demanding in the beginning, around 8.5 million yuan (approximately 1.03 million dollars in 2001) for private domestic firms.

The restrictions on redirect trading were eliminated over the 2001-2004 period when China tried to fulfill WTO accession agreement, at different paces for various ownership types and locations.[10] For example, the registered capital requirements for private domestic firms to get direct exporting rights decreased from 8.5 million yuan to 5 million yuan in January 2001, and further reduced to 3 million yuan in July 2001.

After China entered the WTO in December 2001, the registered capital requirement further dropped to 0.5 million yuan in September 2003, which in practice means there were almost no restrictions on firm exporting as those who want to export typically have registered capital higher than 0.5 million yuan. Finally, starting from June 2004, the registered capital requirement fell to zero, and the restriction was fully removed.[11] One natural result of the export deregulation is that it empowered and encouraged a significant number of productive but financially constrained private domestic enterprises (PDEs) to engage in direct exporting. Hence, the export deregulation in this large developing economy provides us an ideal setting

[10]To have a more detailed perception of how the reform or policy change was accelerated over the period 2001-2004, please see Bai et al. (2017).

[11]Though the registered capital requirement showed a dramatic drop over the 2001-2004 period for most of China, Special Economic Zones like *Shenzhen* and *Xiamen* were treated differently. To be specific, the registered capital requirement for Special Economic Zones stayed at a very low level of 2 million yuan ever since 1998, and dropped to 0.5 million yuan in September 2003. Given this difference, we rule out firms located in Special Economic Zones from our matched sample, as they were essentially unaffected by the trade deregulation, especially in the initial years.

to explore the heterogeneous effects of finance on exports through the lens of differential exporting modes.

It is worthy to mention that even though the restriction on direct exporting rights was eliminated then, there still exist numerous international trade intermediaries in China, since many small firms are relying on them to export under optimal decision processes.[12] Chinese intermediaries appear to have a lower product concentration and export more varieties per country than direct exporters. Moreover, in terms of underlying specific roles, as Ahn et al. (2011) suggest, Chinese intermediaries probably provide services ranging from promoting matches with foreign customers, exploring quality specifications required in foreign markets, and helping firms adapt their products to the needs of foreign consumers. In general, they help firms establish channels to export their products in foreign destinations where small firms themselves could not cover the massive additional fixed/variable costs. The coexistence of direct and indirect exporting, along with the switch from indirect to direct exporting fueled by the export deregulation, further point to the importance of understanding the heterogeneous effects of finance on firm exports across the two different exporting modes.

2.2. Hypothesis

According to Bai et al. (2017), firms that engage in different export modes will exhibit differential cost structures and export growth paths. Specifically, ***indirect exporters*** are firms that rely on the intermediary sector to access foreign markets. The indirect exporting mode allows indirect exporters to save on market-specific bilateral fixed costs. However, comparing with ***direct exporters*** who export products to foreign consumers using their own distribution system, indirect exporters have fewer opportunities to contact with foreign consumers/markets.

[12]As discussed by Ahn et al. (2011), the set of intermediary firms could be identified from the ASIP (Annual Survey of Industrial Production) data set using Chinese characters that have English-equivalent meanings of "importer", "exporter", and/or "trading" in firms' name.

The lack of explorations in foreign markets makes it harder for indirect exporters to design or upgrade products in an appropriate way to satisfy foreign consumers. In contrast, by switching from indirect to direct exporting, firms could engage in frequent contacting with foreign consumers, and thus enhance export profitability more effectively through investing in branding, constructing distribution system, upgrading product quality, etc.

However, those investing activities associated with direct exporting incur large fixed and variable costs, which makes finance a key factor for switchers' export growth. Notice that firms in developing economies are generally financially constrained and the export deregulation mainly encouraged more financially constrained PDEs to switch exporting modes in China. As such, we expect a stronger promoting effect of financial credits on exports for switchers, relative to continuous indirect exporters. Formally, we propose the following hypothesis:

Hypothesis. *Financial credits have a larger positive effect on firm-level exports for firms that switch from indirect to direct exporting, relative to continuous indirect exporters.*

The quasi-natural export deregulation associated with China's WTO accession induces a considerable fraction of indirect exporters, especially small and private domestic firms, to switch from indirect to direct exporting. It thus inspires us to propose a DID estimation strategy to quantity the heterogeneous effects of finance. In particular, **firms switching from indirect to direct exporting** are included in ***the treatment group*** while **firms that remain as indirect exporters** are categorized into ***the control group***. Then, the interaction term of the treatment and finance identifies the heterogeneous treatment effects of finance, which also quantifies the heterogeneous impacts of finance across exporting modes in our story.

2.3. Data Description

To empirically examine the hypothesis, we match two separate Chinese micro-level data sets to get the sample we are employing in the econometric analysis. The first data set is the Annual Survey of Industrial Production (ASIP) spanning the period 1998-2007. This survey, which collects annual firm-level data, is conducted by Chinese National Bureau of Statistics (NBSC). The data set is quite inclusive, in the sense that it incorporates all Chinese state-owned enterprises (SOEs) and non-SOEs with annual sales over 5 million yuan (roughly speaking, 650,000 dollars at that time). In the survey, detailed firm-level information was collected, such as firms' geographic location, year of operation (i.e. the age of the firm), ownership type (state-owned, collective, private, foreign, etc.), employment, production and sales, balance sheet variables, and tax. As for this research, we focus on sales (especially exporting values) and balance sheet information, from which we construct exporting and finance variables in the econometric exercise. The second data set we use is firm-product-level data from Chinese Customs (GACC), which were collected at a monthly frequency over the period 2000-2006. The Customs data cover the universe of transactions going through Chinese Customs, and contain firm-level information like geographic location, ownership type, exporting and importing variables (values, quantities, and unit prices), type of trade, mode of shipment, transit country, export destination country, and import source country.

First, we provide basic statistics for each data set. In the firm-level data set, ASIP, we list statistics of necessary variables to compute firm-level productivity as well as productivity itself in **Table 1**.[13] We inflate labor share (i.e. the ratio of total wage payment to value added) to match the number reported in Chinese input-output tables and national accounts (roughly 50%) as Hsieh and Klenow (2009) suggest. For the deflators of output, intermediate inputs

[13]More specifically, we calculate the revenue productivity, denoted as TFPR, following the methodology introduced by Hsieh and Klenow (2009). Note also that TFPR is dimensionless in **Table 1**.

and capital depreciation rate, we follow the tables constructed by Brandt et al. (2012). It is worth noting that when comparing domestically-selling firms to exporting firms, exporters have larger values of TFPR and value added in **Table 1**, which is consistent with the finding in the literature that firms with higher productivity export.

Basic statistics for the Customs data set are presented in **Table 2**.[14] We notice that Chinese exporters do expand rapidly during our sample period as Manova and Zhang (2012) find. During these seven years, the number of exporting firms has increased from 62,746 to 171,144, which is nearly a 200% gross growth. The average number of products each exporter shipped aboard, measured by the distinct 8-digit HS codes, has also increased from 30 to 36. Firms, on average, exported to 7 countries in 2000 and this increased to more than 8 countries in 2006. To some extent, this evidence suggests that joining the WTO has improved Chinese firms' exporting performance in the global market.

Following Manova and Yu (2016), we carefully match the two data sets. The detailed matching process is in the Appendix. Using the matched sample, we document summary statistics to gain some intuition for our econometric analysis in the following sections. To conduct the econometric analysis, we need to distinguish different types of exporters. Firms, primarily private domestic enterprises, which switched from indirect to direct exporting under the relaxed WTO regulations, are those that may have been most helped by an improvement in their financial conditions. Like Bai et al. (2017), we infer firms' exporting modes as ~~follows. Firms~~ from the ASIP data set are tagged as exporters if they report positive exports (otherwise they are non-exporters), and as direct exporters if they are also observed in the Customs data set. The fact that we observe the universe of transactions going through Chinese Customs allows us to tag the remaining exporting firms (those which are not observed in the Customs

[14]For the product-level Customs data, we first add up the entries to firm-level by exporting values. That is, if a firm exports more than one good, we add up the export values of all goods and then obtain just one entry for that firm.

data set) as indirect exporters. Firms that report exports larger than their exports in the Customs data set are exporting both directly and indirectly and are labeled as direct exporters in this paper. Firms that do not sell domestically are removed from the sample. We notice that a classification bias might show up when direct exporters are misclassified as indirect exporters. It occurs when identical firms are recorded with different Chinese names in the two data sets, and thus matching failure arises. By definition, in our sample, those unmatched direct exporters will be treated in the same way as indirect exporters. This misclassification only renders the heterogeneous treatment effect of finance in our DID estimation downward biased, provided that direct exporters rely more on finance to serve international markets.[15]

In **Table 3**, we are comparing the three types of firms. Above all, we notice that the average export value of direct exporters is systematically higher than that of the indirect exporters over our sample period.[16] Though both exporting values increased dramatically after 2004, the huge level value difference between them remained largely unchanged. The persistent difference suggests that switching from indirect to direct exporting may help firms to grow. This in turn probably provides firms an incentive to switch exporting modes. Next, we find large productivity differences between direct exporters and indirect exporters/non-exporters. The average productivity difference between direct exporters and indirect exporters is in the range of 5% to 20%. This is consistent with the literature that more productive firms are exporting directly as they can afford large additional exporting costs (Ahn et al., 2011). The average TFPR gap between direct exporters and non-exporters is also quite large. It lies between 10% and 30% across years. Also, more firms have been engaged in exporting and more exporters

[15] As we will show later, direct exporters not only have stronger demand for finance to enter exporting markets, but also have a higher efficiency of finance usage than indirect exporters. Therefore, if we misclassified a direct exporter into the indirect exporter group because of matching failure, the effect of financial credits on indirect exporters would be over-estimated. Thus, the heterogeneous treatment effect of finance in the DID estimation results will be downward biased.

