

# Government Credit and Trade War

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## Abstract

By merging transaction-level trade data from China Customs and loan data from the China Development Bank (CDB), we analyze the effects of government credit on trade activities. We find that CDB credit mainly flows to SOEs in strategic industries at the top of the supply chain. These upstream loans lead to the lower price and higher amount of export goods of private firms in downstream industries. This leads to decreases in employment and performance of the US firms in the same industry. In contrast, the US firms in downstream industries use cheaper intermediate goods imported from China and perform better subsequently.

**JEL Classification:** E51, F30, G21, G28

**Keywords:** Government Credit; Export; Supply Chain; Trade War

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## **Abstract**

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## 1. Introduction

Governments play an important role in international trade. The literature document various ways of government interventions in trade (e.g., tariffs, quotas, subsidy).<sup>3</sup> However, the evidence is limited for how government credit affects the trade despite the fast-growing government credit across the globe in recent years.<sup>4</sup> On the one hand, the government could distort the credit allocation for mercantilism. On the other hand, government credit could facilitate international trade, especially for credit constraint firms (e.g., Manova, Wei, and Zhang (2015)). China has become the largest trade partner of many countries with the total export amount of approximately USD 2.3 trillion in 2017. The Chinese government has been criticized for its mercantilist policies for trade such as its industrial policies and credit supports.<sup>5</sup> This directly leads to the recent trade war between China and the US.

In this paper, we study the effects of government credit on international trade across the industry supply chain. In particular, we obtain the population data on all export and import transactions in China and the province-industry level loan data from the China Development Bank (CDB). We document two main findings. First, the CDB mainly lend to state-owned enterprises (SOEs) at the top of the supply chain (e.g., strategic industries such as energy and mining) which leads to the surge in export amount and the decrease in prices of export goods of private firms in downstream industries (e.g., manufacturing). Second, the increased export volume with lower price from China leads to decreases in employment and performance of the US firms in the same industry. In contrast, the US firms in downstream industries use the cheaper intermediate goods imported from China and perform better subsequently. This paper shows novel evidence on how

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<sup>3</sup> See, for example, Khandelwal, Schott, and Wei (2013) for the effect of eliminating export quotas on trade, Amiti and Konings (2007) for reducing tariff effects on productivity, Westphal (1990) for the government subsidy in certain industries.

<sup>4</sup> See La Porta et al. (2002) for the overview of government ownership of banks across the globe. Development banks are prevalent in many countries. For example, there are the KfW Bankengruppe in Germany, the Korea Development Bank, the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, and the Inter-American Development Bank Group. US proposed to build the National Infrastructure Reinvestment Bank in 2007. Development finance institutions (DFIs) grew dramatically in size for the past two decades. For example, in 2015, the total assets of DFIs over GDP ratio is approximately 15% on average across 28 countries (Data are from BankScope).

<sup>5</sup> See, for example, the Forbes' article on [China's mercantilist approach to trade](#) and the discussion of China's increased foreign exchange reserve and foreign direct investments in [NBER digest](#).

government credit reshapes the structure of the supply chain by estimating the spillover effects of upstream industry credit on downstream firms' international trade activities.

Our primary data are from the China Customs which record the universe of firms' export and import transactions. For each transaction, we have detailed information (e.g., product price, the number of products, means of transportation, destination country, firm name, firm location, and firm ownership). We also obtain the loan data from the CDB which record the outstanding loan amounts and issuance amounts across 31 provinces and 95 industries. The CDB is the largest policy bank worldwide with total assets of RMB 15.96 trillion by the end of 2017. It has the mandate to provide subsidized credit to SOEs in strategic industries (e.g., energy and mining) and local governments for infrastructure development. We match the customs data with CDB loan data at the province-industry level from 2000 to 2013.

We first perform the ordinary least square (OLS) regressions of firm export activities on CDB credit across the supply chain. We find that the CDB loans outstanding which mainly flow to SOEs have weak positive correlation with SOEs' export volumes in the same industry. For downstream firms, we find that the CDB upstream loans outstanding are significantly and positively associated with the export amounts, the number of export destinations, and the number of export products for private firms in the downstream industries of the same province. This suggests that the government credit to the upstream industries could have positive spillover effects on downstream firms.

The common identification challenge is that the government credit is allocated endogenously. For example, the CDB has the mandate to grant credit to the undeveloped areas and bottle-necked industries in China. In order to establish causal effects, we use the exogenous variation from the pre-determined municipal politicians' turnover cycles. Ru (2018) find that the municipal city secretaries in China tend to borrow significantly more in their early years in office and monotonically decrease the borrowings over the pre-determined five-year tenure. Using the same method, we first identify each city's largest SOE industry (i.e., focal industry), which is often pre-determined. At the province-industry level, we interact the dummy of the focal industries in any cities of a province and the turnover cycles of these cities' party secretaries. We use the interaction terms as the instruments for CDB loans outstanding. In the first stage regressions, we find that the province borrows significantly more for the focal industries of its cities where the city secretaries

are in their earlier years in office. In other words, the newly appointed city secretaries tend to borrow significantly more for the focal industry in their cities, which would be reflected in CDB province-industry level loan amounts.

In the second stage regressions, we find that CDB loans lead to significant increases in export activities of SOEs in the same industry. In particular, a 100% increase in CDB loans outstanding leads to increases in SOEs' export volumes, the number of export destinations, and the number of export products by 4.02%, 1.69%, and 1.25%, respectively. For private firms, we do not find any significant effects of CDB loans in the same industry. This is consistent with the fact that approximately 90% of CDB credit for industrial firms goes to SOEs whereby the other 10% goes to the private firms which are typically big corporations with government connections.

Furthermore, besides the effects of CDB credit on the firms in the same industry, we trace the effects of CDB credit across the supply chain. For each firm, we define the industry that a firm sources the majority of its inputs as the upstream industry by using the input-output matrix. We then perform the 2SLS of firm export activities on CDB loans outstanding in the upstream industries. We find that consistent with OLS regressions, increases in CDB loans for upstream industries lead to increases in export activities of private firms in downstream industries. On average, a 100% increase in CDB upstream loans outstanding leads to nearly 2% increase in private firms' export amounts, 1.36% increase in the number of export markets, and 1.23% of the number of products. This positive spillover effect is significantly more pronounced for firms with the higher dependency on the inputs from upstream firms. Moreover, we also find that an increase in CDB upstream loans leads to significant declines in the price of export goods. On average, when CDB upstream loan amounts double, the average price drops by 6.5%. In contrast, these effects of upstream CDB credit are muted for SOEs in downstream industries. In short, CDB upstream loans could help the downstream private firms' exports whereby SOEs in downstream industries cannot capture this positive spillover effects from upstream industry credit.

Next, we study how the surges of export activities caused by government credit in China affect the firms in other countries. In particular, we focus on the trade between the US and China that is one of the biggest bilateral trade relationships in the world. Based on the estimated coefficients in 2SLS regressions, we calculate the increased export amount from China to the US caused by CDB

loans at the industry level according to US industry standard. We then perform the regression of US firms' performance and employment on estimated export amounts, both in the same industry (i.e., horizontal effect) and across the industry supply chain (i.e., upstream effect). We find the exports from China decrease US firms' assets, sales, and employment in the same industry. However, the exports benefit downstream US firms which tend to source intermediate goods from China. Specifically, when export volume from China increases by 100%, it increases an average US firm's total asset, sale, and the number of employees by 5.2%, 2.7%, and 3.2%, respectively. Although the US firms are crowded out by the cheaper goods from China, the firms in downstream industries could gain from cheaper intermediate goods as inputs of productions from China.

Our contribution to the literature is three-fold. First, this paper adds to the growing literature on how government intervenes the international trade. It is well documented that governments could use trade policy and tariff to affect the trade activities (e.g., Pavcnik (2002); Amiti and Konings (2007); De Loecker (2011); Khandelwal, Schott and Wei (2013); Topalova and Khandelwal (2011); Fan, Li, and Yeaple (2015); De Loecker et al. (2016); Brandt et al. (2017)), and strong financial institutions could facilitate trade, especially for sectors that rely more on external finance (e.g., Kletzer and Bardhan (1987); Beck (2002, 2003); Svaleryd and Vlachos (2005); Hur, Raj, and Riyanto (2006); Ju and Wei (2010, 2011); Becker, Chen, and Greenberg (2013); Manova (2013)).<sup>6</sup> However, very little attention has been paid to the role of government credit in trade. We fill in this gap by documenting the positive spillover effects of government credit on downstream private firms' export.<sup>7</sup> In particular, the CDB credit could alleviate firms' constraint in financing fixed costs of entering into new markets (i.e., increased number of export destinations) and increase the export amount.<sup>8</sup> This serves as another essential government intervention in international trade.

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<sup>6</sup> Recent literature document the negative effects of credit constraints on trade at the firm level (e.g., Manova (2008); Berman and Héricourt (2010); Amiti and Weinstein (2011); Minetti and Zhu (2011); Bricongne et al. (2012); Fan, Lai and Li (2015); Manova, Wei, and Zhang (2015); Muuls (2015); Paravisini et al. (2015)).

<sup>7</sup> There is a long debate on the economic consequences of government credit. Government credit could crowd out the private sector investments (e.g., King and Levine (1993); Demirguc-Kunt and Maksimovic (1998); Levine and Zervos (1998); Rajan and Zingales (1998); Levine, Loayza, and Beck (2000) while it could have positive externalities (e.g., Stiglitz (1993)). Our results echo Huang, Pagano, and Panizza (2016) that documents the crowding out effects of local government debt in China.

<sup>8</sup> The number of export destinations are widely used in the literature to measure the performance of firms' export (e.g., Minetti and Zhu (2011); Chan and Manova (2015); Manova, Wei and Zhang (2015); Muuls (2015)).

Second, our findings provide empirical evidence and policy implications regarding the recent trade war between the US and China, one of the largest bilateral trade partners worldwide. China contributes 30% of the global GDP growth whereby the “Chinese mercantilism” has been criticized heavily by many countries that is also one of the main triggers of the recent trade war. On the one hand, our finding of crowding out effects of cheaper goods from China on the US firms in the horizontal industries is consistent with prior literature documenting the negative impact of imports from China on US employment (e.g., Autor, Dorn, and Hanson (2013); Pierce and Schott (2016)). On the other hand, we show that the decreased prices of intermediate goods from China could benefit US firms in the downstream industries. This complements the recent study by Wang et al. (2018) that finds the import intermediate goods from China lead to increases in employments of US firms in downstream industries. We provide additional evidence that the government credit leads to the decline in prices of intermediate goods and the subsequent increase of export volume.

The rest of this paper is organized as follows. We describe the institutional background of China in Section 2. We then present our data and summary statistics in Section 3. Section 4 provides the empirical results. Section 5 concludes.

## **2. Background**

China remains a closed economy until the late 1970s. Starting with the economic reform in 1978, China opened its economy, and the trade began to grow. Throughout the reform, the Chinese government reduced tariffs, trade barriers, and regulations, with the overall tariff rate falling from 56% to 15%. More than 60% of the imports were free of tariffs, and only 9% of import were subject to licensing and import quotas by 2001. Trade amount between China and the rest of the world has increased from only \$20 billion at the beginning of the reforms to more than \$500 billion in 2001.

On 11 December 2001, China became an official member of the World Trade Organization (WTO) after going through an arduous and prolonged negotiation of 15 years since its initial application. After joining the WTO, China’s international trade rose rapidly, and firms expanded fast to the global markets. Total trade amounts increased from nearly \$510 billion in 2001 to more than \$4.1 trillion in 2013 with the export amounts rising from \$266 billion to \$2.2 trillion. In 2013,

China surpassed the US to become the largest trading nation in the world. Over the years, to promote international trade, integrate into the global economy and strengthen economic cooperation with other economies, China has established free trade agreements (FTA) with 14 countries or regions.<sup>9</sup> China has been one of the most important players in international trade and has increasingly engaged in trade organizations and treaties in recent years. Our sample period spans from 2000 to 2013, mainly covering China's post-WTO era of international trade.

Although China employs an open market economy, its economic model is often viewed as the socialist market economy characterized by a mixed system presenting the typical features of both the market and planning economies.<sup>10</sup> The fundamental distinction between the Chinese model and the traditional Western market economy model lies in the degree of state-ownership and underlying authoritarian political philosophy, where the Chinese government has controlling power over the economic activity through corporatized government agencies and the state-owned enterprises. The China Development Bank (CDB) provides such a tool for the Chinese government to exert controls over the economy and to implement the fiscal policy.<sup>11</sup> The CDB is the biggest policy bank in China under direct control by the State Council, which is mandated to provide medium- to long-term financing facilities that serve China's long-term economic and social development strategies, especially in undeveloped areas and bottle-necked industries.<sup>12</sup> It is also the largest development finance institution in the world with total assets of RMB 19.56 trillion and balance of loans of RMB 11.04 trillion as of 2017.<sup>13</sup> Currently, it has 37 primary branches and 3 secondary branches on the Chinese mainland, one foreign branch in Hong Kong and five representative offices in Cairo, Moscow, Rio de Janeiro, Caracas, and London.

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<sup>9</sup> Currently, China has 19 free trade agreements under construction, where 14 of them have been signed and implemented. For example, China-Australia FTA, China-Switzerland FTA, China-ASEAN FTA. (<http://fta.mofcom.gov.cn/english/>)

<sup>10</sup> See for example: "The rise of state capitalism". *The Economist*. 21 January 2012. Bremmer, Ian (2009). "State Capitalism Comes of Age". *Foreign Affairs*. Council on Foreign Relations.

