JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS

doi:10.1017/S0022109024000413

Government Credit and International Trade

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Abstract

Using transaction-level trade data from China Customs and loan data from the China Development Bank (CDB), we find that CDB credit to strategic industries at the top of supply chains leads to lower prices, higher volume, and more product varieties and destinations for exports for firms in downstream industries. These positive spillovers stem from reduced intermediate goods prices and increased trade credit from upstream to downstream firms caused by CDB loans. Notably, this surge in import activity displaces U.S. firms within the same industry but bolsters downstream U.S. firms' business performance and employment.

I. Introduction

International trade, a vital part of the global economy, is influenced by government policies (e.g., Grossman and Rogoff (1995)).[1] Despite the recent growing literature on the economic consequences of government-subsidized credit (e.g.,

We thank Nittai Bergman, Hans Degryse, Haichao Fan, Zuzana Fungacova, Jian Gao, Lei Gao, Jarrad Harford (the editor), Yi Huang, Yang Jiao, Chen Lin, Shu Lin, Ernest Liu, Randall Morck, Orkun Saka, Julien Sauvagnat, Antoinette Schoar, Kang Shi, Philip Strahan, Anjan Thakor, Robert Townsend, Pengfei Wang, Shang-Jin Wei, Danyang Xie, Bing Xu, Haoxiang Zhu, and an anonymous referee. We are grateful for valuable comments and suggestions received from the following events: 2020 AEA Poster, 2019 ABFER, 2019 SFS Cavalcade North America, the 2019 SERC Conference, 2019 CESifo/BOFIT Workshop on Banking and Institutions, and the 2018 UIBE International Conference in Finance. We also thank Chinese University of Hong Kong (Shenzhen), Nanyang Technological University, and Xiamen University seminar participants for their comments. To the authors' knowledge, no conflicts of interest, financial or otherwise, exist. The views presented are our own, and we are solely responsible for any errors.

Funding: We gratefully acknowledge the financial support received from the Ministry of Education, Singapore, under its Tier 1 RG134/20., the National Science Foundation of China [72302003], the Multi-Year Research Grant from the University of Macau [MYRG-GRG2023-00011-FBA], and in-kind support for data access from the China Development Bank (CDB).

[1]The total trade transaction volume reached approximately USD 25 trillion in 2019 (approximately 28.5% of global GDP). See this report (https://www.wto.org/english/res_e/statis_e/wts2020_e/wts2020chapter02_e.pdf) for further details on recent global trade activities. International trade has also been shown to affect cross-border mergers and to transmit merger activities across countries (e.g., Ahmad, de Bodt, and Harford (2021), Harford, Schonlau, and Stanfield (2019)).

Huang, Pagano, and Panizza (2020), Kaboski and Townsend (2012), Lucas (2016), and Ru (2018)), there is limited empirical evidence on how government credit affects international trade across the supply chain.[2] This article contributes to the debate by investigating the influence of China's government-subsidized credit as a novel channel on export activities and its spillover effects across the supply chain in the U.S., its largest bilateral trade partner.[3]

Specifically, we harness extensive export transaction data from China and province-industry-level loan data from the CDB, leading to two pivotal discoveries. First, CDB's subsidized loans to China's strategic upstream industries at the top of the supply chain (e.g., energy and mining) generate positive spillovers for downstream firms by lowering the prices of intermediate input products and enabling upstream firms to extend more trade credit to downstream firms. These spillovers result in reduced export prices, increased volumes, more destinations, and greater product varieties for downstream industries. Second, the increased export volume with lower prices from China crowds out the U.S. firms in the same industry in terms of employment and performance. By contrast, the U.S. firms in downstream industries benefit from the cheaper intermediate goods imported from China and subsequently perform better. We provide novel evidence on how government credit reshapes trade activities, especially for spillovers across the supply chain to other countries.

Our primary data, sourced from China Customs, encompasses all export and import transactions between 2000 and 2013. Each transaction provides detailed information, such as product price, quantity, transportation method, destination country, firm name, and location, allowing us to examine the dynamics of China's export activities. Additionally, we draw on loan records from the CDB, the world's premier policy bank, with RMB 18.2 trillion in total assets in 2022. Our sample incorporates CDB loans extended to 46 industries, segregated into 9 upstream and 37 downstream sectors, using upstreamness indexes based on the input–output (IO) matrix as per (Antràs, Chor, Fally, and Hillberry (2012)).[4] We define each firm's key upstream industry in the China Customs data as the industry providing the majority of its inputs.

Utilizing these data, we first conduct OLS regressions of firm export activities on CDB credit to the firm's own industry and upstream industry. In line with the existing literature, we employ export volume, the number of export destinations, the number of products, and the number of destination–product pairs at the firm-year level to capture firms' ability to overcome fixed costs for market entry or new product introduction (Becker, Chen, and Greenberg (2013)), Manova, Wei, and Zhang (2015)). We find that CDB loans to the firm's upstream industry are strongly positively associated with its export activities for firms in downstream industries. In contrast, CDB loans to the firm's industry show weak positive correlations with its

[2]Liu (2019) shows the importance of the input–output linkages across the supply chain for the transmission of government industrial policies in China.

[3]There is a growing literature on the trade frictions between the U.S. and China (e.g., Amiti, Redding, and Weinstein (2020), Ding, Fan, and Lin (2018), Fotak, Lee, Megginson, and Salas (2024), He, Pan, Shim, and Xu (2019), and Huang, Lin, Liu, and Tang (2023)).

[4]See Section IV.A for a detailed discussion.

export activities. The findings suggest that government credit to upstream industries positively impacts downstream firms' exports.

We further investigate how CDB credit to upstream industries affects downstream firms through two channels. First, we scrutinize the pass-through via the intermediate goods channel across the supply chain. We observe a negative relationship between CDB loans to upstream industries (e.g., mining) and their product prices, primarily intermediate goods for downstream industries. This leads to a similar negative correlation between the cost of goods sold by downstream firms and CDB loans to their upstream counterparts, emphasizing the intermediate goods channel's critical role. Simultaneously, we investigate the financial channel, assessing how CDB credit affects trade credit across the supply chain. We find a positive correlation between CDB loans to upstream industries, upstream firms' accounts receivable, and downstream firms' accounts payable. This suggests that CDB credit can traverse from upstream to downstream industries via trade credit, establishing another vital conduit for the positive spillover of CDB credit on downstream exports. In a nutshell, CDB credit facilitates trade activities through both intermediate goods and financial channels.[5]

One potential caveat regarding identification is the nonrandom allocation of CDB credit by the government. To establish causality, we use the exogenous variation from predetermined predicted municipal politicians' turnover cycles. City secretaries of the Communist Party of China (CPC) in Chinese municipalities have promotions tied to local economic performance (Li and Zhou (2005)), incentivizing them to borrow and invest early in their 5-year tenure. We identify each city's largest state-owned enterprises (SOEs) industry (i.e., focal industry), often predetermined by historical reasons. We then interact the dummy variable for focal industries in a province's cities with the dummy for the first 3 years of cities' secretaries' term, using the interaction term as the instrument for province-industry-level CDB loans.[6]

Our first-stage regression indicates that provinces significantly increase their borrowing from CDB for key city industries during a city secretary's initial 3-year term. Second-stage regressions confirm that CDB loans markedly enhance the export activities of downstream firms within the same province. Specifically, a 1-standard-deviation rise in CDB upstream loans leads to approximately 38.4% more export volume, 25.7% additional destinations, 21.1% more products, and 30.4% more destination–product pairs for downstream firms. These effects outperform direct CDB loans, aligning with the fact that roughly 90% of CDB loans serve the 9 upstream industries. In addition, 2-stage least squares (2SLS) regressions show that CDB loans lower upstream firms' product prices and raise accounts receivable and payable, underscoring the spillover effects of government credit

[5]We also discover that larger CDB loans to downstream industries correlate with increased average prices of goods produced by upstream firms and higher accounts receivable. This correlation indicates that downstream CDB loans may boost demand for upstream goods, thus driving up average prices and resulting in higher accounts receivable when downstream customers receive more CDB loans.

[6]We find that city secretaries borrow significantly larger amount of CDB loans during the first 3 years of their terms. Our main findings are consistent if we use city mayor's turnover to construct the instrument. We thank the referee for this very beneficial suggestion.

on the economy. Overall, the increased export volume induced by CDB loans contributes an average of 0.685% to China's annual GDP.

A concern with the instrumental variables in the 2SLS pertains to whether they impact export activities exclusively through CDB loans. In China, local politicians can influence firm export activities via tax incentive schemes (e.g., income tax and value-added tax), subsidies, and treaties for foreign investors. Moreover, local politicians might seek alternative financial and fiscal resources to invest in the local economy, such as loans from other banks, land sales, and fiscal transfers. We test all these channels, finding neither statistically nor economically significant associations with local politician turnover cycles. While our results do not preclude the possibility that local politicians use these policies to influence local exports, the exclusion condition depends on these channels not correlating with predetermined politician turnover cycles, as supported by our data.

Lastly, we explore how lower-priced exports from China, propelled by government credit, impact foreign firms, particularly in U.S.–China trade. By calculating the price drop of Chinese exports due to CDB loans and regressing U.S. firms' performance and employment on these estimated reductions, we reveal that decreased Chinese import prices, prompted by CDB credit, crowded out U.S. firms in the same industry. Conversely, reduced prices of upstream goods from China enhance downstream U.S. firms' assets, sales, and employment, benefiting from affordable inputs. We further explore spillover heterogeneity on U.S. downstream firms from cheaper Chinese imports. Positive spillover effects intensify in high-unemployment states but weaken for firms impacted by tariff increases during the U.S.–China trade war, implying strategic tariff avoidance on primary input imports by the U.S. government.