[16] We also show in **Table 3** the composition of different firms in our matched sample. Specifically, column 3 of **Table 3** reports the number of direct exporters, indirect exporters, and non-exporters over years.

have decided to export directly. From 2000 to 2006 the percentage of exporters has increased from 26.6% to 29.3%. In 2000, 10.9% of firms are inferred to be direct exporters, while 14.7% are indirect exporters. However, in 2006, 15.7% of firms are direct exporters while only 13.5% are indirect exporters. The finding of firm export mode dynamics is consistent with Ahn et al. (2011) and Bai et al. (2017), and probably could be explained by the fact that more productive PDEs are engaged in exporting directly in order to reap a better growth in productivity and demand stock.

Our choice of treatment in the DID estimation, and especially the time-varying heterogeneous treatment effect of finance, is closely tied to the variation in the composition of direct exporters. We expect that more PDEs shall enter the group of direct exporters in the post-WTO accession period when the export deregulation empowers PDEs with lower registered capital to export directly. To verify this, we plot in **Figure 1** the evolution paths for the share of private-domestic-enterprise (PDE) direct exporters in the pool of all direct exporters. It shows that the share of PDE direct exporters had increased significantly since China's WTO accession in December 2001. Specifically, the share of PDE direct exporters within all direct exporters increases from 22% to more than 45%. It is worthy to notice that the peak of PDE direct exporting appeared when the regulation was fully lifted. This could be ascribed to the reason that PDEs that were exempted from regulation in 2001, 2002, or 2003 have planned to switch but start switching in 2004 after a preparation period. This explanation holds in general, considering that direct exporting involves such massive costs and revenue uncertainty that only fairly sizable firms (which were enfranchised in earlier years) can manage it and it takes time to get prepared. Alvarez and López (2005) also find strong evidence, using Chilean data, supporting the conclusion that firms consciously prepare for becoming direct exporters. Moreover, **Figure 1** displays that the average productivity of new switchers had risen remarkably during the export deregulation period. This may suggest that the export regulation resulted in substantial misallocation in exporting licenses. When the regulation was lifted, the degree of distortion had been alleviated, which led to more productive but financially constrained PDEs to switch from indirect into direct exporting, and hence, improved the average productivity of switchers.

As for the accuracy of the matched sample, we also pay attention to the issue of trade types. In recent work, Bernard et al. (2010, 2012) argue that carry-along trade is important in the data. This refers to firms who export final goods for other firms when exporting their own products, thereby acting partially as intermediaries. However, in our benchmark sample, we do not distinguish between such firms and those exporting only their own products, since the data *per se* provide no direct information for classification.[17] We dropped pure intermediaries between domestic producers and foreign buyers, i.e. those who show up in the Customs data set but do not report exporting in the survey data.[18] We also dropped processing and assembly trade firms because they are very different from ordinary trade firms, thus sunk cost and learning opportunities could be very different for processing trade firms (Bai et al., 2017).

3. Measurement and Empirical Methodology

In this section, we first construct key variables related to firm-level exporting, finance, and productivity. Then we set up the baseline econometric model to identify the heterogeneous and time-varying heterogeneous effect of finance on firm export values when the firm switches from indirect to direct exporting.

[17]We check the robustness of carry-along trade by dropping the firms that have export shares higher than 25%. The export share is defined as the ratio of export value from the Customs data to total sales in the ASIP data. When we exclude these carry-along traders, the summary statistics in **Table 3** and our main empirical results are barely changed.

[18]The Customs data do not label the intermediaries. Ahn et al. (2011) and Manova et al. (2015) identify them using keywords in firms' Chinese names, like the Chinese counterparts of "trade company", "export-import company", and so on. We address the issue by following this identification method and find that our benchmark results stay unchanged to a large extent.

3.1. Construction of Key Variables

Before implementing the econometric analysis, we construct the following relevant measures for our study from the two raw data sets and the matched sample. We first construct measures of financial credits. There are various ways to measure internal and external finance based on firms' balance sheet information. We follow Berman and Héricourt (2010) and Guariglia et al. (2011) by defining internal finance (IF_{it}) as the ratio of cash flows (CF_{it}) over total assets (A_{it}), i.e. $IF_{it} = \frac{CF_{it}}{A_{it}}$, since it is a direct measure of the ability of a firm using its own accumulated liquidity to finance new investment. Like Berman and Héricourt (2010), we define external finance (EF_{it}) as the reciprocal of the ratio of total liabilities (L_{it}) over total assets, i.e. $EF_{it} = \frac{1}{L_{it}/A_{it}}$. It measures the firms' ability to borrow from the outside, with a lower liability ratio entailing firms more space to get external funds.

We estimate firm-level productivity using the method introduced by Hsieh and Klenow (2009).[19] Since we do not have firm-level input and output price data, we focus on the "revenue productivity", i.e. TFPR.[20] The estimation of TFPR is conducted using the ASIP data set and the relevant variables for this estimation are value-added and inputs of labor and capital (at the firm level). Next, we define a key measure for this research, i.e. $dExportingmode$, as a dummy variable that takes value 1 when a firm switches from indirect exporting in the previous year to direct exporting in the current year (note that it takes value 0 when the

[19]To account for the robustness of firm-level productivity measure, we compare it with the widely used proxy variable methods with semiparametric estimation, including Olley and Pakes (1996), Levinsohn and Petrin (2003), Wooldridge (2009) and Ackerberg et al. (2015). We find no significant changes relative to our baseline results. To save space, we present only the results using the method by Hsieh and Klenow (2009). It is nontrivial to mention that all these measures are revenue based, given the limitation that there is no firm-level input and output price in our data.

[20]There is a concern that the TFPR might not reflect the real movement in firm-level productivity, thus not acting as an appropriate efficiency measure (See Garcia-Marin and Voigtländer, 2017). The reason is that TFPR is a combination of output price and physical productivity, i.e. TFPQ. When output price decreases, an increase in TFPQ might not be accompanied by an increase in TFPR. That is to say, the efficiency gain will not be captured by TFPR when it is translated into lower output price for consumers. In our study, this potential measurement issue will only downward bias the estimated result when physical productivity is available, conditioning on the fact revealed in Brandt et al. (2017) that trade liberalization upon China's WTO accession induced a drop in output price and more so for direct exporters that are large and productive.

firm remains an indirect exporter from one year to the next).[21] Finally, we obtain measures of export values directly from the Customs dataset, in which exporting values measure the intensive margin of firm exports.

3.2. Empirical Methodology

The empirical strategy we employ in this paper is panel data difference-in-differences (DID) regression. With divergent cost structures and growth paths between direct and indirect exporting, Chinese exporters bearing different exporting modes could serve as an interesting subject for applying the DID methods. To test the heterogeneous effects of finance on export values expressed in our hypothesis, we consider firms that switch from indirect to direct exporting as ***the treatment group*** and firms that continue to engage in indirect exporting as ***the control group***. During the WTO accession period, the Chinese government removed restrictions on direct exporting primarily for PDEs, which encouraged these productive but financially constrained firms to switch from indirect to direct exporting. The policy change thus provides a quasi-natural experiment that inspires us to study the heterogenous effects of finance for switchers and non-switchers because switching in exporting mode might be a nonnegligible source of trade gains from the removal of misallocation or distortions in developing countries like China.

Formally, we will test the hypothesis: *financial credits have a larger positive effect on firm-level exports ~~for~~ firms that switch from indirect to direct exporting, relative to continuous indirect exporters*. Following the research designs of Meyer (1995) and Imbens and Wooldridge (2007), we conduct our benchmark estimation using an individual-level panel data difference-

[21]We report the transition matrix of three exporting status (direct exporting, indirect exporting, and non-exporting) in **Table A1** in the Appendix.

in-differences model for multiple time periods:

$$
\begin{aligned}
y_{it} = \alpha + \beta \times x_{it} + \tau_1 \times dExportingmode_{it} + \tau_2 \times dExportingmode_{it} \times x_{it} \\
+ \mathbf{z}_{it}\gamma + c_i + \eta_{st} + \eta_{pt} + u_{it},
\end{aligned}
\tag{1}
$$

where y_{it} is firm-level export, x_{it} is our measure of financial credits, and $\mathbf{z}_{it}$ are individual-specific controls which include ~~the financial variable x_{it}.~~ The dummy $dExportingmode_{it}$ captures the switch from indirect to direct exporting. It equals 1 if a firm switches from indirect to direct exporting and equals to 0 if it remains an indirect exporter.[22] η_{st} and η_{pt} capture sector-year and province-year fixed effects, and u_{it} is unobserved idiosyncratic shock.