<sup>11</sup> The CDB is fully owned by states and has two main shareholders; the Ministry of Finance and the Central Huijin Investment. The Central Huijin Investment is a state-owned investment company mandated to exercise the rights and the obligations as an investor in major state-owned financial enterprises, on behalf of the State.

<sup>12</sup> See Ru (2018) for a more detailed description of CDB's history and background.

<sup>13</sup> It is also the largest Chinese bank for foreign investment and financing cooperation, long-term lending and bond issuance. (<http://www.cdb.com.cn>)



The CDB is different from Chinese commercial banks in many ways despite the CDB and large commercial banks in China are all state-owned.<sup>14</sup> First, the CDB issues policy loans which target mainly the infrastructure projects and the strategic industries in China. Driven by profit primarily, commercial banks employ a different lending strategy and focus on rich provinces in China (e.g., areas along the east coast). Second, the CDB has longer and closer relationships with local governments than commercial banks do. CDB helped many local governments build the financing vehicles to raise debt for them. Around 50% to 60% of the outstanding loans of the local governments are coming from the CDB between 2006 and 2013 (Gao, Ru, and Tang (2018)).

Local politicians play an essential role in obtaining credit from the CDB. In China, the Communist Party Committee Secretary at the municipal level (i.e., city secretary) is the leading politician of the city. The city secretary has broad administrative power and controls within the city system and is responsible for the overall development of the city. For example, a city secretary generally has the sole power to appoint or remove any government officials in the city at the lower political hierarchy. Maskin, Qian, and Xu (2000) show that promotion is one of the most important career aspirations for politicians in China. It is well known that GDP performance of the city has been the primary determinant of promotion for city secretaries (e.g., Li and Zhou (2005)). The city secretaries have strong incentives to borrow from the CDB and make investments to boost the local GDP so that they can get promoted in future, which is consistent with Ru (2018) who documents that promotion probabilities are positively associated with CDB loans. Therefore, career concerns incentivize a new city secretary to borrow as soon and much as possible from the CDB. In this paper, we utilize this fact to employ our identification strategy and to explore the variations of CDB loans' changes following local politicians' turnover, thereby examining the causal impact of CDB loans on firms' trade activities.

### **3. Data, Variables, and Summary Statistics**

We use five datasets for our empirical analyses, including the population of export transactions from the China Customs Office, the unique proprietary dataset on loans from China Development

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<sup>14</sup> The big four commercial banks in China are Industrial and Commercial Bank of China (ICBC), China Construction Bank (CCB), Agriculture Bank of China (ABC), and Bank of China (BOC).

Bank, firm-level characteristics data from Chinese Industry Census (CIC), hand-collected Chinese politician profile data, and data on US firms' characteristics from Compustat.

### ***3.1. China Customs Data and Chinese Industry Census Data***

Our international trade data record the universe of firms' export and import transactions from 2000 to 2013, where these data have been collected and made available by the Chinese Customs Office.<sup>15</sup> The data report the free-on-board value of firm exports by product and country for more than 200 destinations and over 7000 products identified by the eight-digit Harmonized System (HS) codes.<sup>16</sup> For each transaction, the data contain variables such as the identifying information of the exporter/importer, the unit price, trade amount, type of trade, means of transportation, the customs office where the transaction was processed, the region or city in China where the product was exported from or imported to, and any potential transfer country or region.<sup>17</sup> Figure 1 shows the largest ten destination countries ranked by total export amounts from 2000 to 2013. As expected, US is China's largest trading partner with the export amount almost doubling that of Japan, the second largest trading partner. The top ten countries account for half of all the exports from China from 2000 to 2013.

**[Insert Figure 1 about here]**

Since our CDB loan data are at the province-industry level, we classify export products according to the CDB's 95-industry classification.<sup>18</sup> Using the concordance tables from World Integrated Trade Solution (WITS), we first obtain the US SIC industry code for each product code and then manually match the SIC industry code with CDB industry code. Figure 2 shows the top five export industries as ranked by export amounts for 2002 and 2013. The largest export industry is communications equipment, computers, and electronic equipment manufacturing. The second and third largest export industries have changed from Apparel and Textile in 2002 to general

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<sup>15</sup> Prior literature (e.g. Manova and Zhang (2009); Jarreau and Poncet (2014); Manova, Wei and Zhang (2015)) used the same data to study the export activities of China, and none of them employ a long panel from 2000 to 2013 as in our paper.

<sup>16</sup> Product classification is consistent across countries at the six-digit HS level. The number of distinct product codes in the Chinese eight-digit HS system is comparable to that in the ten-digit HS classification for the US.

<sup>17</sup> See Manova and Zhang (2009) for more detail about the data and stylized facts about firm heterogeneity in Chinese trade.

<sup>18</sup> The CDB industry classification is essentially the same as China's national industrial classification (2002) at the two-digit level, which is comparable to US two-digit SIC industry.

equipment manufacturing and electrical equipment manufacturing in 2013, suggesting a shift in China's industrial structure.

**[Insert Figure 2 about here]**

Based on the information of firm ownership types, we assign firms in the Customs data into two groups: SOE and Private. SOE consist of state-owned enterprises (SOEs) whose majority of shares are owned by government departments (e.g., Ministry of Finance, State-owned Assets Supervision and Administration Commission) and collectively-owned enterprises (COEs) which are owned collectively by all residents in a community and controlled by the local governments. We classify the remaining firms as private firms (i.e., non-SOEs).<sup>19</sup> The key difference between the two groups of firms is that whether the governments control them. Figure 3 shows the time trend of the export amount of both SOEs and private firms. Private firms' export amounts increased from RMB 1 trillion in 2000 to nearly RMB 10 trillion in 2013. Although SOEs exhibit an increasing trend in export, the vast majority of the increases in Chinese export are driven by private firms, consistent with the conventional wisdom that private sectors drive China's economic growth. This fact makes our findings important as we find downstream private firms could benefit from government credit granted to upstream industries.

**[Insert Figure 3 about here]**

Since we are interested in how government credit affects the export activities of the manufacturing firms, we exclude export-import firms that do not engage in manufacturing but serve exclusively as intermediaries between domestic producers (buyers) and foreign buyers (producers). Since there is no variable in the Customs data indicating whether a firm is a trade intermediary, we follow standard practice and use keywords in firms' names to identify them (e.g., Ahn, Khandelwal, and Wei (2011); Manova, Wei, and Zhang (2015)).<sup>20</sup> We also drop observations with missing values on important firm characteristics (e.g., ownership type, location, industry). After data cleaning, the number of exporting manufacturing firms has increased from 55,456 in 2000 to 211,656 in 2013, with the number of export transactions ranging from 2,828,730 in 2000 to 6,692,371 in 2013.

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<sup>19</sup> In this paper, we use the words "private firms" and "non-SOEs" interchangeably.

<sup>20</sup> We search for Chinese characters that mean "trading" and "importer" and "exporter". In pinyin (Romanized Chinese), these phrases are: "jin4chu1kou3", "jing1mao4", "mao4yi4", "ke1mao4" and "wai4jing1".

We construct three main dependent variables at the firm-year level to measure the export activities of Chinese firms. It is of interest to understand how government credit affects the value of the firm's exports. *LogExport* is the logarithm of the export amount (in millions RMB) of the firm, which is the most commonly used metric to measure export performance. Besides, Manova, Wei, and Zhang (2015) argue that tight credit conditions can reduce the firms' number of export destinations if they face a separate fixed cost to enter the new market. The fixed costs can be research on the profitability of potential markets, investment in market-specific capacity, product customization, regulatory compliance and so on. Given limited credit, financially constrained firms must decide which markets to serve and add export destinations in descending order of profitability until they exhaust their limited financial resources. We thus construct *LogNumDestinations* as the logarithm of the number of a firm's export destinations to measure how many markets a firm enters. Moreover, studies have shown credit constraints could reduce export firm's number of products (e.g., Muuls, 2015), we measure a firm's product scope using the logarithm of the number of distinct four-digit HS product codes, denoted as *LogNumProducts*.<sup>21</sup>

To measure the average price level of the exports, we compute two proxies at the firm×product×year level where the product is identified at the four-digit HS produce code level. For each four-digit HS code within a firm-year, *LogPrice* (*LogWTPrice*) is the logarithm of average export price, where the average export price is calculated as the simple (trade amount weighted) average of prices for all transactions.

Since the Customs data do not contain information on firm's accounting variables, we rely on the Chinese Industry Census (CIC) data to obtain firm-level control variables. The CIC data is collected by the Chinese National Bureau of Statistics and available from 1998 to 2013. It covers all manufacturing firms in China with annual sales of more than RMB 5 million (increases to 20 million in 2011). It has detailed firm-level characteristics (e.g., location, industry, registration type) and accounting information (e.g., total assets, total debt, net income, number of workers).<sup>22</sup> In total, there are 806,385 firms from 2000 to 2013. We merge the CIC data to the Customs data from

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<sup>21</sup> We obtain qualitatively similar results if we use six-digit HS codes to identify products.

<sup>22</sup> The CIC data is widely used in literature (e.g. Song, Storesletten and Zilibotti (2011); Ru (2018)).

2000 to 2013. As there is no common firm identifier, we utilize information on the firm name, address, telephone, and postal code to conduct matching.<sup>23</sup> Approximately 43% of the manufacturing firms in Customs data can be matched to the CIC data (i.e., two hundred three thousand out of four hundred seventy-seven thousand).

### ***3.2. CDB Loan Data and Politician Profile Data***

The unique proprietary CDB loan data contain information on the outstanding loan amounts, loan issuances and other loan variables across 95 industries and 31 provinces in mainland China from 1994 to 2013.<sup>24</sup> The loans are at the province×industry×year level. The industries include infrastructure sectors (e.g., road, air, rail transportation, public facilities, and services) and industry sectors (e.g., agriculture, mining, textiles, machinery). Figure 4 plots the total provincial CDB outstanding loan amounts. We find an increasing pattern for both the industrial loans and infrastructure loans over time. At the end of 2013, CDB had outstanding loans amounting to nearly RMB 6 trillion.

**[Insert Figure 4 about here]**

The mission of CDB is to support the strategic industries. In Figure 5, we plot the top five industries that received loans from CDB in both 2002 and 2013. Not surprisingly, the industries received most loans are utility sectors, road and railway transportation, and public facilities.

**[Insert Figure 5 about here]**

We match the CDB loans to firms in China Customs at the province×industry×year level. We define the CDB loan to be *DirectLoan* for a firm if it is in the same province and industry as the CDB loan. We take the log form in regressions. For example, if the CDB loan granted to province P and industry I is 10 million in 2005, the *DirectLoan* for firms located in province P and operating in the industry I is 10 million in 2005.

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<sup>23</sup> The matching is conducted in two steps. First step involves exact matching using firm name, address, and telephone after standardizing them into same format. Second step performs fuzzy name matching. Manual check reveals that many matchings were incorrect even when the match scores were larger than 0.9. Thus, to be accurate and conservative, we only keep the exact matchings in our analyses. Nevertheless, our results hold for the full Customs sample if we do not include control variables obtained from CIC, which mitigates the concern that our results are driven by sample selection issues.

<sup>24</sup> The industry classification is comparable to the U.S. 2-digit SIC codes.

The local governments play a key role in obtaining the CDB loans since most of the industrial loans go to local SOEs.<sup>25</sup> Ru (2018) finds that the loans to private firms' upstream industry have positive effects on their total assets, sales, ROA, and sales per worker, which is consistent with the notion that loans to firms' upstream industry helped the downstream private sector. Therefore, we define the *UpstreamLoan* for a firm if the CDB industrial loans are given to the upstream industry of the firm in the same province and take its log form in regressions. We use the national input-output (IO) matrix of 2007 from the National Bureau of Statistics of China to construct the upstream-downstream industry link. The CDB classifies the loans into 95 industries while the input-output matrix has 135 industries which are more detailed. Using CDB 95-industry as a base, we match these two industrial classifications by aggregating the 135 IO industries to 95 industries. For each industry  $k$ , we select the industry that provides the highest supplies of inputs to be the upstream industry of industry  $k$ . Accordingly, the *UpstreamLoan* is defined using the constructed upstream-downstream industry link.

Given the concern that CDB credit allocation may be endogenous, our identification strategy builds on the manually-collected Chinese local government politician data. It contains detailed information (e.g., gender, age, birthplace) for all city secretaries and mayors at the city-month level for 334 cities from 1949 to 2013.<sup>26</sup> When the local politicians start a new term, they have strong incentives to borrow as much as possible and as early as possible from the CDB to boost GDP, which ultimately contributes to their career progression (Ru, 2018). To identify the causal effect of government credit on the firm's export activities, we employ this dataset to construct the predicted political turnover measures as instrumental variables for CDB loans. Detailed explanation about the identification strategy is in section 4.2.

### **3.3. Data on US Firms**

We focus on trade between the US and China to study how surges in Chinese export caused by government credit affect performance and employment of the domestic firms of China's trade partners. There are three main reasons to focus on US firms. First, the US and China are the world's

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<sup>25</sup> Ru (2018) find that around 95% of the CDB industrial loans were granted to SOEs and the remaining 5% typically went to private firms with political connections.

<sup>26</sup> See Ru (2018) for detailed description of the local politicians' profiles data.

largest two economies. Second, the US-China trade relationship is among the largest bilateral trade relationships in the world.<sup>27</sup> Third, prior literature have mixed views on the impact of Chinese exports on US firms' performance and employment (e.g., Autor, Dorn, and Hanson (2013); Acemoglu et al. (2016); Pierce and Schott (2016); Wang et al. (2018)). At the same time, the current trade war between US and China draws much attention. Hence, it is essential to understand the impact of government credit induced Chinese export on US firms.