We contribute to several strands of the literature. First, our study contributes to the extensive literature on government policies in international trade, which has primarily focused on trade policy, tariffs, and the role of financial institutions (e.g., Brandt, Van Biesebroeck, Wang, and Zhang (2017), De Loecker, Goldberg, Khandelwal, and Pavcnik (2016), Fan, Li, and Yeaple (2015), Khandelwal, Schott, and Wei (2013), Pavcnik (2002), and Topalova and Khandelwal (2011)). Numerous studies have found that strong financial institutions facilitate trade, especially for sectors relying more on external finance (e.g., Beck (2002), Becker et al. (2013), Ju and Wei (2010), Kletzer and Bardhan (1987), and Manova (2013)). Recent literature also documents the negative effects of credit constraints on trade at the firm level (e.g., Amiti and Weinstein (2011), Fan, Lai, and Li (2015), Manova et al. (2015), Minetti and Zhu (2011), Muûls (2015), and Paravisini, Rappoport, Schnabl, and Wolfenzon (2015)). However, few studies specifically examine how government-directed credit affects trade despite its growing size globally in recent years (e.g., Lucas (2016)). Our research fills this gap by documenting a substantial positive spillover of government credit on downstream firms' exports in boosting export volume, destination variety, and product diversity, which is passed through via input–output linkages.[7] This finding suggests that government credit may help

[7]Some prior studies highlight the direct effects of government subsidies, with Westphal (1990) attributing Korea's export competitiveness to selective industrial policies, and He, Pan, Shim, and Xu (2019) suggesting that removing subsidies on China's state-owned enterprises and credit constraints on private firms could spur economic transition, reduce trade imbalance, and increase welfare.

firms overcome market failures (e.g., Atkinson and Stiglitz (1980), Stiglitz (1993)), such as financing entry into new markets.[8] Moreover, we identify two critical mechanisms for the positive spillovers of government credit—cheaper intermediate goods and trade credit transmission across industries—offering policymakers an enhanced understanding of potential spillovers and the mechanisms involved in government credit allocation.[9]

Second, our study sheds light on the literature by differentiating the crowding-out and crowding-in effects of cheaper Chinese exports on U.S. firms from a supply chain perspective. Wang, Wei, Yu, and Zhu (2018) find that imported intermediate goods from China increase employment for downstream U.S. firms, while Huang et al. (2020) note negative stock market reactions to new tariffs in 2018 for U.S. firms using Chinese imports in production. While crowding-out effects on U.S. firms in horizontal industries align with previous studies on the negative impact of Chinese exports on U.S. employment (e.g., Autor, Dorn, and Hanson (2013), Acemoglu, Autor, Dorn, Hanson, and Price (2016), and Pierce and Schott (2016)), we also demonstrate that reduced prices of intermediate goods from China benefit downstream U.S. firms. The finding of these countervailing effects not only holds significant policy implications for the U.S.–China trade war (e.g., Amiti et al. (2020), Ding et al. (2018), He et al. (2019), and Huang et al. (2020)) but also provides useful insights to the ongoing debate about government credit and trade frictions, which are prevalent throughout the world (OECD (2018), (2019)).

The rest of this article is organized as follows: Section II describes China's institutional background. In Section III, we present our data and summary statistics. Section IV provides the empirical results, and Section V concludes.

II. Institutional Background

A. China's Economic Reform and Trade Policies

Initiated in 1978 under Deng Xiaoping, China's economic reforms—encompassing tariff and trade barrier reductions and deregulations—catalyzed a substantial growth in trade volume. For instance, by 2001, the tariff rate had plunged from 56% to 15%, with over 60% of imports being tariff-free, propelling trade from $20 billion at the start of the reform to over $500 billion. China's induction into the World Trade Organization in 2001, after 15 years of negotiation, accelerated this surge in international trade, with firms rapidly expanding to global markets. Tariffs on industrial products further dropped to 8.9% by 2010. This momentum pushed total trade volumes from nearly $510 billion in 2001 to an overwhelming $4.1 trillion in 2013, surpassing the U.S. to become the largest trading nation globally.[10]

[8]This article also relates to the literature on China's economy and the state's role, showcasing the beneficial aspects of government-subsidized credit and its core mechanisms. While state-ownership plays a key role in China's financial market, leading to distorted resource allocation and potential system risks (e.g., Allen, Qian, and Qian (2005), Cong, Gao, Ponticelli, and Yang (2019), Huang et al. (2020), Liu (2019), and Song and Xiong (2018)), our study highlights its brighter and constructive facets.

[9]Our findings on the two channels of government credit transmission are also linked to another strand of the literature on the pass-through of monetary policy via banks (e.g., Bernanke (1983), Drechsler, Savov, and Schnabl (2017), He and Krishnamurthy (2013), and Kashyap and Stein (1994)).

[10]See Hu, Li, Lin, and Wei (2023) for more details.

Although functioning within a market economy, China's state capitalism enables government control over economic activities through corporatized agencies and SOEs. Scholars have posited that government trade policies may have a mercantilist nature (Brander and Spencer (1985), and Rodrik (1995), (2013)). China has faced criticism for its export-oriented mercantilist policies, including industrial strategies and credit support (Atkinson (2012), Godement, Parello-Plesner, and Richard (2011), and Hormats (2011)). Notably, the government employs multiple subsidization techniques for industries such as steel, including direct cash and resource grants, land grants, credit subsidies, tax incentives, preferential loans, and directed credit from state-owned banks (Price, Weld, Nance, and Zucker (2006)). Such policies have been effective, with steel exports quadrupling between 1998 and 2005. However, this approach led to tensions, with the U.S., under former President Trump, initiating an investigation into imposing tariffs on over $50 billion worth of Chinese products in 2018. This marked the start of the U.S.–China trade war, as Trump cited China's "unfair trade practices" as the motivation for the move.

B. The CDB and its Role

The CDB is the largest policy bank in China and operates under the direct control of the State Council. As the world's largest development finance institution, it holds total assets of RMB 16.5 trillion as of 2019. The CDB provides medium- to long-term subsidized credit to support China's long-term economic and social development strategies, particularly in underdeveloped areas and bottlenecked industries.

The CDB differs from major commercial banks in China in several ways. For example, it offers heavily subsidized loans with interest rates averaging 100 basis points lower than those of commercial banks with similar characteristics. In addition, the CDB issues policy loans targeting strategic industries and infrastructure projects in China, while commercial banks primarily focus on profit-driven ventures in wealthier provinces. The CDB also maintains longer and closer relationships with local governments than commercial banks, assisting many local governments in building financing vehicles to raise debt for them (Gao, Ru, and Tang (2021)).[11]

Playing a crucial role in supporting local enterprises as they expand abroad, the CDB provides approximately RMB 120 billion and 98 billion in credit lines to Huawei and Zhongxing, respectively. The bank also provides over RMB 245 billion in loans to leading solar panel manufacturers in China, which primarily export to overseas markets. The CDB focuses its lending on strategic industries in China, such as the production and supply of electricity and heat, coal mining and dressing, petroleum and natural gas extraction, raw chemical materials and chemical products, and petroleum processing and coking. These industries account for roughly

[11] There are 5 major nationwide commercial banks in China: Agriculture Bank of China (ABC), Bank of China (BOC), China Construction Bank (CCB), Industrial and Commercial Bank of China (ICBC), and Bank of Communication (BoCom). For more detailed discussions on China's banking system, see Section 1 of the Supplementary Material.

88.2% of total CDB loans outstanding for all 46 industries in our sample (see Figure A1 in the Supplementary Material). They are at the top of the supply chain in China and provide essential intermediate goods to downstream companies, such as manufacturing firms. This article examines how subsidized CDB loans to upstream industries impact the entire supply chain by passing through to downstream firms.

III. Data, Variables, and Summary Statistics

A. China Customs Data

Our trade data record the universe of firms' exports and imports at the transaction level from 2000 to 2013, collected and made available by the China Customs Office (e.g., Manova and Zhang (2009)). The data report the free-on-board value of firm exports by product and country for more than 200 destinations and over 7,000 products identified by Chinese 8-digit harmonized system (HS) codes.[12] For each transaction, the data contain variables such as the ID and name of the exporter/importer, trade volume, unit price, type of trade, transportation method, location of the customs office where the transaction was processed, region or city in China where the product was exported from or imported to, and potential transfer country or region.

We follow the standard approach used in the literature (e.g., Ahn, Khandelwal, and Wei (2011), Kee and Tang (2016)) to exclude export–import firms that do not engage in manufacturing but serve exclusively as intermediaries between domestic producers (buyers) and foreign buyers (producers).[13] We also drop observations with missing values for important firm characteristics (e.g., ownership type, location, and industry). Overall, the number of exporting manufacturing firms in our sample increased from 55,182 in 2000 to 210,927 in 2013, with the number of export transactions increasing from 2,826,286 in 2000 to 6,688,085 in 2013.[14]

We construct four main firm-year-level dependent variables to capture the export activities of Chinese firms. First, Log(EXPORT) represents the logarithm of firm export volume and serves as a direct and commonly used metric of export performance. To account for credit constraints that can hinder firms' exports on extensive margins due to costs associated with entering new markets or introducing new

[12]Product classification is consistent across countries at the 6-digit HS level. The number of distinct product codes included in the Chinese 8-digit HS system is comparable to that included in the 10-digit HS classification for the U.S.

[13]We use keywords in firm names to identify intermediate firms. We search for Chinese characters that mean "trading," "importer," and "exporter." In pinyin (Romanized Chinese), these terms are: "jin4chu1kou3," "jing1mao4," "mao4yi4," "ke1mao4," and "wai4jing1." The percentage of export amounts of these trade intermediaries decreased from 32% in 2000 to 20% in 2013 in terms of total exports, suggesting that our sample represents the vast majority of China's export volume.

[14]In the Supplementary Material, we plot several graphs to summarize the export activities. Figure A2 shows the time trend of total export amounts from 2000 to 2013. Figure A3 shows the top 5 export industries in China for the early and ending years of our sample period. Figure A4 shows the top 10 destinations by total export amounts. Figure A5 classifies exported goods to non-consumer goods (intermediate goods) versus consumer goods (final goods) and shows that most exports from China were intermediate goods.

products, we employ Log(NUM_DESTINATIONS) and Log(NUM_PRODUCTS), which represent the logarithm-transformed number of export destinations and product types, respectively, following Bernard, Jensen, Redding, and Schott (2007) and Muûls (2015). We also calculate Log(NUM_DEST_PRODUCTS), which represents the logarithm-transformed number of destination–product pairs, to evaluate firms' ability to offset the fixed costs associated with entering new markets with different products, a measure adopted by Manova et al. (2015). Finally, we estimate the average price level of exported goods using two firm-product-year-level proxies. For each firm-year within a 4-digit HS code, we determine the simple (trade-volume-weighted) average price across all transactions, resulting in Log(PRICE) (Log(WT_PRICE)). Detailed definitions of these variables can be found in the Appendix.

B. CDB Loan and Politician Profile Data

Our proprietary CDB loan data contain information on outstanding loan amounts and issuances at the province-industry-year level for mainland China from 1994 to 2013. CDB industry classifications are comparable to U.S. 2-digit SIC codes. We match CDB loans to firms included in China Customs data at the province-industry-year level.[15] We define a CDB loan as a DIRECT_LOAN for a firm if the loan is allocated to the firm's province and industry. For example, suppose the CDB loan granted to province p and industry k is valued at 10 million in 2005. In that case, the DIRECT_LOAN for firms located in province p and operating in industry k is valued at 10 million in 2005. We also construct the variable UPSTREAM_LOAN (DOWNSTREAM_LOAN) for a firm if CDB loans are provided to the firm's key upstream (downstream) industry in the same province.

We use the national IO matrix of 2007 from the National Bureau of Statistics of China to construct upstream–downstream industry links. The IO matrix has a more detailed industry classification of 135 industries than the CDB classification (46 industries in our sample). Despite this discrepancy, the two classifications align significantly, with most industries appearing in both. In cases where industries do not match exactly, the IO matrix provides a more granular classification. To illustrate, the textile industry, as defined in the CDB classification, is partitioned into 5 different industries within the IO matrix. Thus, we manually align these two industrial classifications by aggregating the 135 IO industries to the CDB industry classification. For each industry k, we select the industry that provides the highest supply of inputs as its key upstream industry. The key downstream industry is similarly defined.