The coefficient τ_1 captures the average treatment effect (to be precise, on the treated) of switching exporting mode from indirect to direct exporing, and τ_2 is the ***heterogeneous treatment effect*** of finance on firm exports. We expect a statistically significant and positive τ_2 because direct exporting incurs significant entry/fixed costs and thus creates large space for finance to contribute to export growth. We leave further exploration of the underlying channel through which finance exhibits larger positive impacts on switchers's export to the next section, where we emphasize the efficiency of financial utilization.

We estimate the empirical equation above using the fixed effect (FE) panel data method to control for firm-level unobserved heterogeneity c_i. However, it must be noted that in our context the empirical analysis based on the classic panel data difference-in-differences model might be unreliable since it is subject to an endogeneity (or self-selection) issue. If a firm's

[22]We define treatment as switching from indirect to direct exporting, and then evaluate relevant economic implication of this treatment. The choice of the treatment is not merely in line with the theory on the cost and benefit heterogeneity of alternative exporting modes, but also motivated by our data. It is shown in our sample that on average the transition probability from indirect to direct exporting is double of that from direct to indirect exporting. To be specific, the average annual transition probability is 6.3% versus 3.5% (see **Table A1**). Thus, our data suggests that switching from indirect to direct exporting is relatively more important than the reverse case, which also inspires us to focus on this phenomenon in the current study.

intensive exporting decision (i.e. to export more) encourages the firm to switch from indirect to direct exporting, then the $dExportingmode_{it}$ variable in the difference-in-differences equation is endogenous and the FE estimation is invalid.[23]

We address the endogeneity issue using the instrumental variable approach. We instrument the switch in exporting mode $dExportingmode_{it}$ with the product of firms' base-year productivity and one-period lagged province-level aggregate capital supply shock. Firm-level base-year productivity, $TFPR_{i,t_0}$, is firm i's productivity in the base year,[24] and province-level aggregate capital supply shock is the availability of regional capital stock devoid of state interventionism (see Jarreau and Poncet, 2014, for more information) and accessible to all individual firms. Economically, a larger regional capital supply stock in last period signals an expansion in access to external finance and could encourage firms to switch export modes. The lagged regional capital supply shock also tends to be uncorrelated with unobserved factors that affect current exports because it is predetermined at the aggregate level. Whereas, this aggregate shock lacks within-region variation. As such, we multiply one-period lagged regional capital supply shock by firm-level base-year productivity, to generate sufficient variation for the instrument at the firm level. Firm-level base-year productivity is a key factor in determining firm's export mode, but it does not correlate with unobserved factors that affect current exports because it is predetermined at the very beginning.

Exploring the idea proposed by Jarreau and Poncet (2014), we measure regional aggregate capital supply shock using a financial market deepening variable, which is the market share

[23]Moreover, a selection problem might occur as a result of our differencing calculation in the FE method, when firms do not disappear from our sample but become unobserved for some periods (e.g. some firms stop exporting for a few years and re-enter later). Firms that stop exporting for a few years may not be as productive as constant exporters, thus the probability of their being observed is correlated with our independent variables, individual effect and the error term. Yet, the selection problem does not undermine our estimation because it leads to a downward bias and is less severe if the panel is short, which is just our case.

[24]Base year is the first year that we observe firm i. In our benchmark sample, the base year could be very different across firms. We also keep only firms which enter our sample no later than 2000, and all base-year productivity is computed in year 2000. All results are only marginally different, which are available upon request.

of banking credits extended by commercial banks other than China's four biggest state-owned banks (namely, Industrial & Commercial Bank of China, Bank of China, China Construction Bank, and the Agricultural Bank of China). A higher market share of these non-Big4 banks in total bank credits implies a higher degree of financial market liberalization, and thus more financial access or capital supply for individual firms.[25] Since only province-level information on banking credits is available, we construct this variable at the province level, thus all firms within a province face the same capital supply shock. To further mitigate the endogeneity concern, we use one-period lagged market share to construct the instrumental variable. Specifically, the instrumental variable for $dExportingmode_{it}$ is $TFPR_{i,t_0} \times NonBig4_{p,t-1}$, where t_0 is the base year, $NonBig4_{p,t-1}$ is the one-period lagged share of banking credits extended by banks other than Big4 state-owned banks in province p.

Since our endogenous variable $dExportingmode_{it}$ is binary, we then employ the three-stage procedure proposed by Adams et al. (2009) to avoid the *forbidden regression problem* in IV estimation. In the first stage, we estimate a probit model of $dExportingmode_{it}$ on $TFPR_{i,t_0} \times NonBig4_{p,t-1}$ and other exogenous variables to get the fitted value of the binary endogenous variable. Then, in the second stage, we regress $dExportingmode_{it}$ on the first-stage fitted value of $dExportingmode_{it}$ and other exogenous variables. In the third stage, we regress y_{it} on the second-stage fitted value of $dExportingmode_{it}$ and other exogenous variables. To save space, we present first-stage and third-stage estimation results in the paper, while the second-stage results are available upon request.

Moreover, to alleviate the possible endogeneity in internal and external finance, we also

[25] In China, the market share of these big state banks in total bank credits was basically declining over the sample period, which was a natural outcome following the gradual financial reforms since the 1990s. Primarily completed financial reforms include the promulgation of the Commercial Bank Law that provides a legal basis for changing the specialized state banks to state-owned commercial banks. It also meant the transformation of the share holding system in the four biggest state-owned banks, which helped establish a standardized corporate governance and an internal system of rights and responsibilities in accordance with the requirements for modern commercial banks. Other reforms like establishing privately owned small banks, accelerating interest rate liberalization, developing a deposit insurance scheme and improving financial institutions' market exit mechanism are already well underway.

proxy the current value of finance by its one-period lagged value in all baseline regressions. This approach mitigates reverse causality between firm-level finance and exports. As a robustness check, we further follow Manova et al. (2015) to proxy firm-level finance using province-sector finance measures.

4. Baseline Results and Robustness Checks

This section presents and discusses the empirical results of this paper. We begin with the panel data difference-in-differences estimation to examine the heterogeneous effects of finance on firm exports for switchers and non-switchers (the hypothesis in Section 2).[26] Next, we explore the time-varying feature of the heterogeneous effects of finance, which would be induced by the fact that China's export deregulation upon its WTO accession mainly empowered and encouraged productive but financially constrained PDEs to engage in switching from indirect to direct exporting. With the heterogenous effects of finance on firm exports documented, we further investigate the channels through which finance exhibits larger positive impacts for switchers, relative to continuous indirect exporters. Lastly, we present a series of robustness checks for our benchmark results.

4.1. Heterogeneous Treatment Effects

Tables 4 and **5** show the difference-in-differences estimation results for firm-level export value with internal and external finance. We estimate four scenarios distinguished by two dimensions: whether the switch in exporting mode is instrumented and whether firms' age and size (measured by firms' capital stock) are controlled for. As young and small firms tend to rely more on financial credits to grow, we control for firm age and size to isolate the impact of export mode

[26]It is worthy to point out that we take log values for all continuous variables in our regressions.

switching on firms' export performance.[27] Columns 1 and 2 of **Table 4** and **5** present results for the scenarios without instrumenting the switch in exporting mode. It turns out that the estimates are barely changed when we control for firms' age and size. The estimates indicate a significant larger positive impact of financial credits on firm's export value when the firm switches from indirect to direct exporting, thus supporting our hypothesis of ***heterogeneous treatment effect***. Specifically, a 10% increase in internal (resp. external) finance on average increases the promoting effect of finance on firms' export value by 1.10% (resp. 1.72%) when the firm switches its exporting mode. Columns 3 and 4 indicate that after instrumenting the switching in exporting mode with the product of firms' base-year productivity and one-period lagged province-level capital supply shock, the promoting effect of finance is even larger for switchers.[28] Specifically, a 10% increase in internal (resp. external) finance boosts the promoting effect on firm-level export value by 4.42% (resp. 2.95%) (controlling for firms' age and size makes no difference) for switchers, relative to continuous indirect exporters.[29]

In addition, we also find that the coefficients of $dExportingmode$ and internal (resp. external) finance have expected signs. In particular, if a firm switches from indirect to direct exporting, its export value increases by 20.59% (in the case of internal finace).[30] Meanwhile, a 10% increase in firm-level internal finance (external finance) will increase firm-level exports by 1.50% (0.90%). These results are consistent with theoretical expectations and our hypothesis. Moreover, the first-stage estimation confirms that our instrumental variable is very predictive

[27]In all estimations, we also control for the province-year and sector-year fixed effects that would cause the changes in the difference-in-differences estimates even in the absence of treatment.