Our data on US firms start with all firms in Compustat from 2000 to 2013, where we can easily obtain information on multiple performance metrics and the number of workers. We exclude US firms whose industries do not have imports from China since we cannot gauge the effect of Chinese export on US firms in these cases. Following variables are defined to measure US firms' performance and employment at the firm×year level. *LogAsset\_US* is the logarithm of the US firm's total assets. *PPE/Assets\_US* measures the tangibility defined as plant, property, and equipment divided by total assets. *LogSale\_US* is the logarithm of US firm's total sales. *NI/Asset\_US* is net income scaled by lagged total assets. *LogEmployees\_US* is the logarithm of the number of employees of the firm.

### 3.4. Summary Statistics

Our main sample contains firm-year observations that are jointly determined in the Customs data, CIC data, and the CDB loan data, spanning from 2000 to 2013. We drop firm-years with missing values on export amounts, the number of destination countries, number of products, and CDB loan measures. We further require our sample to have non-missing values on important firm accounting variables from CIC data: *LogAssets* measures the firm size, *LogSales* is the log of firm's annual total sales, *Leverage* is computed as total debt divided by total assets, *ROA* proxies for the profitability of the firm, and *LogNumWorkers* is the log of total number of workers in the firm. Table A1 in the appendix presents detailed variable definitions. As a result, our sample consists of 764,205 firm-year observations.<sup>28</sup>

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<sup>27</sup> Only US-EU and US-Canada have larger bilateral trade amounts than US-China. (<https://www.investmentfrontier.com/2017/01/30/largest-trade-relationships-world/>)

<sup>28</sup> Note that this number is larger than non-missing observations for both CDB loan measures. The reason is that some observations have non-missing *LogDirectLoan* but missing *LogUpstreamLoan* while another part of observations have missing *LogDirectLoan* but non-missing *LogUpstreamLoan*.

Panel A of Table 1 presents the summary statistics for the firm-year export data from 2000 to 2013. An average firm has an annual export amount of RMB 73.22 million, and exports to 9 markets with 4.4 different groups of products. The median values for *Export*, *NumDestinations*, and *NumProducts* are 10.972, 5, and 2, respectively, which suggests that there are many large exporters. Taking natural logarithm of these variables mitigate the right-skewed distribution problem. The average (median) direct loan is around RMB 710 (66) million while the mean (median) upstream loan is RMB 868 (101) million. The fact that upstream loans tend to be larger than direct loans is consistent with CDB's agenda to lend to strategic industries in that these industries are more likely to be upstream industries.

Panel B shows the summary statistics for the average price of the exported products. We have a much larger number of observations because the observation is aggregated at the firm×product×year level. The average prices are close to trading amount weighted average prices. In Panel C, we report the summary statistics for US firms which are jointly determined by the export industries and Compustat.

**[Insert Table 1 about here]**

## **4. Empirical Analyses and Results**

### ***4.1. CDB Loans and Export***

To investigate the effects of CDB loans on firms' export activities, we begin by examining how CDB direct loans affect the exports of SOEs since CDB loans are mainly granted to SOEs. On the one hand, the government credit allocation may be inefficient, which leads to distortion of credit allocation for mercantilism. As a result, CDB loans could be unrelated to or even negatively affect SOEs' export performance. On the other hand, government credit may alleviate credit constraints of firms thus facilitate international trade. Prior literature show that credit constraints impede firms' export activities in many dimensions such as participation in the export market, export amounts, number of export markets and products (e.g., Berman and Héricourt, 2010; Amiti and Weinstein, 2011; Manova, 2013).



To explore the correlations between CDB loan amounts and a firm's export activity, we estimate the following regression model at the firm×year level by regressing measures of export activities on CDB loans:

$$Y_{i,t} = \alpha + \beta \text{LogDirectLoan}_{i,t} + \gamma C_{i,t} + \mu_i + \eta_{p \times t} + \varepsilon_{i,t}, \quad (1)$$

where  $Y_{i,t}$  denote the three dependent variables *LogExport*, *LogNumDestinations*, and *LogNumProducts* for firm  $i$  and year  $t$ . They measure the firm's total export amounts, the number of export destination countries, and the number of export product types, respectively. *LogDirectLoan* is the log of CDB outstanding loan amounts granted to the firm's province and industry.  $C_{i,t}$  represents a set of control variables including firm size (*LogAssets*), sales (*LogSales*), leverage (*Leverage*), profitability (*ROA*), number of employees (*LogNumWorkers*). We also include two city-level control variables, GDP (*LnGDP*) and population (*LogPopulation*) to account for the economic development and macro factors. Detailed variable definitions are in Table A1 in appendix.  $\mu_i$  indicates firm fixed effects which are included to mitigate the concern that unobserved time-invariant firm characteristics may affect our results.  $\eta_{p \times t}$  indicates province×year fixed effects which eliminates the province time trends.  $\varepsilon_{i,t}$  is the error term. We cluster the standard error at the firm level.

We estimate Equation (1) for SOEs as CDB loans usually go to them. The results are shown in Panel A of Table 2. Albeit insignificant, the coefficients are positive in columns (1)-(2), suggesting that a potentially weak positive correlation between CDB loans and export amounts and the number of export markets for SOEs. Ru (2018) finds that CDB loans crowd-in private firms in the downstream industries in that CDB loans benefit downstream private firms regarding total assets, total sales, and ROA. We modify the regression model in Equation (1) to examine how CDB upstream loans affect private firms' exports in the downstream:

$$Y_{i,t} = \alpha + \beta \text{LogUpstreamLoan}_{i,t} + \gamma C_{i,t} + \mu_i + \eta_{p \times t} + \varepsilon_{i,t}, \quad (2)$$

where *LogUpstreamLoan* <sub>$i,t$</sub>  is the log of CDB outstanding loan amounts granted to firm  $i$ 's province and its key upstream industry in year  $t$ . Dependent variables and controls variables are

the same as in Equation (1). Panel B of Table 2 shows the regression results for private firms. The coefficients on *LogUpstreamLoan* are positive and statistically significant at 1% for all three columns. Consistent with the findings in Ru (2018), we find that CDB loans to the upstream industries are positively related to private firms' export amounts, the number of export markets they can enter as well as the number of types of products they can export.

To further shed light on the channels on how private firms expand their exports, we examine whether they can reduce the prices of exported goods due to relaxed financial constraints induced by CDB loans. To test this conjecture, we regress the average price level of exports at the firm×product×year level on CDB loans. The regression can be represented as follows:

$$Price_{i,j,t} = \alpha + \beta LogUpstreamLoan_{i,t} + \gamma C_{i,t} + \mu_i + \eta_{p \times t} + \lambda_j + \varepsilon_{i,t}, \quad (3)$$

where  $Price_{i,j,t}$  is the simple average price (*LogPrice*) or trade amount weighted average price (*LogWTPrice*) of the product  $j$  exported by firm  $i$  in year  $t$ . We include an additional fixed effects - product fixed effects ( $\lambda_j$ ) to control for product specific factors in influencing the prices. In Panel C of Table 2, columns (1) and (2) report the results for SOEs and columns (3) and (4) show the results for private firms. Although they are not statistically significant, the coefficients in columns (3)-(4) are negative, indicating a potential negative relation between CDB upstream loan amounts and average export prices of private firms.

**[Insert Table 2 about here]**

#### ***4.2. Causal Effect of CDB Loans on Exports***

We cannot draw a causal conclusion between CDB loans and firms' export activities from the results in section 4.1 since the CDB credit allocations are not random. For example, the good export opportunities by private firms in certain provinces and industries may need more inputs from upstream industries and the CDB could then lend to those upstream industries after observing the growth in downstream private firms' exports. In this subsection, we employ 2SLS to mitigate the endogenous concerns and to explore the causal effects of CDB loans on export activities. In particular, we exploit the exogenous variations of CDB loans allocation using the predicted municipal political turnover following Ru (2018).

As mentioned in section 2, city secretaries are strongly incentivized to boost local GDP for career concerns. Borrowing from the CDB has been the primary method for city secretaries to drive local economic development. Since it takes time to reveal the economic effects of CDB loans on GDP, city secretaries usually borrow from the CDB as early as possible, i.e., when they take office.<sup>29</sup> The standard term for a city secretary is five-year, and cities typically have their own five-year turnover cycles. This allows us to explore the variations of CDB loan amounts brought by the different five-year turnover cycles from different cities.

Given the concern that realized political turnover (e.g., promotion) can still be endogenous, we use the predicted turnover timing as instruments to predict exogenous CDB loan changes.<sup>30</sup> The predicted turnover cycle is defined in a simple way. The first year of the current city secretary's term is predicted by adding five years to the first year of previous city secretary's term. If there is no previous turnover cycle, we assign the actual first year of the city secretary as the predicted first year. For example, city secretary X took office in 2003, and secretary X's successor secretary Y took office in 2007. We then predict the first year of city secretary Y's term to be 2008 (i.e. 2003 + 5). Since the predicted turnover cycle is pre-determined, it is unlikely that this would confound with contemporaneous economic conditions so it can be used as the source of exogenous variation.

Next, we interact the predicted city secretary turnover cycle with city's focal industry defined using CIC data and use these interactions as instruments for CDB loan amounts. The city's focal industry is identified as the industry of which the SOEs of the city have largest assets in sum. It is vital for the city's economic development and does not change much over time. The city secretary would borrow more from the CDB for SOEs in the city's focal industry if the secretary is in the earlier years of the term. We consider it as an exogenous shock to the province×industry level CDB loans. For a given year, suppose the focal industry of city C is industry I and city C belongs

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<sup>29</sup> In Panel A of Table A2 in the appendix, column (1) shows that city secretary tends to borrow more from the CDB in her early terms using the actual turnover of the city secretary, indicated by the significantly positive and monotonically decreasing coefficients for *First\_Year*, *Second\_Year*, *Third\_Year*, and *Fourth\_Year*. The results are estimated by regressing city-year level CDB loan amounts on *First\_Year*, *Second\_Year*, *Third\_Year*, *Fourth\_Year*, *Fifth\_Year*, where *First\_Year* is a dummy variable which equals 1 if the city secretary is in her first year of the term. *Second\_Year* to *Fourth\_Year* are defined in the same way. *Fifth\_Year* is a dummy which takes the value of 1 if the city secretary is in her fifth or later years of the term. In the regressions, *Fifth\_Year* is the omitted group.

<sup>30</sup> In Panel A of Table A2 in the appendix, column (2) shows that predicted political turnover also affect the city-level CDB loan amounts, which is similar to the results using actual political turnover.

to province P. If there is a predicted political turnover in city C, we predict that the new secretary of city C would borrow more in industry I once she takes office, which contributes to the CDB loans granted to industry I in province P. Formally, the regression can be represented as follows:

$$\begin{aligned} \text{LogLoan}_{k,p,t} = & \alpha + \beta_1 \text{First}_{k,p,t} + \beta_2 \text{Second}_{k,p,t} + \beta_3 \text{Third}_{k,p,t} + \beta_4 \text{Fourth}_{k,p,t} + \\ & \beta_5 \text{Fifth}_{k,p,t} + \mu_k + \eta_{p \times t} + \varepsilon_{i,t}, \end{aligned} \quad (4)$$

where  $\text{LogLoan}_{k,p,t}$  is the logarithm of the CDB outstanding loan amount in industry  $k$ , province  $p$ , and year  $t$ .  $\text{First}_{k,p,t}$  is a dummy variable that equals 1 if there is a city in province  $p$  whose focal industry is  $k$  in year  $t$  and the city's secretary is in her first year of office.  $\text{Second}_{k,p,t}$  is a dummy variable that equals 1 if there is a city in province  $p$  whose focal industry is  $k$  in year  $t$  and the city's secretary is in her second year of office.  $\text{Third}_{k,p,t}$  to  $\text{Fifth}_{k,p,t}$  are defined similarly. Industry fixed effects and province $\times$ year fixed effects are included as well. The results are shown in Panel B of Table A2. We find that CDB loans allocated to a particular industry and province are larger if the industry is one of within-province cities' focal industry with a secretary in the early part of her term. City secretaries borrowed more for the city's focal industries during their early years of the terms, which is consistent with the results in Panel A of Table A2.

We then use  $\text{First}_{k,p,t}$  to  $\text{Fifth}_{k,p,t}$  to instrument CDB loans (i.e.  $\text{LogDirectLoan}$  and  $\text{LogUpstreamLoan}$ ) and perform 2SLS regressions. Specifically, the second stage regression is shown as follows:

$$Y_{i,t} = \alpha + \beta \widehat{\text{LogLoan}}_{i,t} + \gamma C_{i,t} + \mu_i + \eta_{p \times t} + \varepsilon_{i,t}, \quad (5)$$

where  $Y_{i,t}$  still denote the three dependent variables  $\text{LogExport}$ ,  $\text{LogNumDestinations}$ , and  $\text{LogNumProducts}$  for firm  $i$  and year  $t$ . Control variables,  $C_{i,t}$ , are the same as in Equation (1). Firm fixed effects and province $\times$ year fixed effects are included to account for time-invariant firm specific factors and province $\times$ year trends.

In Table 3, we first present the 2SLS regression results for CDB direct loans, that is the effect of CDB loans on firms' exports in the same industry. Panel A shows the results for SOEs where the coefficients are positive and statistically significant at 1% level in column (1) and 5% level in

columns (2)-(3). CDB loans increase SOEs' export amounts, the number of markets SOEs enter, and the number of types of products that SOEs export. On average, when CDB direct loans doubled, SOEs in the same industry increased export amounts by 4%. We show the results for private firms in Panel B. We find the coefficient in column (1) is insignificant, indicating that CDB loans do not increase private firms' exports. Private firms cannot benefit from CDB loans granted to the same industry, which is consistent with the fact that CDB loans are mostly allocated to SOEs.<sup>31</sup>

**[Insert Table 3 about here]**

In Table 4, we re-estimate the 2SLS regression model in Equation (5) using *LogUpstreamLoan*. Panel A reports the results for SOEs in the downstream industries. Although the coefficients in columns (1)-(3) are positive, all of them are not significant at the conventional level, suggesting CDB loans to the upstream industries do not significantly increase SOEs' exports. This is not surprising because SOEs enjoy the benefits from CDB loans at the same industry rather than from CDB loans granted to upstream industry.