For identification, we employ local politician turnover cycles to construct the instrument for CDB loans. We have manually gathered data on local Chinese politicians, including detailed information such as gender, age, and birthplace for all city secretaries and mayors. These data are at the city-month level across 334 cities

[15]The raw CDB loan data cover 95 industries for 31 provinces in China. After matching with the firm-level data from China Customs and the CIC, our sample contains CDB loans to 46 industries and 31 provinces between 2000 and 2013. These 46 industries in our sample mainly cover the basic and strategic sectors in upstream (e.g., mining, oil, and gas) and manufacturing sectors in downstream (e.g., textiles, manufacture of machinery and equipment).

from 1949 to 2013. Section IV.C provides a detailed discussion of our identification strategy.

C. Chinese Industry Census (CIC) Data

Our CIC data cover all manufacturing firms in China with annual sales of RMB 5 million or more (the threshold increased to RMB 20 million in 2011) from 1998 to 2013, collected by the National Bureau of Statistics of China. This firm-year-level data include attributes such as location, industry, and registration type, as well as accounting information such as total assets, total debt, net income, and workforce numbers.

To understand how CDB credit influences supply chains, we create three dependent variables at the firm-year level from these data. We use the logarithm of the cost of goods sold (COGS), represented as Log(COGS), for downstream firms. This allows us to assess whether CDB loans to upstream firms lower their product prices, resulting in decreased COGS for downstream firms. Additionally, we construct Log(ACC_RECT), representing the logarithm of accounts receivable for upstream firms, and Log(ACC_PAY), representing the logarithm of accounts payable for downstream firms. These measures enable us to examine whether CDB loans motivate upstream firms to extend trade credit to downstream firms.

D. Data on U.S. Firms

Our data start with all public firms in Compustat from 2000 to 2013, where we can obtain information on multiple performance metrics and the number of workers. We exclude firms whose industries do not import from China, as we cannot gauge the effect of Chinese exports on these firms. Specifically, we analyze the total assets, fixed assets, sales, and the number of employees of U.S. firms.

E. Summary Statistics

Our primary sample includes firm-year observations merged between the China Customs data and CDB loan data from 2000 to 2013, covering 1,501,445 firm-year observations. The Appendix presents detailed explanations for each variable.

Panel A of Table 1 presents the summary statistics for the firm-year-level data from 2000 to 2013. An average firm has an annual export amount of RMB 49.758 million and exports to 7.6 markets with six different groups of products. The median values for EXPORT, NUM_DESTINATIONS, and NUM_PRODUCTS are 5.058, 3, and 2, respectively, suggesting that there are many large exporters. The mean (median) value of a direct loan is approximately RMB 753 (67) million, while the mean (median) upstream loan is valued at approximately RMB 949 (94) million. These statistics align with the CDB's agenda to lend to strategic industries, which 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 sample data are aggregated at the firm-product-year level. The simple average prices are close to the trading-amount-weighted average prices. Panel C shows the summary statistics

TABLE 1

Summary Statistics

Table 1 shows the summary statistics of the main variables used in this study. Panel A reports the summary statistics at the firm-year level for Chinese firms. Export amounts are measured in millions of RMB, and CDB loans are measured in hundreds of millions of RMB. Panel B provides summary statistics for export prices at the firm-product-year level for Chinese firms, where the product is identified at the 4-digit HS code level. Panel C reports summary statistics at the firm-year level for U.S. firms listed in Compustat. See the Appendix for detailed variable definitions.

Variables	*N*	Mean	SD	25%	Median	75%
Panel A. Firm-Year Level for Chinese Firms						
EXPORT	1,501,445	49.758	762.959	1.075	5.058	19.495
NUM_DESTINATIONS	1,501,445	7.609	10.912	1.000	3.000	9.000
NUM_PRODUCTS	1,501,445	5.977	17.099	1.000	2.000	5.000
NUM_DEST_PRODUCTS	1,501,445	18.872	98.105	2.000	6.000	15.000
Log(EXPORT)	1,501,444	1.452	2.254	0.072	1.621	2.970
Log(NUM_DESTINATIONS)	1,501,445	1.339	1.144	0.000	1.099	2.197
Log(NUM_PRODUCTS)	1,501,445	1.035	1.012	0.000	0.693	1.609
Log(NUM_DEST_PRODUCTS)	1,501,445	1.850	1.312	0.693	1.792	2.708
DIRECT_LOAN	1,501,445	7.533	21.629	0.040	0.673	4.426
UPSTREAM_LOAN	1,501,445	9.493	28.523	0.000	0.940	5.109
Log(DIRECT_LOAN)	1,501,445	−3.842	8.145	−3.219	−0.397	1.487
Log(UPSTREAM_LOAN)	1,501,445	−4.203	8.582	−18.421	−0.062	1.631
Log(ACC_PAY)	1,898,245	12.623	5.515	12.692	14.462	15.767
Log(ACC_RECT)	357,039	13.478	4.772	13.160	14.714	16.026
Log(COGS)	2,640,373	17.093	1.769	16.151	17.090	18.066
Panel B. Firm-Product-Year Level for Chinese Firms						
Log(PRICE)	9,654,875	1.918	2.433	0.362	1.480	2.884
Log(WT_PRICE)	9,654,875	1.915	2.471	0.344	1.465	2.868
Panel C. Firm-Year Level for U.S. Firms						
Log(ASSET)	42,068	5.277	3.028	3.349	5.459	7.464
PPE/ASSETS	42,023	0.377	0.282	0.129	0.316	0.614
Log(SALE)	35,860	5.494	2.888	3.900	5.834	7.471
Log(EMPLOYEES)	33,330	−0.101	2.602	−1.760	0.215	1.727

of the U.S. firms included in the analysis of the implications of Chinese exports for U.S. firms.

IV. Empirical Analyses and Results

A. Baseline Results

We begin by examining the association between CDB loans and Chinese firms' export activities. To formally test this association, we estimate the following regression model at the firm-year level:

$$Y_{i,t} = \begin{aligned} &\alpha + \beta_1 \text{Log(UPSTREAM\_LOAN)}_{i,t} \\ &+ \beta_2 \text{Log(DIRECT\_LOAN)}_{i,t} + \mu_i + \eta_{p\times t} + \varepsilon_{i,t}, \end{aligned} \tag{1}$$

where $Y_{i,t}$ denotes the four dependent variables representing the export volume and extensive margins, Log(EXPORT), Log(NUM_DESTINATIONS), Log(NUM_PRODUCTS), and Log(NUM_DEST_PRODUCTS), for firm i in year t. Log(DIRECT_LOAN) is the natural logarithm of the outstanding CDB loan amounts granted to the province and industry of firm i in year t. Log(UPSTREAM_LOAN) is the natural logarithm of the outstanding CDB loan

amounts granted to the province of firm i and its key upstream industry. μ_i indicates firm fixed effects included to mitigate the concern that unobserved time-invariant firm characteristics may drive our results. $\eta_{p\times t}$ indicates province × year fixed effects that condition out the province-time trends. We cluster standard errors at the firm level.

Panel A of Table 2 shows the regression results. Log(DIRECT_LOAN) has positive coefficients in all columns, with statistical significance in columns 2–4, suggesting that CDB loans positively correlate with export activities within the same industry. Moreover, the coefficients for Log(UPSTREAM_LOAN) are also positive across columns 1–4 and are significant at the 1% level. This implies that CDB loans to strategic upstream industries, such as energy and mining, have notable positive spillover effects on the export activities of downstream industries, such as manufacturing, surpassing the impacts of direct CDB loans.

TABLE 2

Effects of CDB Loans on Export Activities (OLS)

Table 2 reports the OLS regression results for the effects of CDB loans on firms' export activities by using China Customs data from 2000 to 2013. Export activities are measured at the firm-year level using the logarithm of export amount (Log(EXPORT)), number of export destinations (Log(NUM_DESTINATIONS)), number of export product varieties (Log(NUM_PRODUCTS)), and number of export destination–product pairs (Log(NUM_DEST_PRODUCTS)). Log(DIRECT_LOAN) denotes the logarithm of direct CDB loans outstanding in the firm's industry and province. Log(UPSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's upstream industry and province. Panel A shows the baseline regression results for the full sample. Panel B (C) shows the baseline results for firms in upstream (downstream) industries. Upstream industries include nonferrous metals mining and dressing, petroleum and natural gas extraction, coal mining and dressing, chemical fibers manufacturing, ferrous metals mining and dressing, production and supply of electricity and heat, raw chemical materials and chemical products, smelting and pressing of nonferrous metals, and petroleum processing and coking based on the upstreamness index following Antràs et al. (2012). See the Appendix for detailed variable definitions. Standard errors are clustered at the firm level for all regressions, and t-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable			
	Log(EXPORT)	Log(NUM_DESTINATIONS)	Log(NUM_PRODUCTS)	Log(NUM_DEST_PRODUCTS)
	1	2	3	4
Panel A. Full Sample				
Log(UPSTREAM_LOAN)	0.0031***	0.0017***	0.0023***	0.0025***
	(10.03)	(11.80)	(17.10)	(14.07)
Log(DIRECT_LOAN)	0.0004	0.0007***	0.0002*	0.0004**
	(1.48)	(4.78)	(1.94)	(2.34)
Firm FE	Yes	Yes	Yes	Yes
Province × year FE	Yes	Yes	Yes	Yes
Observations	1,501,443	1,501,445	1,501,445	1,501,445
Adjusted R^2	0.693	0.741	0.716	0.725
Panel B. Upstream Sample				
Log(DIRECT_LOAN)	0.0051***	0.0004	0.0008	0.0005
	(3.35)	(0.65)	(1.43)	(0.67)
Log(DOWNSTREAM_LOAN)	−0.0012	0.0002	0.0005	0.0005
	(−0.71)	(0.26)	(0.71)	(0.54)
Firm FE	Yes	Yes	Yes	Yes
Province × year FE	Yes	Yes	Yes	Yes
Observations	121,974	121,974	121,974	121,974
Adjusted R^2	0.702	0.744	0.721	0.726
Panel C. Downstream Sample				
Log(UPSTREAM_LOAN)	0.0035***	0.0019***	0.0024***	0.0026***
	(11.00)	(12.40)	(17.22)	(14.48)
Log(DIRECT_LOAN)	0.0003	0.0007***	0.0003**	0.0004**
	(1.08)	(4.62)	(2.09)	(2.23)
Firm FE	Yes	Yes	Yes	Yes
Province × year FE	Yes	Yes	Yes	Yes
Observations	1,468,598	1,468,600	1,468,600	1,468,600
Adjusted R^2	0.692	0.741	0.716	0.724

The full sample analysis findings shown in Panel A may be influenced by several potential countervailing implications of CDB credit on export activities. For instance, the CDB mainly lends to SOEs and may crowd out private firm export activities, particularly for firms operating in upstream industries that receive most CDB loans. To further substantiate the role of upstream–downstream industry linkages underlying the spillover effects of CDB credit, we follow Antràs et al. (2012) and rank industries across the supply chain by calculating upstreamness indexes. Specifically, 9 of 46 industries in our data set with the highest upstreamness scores are classified as upstream industries, and the rest are classified as downstream industries (e.g., manufacturing industries).[16] Approximately 91% of the goods from firms in these upstream industries are intermediate goods purchased directly by downstream firms as inputs for production. As discussed in Section II.B, the CDB primarily targets strategic industries at the top of the supply chain; in our sample of 46 industries, approximately 90% of CDB loans flow to these 9 upstream industries. This result reconciles the findings in Panel A, showing that CDB loans to upstream industries have larger positive effects than direct CDB loans.