[28]We have instrum[illegible]d the switching dummy whenever it appears in the specifications, including individual and interaction terms.

[29]We implement the weak-identification test for all estimations with instrumental variables to address the potential weak-instrument problem following the routines proposed by Baum et al. (2007). As they suggest, it is better to use the robust analog of the Cragg-Donald (1993) F statistic, i.e. the rk Wald F statistic to replace the original Cragg-Donald F statistic. Though there does not exist a test for weak instruments in the presence of non-i.i.d. disturbances, the rk Wald F statistic is a sensible option as it is the state-of-the-art in the presence of heteroskedasticity, autocorrelation, or clustering. As it shows later, all of our IV estimations pass the weak-identification test, as the rk Wald F statistics are far larger than 10, which not only surpasses the critical values compiled by Stock and Yogo (2005) but also conforms to the "rule of thumb" of Staiger and Stock (1997).

[30]This calculation is based on column 4 of **Table 4**, respectively. Specifically, $exp(0.1872) - 1 = 0.2059$.

of the treatment variable: switching from indirect to direct exporting. **Table 4** shows that an increase in the instrument variable will lead a rise in the probability of firms' switching exporting mode.

Before moving on to the comparison between internal and external finance, we find it necessary to discuss the difference between OLS and IV estimates in **Tables 4** and **5**. A salient pattern in these tables is that the IV estimates are much larger than OLS estimates. We ascribe this difference to the fact that the instrumental variable method assigns more weights to firms that expect large gains from switching exporting modes and accumulating finance, thus inflating the average treatment effect from firm-specific or heterogeneous causal impact. To be specific, following the logic of Imbens and Angrist (1994) and a recent application by Lileeva and Trefler (2010), we can write the average treatment effect from OLS estimation as $\tau + \mathbf{E}(U)$, where τ is the same for all firms and U is the firm-specific or heterogeneous causal impact. The (local) average treatment effect from IV estimation can be written as $\tau + \big(\mathbf{E}(U \times \Delta p)/\mathbf{E}(\Delta p)\big)$, where Δp is the change in probability of switching exporting modes induced by the instrumental variable in the first stage estimation. Δp acts as the weight used to average U across firms. In the OLS case, the weight is the same across all firms since $\mathbf{E}(U)$ is estimated just using simple sample average. Yet, the IV estimation puts more weight on firms that expect to gain substantially from switching exporting modes and accumulating finance, thus $\big(\mathbf{E}(U \times \Delta p)/\mathbf{E}(\Delta p)\big) > \mathbf{E}(U)$.

Noticeably, the heterogeneous treatment effects in the internal and external finance cases are strikingly different. As for export values, the IV estimation in **Tables 4** and **5** shows that the case of internal finance produces much larger estimates. In particular, it turns out that the effect of a 10% increase in internal finance on average increases the promoting effect of finance on firms' exports by 1.47% (4.42% minus 2.95%) more than that of external finance when the firm switches exporting mode. This finding is consistent with the argument in Manova et al.

(2015) that direct exporters are believed to be more dependent on outside funds than indirect exporters and producers only serving domestic markets because they need to pay large entry and fixed costs when entering international markets. Take a representative firm as an example, it incurs large upfront entry and fixed costs (like studying the profitability of potential markets, product adjustment, and setting up distributional networks) when starting to export directly. These mostly once-and-for-all exporting costs are substantial and could not be covered in general by firms' retained earnings or internal cash flows from routine operations. As a result, direct exporters typically rely more heavily on outside rather than internal financing to prepay entry and fixed costs. Alternatively, it means that external credit is more crucial in financing for entry and fixed costs of direct exporting. The variable costs of direct exporting (such as intermediate input, salaries, and equipment rental fees), however, are not as lumpy, which leaves plentiful room for internal finance to take effect. Since export value is a flow variable and the associated costs are variable costs, we should expect internal finance to have a larger impact on firm exports than external finance. Our difference-in-differences estimation provides solid support for this argument.

4.2. Time-varying Heterogeneous Treatment Effects

Export distortions commonly exist in China. Khandelwal et al. (2013), for instance, document that export licenses are misallocated among textile exporters in China. In particular, relatively small-sized firms, especially PDEs, are less likely to be granted export licenses because of small scale. However, these firms are generally more productive though credit constrained. If deregulation eliminates export distortions, we will expect more productive but financially constrained PDEs to switch their exporting modes from indirect to direct exporting.[31] After

[31]In **Table A2** in the Appendix, we show that the majority of firms which switch their exporting modes are PDEs. We thus naturally expect that the benefits (induced by finance on firm exports) by switching from indirect exporting to direct exporting are larger for PDEs. The results in **Table A3** in the Appendix confirm our conjecture: financial credits play an even more pronounced role in promoting firms' export values for PDEs that switch from

switching from indirect to direct exporting, these more productive but financially constrained switchers can better utilize financial credits to improve their exports through investing in brand reputation or size expanding.[32] China's WTO accession offers us an ideal quasi-natural experiment to quantify the effects of a nationwide (rather than sector-level) reduction in misallocation and distortions on firm exports because it is the right type of policy change that removes restrictions (mainly for PDEs) on granting direct exporting permits. We are trying to utilize this exogenous policy change to show that the heterogenous treatment effect of finance is even larger for switchers in the post-WTO accession period when distortions are reduced.

To estimate the time-varying heterogeneous treatment effect of financial credits on firm-level exports, we estimate the following augmented specification of our benchmark DID setting:

$$\begin{aligned} y_{it} = {} & \alpha + \beta_1 \times x_{it} + \tau_1 \times dExportingmode_{it} + \beta_2 \times dPost_t + \tau_2 \times dExportingmode_{it} \times x_{it} \\ & + \beta_3 \times dExportingmode_{it} \times dPost_t + \beta_4 \times dPost_t \times x_{it} \\ & + \tau_3 \times dExportingmode_{it} \times dPost_t \times x_{it} + \mathbf{z}_{it}\gamma + c_i + \eta_{st} + \eta_{pt} + u_{it}. \end{aligned} \tag{2}$$

where $dPost_t$=1 if the year is 2002 and beyond (otherwise it equals to 0).[33] The variable $dExportingmode_i \times dPost_t$ will be 1 if a firm switches from indirect to direct exporting in the post-WTO accession period. The coefficient τ_3 measures the difference in heterogeneous treatment effects of finance on firm exports before and after China's WTO accession, that is, the ***time-varying heterogeneous treatment effect***. Again, we estimate the empirical equation (2) using the fixed-effect (FE) panel data methods to control for firm-level fixed effects, and we

indirect exporting to direct exporting, relative to SOEs.

[32] More productive firms often produce higher-quality products or charge lower prices. As such, after paying market penetration costs, these firms are more likely to increase their exports through accessing more foreign consumers.

[33] Since export deregulation phases in during 2001-2004 after China's WTO accession, we alternatively choose 2003 and 2004 as the threshold years, and re-estimate equation (2). The results still indicate that there is an even larger heterogeneous treatment effect of finance for switchers during the post-WTO period. These results are available upon request.

control for the endogeneity issue in switching exporting modes using the same instrumental variable discussed earlier.

In **Table 6**, we report the results for the time-varying heterogeneous treatment effect of financial credits on firm-level exports. To save space, we report only the IV estimation results. Column 1-2 and 3-4 show the time-varying heterogeneous treatment effect of internal and external finance on firm-level exports, respectively. **Table 6** shows that finance exhibits an ever larger heterogeneous treatment effect for switchers in post-WTO period, and the estimates basically remain unchanged when we control for firms' age and size. Specifically, we obtain statistically significant and positive estimates for the time-varying heterogeneous treatment effect parameter τ_3 in all the four regressions of **Table 6**. And the estimate is around 0.31 for internal finance while 0.84 for external finance. The positive estimate for τ_3 substantiates the time-varying conjecture of our story. Recall that export distortion is a possible interpretation for the time-varying heterogeneous treatment effects. In the pre-WTO accession period, export licenses were granted mainly to large and state-owned enterprises (SOEs), while more productive but financially constrained PDEs have to export through intermediaries.[34] Hence, in the pre-WTO accession period, switchers are more likely to be less financially constrained firms, but not necessarily firms that expect larger export or productivity growth after switching export mode. When the export distortion has been removed in the post-WTO accession period, firms (mainly PDEs) that expect larger export and productivity growth switch their exporting modes, which leads to an even larger heterogeneous impacts of financial credits on firm exports for switchers.

[34] Khandelwal et al. (2013) also find that before the quota removal of textile and cloth products in China, SOEs are more likely to obtain quotas than PDEs, but they are featured with lower production efficiency.