In contrast, we find CDB upstream loans improve private firms' export performance, as shown in Panel B. The coefficient in column (1) is 0.0198 and significant at 1% level, suggesting CDB upstream loans benefit downstream private firms regarding total export amounts. On average, when the CDB upstream loans doubled, the downstream private firms increased export amounts by nearly 2%. Besides, the positive and significant coefficients in both columns (2) and (3) mean that CDB upstream loans also help downstream private firms to export to more countries and export more types of products. The results are consistent with the view that government credit can have positive spillover effects on the downstream private firms.

Moreover, we also explore the strength of the upstream-downstream industry link to further substantiate the spillover effects of CDB loans in the upstream industries. In Table 4, Panel C, we interact the *LogUpstreamLoan* with *UpstreamDependence*, which measures how much the downstream industry sources inputs from the key upstream industry. A higher value of *UpstreamDependence* indicates a higher degree of dependence on the upstream industry's inputs. If government credit helps downstream private firms' exports, the effects should be stronger for

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<sup>31</sup> Our results hold for all manufacturing firms in Customs data, so they are not driven by the matched sample. In Table A3, we estimate the same regression as in Table 3 and the only difference is that control variables are not included because we do not use the Customs-CIC merged data where firm-level control variables come from CIC.

firms having a higher dependence on the upstream industry’s inputs. Supporting the conjecture, the coefficients in both columns (1) and (2) are positive at 1% significance level as shown in the regression results in Panel C. Private firms with a stronger dependence on the key upstream industry can benefit significantly more from CDB upstream loans.<sup>32</sup>

**[Insert Table 4 about here]**

After establishing the causal link between CDB loans and export activities, we investigate the causal impact of CDB loans on another important dimension of export – the price of exported goods. We want to answer the question that whether CDB loans decrease the export prices by relaxing firms’ credit constraints. Using the same 2SLS setting as described above, the second stage regression can be represented as follows:

$$Price_{i,j,t} = \alpha + \beta \widehat{LogLoan}_{i,t} + \gamma C_{i,t} + \mu_i + \eta_{p \times t} + \lambda_j + \varepsilon_{i,t}, \quad (6)$$

where  $Price_{i,j,t}$  denote the simple average price (*LogPrice*) or trade amount weighted average price (*LogWTPPrice*) of the product code  $j$  exported by firm  $i$  in year  $t$ .  $\widehat{LogLoan}_{i,t}$  represent the instrumented *LogDirectLoan* or *LogUpstreamLoan* for firm  $i$  in year  $t$ . Control variables, firm fixed effects, province×year fixed effects, and product fixed effects are included as usual.

In Table 5 Panel A, we present the 2SLS regression results for CDB direct loans. CDB loans do not significantly change the average export prices of SOEs in the same industries as shown by the insignificant coefficients in columns (1) and (2). In Panel B, we show the 2SLS results for CDB upstream loans. The insignificant coefficients in columns (1) and (2) suggest that CDB upstream loans also have no effect on export prices of SOEs. However, we find the coefficients in columns (3) and (4) are both negative and significant at 1% significance level. This indicates CDB upstream loans decreases the average export prices of private firms in the downstream industries. It may explain the increase in export amounts because they export at a lower price.

**[Insert Table 5 about here]**

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<sup>32</sup> Our results hold for all manufacturing firms in Customs data, so they are not driven by the matched sample. In Table A4, we estimate the same regression as in Table 4 and the only difference is that control variables are not included because we do not use the Customs-CIC merged data where firm-level control variables come from CIC.

In sum, to establish the causal relationship, we utilize 2SLS to exploit the exogenous variations of CDB credit flows brought by predicted political turnover. As expected, CDB loans generally benefit SOEs' exports in the same industry because these loans are mostly granted to SOEs. More importantly, we find CDB loans have strong positive spillover effects on downstream private firms' export performance regarding export amounts, number of countries they can enter, and the number of products they can export. One channel is that CDB upstream loans reduce the average prices of exports by private firms in the downstream industry.

### ***4.3. Impact on US Firms***

In this subsection, we examine the impact of increase Chinese export on US public firms. The literature have focused on the direct competition channel and argue that imports from China negatively impact the US employment (e.g. Autor, Dorn, and Hanson (2013); Pierce and Schott (2016)). In contrast, Wang et al. (2018) find that the import intermediate goods from China to the US lead to increases in employments of US firms in downstream industries. We adopt this industry supply chain perspective to investigate how China exports to the US affect horizontal and downstream US firms' performance and employment, respectively. In particular, based on the 2SLS estimation results in section 4.2, we estimate the impact of China exports on US firms from two perspectives of both export amounts and price changes induced by the exogenous variations of CDB loans.

In the first approach, we estimate the impacts of CDB credit on US firms through the trade amount perspective. The idea is to test how US firms perform in response to China's exports induced by CDB loans. Since we cannot identify the trade link at the firm level between US firms and Chinese firms, we aggregate the exports at the industry level. In particular, we use the industries in US IO Table to identify the upstream-downstream link for US firms in this subsection because the US industry supply chain structure may be different from the structure in China.<sup>33</sup> As there are 71 industries in the US IO summary table and 95 industries in CDB industry classification, we manually match the two industry classifications by collapsing the 95 CDB industries into the industries in US IO table. For each of the 71 industries, we construct the CDB-loan induced export

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<sup>33</sup> The US IO table we used in this study is the 2007 summary table, obtained from Bureau of Economic Analysis.

amount at the industry×year level by predicting the export amount of individual exporter using the 2SLS results in section 4.2 and aggregating the predicted amounts of all exporters in that industry. Formally, the following regression models are used to test the impact of China’s export induced by CDB loans on US firms:

$$Y_{US_{i,k,t}} = \alpha + \beta Estimated\_LogDirectExport_{k,t} + \mu_i + \eta_t + \varepsilon_{i,t}, \quad (7)$$

$$Y_{US_{i,k,t}} = \alpha + \beta Estimated\_LogUpstreamExport_{k,t} + \mu_i + \eta_t + \varepsilon_{i,t}, \quad (8)$$

where  $Y_{US_{i,k,t}}$  denote a set of dependent variables measuring the performance and employment of US firm  $i$  in year  $t$  whose primary industry is  $k$ . These dependent variables are the logarithm of total assets ( $LogAsset\_US$ ), tangibility ( $PPE/Assets\_US$ ) which is computed as property, plant, and equipment scaled by total assets, logarithm of total sales ( $LogSales\_US$ ), profitability ( $NI/Assets\_US$ ) which is the ratio of net income and total assets, and employment ( $LogEmployees\_US$ ) which is calculated as the logarithm of the number of employees. In both models, we control for firm fixed effects and year fixed effects and cluster standard errors by firm.

Equation (7) tests the direct competition channel where characteristics of US firms are regressed on estimated China’s exports in the same industry.  $Estimated\_LogDirectExport_{k,t}$  is the CDB-loan induced export amount from China in industry  $k$  and year  $t$ . To compute this variable, we first predict the CDB-loan induced export amount for each individual Chinese firms in our sample and then aggregate the individual predicted export amounts by industry. Specifically, we predict the firm×year level CDB-loan induced export amount using the 2SLS results in Tables 3 and 4. We use different method to predict the CDB-loan induced export amount for SOEs and private firms because we find CDB loans increase the export amount of SOEs in the same industry and the export amount of private firms in the downstream industry. For each SOE, we use the estimation result of 2SLS regressing export amounts on CDB direct loans and predict the export amount using the fitted values by utilizing the estimated coefficient of CDB direct loans on SOEs (i.e., 0.0402 in column (1), Table 3 Panel A) and the CDB direct loan amounts for the SOE. For each private firm, we predict the export amount using the fitted values by utilizing the estimated coefficient of CDB upstream loans on private firms (i.e., 0.0198 in column (1), Table 4 Panel B)



and the CDB upstream loan amounts for the private firm. For each industry  $k$  and year  $t$ , we sum up the predicted export amount of all SOEs and private firms that export in industry  $k$  and year  $t$  and take the logarithm to obtain  $Estimated\_LogDirectExport_{k,t}$ . Equation (8) tests the upstream effect channel and examines how US firm  $i$  which operates in industry  $k$  perform in year  $t$  reacting to China's exports to its upstream industry ( $Estimated\_LogUpstreamExport_{k,t}$ ). The variable is the CDB-loan induced export amount from China in the upstream industry of  $k$  and year  $t$ . The estimated export amounts capture the causal effects of CDB loans on the export amount. In other words, these two variables tease out the exogenous variation from the IV.

Panel A of Table 6 reports the results for the direct competition channel where the  $Estimated\_LogExport$  is matched to US firms in the same industry. The coefficients are negative in all five columns and statistically significant in four out of five columns. The results show that China's exports lead to decreases in same-industry US firms' total assets, fixed assets, sales, and the number of workers employed. The coefficient in column (1) of Table 6 Panel A is -0.1934 and significant at 1% significance level. This means, on average, a 100% increase in the estimated export amount would decrease US firms' total assets by 19.34%. This is consistent with prior literature on the crowding-out effect of Chinese exports on US firms and employment. In contrast, if we consider the effects of Chinese exports on the downstream US firms, we find opposite results as shown in Panel B. We find that Chinese exports increase total assets, sales, and employment for US firms in the downstream industry. One reason could be these downstream US firms can now benefit from sourcing more intermediate goods from China. This is also consistent with the recent findings in Wang et al. (2018) where they argue the total impact of trading with China is a positive boost to US local employment and real wages mainly due to the downstream US firms.

**[Insert Table 6 about here]**

In the second approach, we further explore how US firms respond to cheaper exports from China since we document that CDB loans reduce the average export prices for private firms in the downstream industry. Following the method described above, we match the US IO industry classification and CDB industry classification and estimate the change of average price levels at the industry level. Formally, we estimate the following two models to investigate how US firms

are affected by China's exports at lower prices from both the direct competition channel and the upstream effect channel:

$$Y_{US_{i,k,t}} = \alpha + \beta Direct\_PriceChange_{k,t} + \mu_i + \eta_t + \varepsilon_{i,t}, \quad (9)$$

$$Y_{US_{i,k,t}} = \alpha + \beta Upstream\_PriceChange_{k,t} + \mu_i + \eta_t + \varepsilon_{i,t}, \quad (10)$$

where  $Y_{US_{i,k,t}}$  denote the same set of dependent variables as in Equation (7) and (8) which measure the performance and employment of US firm  $i$  in year  $t$  whose primary industry is  $k$ . In both models, we control for firm fixed effects and year fixed effects and cluster standard errors by firm.

Equation (9) tests the direct competition channel where we regress US firms' performance measures on estimated average price change in the same industry.  $Direct\_PriceChange_{k,t}$  is the CDB-loan induced average price change of China's export in industry  $k$  and year  $t$ . We use the 2SLS regression results in Table 5 to construct the average price change for China's export. For each exporter-year-product combination where the product is identified using four-digit HS code, we multiply the coefficient estimate (i.e., -0.0065 in column (3), Panel B of Table 5) with the CDB upstream loan amounts to get the export price drop. For each industry  $k$  and year  $t$ , we compute the simple average of all price changes whose product type fall in the industry  $k$  to obtain  $Direct\_PriceChange_{k,t}$ , the average price change of China's export in industry  $k$  and year  $t$ . Equation (10) tests the upstream effect channel and examines how US firm  $i$  which operates in industry  $k$  perform in year  $t$  reacting to average export price change from China which take place in firm  $i$ 's upstream industry ( $Upstream\_PriceChange_{k,t}$ ). The variable is the CDB-loan induced average price change from China's export in the upstream industry of  $k$  and year  $t$ .

We report the results of this approach in Table 7. Panel A shows the horizontal effect of the reduced export price of China's exports on US firms in the same industry. Given  $Direct\_PriceChange$  represents the decrease in export prices due to CDB loans, the positive and significant coefficients from columns (1)-(5) suggest decreases in the dependent variables. Facing exports from China with reduced prices, US firms in the same industry experience a decline in performance and employment regarding assets, sales, profitability, and employment. In Panel B,

we examine the upstream effect channel. We find the coefficients in columns (2)-(5) are negative and significant, meaning that the lower average prices of China's exports increase US downstream firms' fixed assets, sales, profitability, and employment. The findings are consistent with the results in Table 6.

**[Insert Table 7 about here]**

The government credit from the CDB leads to increased amount of export from China to the US. This competition from China's exports hurt US firms from the direct competition channel. This is consistent with the criticism of China's mercantilism. In contrast, we show that China's exports with lower prices could benefit the downstream US firms which tend to source intermediate goods from China.<sup>34</sup> This positive spillover effect serves as an important consideration in understanding the overall effects of China's international trade activities. Moreover, we shed light on the export price channel of how Chinese exports can benefit US firms regarding performance and employment.