In Panel B, we perform the regressions of export activities on CDB direct loans for the subsample of firms in the 9 upstream industries. The coefficients of Log(DIRECT_LOAN) are positive but only statistically significant in column 1, consistent with anecdotal evidence that most CDB loans are intended for strategic industries at the top of the supply chain, which do not export much. For firms in this upstream subsample, we also control for the CDB loans allocated to firms' key downstream industries. The coefficients of Log(DOWNSTREAM_LOAN) in all 4 columns are insignificantly different from zero, suggesting that CDB loans to the downstream industries do not discernibly affect the export activities of firms in the upstream industries. The insignificance of such results may not be surprising, given that most of the CDB loans are extended to firms in the upstream industries.

In Panel C, we repeat the regressions applied in equation (1) for the subsample of firms in the downstream industries. We find that CDB direct loans to these downstream industries are positively associated with export activities, as suggested by the positive and significant coefficients of Log(DIRECT_LOAN) in columns 2 to 4. More importantly, the positive and significant coefficients of Log(UPSTREAM_LOAN) in all 4 columns show that CDB loans to upstream industries have larger positive effects, which are stronger than what we find in Panel A since these downstream industries depend heavily on their upstream suppliers.

[16]In particular, we replicate the method used in Antràs et al. (2012) to calculate industry "upstreamness" (or the average distance to the final use) for the 46 industries included in our sample under CDB classifications. A higher value of the upstreamness index indicates a more upstream industry, which tends to be involved in processing raw materials. Conversely, a low upstreamness index value suggests that the industry is a downstream industry with a significant amount of its output going directly to the end user. The top 9 upstream industries have an average upstreamness score of 5.406. They are nonferrous metals mining and dressing, petroleum and natural gas extraction, coal mining and dressing, chemical fibers manufacturing, ferrous metals mining and dressing, production and supply of electricity and heat, raw chemical materials and chemical products, smelting and pressing of nonferrous metals, and petroleum processing and coking. The other 37 industries have an average upstreamness score of 3.391. In addition, we use the data provided by Antràs et al. (2012) for China, and the first 5 industries with the highest scores are mining and quarrying, coke and refined petroleum products, electricity, chemicals, and iron and steel, which are consistent with our classification of the 9 upstream industries.

To confirm the robustness of our results, we conduct various tests. Initially, we account for all upstream industries when calculating loans, not just the key industry. The positive and significant coefficients of our new measure, Log(WT_UPSTREAM_LOAN), mirror previous results (Supplementary Material Table A1, Panel A). Additionally, firms may source from suppliers in other provinces, even though the costs might be higher due to geographic distance (e.g., Da, Gurun, Li, and Warachka (2021), Giroud (2013)). We accumulate our loans at the national-industry-year level. The results (Table A1, Panel B) consistently show positive and significant coefficients of Log(ALL_UPSTREAM_LOAN). Finally, we control for time-varying firm characteristics by cross-referencing China Customs data with CIC data (e.g., Feenstra, Li, and Yu (2014), Fan et al. (2015)). Despite the limited match (43% of manufacturing firms), the results (Table A1, Panel C) support our main findings, affirming the beneficial impact of CDB loans to upstream industries on downstream firms.

Taken together, these findings suggest significant positive spillovers of CDB credit to upstream industries on downstream export activities that are stronger than the direct effects of CDB loans to these downstream industries.[17] The results are consistent with the mandate of the CDB to provide subsidized government credit to strategic industries for the growth of China's economy.

B. Fundamental Mechanisms Underlying Upstream–Downstream Spillover Effects

In this subsection, we further study the fundamental channels of positive spillover effects, that is, how CDB credit to upstream industries affects downstream firms. In particular, we explore two potential channels across the supply chain: i) intermediate goods transactions between downstream and upstream industries, and ii) financial transactions via trade credit between customers and suppliers.

1. Intermediate Goods Channel Underlying Upstream–Downstream Spillover Effects

First, we investigate how CDB credit to upstream industries affects downstream industries via intermediate goods across the supply chain. We perform regressions of export good prices on CDB direct loans outstanding for the subsample of 9 upstream industries. Panel A of Table 3 shows the regression results. In column 1, we use the average price level as the dependent variable and find that the coefficient of Log(DIRECT_LOAN) is significantly negative. Moreover, in column 2, we find similar results using the export-amount-weighted average price level as the dependent variable. These findings suggest that subsidized CDB credit to upstream industries can lower the prices of their goods, which are mainly intermediate goods used by downstream firms as inputs, as discussed in Section IV.A. The positive and significant coefficients of Log(DOWNSTREAM_LOAN) suggest that higher CDB

[17] As an additional robustness test, we regress export activities aggregated at the province-industry-year level on CDB loans. The results are shown in Table A2 in the Supplementary Material, and we still find higher CDB upstream loans lead to significantly higher export volume. Furthermore, we examine the effects of CDB loans on the number of exporting firms, shedding light on firm export decisions, and find that both CDB direct loans and upstream loans increase the number of exporting firms.

TABLE 3

Fundamental Channel: Intermediate Goods (OLS)

Table 3 reports the OLS regression results for the effects of CDB loans on firms' COGS and export prices. Panel A shows the relationship between CDB loans and prices for firms in upstream industries. Panel B shows the association between CDB loans and COGS for firms in downstream industries. Log(PRICE) and Log(WT_PRICE) are the average prices and export-amount-weighted average prices, respectively. Log(COGS) is the natural logarithm of costs of goods sold at the firm level. Log(DIRECT_LOAN) denotes the logarithm of direct CDB loans outstanding in the firm's industry and province. Log(DOWNSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's downstream industry and province. Log(UPSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's upstream industry and province. Firm-level controls include the logarithm of a firm's sales, Log(SALE), and the firm's leverage ratio, *Lev*. Province-level controls include the logarithm of GDP, Log(GDP), and the logarithm of population, Log(POPU.) See the Appendix for detailed variable definitions. Firm fixed effects and province × year fixed effects are included. Standard errors are clustered at the firm level for all regressions, and *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Reduction in Prices of Inputs from Upstream Firms

	Dependent Variable	
	Log(PRICE)	Log(WT_PRICE)
	1	2
Log(DIRECT_LOAN)	−0.0052***	−0.0050***
	(−8.35)	(−7.79)
Log(DOWNSTREAM_LOAN)	0.0063***	0.0062***
	(10.03)	(9.57)
Firm FE	Yes	Yes
Product × year FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	452,722	452,722
Adjusted R^2	0.687	0.677

Panel B. COGS for Downstream Firms

	Dependent Variable	
	Log(COGS)	Log(COGS)
	1	2
Log(UPSTREAM_LOAN)	−0.0001***	−0.0001***
	(−3.03)	(−3.03)
Log(DIRECT_LOAN)	−0.0000	−0.0000
	(−0.24)	(−0.24)
Firm controls	Yes	Yes
Province controls	No	Yes
Firm FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	2,640,373	2,640,373
Adjusted R^2	0.969	0.969

loans to the firms' downstream industries are associated with higher average prices of the goods produced by these firms.

Next, we examine whether downstream firms indeed benefit from the reduced price of goods sold by their key upstream firms. In Panel B of Table 3, we perform regressions of the COGS on Log(DIRECT_LOAN) and Log(UPSTREAM_LOAN) for the downstream firm subsample. In column 1, the coefficient of Log(UPSTREAM_LOAN) is significantly negative. In column 2, we further control for province-level characteristics (i.e., the province's GDP and population), and the results remain unchanged. These findings suggest that downstream firms can enjoy significantly lower costs of goods in their productions when their upstream suppliers receive more subsidized CDB credit.

Taken together, the findings presented in Table 3 show that CDB credit to upstream industries can help them lower the price of goods sold, which are mostly intermediate goods. Such price reductions can be passed onto downstream firms, which enjoy significantly lower costs of goods sold. This mechanism serves as a

fundamental channel underlying the positive spillover effects of CDB loans, passing through from upstream to downstream industries, as shown in Table 2.

2. Financial Channel Underlying Upstream–Downstream Spillover Effects

Second, we explore the potential pass-through between upstream and downstream firms via financial channels. Specifically, trade credit is one of the most crucial financing sources for corporations (e.g., Demirgüç-Kunt and Maksimovic (2001), Fisman and Love (2003)). On the one hand, using the subsample of firms in the 9 upstream industries, we perform regressions of accounts receivable on CDB loans to those upstream industries. Panel A of Table 4 shows the results. In column 1, the coefficient of Log(DIRECT_LOAN) is significantly positive. In column 2, we find similar results when including province-level controls, suggesting that CDB loans to these 9 upstream industries help them extend accounts receivable to their customer firms. The significant coefficient of Log(DOWNSTREAM_LOAN) suggests a weak

TABLE 4

Fundamental Channel: Trade Credit (OLS)

Table 4 reports the OLS regression results for the effects of CDB loans on firms' trade credit. Panel A shows the association between CDB loans and accounts receivable for firms in upstream industries. Panel B shows the relationship between CDB loans and accounts payable for firms in downstream industries. Log(ACC_RECT) and Log(ACC_PAY) are the logarithm of accounts receivable and accounts payable, respectively. Log(DIRECT_LOAN) denotes the logarithm of direct CDB loans outstanding in the firm's industry and province. Log(DOWNSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's downstream industry and province. Log(UPSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's upstream industry and province. Firm-level controls include the logarithm of firm sales, Log(SALE), and the firm's leverage, *Lev*. Province-level controls include the logarithm of GDP, Log(GDP), and the logarithm of population, Log(POPU). See the Appendix for detailed variable definitions. Firm fixed effects and province × year fixed effects are included. Standard errors are clustered at the firm level for all regressions, and *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Trade Credit Extension from Upstream Firms (Accounts Receivable)

	Dependent Variable: Log(ACC_RECT)	
	1	2
Log(DIRECT_LOAN)	0.0037**	0.0037**
	(2.02)	(2.02)
Log(DOWNSTREAM_LOAN)	0.0036*	0.0036*
	(1.69)	(1.69)
Firm controls	Yes	Yes
Province controls	No	No
Firm FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	357,039	357,039
Adjusted R^2	0.493	0.493

Panel B. Trade Credit Extension to Downstream Firms (Accounts Payable)

	Dependent Variable: Log(ACC_PAY)	
	1	2
Log(UPSTREAM_LOAN)	0.0014**	0.0014**
	(1.97)	(1.97)
Log(DIRECT_LOAN)	0.0032***	0.0032***
	(4.35)	(4.35)
Firm controls	Yes	Yes
Province controls	No	Yes
Firm FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	1,898,245	1,898,245
Adjusted R^2	0.459	0.459

positive association between CDB loans to the firm's downstream industry and the firm's accounts receivable.

On the other hand, we examine the pass-through to the accounts payable of downstream firms. Specifically, in Panel B of Table 4, we use the subsample of downstream firms and perform regressions of accounts payable on CDB direct and upstream loans for those firms. In columns 1 and 2, the coefficients of Log(UPSTREAM_LOAN) are both significantly positive, suggesting that CDB credit to the upstream suppliers could be passed onto downstream firms via trade credit.