4.3. The Role of Finance Utilization

In this subsection, we investigate firm-level heterogeneous efficiency in finance utilization to uncover the mechanism through which finance exhibits heterogenous impacts on firm exports across switchers and non-switchers. To this end, we construct four types of measure for finance utilization, and check how they are different when firms engage in switching from indirect to direct exporting, relative to continuous indirect exporters. In addition, we also examine the heterogeneous effects of financial credits on firm-level productivity across switchers and non-switchers, which might act as a bridge to connect difference in finance utilization and heterogeneous impacts of finance on firm exports because productivity improvement could be a key factor determining firm export growth.

Working capital management has long been regarded as an effective way to increase firms' profitability (e.g., Shin and Soenen, 1998; Petersen and Rajan, 1997; Deloof, 2003; Eljelly, 2004). The four measures that characterize the efficiency of firms' usage of finance are current liquidity ratio, receivable turnover ratio, inventory turnover ratio, and operation cycle (Eljelly, 2004; Ding et al., 2013). First, current liquidity ratio (CL_{it}) is the ratio of liquid liability (LL_{it}) to liquid assets (LA_{it}), i.e. $CL_{it} = \frac{LL_{it}}{LA_{it}}$, which expresses a company's ability to repay short-term creditors out of its total cash. A lower liquidity ratio indicates that a company is more liquid and has better coverage of outstanding debts, thus suggesting a higher efficiency in managing liquidity. Second, receivable turnover ratio (RT_{it}) is the ratio of net credit sales (NCS_{it}) to average accounts receivable (AR_{it}) in previous and current periods, i.e. $RT_{it} = 2 \times \frac{NCS_{it}}{AR_{i,t-1}+AR_{it}}$. It quantifies a firm's effectiveness in extending credit and in collecting debts on that credit. The receivable turnover ratio is an activity ratio measuring how efficiently a firm uses its assets. Third, inventory turnover ratio (IT_{it}) is defined as current sales (S_{it}) divided by average inventory (IN_{it}) in two recent periods, i.e. $IT_{it} = 2 \times \frac{S_{it}}{IN_{i,t-1}+IN_{it}}$. It is a ratio showing how many times a company's inventory is sold and replaced over a single period. A high turnover implies strong sales and, therefore, weak inventory, which then indicates that the firm is more efficient at generating returns from its assets and thus maintaining healthy financial conditions. Fourth, operation cycle (OC_{it}) is the sum of two parts, days receivables outstanding and days inventory outstanding within a year, that is, $OC_{it} = \frac{365}{RT_{it}} + \frac{365}{IT_{it}}$. It is also known as the cash conversion cycle, measuring how long a firm takes to convert its sales into cash holdings. A shorter operation cycle means better management performance and more efficiency in finance utilization.

Figure 2 plots the dynamic paths of four financial variables defined above. It shows that, over the period 2001-2004 when the export deregulation on direct exporting rights phased in, switchers exhibit higher efficiency and larger efficiency gains in finance usage than non-switchers, where switchers are firms switching from indirect to direct exporters while non-switchers are continuous indirect exporters. In specific, switchers not only have lower liquidity ratio but also exhibit a steeper decline than non-switchers, from 1.08 to 1.04 versus from 1.10 to 1.09. Similar patterns apply to inventory turnover ratio and operation cycle. Switchers have a higher inventory turnover ratio and shorter operation cycle. They also experience a steeper increase in their inventory turnover ratio and more significant drop in operation cycle. One exception is that the receivable turnover rate divergence between switchers and non-switchers occurs after 2005, rather than over the phase-in period of 2001-2004. This might be caused by the aggressive expansion of direct exporters when the direct exporting was fully liberalized. In that case, direct exporters tend to sell aggressively even when they cannot receive payments immediately, which then leads to massively accumulated accounts receivable and suppresses the receivable turnover ratio.

We further run panel data difference-in-differences regressions for all the four types of financial variables. As in the baseline case, the treatment is defined as the switch from indirect to direct exporting. Results are reported in **Table 7**. It reveals that exporters experience lower liquidity ratios, higher inventory turnover, and a shorter operation cycle when they switch from indirect to directing exporting, in comparison with the case where firms remain as indirect exporters. As for the receivable turnover rate, the treated group barely gains any efficiency. The coefficient is not significant, neither statistically nor economically. Overall, the DID estimation for finance utilization suggests an improvement in finance usage when firms switch from indirect to direct exporting, relative to continuous indirect exporters. Since finance is generally very important and even scarce for exporters, it also helps us to explain the larger positive average treatment effect of finance for switchers in our DID regressions.

We are aware of the caveat that both finance utilization and firm export growth are endogenously determined in general equilibrium models. Thus, it might be difficult to understand why better finance utilization leads to higher export growth. We argue that productivity improvement might be an important connecting bridge, so we further examine the heterogeneous effects of financial credits on firm-level productivity across switchers and non-switchers. If the efficiency of finance utilization is higher for switchers, we will also expect a larger promoting effect of financial credits on productivity (TFPR) for switchers, relative to non-switchers. In particular, we re-estimate equation (1) by replacing firm-level exports with firm-level TFPR. The results are reported in **Table 8**. It demonstrates that financial credits have a stronger promoting effect on firm-level TFPR for switchers. This finding is highly consistent with the learning channel for direct exporters. First, switchers need to effectively utilize finance to support the learning process. After switching into direct exporting, firms have access to frequent contacts with foreign consumers and producers (see Egan and Mody, 1992, for more details), which encourages them to better design products and raise competitiveness via technology upgrading. Those learning activities require more support from finance, thus in turn urging firms to more effectively exploit existing financial credits that are typically scare when firms are serving international markets. Second, direct exporting brings about better growth opportunities for productivity and demand, the higher expected returns also encourage switchers to hike finance utilization rates. Bai et al. (2017) demonstrate that direct exporting generates much better productivity and demand growth paths for switchers. In that case, a profit-maximizing firm will naturally be incentivized to speed up the velocity of financial credits so that it can reap more future benefits from exporting given a fixed amount of financial credits.

4.4. Robustness Checks

In this subsection, we conduct a series of robustness checks for the heterogeneous treatment effects in our benchmark DID estimations. First, if productivity exhibits high persistence, base-year firm-level productivity may still be endogenous. Export license favors state-owned enterprises and firms in large size. Therefore, the share of non-SOEs in each industry will affect the possibility that PDEs acquire their direct export licenses.[35] This further influences these firms' incentive of switching their exporting mode after export deregulation. Economically, a higher share of non-SOEs in an industry in the base year increases firm-level incentive to switch from indirect to direct exporting after deregulation (because it means that firms face less competition to acquire export licenses from those preferentially treated SOEs), but does not correlate with firm-level productivity or exports. To instrument $dExportingmode_{it}$, we thus alternatively multiply the share of non-SOEs in each industry in the base year by the the lagged regional capital stock that is generally accessible to all individual firms. **Table 9** ~~report~~ DID results with the alternative instrumental variable. The results indicate that using the new instrument only slightly changes the magnitude of our benchmark results.

Second, firm-level internal and external finance rely on firm-level performance. Therefore, firm-level exports may potentially influence firm-level internal and external finance, and

[35]We choose year 2000 as the base year and compute the share of non-SOEs in each industry in this base year.

endogeneity in finance arises (induced by reverse causation). Previously, we employ one-period lagged value of finance to replace current value of finance in benchmark regressions. Here, we shall show that a more rigorous proxy for endogenous firm-level financial credits that captures relatively exogenous variation in these variables does not change our main findings. We follow the idea of Manova et al. (2015) to replace firm-level internal and external finance with their sectoral counterparts. With sector-level proxies for firm-level internal and external finance, we re-estimate our benchmark DID model. The estimation results are reported in **Table 10**. ~~Column 1~~ and 2 of **Table 10** reveal that replacing firm-level finance using sector-level counterparts marginally changes our baseline results. The statistical significance keeps unchanged and economic magnitude is just slightly changed. We still have the conclusion that on average the promoting effect of finance on firms' export value is larger when a firm switches from indirect to direct exporting.

5. Conclusions

This paper examines the heterogeneous effects of finance on firm exports through the lens of differential exporting modes. We explore this heterogeneity for firms that engage in switch from indirect to direct exporting and continuous indirect exporters in the context of China's WTO accession. To fulfill WTO accession commitments, China lifted the restriction on direct exporting rights over the period 2001-2004. It is worthy to notice that the regulation on exporting modes primarily inhibited PDEs from exporting directly while more SOEs were exempted. Thus, the export deregulation upon China's WTO accession mainly empowers and encourages PDEs to switch exporting modes. This observation inspires us to concentrate on the heterogeneous effects of finance across switchers and non-switchers on the one hand, and to examine the time varying heterogenous effects of finance for switching exporting modes across pre-WTO and post-WTO periods because PDEs are generally more productive but financially constrained in China.