## **5. Conclusion**

This paper examines the heterogeneous effects of government credit across different levels of the supply chain (direct loan vs. upstream loan) on Chinese manufacturing firms' export activities and hence the trade activities between the US and China. By merging the unique loan data from the CDB with the detailed universal transaction-level data from China Customs, we find that CDB loans granted to upstream industries lead to the surge in export amount and the decrease in export prices for private firms in the downstream industries. Moreover, the increase in export amount with decreased prices from China benefits downstream US firms regarding assets, profitability, and employment, although US firms in the same industry still suffer from direct competition from China's exports. Our paper investigates how government credit affects the industry supply chain

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<sup>34</sup> In Table A5 in the appendix, we interact the CDB loans with the dummy variable *NonConsumerGood* which equals 1 if the firm mainly exports non-consumer goods (i.e., raw materials, intermediate goods). Panel A reports the results of the effect of CDB direct loans on SOEs and Panel B reports the results of effect of CDB upstream loans on private firms. The positive coefficient of the interaction terms between CDB loans and *NonConsumerGood* suggest that CDB loans increase more exports in intermediate goods compared to final consumer goods. Figure A1 shows that majority of the exports from China are non-consumer goods where trading partners could utilize these goods to produce final consumer goods. These findings lend further support to beneficial effects of China's exports on downstream US firms.

structure by documenting the positive spillover effects of upstream industrial loans on downstream private firms' export activities. Also, the paper also shed light on the ongoing debate on whether exports from China hurt US firms and employment and provide a potential price channel for the positive impact of China's exports on downstream US firms.

Besides China, many countries have their own national development finance institutions (DFI), even for the most developed economies such as the US and Germany. One major concern for such DFIs is to facilitate and promote international trade. For example, the primary objective for the Export-Import Bank of the United States, which is a wholly owned federal government corporation, is to assist in financing and facilitating US export of goods and services. Based on the empirical findings of this paper, policymakers should consider different types of government credit at different levels along the supply chain when making lending decisions. Hence, this paper's findings are important for policymakers across the globe.

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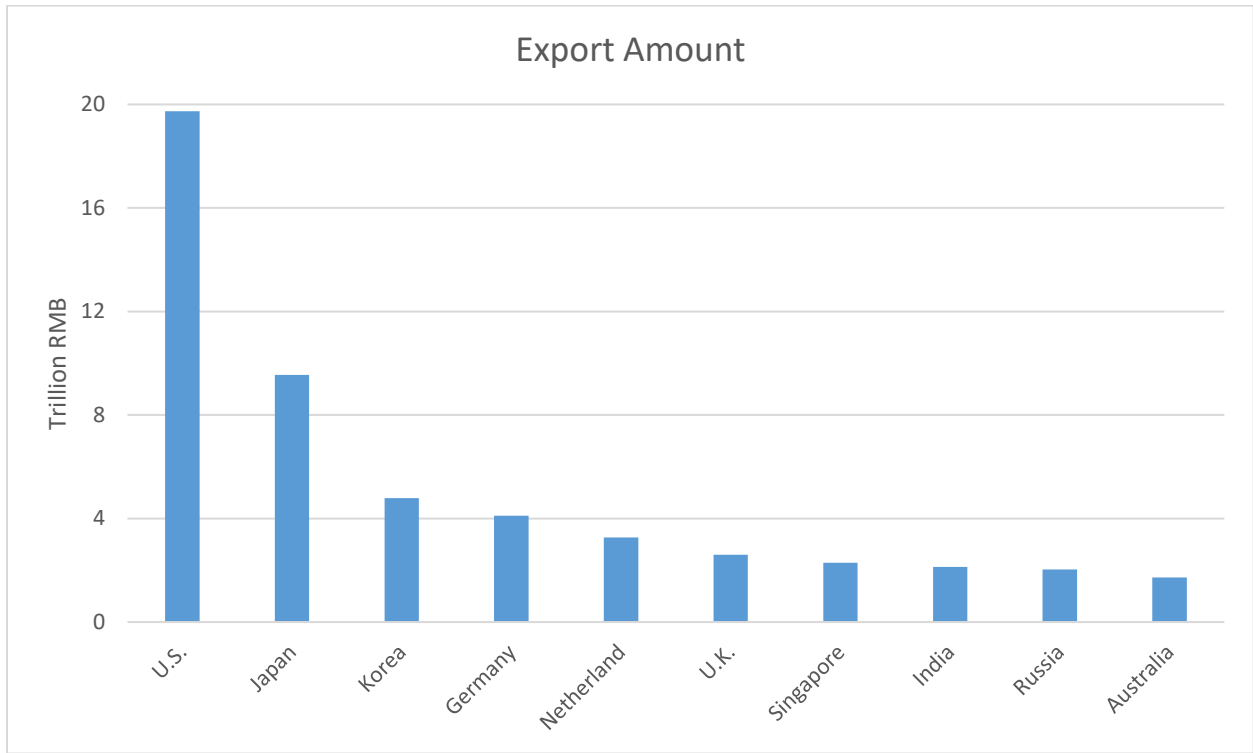
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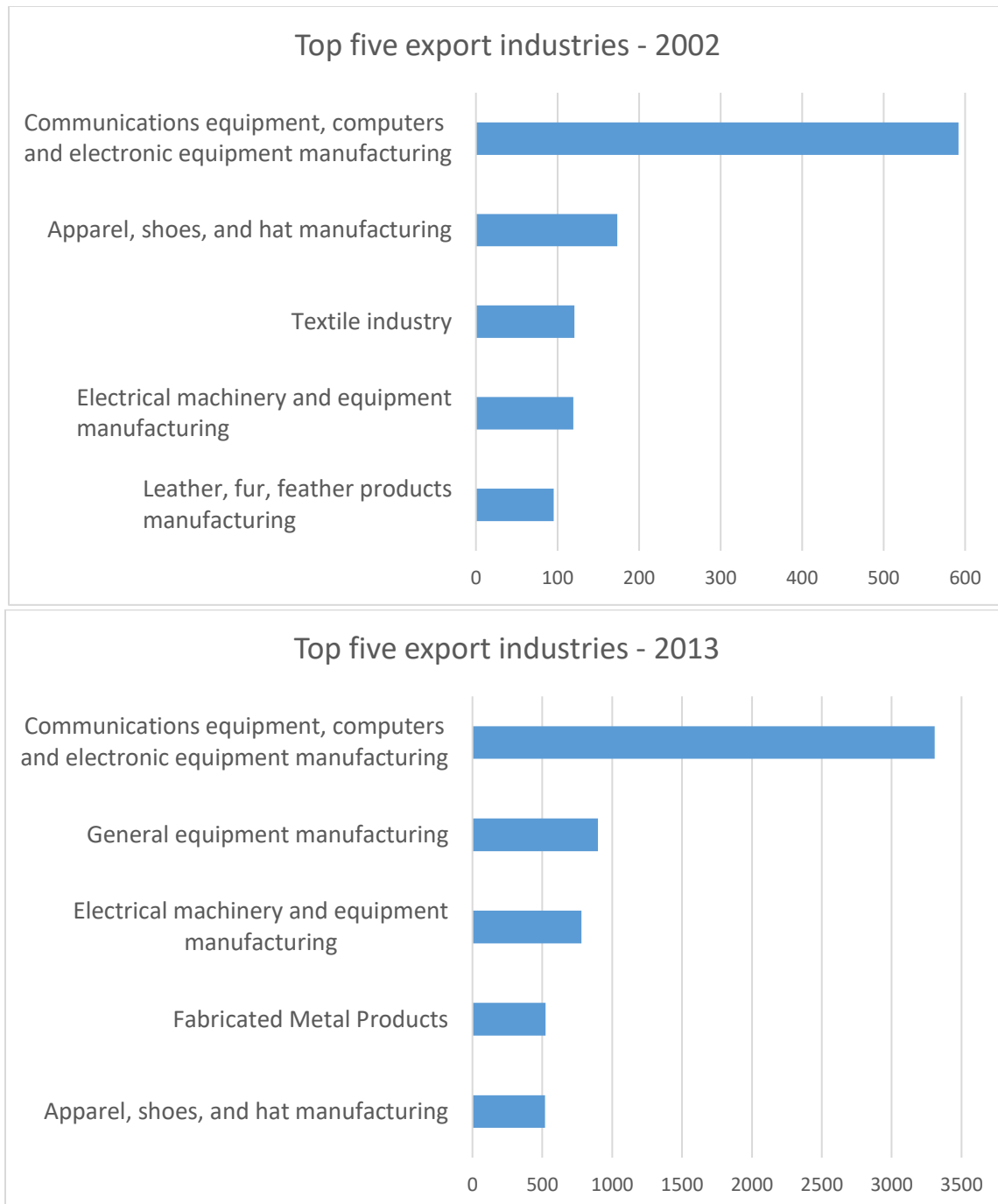
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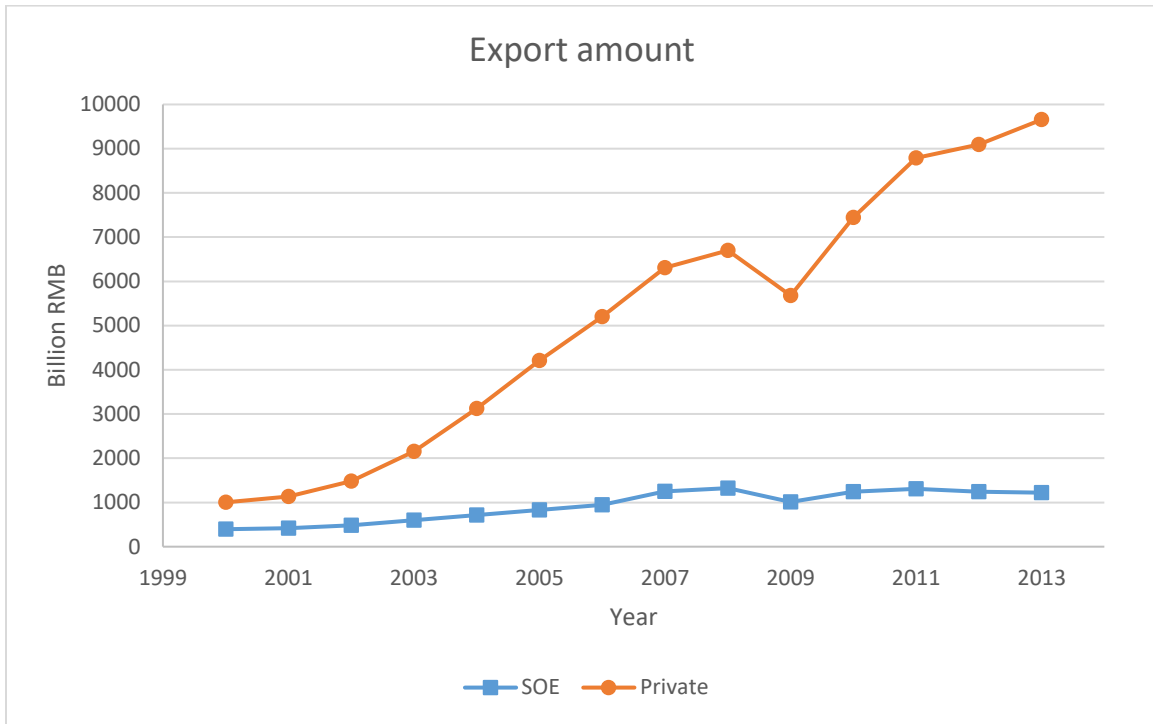
**Figure 1: Top ten destination countries by the export amount**

This figure shows the largest ten destination countries ranked by total export amounts of Chinese firms from 2000 to 2013. Based on the population data of China Customs, we aggregate the export amount from all export transactions (i.e., exports by manufacturing firms and exports by intermediary firms) from 2000 to 2013 by destination country and plot the total export amount for the top ten countries (Hong Kong is excluded). The unit is in trillion RMB.



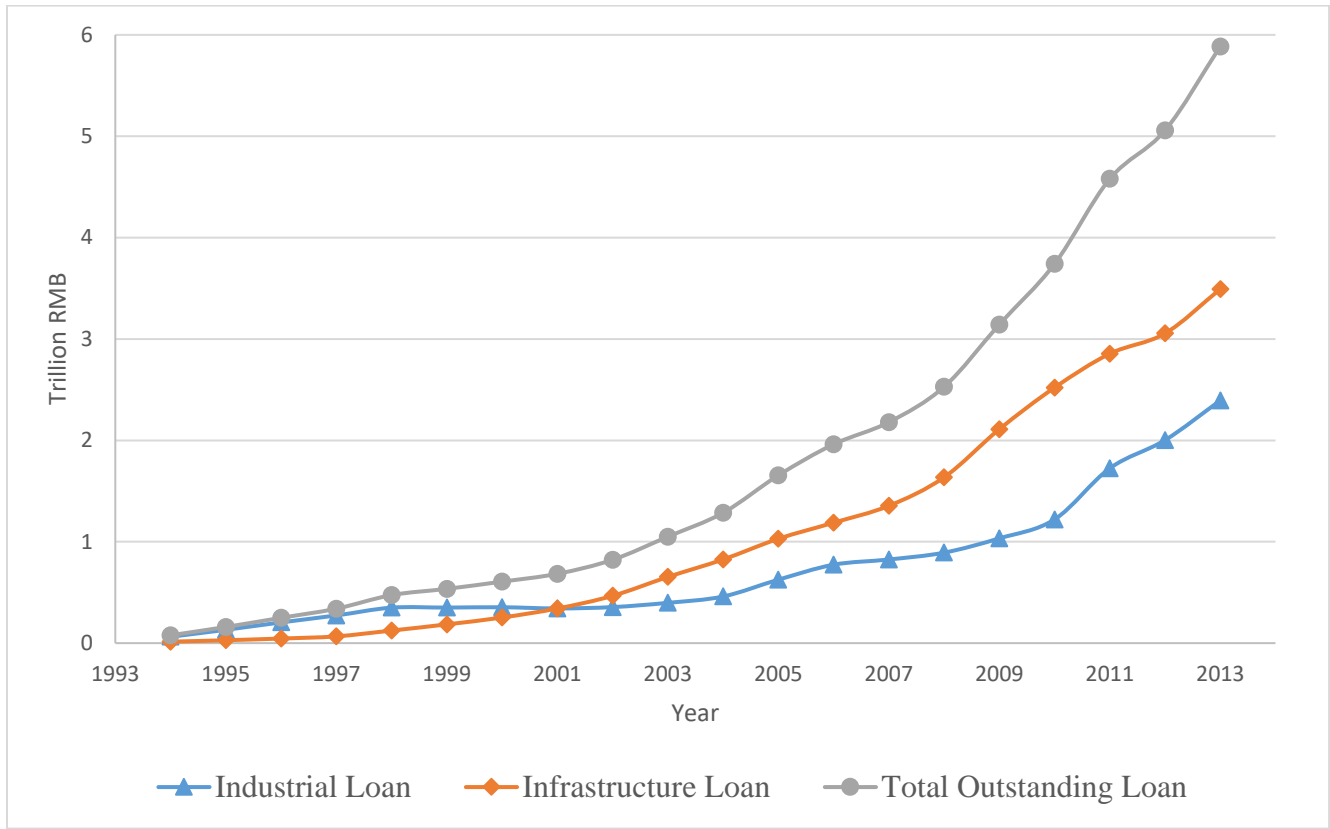
**Figure 2: Top five export industries**

This figure shows the top five export industries ranked by export amounts for 2002 and 2013, respectively. The sample includes only manufacturing firms (i.e. excluding trade intermediaries) in the China Customs data from 2000 to 2013. The industry is at the two-digit CDB industry classification level, which is comparable with US two-digit SIC code. The top panel shows the largest five industries ranked by export amounts and the associated export amounts for 2002 while the bottom panel is for 2013. The unit is in billion RMB.