In summary, the findings presented in Table 4 reveal another fundamental mechanism underlying the positive spillover effects of CDB loans passing through from upstream to downstream industries: Firms in upstream industries can extend more trade credit to downstream firms, which could help downstream firms mitigate financial constraints, such as fixed costs to enter new markets with broader product scopes, as demonstrated in Table 2.

C. Identification and Instrumental Variables

We cannot draw a causal connection between CDB loans and firms' export activities based on the results provided in the previous subsection because CDB credit allocations are not random. For example, private firms in certain provinces and industries may have better export opportunities and require more inputs from upstream industries. The CDB could lend to those upstream industries mainly due to such opportunities. In this subsection, we employ the 2SLS regressions to estimate the causal effects of CDB loans on export activities. In particular, we exploit the exogenous variations of CDB loan allocation using the predicted municipal politician turnover cycles.

Local politicians play a crucial role in obtaining credit from the CDB. In China, the CPC secretary at the municipal level (i.e., city secretary) serves as the leading politician of a city. The city secretary wields broad administrative power and controls in the city and is responsible for local economic development. 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 the promotion of local politicians depends heavily on their GDP performance (Li and Zhou (2005)). Given that it takes time for CDB loans to affect local GDP growth, career concerns incentivize city secretaries to borrow as soon and as much as possible from the CDB after taking office. The standard term for a city secretary in China is 5 years, and cities typically have different 5-year turnover cycles. This allows us to explore the variations in CDB loan amounts brought by the different 5-year turnover cycles in different cities.

Given the concern that the timing of politician turnovers can still be endogenous, we use the predicted turnover timing.[18] In particular, we use a simple way to predict turnover timing: The first year of the current city secretary's term is

[18]We follow Cole (2009) and Shue and Townsend (2013) in using predicted turnover cycles, which are predetermined and not correlated with concurrent political activities and economic conditions. Our main results also hold when we use actual turnover cycles, as shown in Table A4 in the Supplementary Material.

predicted by adding 5 years to the first year of the 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. Because the predicted turnover cycle is predetermined, it is unlikely to be confounded with contemporaneous economic conditions.

Next, we interact the predicted city secretary turnover cycle with the city's focal industry defined using the CIC data and use the interaction as an instrument for province-industry-level CDB loan amounts. The city's focal industry is identified as the industry in which the SOEs of the city have the largest total assets. The focal industry is vital to the city's economic development and does not change much over time.[19] The city secretary borrows more from the CDB for SOEs in the city's focal industry if the secretary is in the early years of the term, which we consider an exogenous shock to province-industry-level CDB loans. Suppose the focal industry of city c is industry k, and city c belongs to province p. If there is a predicted politician turnover in city c, the new secretary of city c will borrow more for industry k once he or she takes office. As a result, CDB loans to industry k in province p increase. Formally, the regression can be represented as follows:

$$\text{Log(PROV\_LOAN)}_{k,p,t} = \alpha + \beta_1 \text{FIRST3}_{k,p,t} + \mu_k + \eta_{p\times t} + \varepsilon_{i,t}, \tag{2}$$

where $\text{Log(PROV\_LOAN)}_{k,p,t}$ is the logarithm of the outstanding CDB loan amount in industry k, province p, and year t. $\text{FIRST3}_{k,p,t}$ is the instrument for the CDB loans, which 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 the first 3 years of his or her term. μ_k represents the industry fixed effects, and $\eta_{p\times t}$ indicates the province × year fixed effects. We thus perform 2SLS regressions, and the second-stage regression is specified as follows:

$$\begin{aligned} Y_{i,t} = {} & \alpha + \beta_1 \text{Log}(\widehat{\text{UPSTREAM\_LOAN}})_{i,t} \\ & + \beta_2 \text{Log(DIRECT\_LOAN)}_{i,t} + \mu_i + \eta_{p\times t} + \varepsilon_{i,t}, \end{aligned} \tag{3}$$

where $Y_{i,t}$ denotes the four dependent variables Log(EXPORT), Log(NUM_DESTINATIONS), Log(NUM_PRODUCTS), and Log(DEST_PRODUCTS) for firm i and year t. Firm fixed effects (μ_i) and province × year fixed effects ($\eta_{p\times t}$) are included to account for time-invariant firm-specific factors and province × year trends.

Table 5 presents the second-stage results of the 2SLS regressions for the sample of downstream industries. We also trace the effects of CDB loans along the industry supply chain because the majority of loans were extended to strategic industries at the top of the supply chain. We find that the coefficients of

[19]The CIC data contain more than 800 thousand firms from 2000 to 2013, making it appropriate to define the city's focal industry using this large and representative data. We follow the official classification of an SOE provided by the National Bureau of Statistics in China. In particular, SOEs include typical SOEs and collectively owned enterprises (COEs), which are owned collectively by all residents in a community and are typically controlled by local governments (e.g., Song, Storesletten, and Zilibotti (2011)). We classify the remaining firms as private firms. More than 75% of CDB loans go to SOEs; hence, we use this approach to define the focal industries as in Ru (2018).

TABLE 5

Causal Effects of CDB Loans on Export Activities

Table 5 shows the 2-stage least squares (2SLS) regression results for the effect of CDB loans on Chinese firms' export activities across the industry supply chain using FIRST3 as the instrumental variable for Log(UPSTREAM_LOAN) (excluding Beijing, Shanghai, Tianjin, and Chongqing) for firms in downstream industries. The dependent variables are the logarithm of export amount (Log(EXPORT)), the number of export destinations (Log(NUM_DESTINATIONS)), the number of export product varieties (Log(NUM_PRODUCTS)), and the number of export destination–product pairs (Log(NUM_DEST_PRODUCTS)). Log(UPSTREAM_ LOAN) denotes the logarithm of upstream CDB loans in the firm's upstream industry, which is at the province-industry-year level. Log(DIRECT_LOAN) denotes the logarithm of direct CDB loans for the firm in the same industry and province as the loan, which is at the province-industry-year level. See the Appendix for detailed variable definitions. Firm fixed effects and province × year fixed effects are included. Standard errors are clustered at the firm level for all regressions, and *t*-statistics are reported in parentheses. Kleibergen-Paap (KP) Wald F-statistics for weak identification tests are reported. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable			
	Log (EXPORT)	Log (NUM_DESTINATIONS)	Log (NUM_PRODUCTS)	Log (NUM_DEST_PRODUCTS)
	1	2	3	4
Log(UPSTREAM_LOAN)	0.0448***	0.0299***	0.0246***	0.0354***
	(6.87)	(9.67)	(8.81)	(9.69)
Log(DIRECT_LOAN)	−0.0003	0.0005***	0.0000	0.0001
	(−0.82)	(2.94)	(0.10)	(0.60)
Firm FE	Yes	Yes	Yes	Yes
Province × year FE	Yes	Yes	Yes	Yes
Observations	1,294,794	1,294,796	1,294,796	1,294,796
KP Wald F–stat	1,517	1,517	1,517	1,517

Log(UPSTREAM_LOAN) are positive in all columns at the 1% significance level. The spillover effects across the industry supply chain are both statistically and economically significant. On average, a 1-standard-deviation increase in Log(UPSTREAM_LOAN) to upstream industries leads to 38.4% (4.48% × 8.582), 25.7% (2.99% × 8.582), 21.1% (2.46% × 8.582), and 30.4% (3.54% × 8.582) increases in downstream firms' export amounts, the number of export countries, the number of export products, and the number of destination–product pairs, respectively. The coefficient of Log(DIRECT_LOAN) is only positive and statistically significant in column 2. Consistent with the OLS regressions, the effects of CDB upstream loans are more pronounced than those of CDB direct loans.

In addition, we perform the 2SLS regressions for the two fundamental channels underlying the CDB's positive spillovers. For the intermediate goods channel, as shown in Table 3, we run the 2SLS regressions of export good prices on CDB direct loans for the subsample of 9 upstream industries by instrumenting CDB direct loans. Panel A of Table 6 reports the second-stage regression results. In column 1, the coefficient of Log(DIRECT_LOAN) is negative and significant at the 1% level, suggesting that an increase in Log(DIRECT_LOAN) to upstream industries leads to a decrease in the average price of their products. Moreover, in column 2, we use the export-amount-weighted average price level as the dependent variable and find similar results, consistent with OLS regression results shown in Table 3.

Next, we run the 2SLS regressions of the cost of goods sold on CDB direct and upstream loans for the subsample of downstream firms by instrumenting CDB upstream loans. Panel B of Table 6 reports the second-stage regression results. In particular, the coefficients of Log(UPSTREAM_LOAN) are significantly negative, while the coefficients of Log(DIRECT_LOAN) are insignificant in both columns. For example, in column 1, the negative coefficient of Log(UPSTREAM_LOAN)

TABLE 6

Fundamental Channel: Intermediate Goods

Table 6 shows the 2-level least squares (2SLS) regression results for the effects of CDB loans on firms' COGSs and export prices. Panel A shows the impact of CDB loans on prices for firms in upstream industries. Panel B shows the causal effects of CDB loans on COGSs for firms in downstream industries. Log(COGS) is the natural logarithm of costs of goods sold at the firm level. Log(PRICE) and Log(WT_PRICE) are the average prices and export-amount-weighted average prices, respectively. Log(DIRECT_LOAN) denotes the logarithm of direct CDB loans outstanding in the firm's industry and province. Log(DOWNSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's downstream industry and province. Log(UPSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's upstream industry and province. Firm-level controls include the logarithm of a firm's sales, Log(SALE), and the firm's leverage ratio, *Lev*. Province-level controls include the logarithm of GDP, Log(GDP), and the logarithm of population, Log(POPU). See the Appendix for detailed variable definitions. Firm fixed effects and province × year fixed effects are included. Standard errors are clustered at the firm level for all regressions, and *t*-statistics are reported in parentheses. Kleibergen-Paap (KP) Wald *F*-statistics for weak identification tests are reported. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Reduction in Prices of Inputs from Upstream Firms

	Dependent Variable	
	Log(PRICE)	Log(WT_PRICE)
	1	2
Log(DIRECT_LOAN)	−0.0921***	−0.0989***
	(−2.62)	(−2.70)
Log(DOWNSTREAM_LOAN)	0.0049***	0.0047***
	(6.16)	(5.70)
Firm FE	Yes	Yes
Product × year FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	375,303	375,303
KP Wald F–stat	48.54	48.54

Panel B. COGS for Downstream Firms

	Dependent Variable	
	Log(COGS)	Log(COGS)
	1	2
Log(UPSTREAM_LOAN)	−0.0017*	−0.0017*
	(−1.87)	(−1.87)
Log(DIRECT_LOAN)	−0.0000	−0.0000
	(−0.63)	(−0.63)
Firm controls	Yes	Yes
Province controls	No	Yes
Firm FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	2,354,317	2,354,317
KP Wald F–stat	1,878	1,878

suggests that an increase in Log(UPSTREAM_LOAN) leads to a decrease in the average cost of goods sold by downstream firms. Taken together, the 2SLS regression results shown in Table 6 are consistent with the OLS regressions shown in Table 3, suggesting that CDB credit to the upstream industries leads to lower prices for intermediate goods produced by these upstream industries and used as production inputs for firms in downstream industries.