Using panel survey data on Chinese manufacturing firms, we find the evidence that financial credits improve firm-level exports more for firms that switch from indirect to direct exporting, relative to continuous indirect exporters. We also propose one potential channel through which finance exhibits larger positive effects on firm exports for switchers: switchers have better finance utilization than non-switchers, which leads to larger productivity improvements for switchers, and further helps them gain more export growth from serving international markets through investing in more learning activities. Moreover, the promoting effect of finance on firm exports is even larger for switchers in the post-WTO accession period. The time-varying heterogeneous effects of finance might suggest an economic loss from the export distortions in the pre-WTO accession period when the misallocation prevented more productive but financially constrained PDEs to switch exporting modes and also restricted finance from helping export growth of those firms.

Though we are focusing on the export deregulation in a large developing economy, our work has strong implications in two respects. First, we show the heterogeneous impact of financial credits on different firms. We demonstrate that finance could make a larger contribution to firm-level exports and also productivity growth when firms have a higher efficiency in finance utilization. Second, our study implies additional welfare gains of trade liberalization. The existing literature suggest that: when massive domestic distortions exist, trade liberalization is an effective way to eliminate the distortions relevant to trade, like what happened upon China's WTO accession. Our empirical study further suggests that the elimination of trade distortions provides financial markets a better chance to improve firm-level exports, which results in additional welfare gains as export grows even more.

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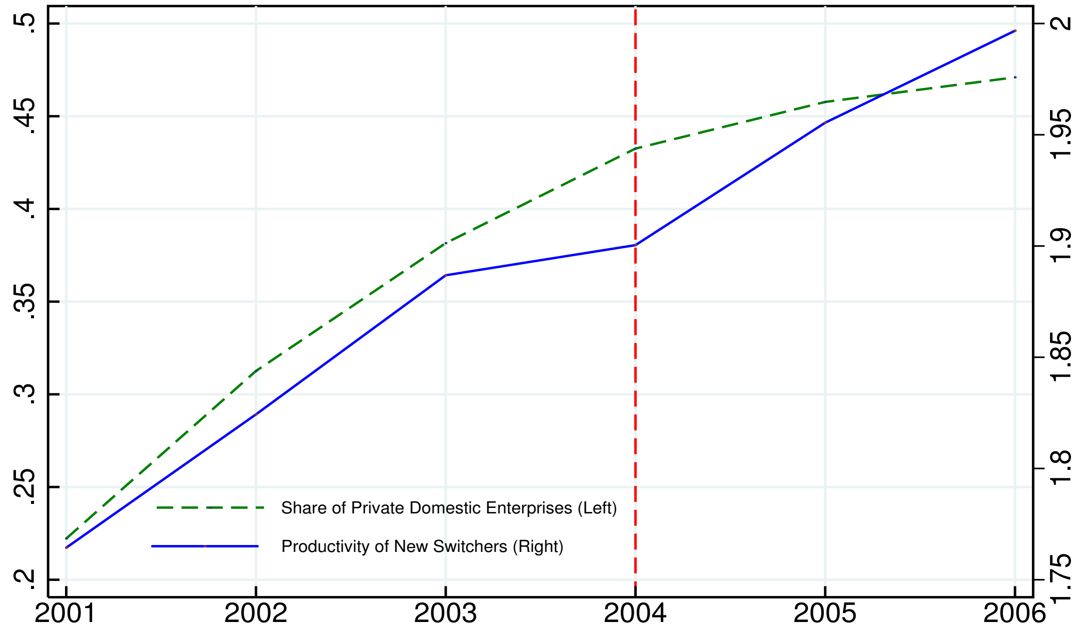

Figure 1. Share of PDEs and average productivity of new switchers, 2001-2006.

Notes. Share of PDEs is the share of PDEs direct exporters in the pool of all direct exporters. Productivity of new switchers is the average productivity of firms that newly switch from indirect to direct exporting. The red dash line confines the period when China fully lifted its regulation on direct exporting rights, that is, 2004.

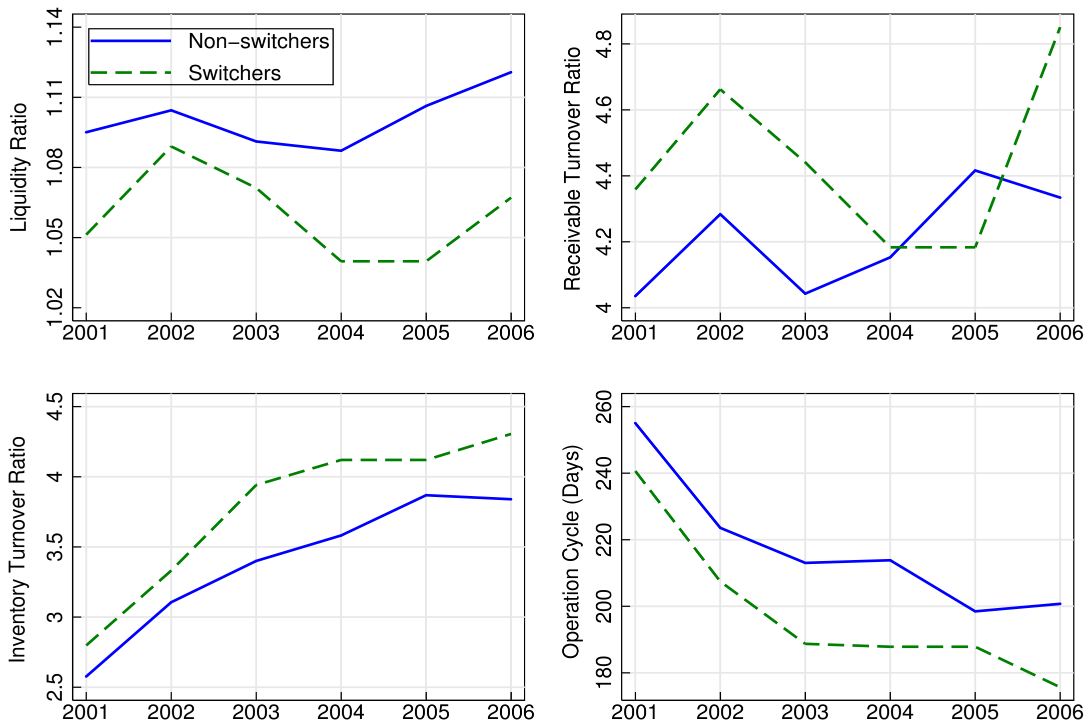

Figure 3. Four measures of firms' efficiency in utilizing finance, 2001-2006.

Notes. Non-switchers are indirect exporters in both previous and current periods. Switchers are firms switching from indirect exporters in the previous period to direct exporters in the current period. The definitions of these four measures for finance utilization could be found in the main text of this paper.

Table 1. Basic Statistical Summary of the ASIP Dataset

Year	Number of Firms	Number of Exporters	TFPR	TFPR of Exporters	Value Added	Value Added of Exporters	Employment Value	Capital Stock	Intermediate Input
2000	146,898	36,759	1.46	1.62	14,105	28,573	354	25,247	39,597
2001	153,958	39,997	1.55	1.71	14,833	28,992	296	24,348	41,570
2002	165,491	44,886	1.64	1.77	16,600	31,738	287	24,274	45,893
2003	180,696	50,534	1.73	1.83	19,410	37,006	276	24,294	55,254
2004	258,390	76,482	1.79	1.88	17,235	31,645	224	20,400	49,465
2005	250,467	74,250	1.85	1.91	21,492	38,993	240	24,123	59,697
2006	278,014	78,052	1.90	1.95	24,101	45,515	229	25,227	65,822

Notes. As in Hsieh and Klenow (2009), TFPR is dimensionless; value added is measured in thousand yuan; labor is measured in persons; capital and intermediate inputs are measured in thousand yuan.

Table 2. Basic Statistical Summary of the Customs Dataset

Year	Number of Observations	Number of Firms	Export Value	Total Destinations	Average Destinations	Number of Products
2000	1,882,359	62,746	29,6791.4	213	6.9	30.0
2001	2,121,515	68,487	286,292.2	222	7.3	30.9
2002	2,613,005	78,612	270,810.7	222	7.5	33.2
2003	3,243,538	95,686	276,459.1	220	7.8	33.9
2004	4,029,789	120,590	297,836.6	220	8.3	33.4
2005	5,103,048	144,030	298,019.1	221	8.3	35.4
2006	6,187,856	171,144	301,018.7	220	8.1	36.2

Notes. Export value is measured in thousand yuan.