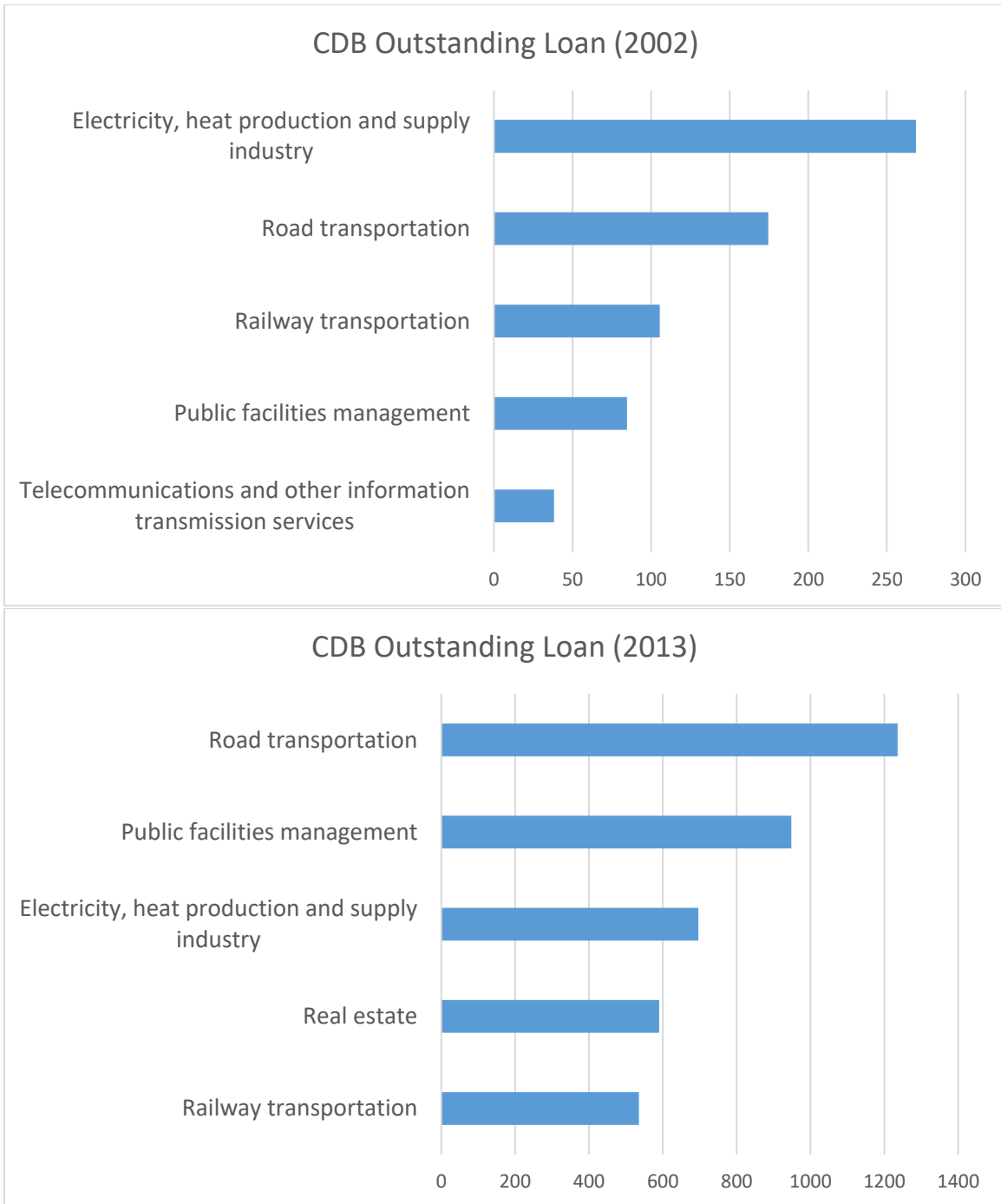
**Figure 3: Export amount by firm type and year**

This figure shows the time trend of export amounts for two types of firms from 2000 to 2013: SOE and Private firms. The sample includes only manufacturing firms (i.e. excluding trade intermediaries) in the China Customs data from 2000 to 2013. SOE denotes firms that are state-owned enterprises or collectively-owned firms. Private firms denote non-SOE firms consists of private domestic firms, joint ventures, foreign-owned affiliate firms. The unit is in billion RMB.



**Figure 4: Time trend of CDB outstanding loans**

This figure plots the time trend of aggregate CDB provincial outstanding loan amounts from 1994 to 2013. CDB loans can be classified into two groups: industrial loan and infrastructure loan. Infrastructure includes transportation (e.g., road, railway, airport, bridge, tunnel), water supply, energy supply (e.g., gas, electric), telecommunications, and public service (e.g., sewage discharge). Industrial loans are credits granted to the industrial firms. By construction, total outstanding loan = industrial loan + infrastructure loan. The unit is in trillion RMB.



**Figure 5: Shifts of CDB industrial loans over time**

This figure shows the top five industries that have CDB outstanding loans in 2002 and 2013, respectively. Data are restricted to CDB province-level industrial loans across 31 provinces in China. The top (bottom) panel shows the five industries with the largest CDB outstanding loans in 2002 (2013). The amount for each industry is the sum of all CDB outstanding loan amounts across 31 provinces in China. The unit is in billion RMB.

**Table 1: Summary Statistics**

This table describes the summary statistics of the main variables used in this study. The sample is restricted to merged firms in both the China Customs data and the Chinese Industry Census (CIC) data from 2000 to 2013. Panel A reports the summary statistics at the firm×year level for Chinese firms. Panel B provides summary statistics for export prices at the firm×product×year level for Chinese firms, where the product is identified at the four-digit Harmonized System (HS) code level. Panel C reports the summary statistics at the firm×year level for U.S. firms in Compustat. See Table A1 for detailed variable definitions.

	N	Mean	SD	25%	Median	75%
Panel A: Firm-Year Level for Chinese firms						
<i>Export</i>	764,205	73.220	963.644	2.551	10.972	35.103
<i>NumDestinations</i>	764,205	9.070	11.379	2.000	5.000	12.000
<i>NumProducts</i>	764,205	4.415	6.269	1.000	2.000	5.000
<i>LogExport</i>	764,205	2.125	2.198	0.936	2.395	3.558
<i>LogNumDestinations</i>	764,205	1.562	1.154	0.693	1.609	2.485
<i>LogNumProducts</i>	764,205	1.013	0.907	0.000	0.693	1.609
<i>LogAssets</i>	764,205	3.781	1.519	2.708	3.621	4.692
<i>LogSales</i>	764,205	4.051	1.424	3.066	3.908	4.893
<i>ROA</i>	764,205	0.066	0.146	0.003	0.029	0.090
<i>Leverage</i>	764,205	0.543	0.254	0.355	0.556	0.739
<i>LogNumWorkers</i>	764,205	5.386	1.156	4.605	5.384	6.089
<i>LogGDP</i>	764,205	7.847	1.051	7.147	7.896	8.596
<i>LogPopulation</i>	764,205	6.203	0.633	5.829	6.342	6.616
<i>DirectLoan</i>	722,157	7.073	19.044	0.040	0.660	4.500
<i>UpstreamLoan</i>	659,120	8.684	25.940	0.050	1.010	5.050
<i>LogDirectLoan</i>	722,157	-3.885	8.172	-3.229	-0.416	1.504
<i>LogUpstreamLoan</i>	659,120	-3.424	7.986	-2.996	0.010	1.619
Panel B: Firm-Product-Year Level for Chinese firms						
<i>LogPrice</i>	2,782,125	4.225	2.366	2.783	3.771	5.137
<i>LogWTPrice</i>	2,782,125	4.225	2.418	2.766	3.749	5.121
Panel C: Firm-Year Level for U.S. firms						
<i>LogAsset_US</i>	56,686	4.679	2.948	2.889	4.713	6.641
<i>PPE/Assets_US</i>	56,657	0.314	0.281	0.083	0.219	0.495
<i>LogSale_US</i>	48,612	4.620	3.096	2.814	4.808	6.741
<i>NI/Asset_US</i>	56,434	-1.579	35.179	-0.196	0.013	0.093
<i>LogEmployees_US</i>	45,980	-0.803	2.667	-2.688	-0.830	1.163

**Table 2: Effects of CDB Loans on Export Activities (OLS)**

This table reports the regression results on the effects of CDB loans on firms' export activities. The sample contains the merged firms in China Customs data and CIC data from 2000 to 2013. Panel A reports the effect of CDB loans on SOEs' export activities in the same industry at the firm×year level in terms of export amount (*LogExport*), number of export destinations (*LogNumDestinations*), number of export product varieties (*LogNumProducts*). *LogDirectLoan* denotes the direct CDB loan for the firm and is the CDB industrial loans outstanding for each of the 31 provinces and 38 manufacturing industries per year which is the same as in the firm's industry. Panel B shows the effect of CDB loans on private firms' export activities in the downstream industry. *LogUpstreamLoan* denotes the upstream loan for the firm and is the CDB industrial loans outstanding in the firm's upstream focal industry which is also at province×industry×year level. In Panel C, we regress the logarithm of exported goods price (averaged and aggregated at the four-digit HS code level) on CDB upstream loan at the firm×product×year level. *LogAssets*, *LogSales*, *ROA*, *Leverage*, *LogNumWorkers*, *LogGDP*, and *LogPopulation* are included as control variables in all regressions. All variables are defined in Table A1. In Panel A and B, firm fixed effects and province×year fixed effects are included. In Panel C, one additional fixed effect – product fixed effects – is added. Coefficients of control variables and fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

Panel A: Effect of Direct Loan on SOEs

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogDirectLoan</i>	0.0011 (0.8)	0.0000 (0.0)	-0.0002 (-0.3)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	60,164	60,164	60,164
Adjusted R-squared	0.697	0.747	0.684

Panel B: Effect of Upstream Loan on Private Firms

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogUpstreamLoan</i>	0.0018*** (4.6)	0.0008*** (3.7)	0.0013*** (7.0)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	577,579	577,579	577,579
Adjusted R-squared	0.771	0.798	0.735

Panel C: Effect of Upstream Loan on Average Export Prices

	(1)	(2)	(3)	(4)
	SOE <i>LogPrice</i>	SOE <i>LogWTPrice</i>	Private <i>LogPrice</i>	Private <i>LogWTPrice</i>
<i>LogUpstreamLoan</i>	0.0004 (0.4)	0.0005 (0.5)	-0.0001 (-0.3)	-0.0002 (-0.8)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
Observations	246,415	246,415	2,698,704	2,698,704
Adjusted R-squared	0.710	0.701	0.639	0.623

**Table 3: Effects of Direct CDB Loans on Export Activities (2SLS)**

This table shows the two-stage least squares regression results on the effect of CDB loans on both SOEs and private firms' export activities in the same industry by using *First* to *Fifth* as instrumental variables for the logarithm of the CDB province-industry level outstanding loan amounts in 38 industries and 27 provinces (excluding Beijing, Shanghai, Tianjin, and Chongqing). The sample contains the merged firms in China Customs data and CIC data from 2000 to 2013. The dependent variables are the export amount (*LogExport*), number of export destinations (*LogNumDestinations*), number of export product varieties (*LogNumProducts*). The independent variable, *LogDirectLoan*, denotes the direct CDB loan for the firm in the same industry as the loan which is at province×industry×year level. In Panel A, the sample is restricted to SOEs. In Panel B, the sample is restricted to private firms. *LogAssets*, *LogSales*, *ROA*, *Leverage*, *LogNumWorkers*, *LogGDP*, and *LogPopulation* are included as control variables in all regressions. All variables are defined in Table A1. Firm fixed effects and province×year fixed effects are included in all regressions. Coefficients of control variables and fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. Cragg-Donald Wald F-statistics for weak identification tests are reported. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