As in Table 4, we also perform the 2SLS regressions for the financial channels. In Panel A of Table 7, we use the subsample of 9 upstream industries to perform the 2SLS regressions of accounts receivable on CDB loans to those upstream industries by instrumenting Log(DIRECT_LOAN). In column 1, the coefficient of Log(DIRECT_LOAN) is positive and significant, indicating that more CDB loans to the upstream industries lead to an increase in the accounts receivable of firms in such upstream industries. The results are similar in column 2, where we include province-level controls.

TABLE 7

Fundamental Channel: Trade Credit (2SLS)

Table 7 shows the 2SLS regression results for the effects of CDB loans on firms' trade credit. Panel A (B) shows the causal effects of CDB loans on accounts receivable (accounts payable) for firms in upstream (downstream) industries. Log(ACC_RECT) and Log(ACC_PAY) are the logarithms of accounts receivable and accounts payable, respectively. Log(DIRECT_LOAN) denotes the logarithm of direct CDB loans outstanding in the firm's industry and province. Log(DOWNSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's downstream industry and province. Log(UPSTREAM_LOAN) denotes the logarithm of CDB loans outstanding in the firm's upstream industry and province. Firm-level controls include the logarithm of a firm's sales, Log(SALE), and the firm's leverage ratio, *Lev*. Province-level controls include the logarithm of GDP, Log(GDP), and the logarithm of population, Log(POPU). See the Appendix for detailed variable definitions. Firm fixed effects and province × year fixed effects are included. Standard errors are clustered at the firm level for all regressions, and *t*-statistics are reported in parentheses. Kleibergen-Paap (KP) Wald *F*-statistics for weak identification tests are reported. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Trade Credit Extension from Upstream Firms (Accounts Receivable)

	Dependent Variable: Log(ACC_RECT)	
	1	2
Log(DIRECT_LOAN)	0.1062*	0.1062*
	(1.90)	(1.90)
Log(DOWNSTREAM_LOAN)	0.0100*	0.0100*
	(1.67)	(1.67)
Firm controls	Yes	Yes
Province controls	No	Yes
Firm FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	267,412	267,412
KP Wald F–stat	102	102

Panel B. Trade Credit Extension to Downstream Firms (Accounts Payable)

	Dependent Variable: Log(ACC_PAY)	
	1	2
Log(UPSTREAM_LOAN)	0.3008***	0.3008***
	(3.09)	(3.09)
Log(DIRECT_LOAN)	0.0128***	0.0128***
	(3.92)	(3.92)
Firm controls	Yes	Yes
Province controls	No	Yes
Firm FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	1,710,239	1,710,239
KP Wald F–stat	67.84	67.84

Next, we run the 2SLS regressions of accounts payable for downstream firms. Specifically, in Panel B of Table 7, we use the subsample of downstream firms and perform the regressions of accounts payable on CDB direct and upstream loans by instrumenting Log(UPSTREAM_LOAN). The coefficients of Log(UPSTREAM_LOAN) are significantly positive in both columns, suggesting that the increase in Log(UPSTREAM_LOAN) leads to an increase in the accounts payable of downstream firms. Taken together, the 2SLS regression results shown in Table 7 are consistent with the OLS regressions shown in Table 4, implying that CDB credit to the upstream industries leads to significant extensions of trade credit from upstream firms to downstream firms. It serves as another fundamental mechanism underlying CDB credit's positive spillovers on export activities in downstream industries, as shown in Table 5.

In summary, government credit not only helps firms in the same industry but also benefits firms in downstream industries. Furthermore, from a back-of-the-

envelope calculation, the increased export amount induced by CDB loans is estimated to account for an average of 0.685% of China's yearly GDP.[20] The economic magnitude of our findings is substantial. To put it in perspective, Zia (2008) shows that removing subsidized credit significantly decreases the exports of private firms, yet nearly half of such loans are assigned to publicly listed, financially unconstrained firms, implying an output loss to private firms of 0.75% of GDP. Moreover, Wacziarg and Welch (2008) find that countries with overall trade liberalization increased their average trade-to-GDP ratios by approximately 5% based on cross-country data from 1950 to 1998.

D. Key Identification Assumptions

For our instrumental variable (IV) approach, we consider a few critical assumptions. First, given that the timing of local politician turnover could be influenced by endogenous factors, like power struggles, we use predicted turnover cycles instead of actual ones as the instrument in the first stage. As reported in Table A3 Panel A (Supplementary Material), the positive and significant coefficient of FIRST3 validates the impact of our instrument on the independent variable—CDB loans at the province × industry level. Furthermore, the results indicate that the amount of CDB loans in a particular industry k and province p is significantly greater if any cities in p have a focal industry of k and concurrently have a secretary in the first 3 years of his or her term with strong incentives to borrow and invest, as discussed in Section IV.C.[21]

The second assumption central to our IV approach is the exclusion condition of our instrument in influencing the dependent variables through the instrumented endogenous variable. In our context, it means that the predicted turnover cycles of city secretaries should only affect export activities via CDB loans. Despite city secretaries' considerable discretion in shaping local economic policies (e.g., Xu (2011)), the exclusion condition requires that they do not significantly exploit these mechanisms earlier in their terms, rather than not using these tools at all.

To test this, we regress various potential channels through which local politicians might influence local export activities on the instrumental variable. These channels include overall tax rates, income tax rates, value-added tax rates, subsidies received by firms, and foreign equity. As indicated in columns 2 to 6 of Table A3 Panel A, none of these potential channels correlate significantly with our instrument.

In addition to these province-industry-year level analyses, we use data from 305 Chinese cities to examine whether local politician turnover timing aligns with other potential influences on exports, such as fiscal income, fiscal expenditures,

[20]We utilize the estimated coefficients for CDB upstream loans (i.e., 0.0448) in Table 5 to perform the back-of-the-envelope calculation. First, we estimate the increase in export amounts induced by the change in CDB upstream loans for each firm in a given year. Next, we compute the yearly aggregate effects by summing the estimated increases in all firms' export amounts in our sample and then take the average across all the years.

[21]Another concern of the 2SLS is the presence of weak IV problems. We conduct weak identification tests and report the Kleibergen-Paap (KP) Wald F-statistics in the tables. All KP values suggest that our 2SLS tests do not suffer from weak identification problems.

land sales, loans from other financial institutions, and fiscal transfers. Regression results presented in Table A3 Panel B reveal that these alternative channels have no significant association with the politician turnover cycles. We also conduct additional analysis using actual turnover cycles (Table A4, Supplementary Material), which yield consistent results.

Collectively, these findings uphold the exclusion condition for the IV: The effects of local politician turnover cycles on export activities operate through CDB lending rather than through alternative channels. Notably, in our case, the threshold for meeting the exclusion condition does not imply that city secretaries refrain from engaging in any of these other activities entirely. Provided that these alternative channels do not align with turnover timing (e.g., they do not display the same significant decreasing pattern over city secretaries' terms as CDB loans), our instrumental variable approach satisfies the exclusion condition.

E. Further Analysis: Spillovers on U.S. Firms

In this subsection, we explore the implications of surges in exports with lower-priced goods from China, fueled by CDB credit, on the U.S. economy. We focus on U.S. firms for two main reasons. First, the U.S. and China are the two largest economies worldwide, and their trade relationship is among the most impactful bilateral trade relationships globally. Second, the ongoing trade conflict between the U.S. and China has provoked considerable debate among academics and practitioners. China has faced criticism from trade partners for its perceived mercantilist trade policies (e.g., Lim, Wang, and Zeng (2018), Price et al. (2006)). Notably, former U.S. President Trump initiated a trade war with China, alleging "unfair trade practices." Many argue that it could inadvertently damage U.S. industrial sectors and households, potentially leading to unemployment in the U.S.[22] Therefore, it is important to understand how Chinese exports, induced by government credit, affect the performance and employment of U.S. firms.

We begin by documenting that CDB loans lower the price of exported goods, as the changes in export prices caused by CDB credit could directly affect U.S. firms. To formally test this, we first use the 2SLS setting as follows:

$$\begin{aligned} Price_{i,j,t} = {} & \alpha + \beta_1 \text{Log}(\widehat{\text{UPSTREAM\_LOAN}})_{i,t} \\ & + \beta_2 \text{Log}(\text{DIRECT\_LOAN})_{i,t} + \mu_i + \eta_{p\times t} + \lambda_{j\times t} + \varepsilon_{i,t}, \end{aligned} \tag{4}$$

where $Price_{i,j,t}$ denotes the simple average price (Log(PRICE)) or trade-amount-weighted average price (Log(WT_PRICE)) of 4-digit product code j exported by firm i in year t. $\text{Log}(\widehat{\text{UPSTREAM\_LOAN}})_{i,t}$ represents the instrumented Log(UPSTREAM_LOAN) for firm i in year t. Firm fixed effects and province × year fixed effects are included as usual. We add product-year fixed effects ($\lambda_{j\times t}$) in the regression to control for the impact of products' intrinsic characteristics on prices.

[22] For example, CNN cites a report from Moody's Analytics, which estimates the current trade war with China cost U.S. 300,000 jobs through Sept. 2019 (https://edition.cnn.com/2020/01/14/politics/cost-of-china-tariff-trade-war/index.html). An article in the New York Times reported that the cost of the trade war to the average U.S. family is about $460 in 2019 (https://www.nytimes.com/interactive/2019/business/economy/trade-war-costs.html).