Table 3. Three Types of Firms in the Matched Dataset

Year	Exporting Mode	Number of Firms	Mean TFPR	Custom Export Value	Average Destinations
2000	Direct	15,639	1.63	55,120.52	6.46
	Indirect	21,120	1.47	26,580.81	
	Non-exporters	106,994	1.37		
2001	Direct	17,957	1.71	55,482.69	7.00
	Indirect	22,040	1.53	26,678.49	
	Non-exporters	110,188	1.48		
2002	Direct	21,157	1.77	60,235.41	7.66
	Indirect	23,729	1.65	29,911.51	
	Non-exporters	115,891	1.57		
2003	Direct	25,392	1.85	68,748.30	8.27
	Indirect	25,142	1.74	37,509.51	
	Non-exporters	124,233	1.66		
2004	Direct	41,392	1.88	64,746.70	8.09
	Indirect	37,431	1.81	37,237.03	
	Non-exporters	174,321	1.73		
2005	Direct	38,683	1.93	78,127.19	9.21
	Indirect	35,567	1.85	47,413.39	
	Non-exporters	166,285	1.78		
2006	Direct	41,944	1.97	90,630.63	9.81
	Indirect	36,109	1.91	61,387.64	
	Non-exporters	188,714	1.84		

Notes. As in Hsieh and Klenow (2009), TFPR is dimensionless; custom export value is measured in thousand yuan.

Table 4. DID Estimation for Export Value with Internal Finance

Dependent Variable ~~(horizontal)~~	Export Value (1)	Export Value (2)	Export Value (3)	Export Value (4)
dExportingmode × *Internalfinance*	0.1081***	0.1084***		
	[0.0364]	[0.0367]		
dExportingmode_IV × *Internalfinance*			0.4223**	0.4421**
			[0.2123]	[0.2134]
dExportingmode	0.1941***	0.1943***		
	[0.0218]	[0.0219]		
dExportingmode_IV			0.1863***	0.1872***
			[0.0206]	[0.0214]
Internalfinance	0.1521***	0.1529***	0.1482***	0.1503***
	[0.0557]	[0.0559]	[0.0580]	[0.0592]
Age		0.0038*		0.0035*
		[0.0021]		[0.0018]
Size		0.0000		0.0000
		[0.0003]		[0.0004]
Province-Year Fixed Effect	YES	YES	YES	YES
Sector-Year Fixed Effect	YES	YES	YES	YES
R Squared	0.15	0.15	0.14	0.14
Number of Observations	24,782	24,775	24,690	24,683
First stage estimation:				
dExportingmode_IV			0.5525***	0.5549***
			[0.0038]	[0.0038]
dExportingmode_IV× *Internalfinance*			0.2473**	0.2618**
			[0.1057]	[0.1206]
rk Wald F Statistic			408.24	406.79

Notes. Robust standard errors in bracket. Size is measured by firms' capital stock. *dExportingmode_IV* is constructed as the product of firm-level base-year productivity and province-level lagged aggregate capital supply shock. rk Wald F Statistic is reported for the weak identification test of our instrumental variable. ***To save space, we only report the coefficients on instrumental variables in the first stage estimation***. *, **, *** indicate significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 5. DID Estimation for Export Value with External Finance

Dependent Variable ~~(horizontal)~~	Export Value (1)	Export Value (2)	Export Value (3)	Export Value (4)
dExportingmode × *Externalfinance*	0.1701***	0.1698***		
	[0.0212]	[0.0214]		
dExportingmode_IV × *Externalfinance*			0.2565**	0.2946**
			[0.1164]	[0.1426]
dExportingmode	0.1903***	0.1897***		
	[0.0122]	[0.0105]		
dExportingmode_IV			0.1794***	0.1718***
			[0.0089]	[0.0088]
Externalfinance	0.0952***	0.0918***	0.0925***	0.0896***
	[0.0042]	[0.0037]	[0.0039]	[0.0031]
Age		0.0048**		0.0053**
		[0.0022]		[0.0027]
Size		0.0000		0.0000
		[0.0001]		[0.0001]
Province-Year Fixed Effect	YES	YES	YES	YES
Sector-Year Fixed Effect	YES	YES	YES	YES
R Squared	0.15	0.15	0.15	0.15
Number of Observations	24,584	24,576	24,393	24,385
First stage estimation:				
dExportingmode_IV			0.5677***	0.5659***
			[0.0039]	[0.0038]
dExportingmode_IV× *Externalfinance*			0.3128**	0.2956**
			[0.1276]	[0.1238]
rk Wald F Statistic			561.77	564.32

Notes. Robust standard errors in bracket. Size is measured by firms' capital stock. *dExportingmode_IV* is constructed as the product of firm-level base-year productivity and province-level lagged aggregate capital supply shock. rk Wald F Statistic is reported for the weak identification test of our instrumental variable. ***To save space, we only report the coefficients on instrumental variables in the first stage estimation***. *, **, *** indicate significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 6. Time-Varying DID Estimation for Export Value with Internal and External Finance

Dependent Variable ~~(horizontal)~~	Export Value	Export Value	Export Value	Export Value
	(1)	(2)	(3)	(4)
dExportingmode_IV × *Finance* × *dPost*	0.3197***	0.3095***	0.8473***	0.8439***
	[0.0782]	[0.0780]	[0.0311]	[0.3107]
dExportingmode_IV	0.1433***	0.1417***	0.1628***	0.1614***
	[0.0158]	[0.0156]	[0.0172]	[0.0169]
Finance	0.0946***	0.0927***	0.0614***	0.0602***
	[0.0313]	[0.0304]	[0.0065]	[0.0062]
dExportingmode_IV × *dPost*	0.0517*	0.0498*	0.0738*	0.0716*
	[0.0305]	[0.0298]	[0.0397]	[0.0392]
dExportingmode_IV × *finance*	0.1972**	0.1894**	0.0956**	0.0941**
	[0.0944]	[0.0931]	[0.0379]	[0.0362]
dPost × *Finance*	0.0327*	0.0316*	0.1072*	0.1033*
	[0.0179]	[0.0174]	[0.0583]	[0.0580]
Age		0.0061*		0.0105**
		[0.0035]		[0.0056]
Size		0.0000***		0.0000*
		[0.0000]		[0.0000]
Province-Year Fixed Effect	YES	YES	YES	YES
Sector-Year Fixed Effect	YES	YES	YES	YES
R Squared	0.19	0.19	0.16	0.16
Number of Observations	24,636	24,609	24,634	24,609
First stage estimation:				
dExportingmode_IV	0.5645***	0.5672***	0.5507***	0.5494***
	[0.0033]	[0.0035]	[0.0039]	[0.0037]
dExportingmode_IV×	0.2386**	0.2438**	0.2873**	0.2721**
Finance	[0.1020]	[0.1007]	[0.1318]	[0.1302]
dExportingmode_IV×	0.2793**	0.2524**	0.3381**	0.3029**
Finance×*dPost*	[0.1214]	[0.1022]	[0.1352]	[0.1323]
rk Wald F Statistic	514.78	409.34	92.78	94.84

Notes. Columns (1)-(2) and columns (3)-(4) report the time-varying DID estimation results for internal finance and external finance, respectively. Robust standard errors in bracket. Size is measured by firms' capital stock. *dExportingmode_IV* is constructed as the product of firm-level base-year productivity and province-level lagged aggregate capital supply shock. *dPost* is a dummy variable which takes value 1 if the year is 2002 and beyond. *Finance* indicates either internal or external finance. rk Wald F Statistic is reported for the weak identification test of our instrumental variable. ***To save space, we only report the coefficients on instrumental variables in the first stage estimation.*** *, **, *** indicate significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 7. DID Estimation for Efficiency of Finance Utilization

Dependent Variable ~~(horizontal)~~	Liquidity (1)	Receivable Turnover (2)	Inventory Turnover (3)	Operation Cycle (4)
dExportingmode	-0.0218**	0.0026	0.0534***	-0.0322***
	[0.0107]	[0.0130]	[0.0127]	[0.0094]
Export Share	-0.0002	-0.0006***	-0.0008***	0.0007***
	[0.0002]	[0.0002]	[0.0002]	[0.0001]
Age	YES	YES	YES	YES
Size	YES	YES	YES	YES
Province-Year Fixed Effect	YES	YES	YES	YES
Sector-Year Fixed Effect	YES	YES	YES	YES
R Squared	0.16	0.09	1.14	0.08
Number of Observations	9,830	9,853	9,853	9,853

Notes. Export share is the share of exports in firms' total sales, included to control for the level of involvement in international markets after the entry into direct exporting.