## Panel A: Export Activities of SOEs

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogDirectLoan</i>	0.0402*** (2.9)	0.0169** (2.6)	0.0125** (2.2)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	52,458	52,458	52,458
Adjusted R-squared	0.748	0.790	0.739
Wald F-stat	85.97	85.97	85.97

## Panel B: Export Activities of Private Firms

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogDirectLoan</i>	0.0028 (0.6)	0.0059*** (2.6)	0.0031 (1.6)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	562,772	562,772	562,772
Adjusted R-squared	0.811	0.833	0.785
Wald F-stat	459.5	459.5	459.5



**Table 4: Effects of Upstream CDB Loans on Export Activities (2SLS)**

This table shows the two-stage least squares regression results on the effect of CDB loans on downstream SOEs and private firms' export activities by using *First* to *Fifth* as instrumental variables for the logarithm of the upstream CDB province-industry level outstanding loan amounts in 35 industries and 27 provinces (excluding Beijing, Shanghai, Tianjin, and Chongqing). The sample contains the merged firms in China Customs data and CIC data from 2000 to 2013. The dependent variables are the export amount (*LogExport*), number of export destinations (*LogNumDestinations*), number of export product varieties (*LogNumProducts*). The independent variable, *LogUpstreamLoan*, denotes the upstream CDB loan in the firm's upstream focal industry which is at province×industry×year level. In Panel A, the sample is restricted to SOEs. In Panel B, the sample is restricted to private firms. In Panel C, *UpstreamDependence* is the direct consumption coefficient extracted from the China IO table (2007) measuring how much the downstream industry sources inputs from the key upstream industry. I follow Wooldridge (2002) to include the interaction term in 2SLS. *LogAssets*, *LogSales*, *ROA*, *Leverage*, *LogNumWorkers*, *LogGDP*, and *LogPopulation* are included as control variables in all regressions. All variables are defined in the Appendix Table A1. Firm fixed effects and province×year fixed effects are included in all regressions. Coefficients of control variables and fixed effects estimates are omitted for brevity. Standard errors are clustered by firm for all regressions and *t*-statistics are reported in parentheses. Cragg-Donald Wald F-statistics for weak identification tests are reported. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

## Panel A: Export Activities of SOEs

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogUpstreamLoan</i>	0.0234 (1.1)	0.0158 (1.6)	0.0080 (0.9)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	44,978	44,978	44,978
Adjusted R-squared	0.757	0.793	0.742
Wald F-stat	28.46	28.46	28.46

## Panel B: Export Activities of Private Firms

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogUpstreamLoan</i>	0.0198*** (4.7)	0.0136*** (6.3)	0.0123*** (6.2)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	519,197	519,197	519,197
Adjusted R-squared	0.814	0.834	0.784
Wald F-stat	507.6	507.6	507.6

**Table 4: Effects of Upstream CDB Loans on Firms' Export (2SLS) – continued**

Panel C: Strength of Upstream-Downstream Industry Link

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogUpstreamLoan</i>	0.0189*** (4.5)	0.0122*** (5.6)	0.0123*** (6.2)
<i>LogUpstreamLoan</i> × <i>UpstreamDependence</i>	0.0181*** (3.4)	0.0325*** (10.5)	0.0034 (1.4)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	519,197	519,197	519,197
Adjusted R-squared	0.813	0.832	0.784
Wald F-stat	907.9	907.9	907.9

**Table 5: Effects of CDB Loans on Export Prices (2SLS)**

This table shows the two-stage least squares regression results by using *First to Fifth* as instrumental variables for the logarithm of the CDB province-industry level outstanding loan amounts on the exported goods prices at the firm×product×year level. Product is measured at the four-digit harmonized system (HS) code level. The sample contains the merged firms in China Customs data and CIC data from 2000 to 2013. In Panel A, we examine the effects of direct CDB loans, and in panel B, we examine the effects of upstream CDB loans. *LogPrice*, *LogWTPPrice* are the average prices and export-amount weighted average prices. In each panel, columns (1) and (2) are restricted to SOEs and columns (3) and (4) are restricted to private firms. *LogAssets*, *LogSales*, *ROA*, *Leverage*, *LogNumWorkers*, *LogGDP*, and *LogPopulation* are included as control variables in all regressions. All variables are defined in Table A1. The firm fixed effects, province×year fixed effects, and product fixed effects are included in all regressions. Coefficients of control variables and fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. Cragg-Donald Wald F-statistics for weak identification tests are reported. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

## Panel A: Effect of Direct Loans

	(1)	(2)	(3)	(4)
	SOE	SOE	Private	Private
	<i>LogPrice</i>	<i>LogWTPPrice</i>	<i>LogPrice</i>	<i>LogWTPPrice</i>
<i>LogDirectLoan</i>	0.0068 (1.0)	0.0077 (1.1)	0.0035 (1.4)	0.0046* (1.7)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
Observations	233,998	233,998	2,491,366	2,491,366
Adjusted R-squared	0.732	0.724	0.665	0.650
Wald F-test	48.56	48.56	223.8	223.8

## Panel B: Effect of Upstream Loans

	(1)	(2)	(3)	(4)
	SOE	SOE	Private	Private
	<i>LogPrice</i>	<i>LogWTPPrice</i>	<i>LogPrice</i>	<i>LogWTPPrice</i>
<i>LogUpstreamLoan</i>	-0.0089 (-0.9)	-0.0109 (-1.0)	-0.0065*** (-2.7)	-0.0069*** (-2.8)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
Observations	208,598	208,598	2,349,154	2,349,154
Adjusted R-squared	0.728	0.720	0.661	0.646
Wald F-test	24.41	24.41	366.7	366.7

**Table 6: Impact on U.S. Firms – Trade Amount Perspective**

This table shows the results of regressing U.S. firms' characteristics on the instrumented export amount estimated using the coefficients of 2SLS results in Table 3 and 4. The sample contains U.S. public firms from 2000 to 2013 where the firm's industry imports from China. Data on U.S. firms come from Compustat. The dependent variables are *LogAsset\_US*, *PPE/Assets\_US*, *LogSale\_US*, *NI/Asset\_US*, and *LogEmployees\_US* at firm×year level. *LogAsset\_US* is the logarithm of US firm's total assets. *PPE/Assets\_US* measures the tangibility defined as plant, property, and equipment divided by total assets. *LogSale\_US* is the logarithm of US firm's total sales. *NI/Asset\_US* is net income scaled by lagged total assets. *LogEmployees\_US* is the logarithm of the number of employees of the firm. The independent variable, *Estimated LogDirectExport*, is at the industry×year level and proxies for the CDB loans-induced export amount that is in the same industry as the US firm. *Estimated LogUpstreamExport*, is at the industry×year level and proxies for the CDB loans-induced export amount that is in the upstream industry of the US firm. For each industry, it is computed as the sum of the predicted export amount of all the firms in that industry, where the individual firm's predicted export amount is calculated using the coefficient estimates of 2SLS regression results. To match the Chinese export industry with U.S. firm's industry, we collapse the 95 CDB industries into 71 industries as identified by the U.S. IO table summary file from the U.S. Bureau of Economic Analysis. In particular, we use the 2007 data as the benchmark to link CDB industries and U.S. IO industries. The upstream-downstream industry link for U.S. firms is constructed using U.S. IO table as well. In Panel A, we examine how China's export affects US firms in the same industry. In Panel B, we examine how China's export affects US firms in the downstream industry. Firm fixed effects and year fixed effects are included in all regressions. Fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

## Panel A: Horizontal Effect

	(1)	(2)	(3)	(4)	(5)
	<i>LogAsset_US</i>	<i>PPE/Assets_US</i>	<i>LogSale_US</i>	<i>NI/Asset_US</i>	<i>LogEmployees_US</i>
<i>Estimated_LogDirectExport</i>	-0.1934*** (-12.2)	-0.0162*** (-6.9)	-0.1165*** (-6.7)	-0.0386 (-0.3)	-0.0869*** (-7.2)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	56,686	56,655	48,460	56,408	45,700
Adjusted R-squared	0.927	0.829	0.942	0.313	0.962

## Panel B: Upstream Effect

	(1)	(2)	(3)	(4)	(5)
	<i>LogAsset_US</i>	<i>PPE/Assets_US</i>	<i>LogSale_US</i>	<i>NI/Asset_US</i>	<i>LogEmployees_US</i>
<i>Estimated_LogUpstreamExport</i>	0.0521*** (4.5)	0.0025 (1.1)	0.0271** (2.1)	-0.1102 (-0.7)	0.0317*** (2.7)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	42,068	42,023	35,860	41,873	33,330
Adjusted R-squared	0.944	0.831	0.957	0.309	0.964

**Table 7: Impact on U.S. Firms – Export Price Perspective**

This table shows the results of regressing U.S. firms’ characteristics on export price change induced by CDB loans estimated using the coefficients from 2SLS. The sample contains U.S. public firms from 2000 to 2013 where the firm’s industry imports from China. Data on U.S. firms come from Compustat. The dependent variables are *LogAsset\_US*, *PPE/Assets\_US*, *LogSale\_US*, *NI/Asset\_US*, and *LogEmployees\_US* at firm×year level. *LogAsset\_US* is the logarithm of US firm’s total assets. *PPE/Assets\_US* measures the tangibility defined as plant, property, and equipment divided by total assets. *LogSale\_US* is the logarithm of US firm’s total sales. *NI/Asset\_US* is net income scaled by lagged total assets. *LogEmployees\_US* is the logarithm of the number of employees of the firm. The independent variable *Direct\_PriceChange* is at the industry×year level and denotes the average price change from China’s export in the same industry resulting from CDB loans estimated using the coefficient estimate of 2SLS regression result. *Upstream\_PriceChange* is at the industry×year level and denotes the average price change from China’s export in the upstream industry. To match the Chinese export industry with U.S. firm’s industry, we collapse the 95 CDB industries into 71 industries as identified by the U.S. IO table summary file from the U.S. Bureau of Economic Analysis. In particular, we use the 2007 data as the benchmark to link CDB industries and U.S. IO industries. The upstream-downstream industry link for U.S. firms is constructed using U.S. IO table as well. In Panel A, we examine how US firms react to China’s export price reduction brought by CDB loans in the same industry. In Panel B, we examine how US firms in downstream industry react to China’s export price reduction. Firm fixed effects and year fixed effects are included in all regressions. Fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

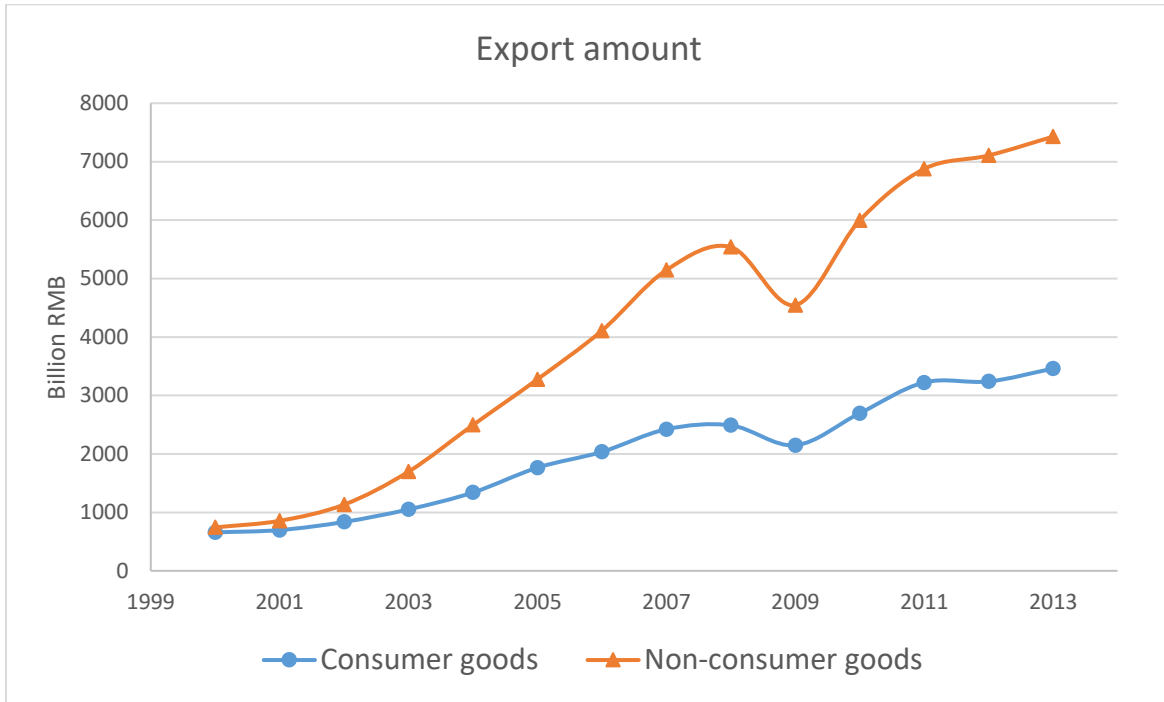
Panel A: Horizontal Effect

	(1)	(2)	(3)	(4)	(5)
	<i>LogAsset_US</i>	<i>PPE/Assets_US</i>	<i>LogSale_US</i>	<i>NI/Asset_US</i>	<i>LogEmployees_US</i>
<i>Direct_PriceChange</i>	0.1497*** (11.7)	0.0123*** (7.3)	0.0646*** (5.5)	0.0307* (1.8)	0.0450*** (4.7)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	56,686	56,655	48,460	48,128	45,700
Adjusted R-squared	0.927	0.828	0.941	0.555	0.962

Panel B: Upstream Effect

	(1)	(2)	(3)	(4)	(5)
	<i>LogAsset_US</i>	<i>PPE/Assets_US</i>	<i>LogSale_US</i>	<i>NI/Asset_US</i>	<i>LogEmployees_US</i>
<i>Upstream_PriceChange</i>	0.0007 (0.1)	-0.0036** (-2.3)	-0.0209** (-2.2)	-0.0495*** (-3.1)	-0.0177** (-2.0)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	42,068	42,023	35,860	36,041	33,330
Adjusted R-squared	0.944	0.831	0.957	0.572	0.964

## Appendix



**Figure A1: Export amount by type of goods**

This figure shows the export amount for two types of exported goods: consumer goods and non-consumer goods. Based on the population data of China Customs, we aggregate the export amount from all export transactions (i.e., exports by manufacturing firms and exports by intermediary firms) from 2000 to 2013. Exported goods are classified as either raw materials, intermediate goods, capital goods, or consumer goods using the concordance table from HS standard product groups (UNCTAD-SoP), which is available at <https://wits.worldbank.org/referencedata.html>. We classify the first three types of goods into non-consumer goods group, and consumer goods are classified into consumer goods group. We plot the time trend of export amounts for the two groups. The unit is in billion RMB.