TABLE 8

Impact of China's Cheaper Exports on U.S. Firms

Table 8 shows the impact of China's exports on U.S. firms. Panel A shows the 2SLS results for the effect of CDB loans on exported goods prices at the firm-product-year level using FIRST3 as the instrumental variable for Log(UPSTREAM_LOAN). The product is measured at the 4-digit HS code level. Log(PRICE) and Log(WT_PRICE) are the logarithm of the average prices and export-amount-weighted average prices, respectively. Firm fixed effects, province × year fixed effects, and product fixed effects are included. Kleibergen-Paap (KP) Wald *F*-statistics for weak identification tests are reported. Panel B shows the OLS results of regressing U.S. firms' characteristics on export price reductions induced by CDB loans estimated using the coefficients from the results shown in Panel A. The sample includes North American public firms in Compustat from 2000 to 2013, where the firm's industry imports from China. The dependent variables are at the firm-year level: Log(ASSET) is the logarithm of the firm's total assets; PPE/ASSETS measures tangibility defined as plants, property, and equipment divided by total assets; Log(SALE) is the logarithm of the firm's total sales; Log(EMPLOYEES) is the logarithm of the number of employees in the firm. PRICE_DROP_DIRECT denotes the average price reduction from China's exports in the same industry resulting from CDB loans estimated using the 2SLS coefficient estimates shown in Panel A. PRICE_DROP_UPSTREAM denotes the average price reduction from China's exports in the upstream industry. Firm fixed effects and year fixed effects are included. Standard errors are clustered by firm, and *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Effects of CDB Loans on Export Prices

	Dependent Variable	
	Log(PRICE)	Log(WT_PRICE)
	1	2
Log(UPSTREAM_LOAN)	−0.0714***	−0.0807***
	(−6.02)	(−6.56)
Log(DIRECT_LOAN)	−0.0028***	−0.0029***
	(−12.22)	(−12.19)
Firm FE	Yes	Yes
Product × year FE	Yes	Yes
Province × year FE	Yes	Yes
Observations	7,924,223	7,924,223
KP Wald F–test	533.9	533.9

Panel B. Impact on U.S. Firms

	Dependent Variable			
	Log(ASSET)	PPE/ASSETS	Log(SALE)	Log(EMPLOYEES)
	1	2	3	4
PRICE_DROP_DIRECT	−0.0068***	−0.0016***	0.0002	−0.0019
	(−5.05)	(−7.66)	(0.16)	(−1.58)
PRICE_DROP_UPSTREAM	0.0045***	0.0008***	0.0047***	0.0035***
	(4.05)	(3.90)	(3.77)	(3.08)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	42,068	42,023	35,860	33,330
Adjusted R^2	0.936	0.806	0.950	0.959

In Panel A of Table 8, we present the 2SLS regression results for the effects of CDB loans on export prices. We find that the coefficients of Log(UPSTREAM_LOAN) in both columns are negative and significant at the 1% significance level, indicating that CDB upstream loans decrease the average export prices of firms in downstream industries, which helps explain the increased export amounts. We perform another back-of-the-envelope calculation that reveals an estimated average price change (in USD) induced by CDB loans of -8.1% from 2000 to 2013 (i.e., -0.65% per year on average) for exports from China induced by CDB loans.[23] Considering that the RMB appreciated by approximately 25%

[23]We use the estimated coefficient for Log(UPSTREAM_LOAN) (-0.0714) from the 2SLS regression results in column 1 of Panel A of Table 8. For a firm *i* in year *t* that exports product *j*, we multiply the coefficient estimate, -0.0714, with the logarithm of CDB loans allocated to the firm's province and key

against the USD during our sample period, CDB loans led to a 31.25% decrease in average export goods prices (in RMB) during this period. In short, the price reduction caused by CDB credit largely offsets the RMB appreciation in this period.

Next, we investigate the impacts of surging export volumes with lower-priced goods from China, caused by CDB credit, on U.S. firm activities. Wang et al. (2018) find that intermediate goods from China to the U.S. lead to increases in employment among U.S. firms in downstream industries. We adopt this industry supply chain perspective to investigate how exports from China affect the performance and employment of horizontal and downstream U.S. firms.

Due to the differences in industry classifications between the U.S. and China, we first align the 95 CDB industries with the 71 industries using the 2007 U.S. IO table from the Bureau of Economic Analysis.[24] We conduct a manual alignment of two industry classification systems, consolidating the 95 industries outlined by the CDB into the categories present in the U.S. IO table. Of the 71 industries specified in the U.S. IO table, 38, including the paper products and textile sectors, offer a direct one-to-one match with the CDB classification. For the remaining industries, the CDB system provides more detailed segments, which are therefore merged to match their corresponding U.S. IO categories. For instance, the food, beverage, and tobacco industries in the CDB classification are aggregated and paired with the food, beverage, and tobacco products category in the U.S. IO table classification.

To examine the impact of exports from China on U.S. firms across the supply chain, we construct the upstream–downstream link for U.S. firms using the U.S. IO table and identify the key upstream industry as the one that supplies the most inputs. For each of the 71 industries in the IO table, we estimate the change in average prices at the industry level. We use the estimated coefficients from the 2SLS regression results in Panel A of Table 8 to construct the average price changes for China's exports. In particular, we multiply the coefficient estimate (i.e., -0.0714 in column 1) for the instrumented independent variable with the logarithm of CDB upstream loans to obtain the estimated export price changes. Then, for each industry k and year t, we compute the weighted average of all individual price changes using export amount as the weight, whose products fall into industry k and year t, and then multiply it by negative one to obtain $\text{PRICE\_DROP}_{k,t}$, such that higher values indicate larger decreases in prices. This variable represents the average price decreases of China's exports in industry k and year t, induced by CDB loans.

For U.S. firm i whose primary industry is k, we define PRICE_DROP_DIRECT using $\text{PRICE\_DROP}_{k,t}$, which measures direct competition from China for U.S. firms in the same industry. For upstream effects, we define PRICE_DROP_UPSTREAM using $\text{PRICE\_DROP}_{k',t}$, where k' is the key upstream industry of k. It measures the price changes of the output from the firm's

upstream industry. This allows us to estimate the average price change for the firm-product pair in the given year. We utilize export data to all destinations, including the U.S. Next, for each year, we aggregate the average price change across all firm-product pairs by calculating the export amount weighted average price changes for all exported goods. We then compound these CDB-loans-induced yearly average price changes across all years in our sample period to obtain the -8.1% change in average prices induced by CDB loans.

[24]We choose the industry classification of the U.S. IO table because the goal is to identify the upstream–downstream industry link for U.S. firms, which is also done through the U.S. IO table.

key upstream industry that they source as inputs. The following model is estimated to investigate how China's exports with lower prices impact U.S. firms from both the direct competition channel and upstream spillover channel:

$$Y_{USi,k,t} = \begin{array}{l}\alpha + \beta_1 \text{PRICE\_DROP\_DIRECT}_{k,t} \\ + \beta_2 \text{PRICE\_DROP\_UPSTREAM}_{k,t} + \mu_i + \eta_t + \varepsilon_{i,t},\end{array} \tag{5}$$

where $Y_{USi,k,t}$ denotes a set of dependent variables measuring the performance and employment of U.S. firm i in year t whose primary industry is k. These dependent variables include the logarithm of total assets (Log(ASSET)); tangibility (PPE/ASSETS) computed as property, plants, and equipment scaled by total assets; the logarithm of total sales (Log(SALE)); and employment (Log(EMPLOYEES)). μ_i represents firm fixed effects, and η_t indicates year fixed effects.

We report the results in Panel B of Table 8. The coefficients of PRICE_DROP_DIRECT are significantly negative in columns 1 and 2, which suggests that when facing imports from China with reduced prices, U.S. firms in the same industry experience a decline in total and fixed assets. This crowding-out effect of China's exports is consistent with prior findings in the literature. By contrast, the coefficients of PRICE_DROP_UPSTREAM are significantly positive in all columns, suggesting that the lower average prices of exports from China benefit downstream U.S. firms. The results imply that U.S. firms can use cheaper inputs from China, induced by CDB credit, in their productions, leading to increased investments in assets, employment, and sales. The finding of these countervailing effects has substantial policy implications regarding the recent trade war between the U.S. and China.

In addition, we examine the heterogeneity in the spillover effects of cheaper Chinese imports on downstream U.S. firms. We first explore the geographical variations of unemployment across U.S. states to investigate whether such positive spillovers are stronger in states with higher unemployment rates. We obtain the state-level unemployment rate from the U.S. Bureau of Labor Statistics and classify the states into two groups—high versus low—based on the median unemployment rate using the data in 1999, represented by a dummy variable HIGH_UNEMPLOYMENT. We choose 1999 for two reasons: i) We want to mitigate the endogeneity concerns by using a historical unemployment rate as our sample starts in 2000; and ii) the state unemployment rates are highly persistent, so it can alleviate the concern of measurement errors. Panel A of Table 9 reports the results. The coefficients of the interaction term between HIGH_UNEMPLOYMENT and PRICE_DROP_UPSTREAM are positive and significant at the 1% significance level in all columns. This suggests that firms in high unemployment states benefit from cheaper inputs from China's upstream industries induced by CDB loans in terms of assets, sales, and employment, which enhances the positive spillovers of cheaper upstream inputs from China on job creation in the U.S.

Finally, we examine whether the opposing effects of increased imports from China have been taken into account in the recent trade war. Former U.S. President Donald Trump asked the United States Trade Representative (USTR) to investigate applying tariffs on US$50-60 billion worth of Chinese goods on Mar. 22, 2018. We obtain the full list of the products for tariff increase in the USTR report and match the 10-digit product codes to the SIC industries using the concordance table

TABLE 9

Heterogeneous Effects of China's Cheaper Exports on U.S. Firms

Table 9 reports the results on the heterogeneous effects of export price reduction induced by CDB loans on U.S. firms. The sample contains public firms from Compustat between 2000 and 2013, where the firm's industry imports from China. In Panel A, we construct a dummy variable, HIGH_UNEMPLOYMENT, which equals 1 if the unemployment rate of a firm's headquarters state is above the median in 1999, and 0 otherwise. In Panel B, we construct a dummy variable, TRADE_WAR_INDUSTRY, which equals 1 if it is the key upstream industry of a firm and at the same time listed for tariff increase in the U.S. section 301 report by USTR at the beginning of the 2018 China–U.S. trade war. PRICE_DROP_DIRECT denotes the average price reduction from China's exports in the same industry resulting from CDB loans estimated using the 2SLS coefficient estimates in Panel A of Table 8. PRICE_DROP_UPSTREAM denotes the average price reduction from China's exports in the upstream industry. Firm fixed effects and year fixed effects are included in all regressions. Standard errors are clustered at the firm level for all regressions, and *t*-statistics are reported in parentheses. *, **, and *** indicate the statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable			
	Log (ASSET)	PPE/ ASSETS	Log(SALE)	Log (EMPLOYEES)
	1	2	3	4
Panel A. Unemployment Rate Across States				
PRICE_DROP_UPSTREAM × HIGH_UNEMPLOYMENT	0.0109***	0.0008**	0.0101***	0.0080***
	(3.83)	(2.00)	(4.14)	(3.67)
PRICE_DROP_UPSTREAM	−0.0029	0.0002	−0.0011	−0.0008
	(−1.26)	(0.72)	(−0.56)	(−0.51)
PRICE_DROP_DIRECT	−0.0067***	−0.0017***	0.0007	−0.0023**
	(−4.59)	(−7.65)	(0.47)	(−1.98)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	36,849	36,806	31,015	28,936
Adjusted R^2	0.931	0.801	0.948	0.958
Panel B. Industries Targeted by the 2018 Trade War				
PRICE_DROP_UPSTREAM × TRADE_WAR_INDUSTRY	−0.0149***	−0.0018***	−0.0124***	−0.0072*
	(−3.52)	(−3.64)	(−3.38)	(−1.86)
PRICE_DROP_UPSTREAM	0.0056***	0.0009***	0.0057***	0.0039***
	(4.75)	(4.33)	(4.43)	(3.41)
PRICE_DROP_DIRECT	−0.0061***	−0.0015***	0.0008	−0.0015
	(−4.55)	(−7.25)	(0.61)	(−1.24)
TRADE_WAR_INDUSTRY	−0.1376	−0.0037	−0.2463	−0.3033
	(−0.98)	(−0.26)	(−1.26)	(−1.45)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	42,068	42,023	35,860	33,330
Adjusted R^2	0.936	0.807	0.950	0.959

provided by Pierce and Schott (2012). We construct a dummy variable, TRADE_WAR_INDUSTRY, which equals 1 if the focal upstream industry of the U.S. firm is included in the list of tariff-increase industries, and 0 otherwise. In Panel B of Table 9, the negative and significant coefficients of TRADE_WAR_INDUSTRY × PRICE_DROP_UPSTREAM in all columns suggest that the positive spillover effects from cheaper Chinese inputs are significantly weaker for these selected firms. In other words, firms that benefit from cheaper Chinese inputs are less affected by tariff increases occurring from this trade war, implying that the U.S. government understands these countervailing effects of imports from China and strategically avoids raising tariffs on imports used primarily as inputs for U.S. firms in downstream industries.