Table 8. DID Estimation for TFPR with Internal and External Finance

Dependent Variable (~~horizontal~~)	TFPR	TFPR	TFPR	TFPR
	(1)	(2)	(3)	(4)
dExportingmode_IV ×	0.0778***	0.0783***		
Internalfinance	[0.0084]	[0.0084]		
dExportingmode_IV ×			0.0655***	0.0659***
Externalfinance			[0.0072]	[0.0072]
dExportingmode_IV	0.0264***	0.0257***	0.0207***	0.0196***
	[0.0058]	[0.0056]	[0.0046]	[0.0044]
internalfinance	0.0118***	0.0112***		
	[0.0015]	[0.0014]		
externalfinance			0.0073***	0.0068***
			[0.0024]	[0.0023]
Age		-0.0001		0.0002*
		[0.0001]		[0.0001]
Size		-0.0000***		-0.0000***
		[0.0000]		[0.0000]
Province-Year Fixed Effect	YES	YES	YES	YES
Sector-Year Fixed Effect	YES	YES	YES	YES
R Squared	0.02	0.03	0.02	0.02
Number of Observations	37,438	37,426	37,274	37,261
First stage estimation:				
dExportingmode_IV	0.5842***	0.5785***	0.5906***	0.5893***
	[0.0012]	[0.0012]	[0.0015]	[0.0014]
dExportingmode_IV×	0.1908**	0.1836**		
Internalfinance	[0.0815]	[0.0806]		
dExportingmode_IV×			0.2247**	0.2098**
Externalfinance			[0.0944]	[0.0863]
rk Wald F Statistic	12165.74	12162.61	9200.25	9196.48

Notes. Robust standard errors in bracket. Size is measured by firms' capital stock. *dExportingmode_IV* is constructed as the product of firm-level base-year productivity and province-level lagged aggregate capital supply shock. rk Wald F Statistic is reported for the weak identification test of our instrumental variable. ***To save space, we only report the coefficients on instrumental variables in the first stage estimation***. *, **, *** indicate significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 9. DID Estimation with an Alternative IV for Switching Exporting Mode

Dependent Variable ~~(horizontal)~~	Export Value (1)	Export Value (2)
dExportingmode_IV2 × *Internalfinance*	0.2694** [0.1242]	
dExportingmode_IV2 × *Externalfinance*		0.1748** [0.0828]
dExportingmode_IV2	0.2072*** [0.0294]	0.1994*** [0.0118]
Internalfinance	0.1479*** [0.0535]	
Externalfinance		0.1078*** [0.0046]
Age	YES	YES
Size	YES	YES
Province-Year Fixed Effect	YES	YES
Sector-Year Fixed Effect	YES	YES
R Squared	0.11	0.13
Number of Observations	24,367	24,078
First stage estimation:		
dExportingmode_IV2	0.1819*** [0.0124]	0.1880*** [0.0128]
dExportingmode_IV2× *Internalfinance*	0.0935** [0.0429]	
dExportingmode_IV2× *Externalfinance*		0.0874** [0.0361]
rk Wald F Statistic	217.88	214.06

Notes. $dExportingmode\_IV2$ is an alternative instrumental variable for switching in exporting mode, it is the product of sector-level share of non-SOE firms and province-level lagged aggregate capital supply stock. rk Wald F Statistic is reported for the weak identification test of our instrumental variable. ***To save space, we only report the coefficients on instrumental variables in the first stage estimation***. *, **, *** indicate significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 10. DID Estimation with Sectoral Finance Proxy

Dependent Variable ~~(horizontal)~~	Export Value (1)	Export Value (2)
dExportingmode_IV × *Internalfinance_proxy*	0.3862*** [0.1893]	
dExportingmode_IV × *Externalfinance_proxy*		0.2573*** [0.1191]
dExportingmode_IV	0.1985*** [0.0221]	0.1801*** [0.0097]
Internalfinance_proxy	0.1438*** [0.0498]	
Externalfinance_proxy		0.0923*** [0.0039]
Age	YES	YES
Size	YES	YES
Province-Year Fixed Effect	YES	YES
Sector-Year Fixed Effect	YES	YES
R Squared	0.13	0.14
Number of Observations	24,683	24,385
First stage estimation:		
dExportingmode_IV	0.5467*** [0.0036]	0.5502*** [0.0019]
dExportingmode_IV× *Internalfinance_proxy*	0.2387** [0.0956]	
dExportingmode_IV× *Externalfinance_proxy*		0.2896** [0.1209]
rk Wald F Statistic	379.38	502.78

Notes. *Internalfinance_proxy* and *Externalfinance_proxy* are sector level internal and external finance. rk Wald F Statistic is reported for the weak identification test of our instrumental variable. ***To save space, we only report the coefficients on instrumental variables in the first stage estimation***. *, **, *** indicate significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Appendices (Not for Publication)

A.1. Matching Procedure for Manufacturing and Customs Data

We match Chinese manufacturing survey data (ASIP) and Customs data using the following procedure. This algorithm produces highly comparable results to the existing studies, like Manova and Yu (2016).

Step 1. Given the potential existence of typographical errors in both data sets, we clean the data sets using a conservative approach. In the Customs data set, we use the non-missing modes (i.e. the most frequent value) of party_id, zip code, and telephone number of the monthly data as the annual value for our matching purpose. In both annual data sets, if the identifier or "concatenation of zip code and telephone number" exists more than once, we discard all the observations to avoid the case that an identifier in one data set might link to multiple identifiers in the other data set. Less than 0.01% of the observations are dropped each year due to these typographical errors.

Step 2. To get the identifier concordance, we first match firms' Chinese name of the two data sets if the same names appear in both data sets in the same year. This provides the most reliable matching results. Then we add concordances if the same name shows up in different years of the two data sets, which might be due to delays in information updating. If the second match generates a different identifier concordance from the first match, we dropped the second matched result.

Step 3. We follow the same procedure in *Step 2* for the "concatenation of zip code and telephone" for the two data sets. Again we think that the matches from the same year are more reliable than matches from different years.

Step 4. The order of confidence in the concordance is: same names in the same year, same telephone number and zip code in the same year, same names in different years, and same telephone number and zip code in the different years. Every time the latter matches generate a different identifier concordance from the earlier matches, we use the earlier matched results.

A.2. Additional Tables

Table A1. Transition Matrix of of Exporting Modes

Exporting Mode		Time t	
Time t-1	Non-Exporter	Indirect Exporter	Direct Exporter
Non-Exporter	97.1%	2.1%	0.8%
Indirect Exporter	25.4%	68.3%	6.3%
Direct Exporter	3.0%	3.5%	93.5%

Notes. This table shows the transition matrix of exporting modes for firms in our matched dataset. The transition probabilities are averages across our sample years.

Table A2. Distribution of Firms Switching Exporting Mode into Direct Exporting

Year	PDEs	SOEs	Foreign	Total
2001	53.72%	40.84%	5.44%	100%
2002	64.27%	30.52%	5.21%	100%
2003	72.86%	22.41%	4.73%	100%
2004	58.63%	35.65%	5.72%	100%
2005	52.38%	41.23%	6.39%	100%
2006	47.62%	46.57%	5.81%	100%

Notes. This table exhibits the distribution of firms that switch exporting mode from indirect exporting or non-exporting into direct exporting by ownerships. *PDEs* are private domestic firms, *SOEs* denotes state-owned firms, and *Foreign* are foreign and HMT (Hong Kong, Macau, Taiwan) firms.

Table A3. DID Estimation with Ownership Heterogeneity

Dependent Variable ~~(horizontal)~~	Export Value	Export Value	TFPR	TFPR
	(1)	(2)	(3)	(4)
dExportingmode ×*Internalfinance*	0.1518**		0.0339**	
×*ownership*	[0.0662]		[0.0147]	
dExportingmode ×*Externalfinance*		0.1326**		0.0268**
×*ownership*		[0.0539]		[0.0109]
ownership ×	0.1793**		0.0152**	
Internalfinance	[0.0779]		[0.0063]	
ownership×		0.0926**		0.0076*
Externalfinance		[0.0514]		[0.0042]
dExportingmode_IV×	0.2285*	0.1873*	0.0276*	0.0203*
ownership	[0.1221]	[0.0986]	[0.0154]	[0.0122]
dExportingmode_IV×	0.3297***		0.0643***	
Internalfinance	[0.1030]		[0.0223]	
dExportingmode_IV×	0.2417**		0.0547**	
Externalfinance	[0.1007]		[0.0219]	
Firm-Level Controls	YES	YES	YES	YES
Province-Year Fixed Effect	YES	YES	YES	YES
Sector-Year Fixed Effect	YES	YES	YES	YES
R Squared	0.15	0.15	0.04	0.04
Number of Observations	25,716	25,694	37,319	37,108
First stage estimation:				
dExportingmode_IV	0.5641***	0.5716***	0.5832***	0.5804***
	[0.0044]	[0.0037]	[0.0014]	[0.0013]
dExportingmode_IV×	0.6215**	0.6372**	0.6179**	0.6038**
ownership	[0.2590]	[0.2896]	[0.2686]	[0.2533]
dExportingmode_IV×	0.2539**		0.2873 **	
Internalfinance	[0.1309]		[0.1011]	
dExportingmode_IV×		0.1724**		0.1978**
Externalfinance		[0.0724]		[0.0804]
rk Wald F Statistic	427.86	508.29	12706.48	9125.74

Notes. *ownership* is a dummy variable, which takes value 1 if a firm is a PDE firm, and takes value 0 if it is an SOE firm. Firm-level controls include age, size, and financial credits. The results suggest that finance has an even larger positive impacts on firm exports for switchers if they are PDEs, relative to SOE firms.