**Table A1: Variable Definitions**

<b>Variable</b>	<b>Definition</b>
<i>LogDirectLoan</i>	Logarithm of direct CDB outstanding loan amount at the province×industry×year level. The loan is defined as “direct” for a firm if the firm is in the same province and industry as the loan. The unit of CDB loan is in hundred million RMB. We take the logarithm form in the regression analyses.
<i>LogUpstreamLoan</i>	Logarithm of direct CDB outstanding loan amount at the province×industry×year level. The loan is defined as “upstream” for a firm if the loan is given to the upstream industry of the firm in the same province. The unit of CDB loan is in hundred million RMB. We take the logarithm form in the regression analyses.
<i>LogExport</i>	Logarithm of the export amount (in millions RMB) of the firm in the China Customs data. The variable is at firm×year level.
<i>LogNumDestinations</i>	Logarithm of the number of a firm’s export destinations in the China Customs data. The variable is at firm×year level.
<i>LogNumProducts</i>	Logarithm of the number of a firm’s export product types, where the product type is measured by aggregating the eight-digit product code in China Customs data at the four-digit Harmonized System (HS) code level. The variable is at firm×year level.
<i>Export/Sales</i>	Ratio of the export amount to total sales at firm×year level.
<i>LogAssets</i>	Logarithm of the firm’s total asset in the CIC data.
<i>LogSales</i>	Logarithm of the firm’s total sales in the CIC data.
<i>ROA</i>	Contemporaneous return on assets. It is calculated by dividing a firm's annual earnings by its total assets in the same year in the CIC data.
<i>Leverage</i>	Leverage ratio defined as total debt divided by total asset in the CIC data.
<i>LogNumWorkers</i>	Logarithm of the firm’s number of workers in the CIC data.
<i>LogGDP</i>	Logarithm of the city’s GDP where the firm locates. The variable is at city×year level.
<i>LogPopulation</i>	Logarithm of the city’s population where the firm locates. The variable is at city×year level.
<i>UpstreamDependence</i>	Direct consumption coefficient extracted from the China IO table (2007), measuring how much the downstream industry sources the inputs from the key upstream industry. A higher value indicates the industry has a higher dependence on the upstream industry.
<i>LogPrice</i>	Logarithm of average export price measured at the firm×product×year level. We compute the simple average of prices at the eight-digit HS product level within a firm-year and aggregate them at four-digit HS product level.
<i>LogWTPPrice</i>	Logarithm of export-weighted-average export price measured at the firm×product×year level. We compute the average prices using the export amount as weight at eight-digit HS product level within a firm-year and aggregate them at four-digit HS product level.
<i>NonConsumerGood</i>	A dummy variable that equals 1 if the firm mainly exports non-consumer goods (i.e., raw material, intermediate goods, capital goods) and zero if the firm mainly exports consumer goods. A firm is classified as non-consumer goods exporter if the amount of non-consumer goods exports is larger than the amount of consumer goods exports and vice versa. The products are classified as either raw materials, intermediate goods, capital goods, or consumer goods using the concordance tables from HS standard product groups (UNCTAD-SoP), which is available at <a href="https://wits.worldbank.org/referencedata.html">https://wits.worldbank.org/referencedata.html</a> .
<i>LogAsset_US</i>	Logarithm of total assets for U.S. firms in Compustat.
<i>PPE/Assets_US</i>	Tangibility of U.S. firms in Compustat, computed as property, plant, and equipment divided by total assets.

<i>LogSale_US</i>	Logarithm of total sales for U.S. firms in Compustat.
<i>NI/Asset_US</i>	Profitability of U.S. firms in Compustat computed as net income divided by total assets.
<i>LogEmployees_US</i>	Logarithm of the number of employees for U.S. firms in Compustat.

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**Table A2: CDB Loans and Political Turnover**

This table shows the relation between political turnover and CDB loans outstanding from 2000 to 2013. In Panel A, we regress CDB city loans outstanding on city secretary turnover cycle. *LogCityLoan* is the logarithm of CDB total loans outstanding at the city×year level. *First\_Year* is a dummy which equals 1 if it is the first year in a city secretary’s term. *Second\_Year* to *Fourth\_Year* are defined in the same way. The dummy for the fifth year is the missing category. Column (1) is for the effect of the actual turnover cycle on the total CDB city loans outstanding while Column (2) is for the effect of the predicted turnover cycle. Control variables include city-level GDP, income per capita, and population. The city fixed effects, politician fixed effects and year fixed effects are included in Panel A. Standard errors are clustered at the city level. Panel B reports the results of regressing CDB provincial industry loan amounts on the *First* to *Fifth* dummies at the province×industry×year level. *LogProvinceLoan* is the logarithm of CDB annual province-industry loans outstanding. *First* is a dummy for whether the city secretary is in the predicted first year of his/her term and the city's largest SOE industry (i.e., focal industry) is in the same industry as in the provincial industry loans. *Second* is a dummy for whether the city secretary is in the predicted second year of the term and the city's largest SOE industry (i.e., focal industry) is in the same industry as in the provincial industry loans. The dummies *Third* to *Fifth* are defined similarly. Province×year fixed effects and industry fixed effects are included in Panel B. Standard errors are clustered at the province level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

Panel A: CDB City-level Loans and City Secretary Turnover

	Actual Turnover (1) <i>LogCityLoan</i>	Predicted Turnover (2) <i>LogCityLoan</i>
<i>First_Year</i>	0.4289* (1.7)	0.4062** (2.1)
<i>Second_Year</i>	0.3826* (1.9)	0.3003* (2.0)
<i>Third_Year</i>	0.2891** (2.1)	0.2277** (2.0)
<i>Fourth_Year</i>	0.1706** (2.1)	0.1254 (1.6)
Controls	Yes	Yes
City FE, Secretary FE, Year FE	Yes	Yes
Observations	3,505	3,602
Adjusted R-squared	0.881	0.893

Panel B: CDB Province-industry Loans and Political Turnover

	(1) <i>LogProvinceLoan</i>
<i>First</i>	0.5803*** (5.4)
<i>Second</i>	0.4856*** (3.6)
<i>Third</i>	0.3182** (2.8)
<i>Fourth</i>	0.2508 (1.4)
<i>Fifth</i>	0.3399 (1.6)
Province×Year FE, Industry FE	Yes
Observations	5,573
Adjusted R-squared	0.336

**Table A3: Effects of Direct CDB Loans on All Customs Firms (2SLS)**

This table shows the two-stage least squares regressions results on the effect of CDB direct loans on both SOEs and private firms' export activities by using *First* to *Fifth* as instrumental variables for the logarithm of the direct CDB province-industry level outstanding loan amounts in 38 industries and 27 provinces (excluding Beijing, Shanghai, Tianjin, and Chongqing). The sample contains all manufacturing firms in China Customs data from 2000 to 2013 so control variables are not included in regressions. The dependent variables are the export amount (*LogExport*), number of export destinations (*LogNumDestinations*), number of export product varieties (*LogNumProducts*). The independent variable, *LogDirectLoan*, denotes the direct CDB loan for the firm in the same industry as the loan which is at province  $\times$  industry  $\times$  year level. In Panel A, the sample is restricted to SOEs. In Panel B, the sample is restricted to private firms. All variables are defined in Table A1. Firm fixed effects and province  $\times$  year fixed effects are included in all regressions. Fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. Cragg-Donald Wald F-statistics for weak identification tests are reported. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

## Panel A: Export Activities of SOEs

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogDirectLoan</i>	0.0413*** (3.2)	0.0185*** (3.1)	0.0089* (1.7)
Firm FE	Yes	Yes	Yes
Province $\times$ Year FE	Yes	Yes	Yes
Observations	106,130	106,130	106,130
Adjusted R-squared	0.715	0.773	0.806
Wald F-stat	103.8	103.8	103.8

## Panel B: Export Activities of Private Firms

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogDirectLoan</i>	0.0014 (0.3)	0.0024 (1.2)	0.0022 (1.2)
Firm FE	Yes	Yes	Yes
Province $\times$ Year FE	Yes	Yes	Yes
Observations	1,321,832	1,321,834	1,321,834
Adjusted R-squared	0.753	0.790	0.766
Wald F-stat	743.3	743.3	743.3

**Table A4: Effects of Upstream CDB Loans on All Customs Firms (2SLS)**

This table shows the two-stage least squares regressions results on the effect of CDB upstream loans on downstream SOEs and private firms' export activities by using *First* to *Fifth* as instrumental variables for the logarithm of the direct CDB province-industry level outstanding loan amounts in 39 industries and 27 provinces (excluding Beijing, Shanghai, Tianjin, and Chongqing). The sample contains all manufacturing firms in China Customs data from 2000 to 2013 so control variables are not included in regressions. The dependent variables are the export amount (*LogExport*), number of export destinations (*LogNumDestinations*), number of export product varieties (*LogNumProducts*). The independent variable, *LogUpstreamLoan*, denotes the upstream CDB loan in the firm's upstream focal industry which is at province×industry×year level. In Panel A, the sample is restricted to SOEs. In Panel B, the sample is restricted to private firms. All variables are defined in Table A1. Firm fixed effects and province×year fixed effects are included in all regressions. Fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. Cragg-Donald Wald F-statistics for weak identification tests are reported. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

## Panel A: Export Activities of SOEs

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogUpstreamLoan</i>	0.0408*** (2.7)	0.0184** (2.6)	0.0208*** (2.9)
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	90,703	90,703	90,703
Adjusted R-squared	0.721	0.777	0.804
Wald F-stat	67.82	67.82	67.82

## Panel B: Export Activities of Private Firms

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogUpstreamLoan</i>	0.0400*** (10.7)	0.0197*** (11.4)	0.0183*** (11.4)
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	1,222,157	1,222,157	1,222,159
Adjusted R-squared	0.750	0.786	0.763
Wald F-stat	948.7	948.6	948.7

**Table A5: Effect of CDB loans on Non-consumer goods (2SLS)**

This table shows the two-stage least squares regression results on the effects of CDB loans on types of exported goods by using *First* to *Fifth* as instrumental variables for the logarithm of the direct CDB province-industry level outstanding loan amounts in 27 provinces (excluding Beijing, Shanghai, Tianjin, and Chongqing). The sample contains the merged firms in China Customs data and CIC data from 2000 to 2013. The dependent variables are the export amount (*LogExport*), number of export destinations (*LogNumDestinations*), number of export product varieties (*LogNumProducts*). *NonConsumerGood* is a dummy variable at the firm×year level that equals 1 if the firm mainly exports non-consumer goods (i.e., raw material, intermediate goods, capital goods) and zero if the firm mainly exports consumer goods. In Panel A, the sample is restricted to SOEs. In Panel B, the sample is restricted to private firms. *LogAssets*, *LogSales*, *ROA*, *Leverage*, *LogNumWorkers*, *LogGDP*, and *LogPopulation* are included as control variables in all regressions. All variables are defined in Table A1. I follow Wooldridge (2002) to include the interaction term in 2SLS. Firm fixed effects and province×year fixed effects are included in all regressions. Coefficients of control variables and fixed effects estimates are omitted for brevity. Standard errors are clustered by the firm for all regressions and *t*-statistics are reported in parentheses. Cragg-Donald Wald F-statistics for weak identification tests are reported. \*\*\*, \*\*, and \* indicate statistical significant at the 1%, 5%, and 10% level, respectively.

## Panel A: Direct Loan on SOEs

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogDirectLoan</i>	0.0651*** (3.0)	0.0246** (2.3)	0.0141 (1.6)
<i>LogDirectLoan</i> × <i>NonConsumerGood</i>	0.0318*** (6.0)	0.0150*** (5.7)	0.0076*** (3.5)
<i>NonConsumerGood</i>	0.3875*** (5.6)	0.0900*** (2.9)	0.0418* (1.8)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	52,458	52,458	52,458
R-squared	0.725	0.776	0.734
Wald F-stat	52.27	52.27	52.27

## Panel B: Upstream Loan on Private Firms

	(1)	(2)	(3)
	<i>LogExport</i>	<i>LogNumDestinations</i>	<i>LogNumProducts</i>
<i>LogUpstreamLoan</i>	0.0144*** (3.2)	0.0126*** (5.4)	0.0088*** (4.1)
<i>LogUpstreamLoan</i> × <i>NonConsumerGood</i>	0.0080*** (6.2)	0.0016** (2.3)	0.0054*** (9.2)
<i>NonConsumerGood</i>	0.0553*** (3.7)	-0.0072 (-1.0)	0.0355*** (5.6)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Province×Year FE	Yes	Yes	Yes
Observations	519,197	519,197	519,197
R-squared	0.814	0.834	0.785
Wald F-stat	1016	1016	1016