In summary, Tables 8 and 9 uncover the dual effects of China's surge in lower-priced exports, stimulated by CDB loans, on U.S. industries. While increased competition from cheaper Chinese goods results in reduced assets for directly competing U.S. firms, those leveraging cheaper Chinese inputs see growth in

assets, employment, and sales. Consequently, these nuanced dynamics underscore the importance of considering sector-specific impacts when formulating trade policies, as revealed by the strategic tariff increases during the U.S.–China trade war.

Furthermore, the implications of these findings are generalizable beyond China. In particular, trade conflicts, such as those involving subsidies and tariffs, are a global issue extending beyond the U.S.–China dynamic, affecting relationships like U.S.–EU, U.S.–Japan, EU–Japan, and EU–China, and even close allies like the U.S. and Canada.[25] Additionally, the OECD Economic Outlook (2018), (2019) note the increasing trend of discriminatory actions by G20 economies since 2012, highlighting that government support, particularly below-market loans from state banks, can disrupt international markets. However, the nature and extent of such support remain largely unexplored due to their complexity and lack of comprehensive data.

V. Conclusion

This article examines how government-subsidized credit is passed through the supply chain and affects trade activities in the context of China. By merging unique loan data from the CDB with detailed, universal transaction-level data from China Customs, we find that CDB loans granted to upstream industries lead to a surge in export activities and a decrease in export prices for firms in downstream industries. Furthermore, the increase in the export amount with decreased prices from China, in turn, crowds in downstream U.S. firms regarding asset investment and employment, while the U.S. firms in the same industry are crowded out by this direct competition from China's exports. These findings from the perspective of supply chains shed light beyond U.S.–China relations to broader, escalating trade frictions worldwide.[26] In addition, the world is currently under high inflationary pressure, and the U.S. is facing decades-high inflation; our findings of lower-priced exports induced by government credit may provide more insights into helping ease inflation.[27]

Moreover, the global prevalence of government-owned banks, such as Germany's KfW Bankengruppe and the Korea Development Bank, indicates a

[25]Trade disputes arise among various countries, such as the U.S.–EU, U.S.–Japan, EU–Japan, and EU–China. The Wall Street Journal has compiled a collection titled "Trade: Full Coverage," (https://www.wsj.com/news/collection/trade-3eb192d8) which features an array of WSJ articles addressing global trade disputes. It is worth noting that even close allies such as the U.S. and Canada have enduring longstanding trade frictions involving commodities like softwood lumber, solar goods, and dairy products.

[26]For example, the Reagan administration began a trade war with Japan in 1987 mainly to restore domestic manufacturers, such as automakers; however, this move also cost U.S. jobs. Moreover, the Smoot–Hawley Act in 1930 raised tariffs on almost all imports to the U.S. to protect domestic jobs but potentially extended the Great Depression. The consequences of these policies are debatable and mixed.

[27]U.S. Treasury Secretary Janet Yellen has expressed the view that reducing tariffs on Chinese goods is a way to ease U.S. decades-high inflation in multiple occasions. See, for example, Reuters' article "Yellen says cutting some tariffs on Chinese goods could ease price pressures" (https://www.reuters.com/markets/rates-bonds/yellen-says-cutting-some-tariffs-chinese-goods-could-ease-price-pressures-2021-12-02/) in 2021 and WSJ's article "U.S. Considering Reducing Tariffs on China to Ease Inflation, Yellen Says" (https://www.wsj.com/articles/yellen-expects-progress-on-global-tax-deal-11654705060) in 2022.

universal pattern of state-backed financing driving international trade. The assets of such national development finance institutions (DFIs) accounted for approximately 15% of GDP across developed countries in 2015, underscoring their substantial role in the global economy. As such, understanding the effects of government credit on international trade becomes critical. This comprehensive examination of the effects of government credit on trade, therefore, encourages policymakers to consider the broader impacts and spillovers of trade policies, extending their view beyond direct effects to encompass global implications.

Appendix. Variable Definitions

Log(DIRECT_LOAN): The logarithm of DIRECT_LOAN. DIRECT_LOAN is the direct CDB outstanding loan amount (in hundred million RMB) at the province-industry-year level. A loan is defined as "direct" for a firm if the firm is in the same province and industry as the loan. Source: CDB Loan Data

Log(UPSTREAM_LOAN): The logarithm of UPSTREAM_LOAN. UPSTREAM_LOAN is the upstream CDB outstanding loan amount (in hundred million RMB) 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. Source: CDB Loan Data

Log(DOWNSTREAM_LOAN): The logarithm of DOWNSTREAM_LOAN. DOWNSTREAM_LOAN is the downstream CDB outstanding loan amount (in hundred million RMB) at the province-industry-year level. The loan is defined as "downstream" for a firm if the loan is given to the downstream industry of the firm in the same province. Source: CDB Loan Data

Log(EXPORT): The logarithm of the export volume (in million RMB) of the firm in China Customs data. The variable is at the firm-year level. Source: China Customs

Log(NUM_DESTINATIONS): The logarithm of the number of a firm's export destinations in China Customs data. The variable is at the firm-year level. Source: China Customs

Log(NUM_PRODUCTS): The logarithm of the number of a firm's export product types, where the product type is measured by aggregating the 8-digit product code listed in China Customs data at the 4-digit HS code level. The variable is at the firm-year level. Source: China Customs

Log(NUM_DEST_PRODUCTS): The logarithm of the number of a firm's destination–product pairs. Product type is measured at the 4-digit HS level. The variable is at the firm-year level. Source: China Customs

Log(PRICE): The logarithm of the average export price (in USD) measured at the firm-product-year level. We compute the simple average of prices at the 8-digit HS product level within a firm-year and aggregate them at the 4-digit HS product level. Source: China Customs

Log(WT_PRICE): The logarithm of the export-weighted-average export price (in USD) measured at the firm-product-year level. We compute average prices using the export amount as the weight at the 8-digit HS product level for a firm-year and aggregate them at the 4-digit HS product level. Source: China Customs

Log(COGS): The natural logarithm of the cost of goods sold (in RMB). Source: CIC Data

Log(ACC_RECT): The natural logarithm of accounts receivable (in RMB). Source: CIC Data

Log(ACC_PAY): The natural logarithm of accounts payable (in RMB). Source: CIC Data

Log(PROV_LOAN): The logarithm of the CDB outstanding loan amount (in hundred million RMB) at the province-industry-year level. Source: CDB Loan Data

Log(CITY_LOAN): The logarithm of the CDB outstanding loan amount (in hundred million RMB) at the city-year level. Source: CDB Loan Data

OVERALL_TAX: The average overall tax rate (=total tax/sales) of firms within a province-industry pair for each year. Source: CIC Data

INCOME_TAX: The average income tax rate (=income tax/total profit) of firms within a province-industry pair for each year. Source: CIC Data

VAT: The average value-added tax rate (=value-added tax/sales) of firms within a province-industry pair for each year. Source: CIC Data

Log(SUBSIDY): The logarithm of total subsidies (in thousand RMB) received by firms within a province-industry pair for each year scaled by their total assets. Source: CIC Data

FOREIGN_CAP: The sum of the foreign equity (in thousand RMB) of firms within a province-industry pair for each year scaled by their total equities. Source: CIC Data

Log(FISCAL_INC): The logarithm of the city's fiscal income (in ten thousand RMB). Source: CSMAR

Log(FISCAL_EXP): The logarithm of the city's fiscal expenditure (in ten thousand RMB). Source: CSMAR

Log(LAND): The logarithm of the aggregate value of a city's land sales (in ten thousand RMB). Source: LandChina website

Log(BANK_LOAN): The logarithm of the total loan balance of a city's financial institutions (in ten thousand RMB). Source: CSMAR

Log(TRANSFER): The logarithm of a city's total fiscal transfer income (in ten thousand RMB). Source: EPS China Data

FIRST3: A dummy variable equals 1 if there is a city secretary who is in the predicted first 3 years of his/her term and if the city's largest SOE industry (i.e., focal industry) is in the same industry as that of the provincial industry loans. The variable is at the province-industry-year level. Source: CIC and Politician Profile Data

FIRST3A: A dummy variable equals 1 if there is a city secretary who is in the actual first 3 years of his/her term and if the city's largest SOE industry (i.e., focal industry) is in the same industry as that of the provincial industry loans. The variable is at the province-industry-year level. Source: CIC and Politician Profile Data

YEAR1-3: A dummy variable which equals 1 if a city secretary is in the predicted first 3 years of his/her term. The variable is at the city-year level. Source: Politician Profile Data

YEAR1-3A: A dummy variable which equals 1 if a city secretary is in the actual first 3 years of his/her term. The variable is at the city-year level. Source: Politician Profile Data

Log(WT_UPSTREAM_LOAN): The logarithm of the weighted average upstream loan amount (in hundred million RMB) computed as the weighted average of loan amounts to all upstream industries (excluding itself) with the weight being the direct consumption coefficient identified from the China IO table. Source: CDB Loan Data

Log(ALL_UPSTREAM_LOAN): The logarithm of the sum of UPSTREAM_LOAN (in hundred million RMB) for all provinces for a given industry and year. The variable is at the industry-year level. Source: CDB Loan Data

Log(NUM_FIRMS): The logarithm of the number of firms that export in a given province and industry for a year. Source: China Customs

Log(ASSET): The logarithm of a firm's total assets. Source: Compustat

PPE/ASSETS: The tangibility of a firm, computed as property, plants, and equipment divided by total assets. Source: Compustat

Log(SALE): The logarithm of a firm's total sales. Source: Compustat

Log(EMPLOYEES): The logarithm of the number of employees in a firm. Source: Compustat

PRICE_DROP_DIRECT: The industry-year level average price reduction from China's export in the same industry resulted from CDB loans. See detailed explanation in Section IV.E. Source: China Customs and CDB Loan Data

PRICE_DROP_UPSTREAM: The industry-year level average price reduction from China's export in the upstream industry resulted from CDB loans. See detailed explanation in Section IV.E. Source: China Customs and CDB Loan Data

HIGH_UNEMPLOYMENT: A dummy variable that equals 1 if the unemployment rate of a firm's headquarters state is above the median in 1999, and 0 otherwise. Source: U.S. Bureau of Labor Statistics

TRADE_WAR_INDUSTRY: A dummy variable at the industry level that equals 1 if it is the key upstream industry of a firm and is listed for tariff increase in the U.S. section 301 report by USTR (https://ustr.gov/sites/default/files/Section 301 FINAL.PDF) on Mar. 22, 2018, the beginning of the 2018 China–U.S. trade war. We use the concordance table constructed by Pierce and Schott (2012) to link the HS product codes in the report and the SIC industries. Source: U.S. Government website

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109024000413.

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