Trade Diversion and Government-Led Credit Provision: Evidence from China's VAT Rebate Loan Program *

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Abstract

We show that financial constraints distort how multi-product firms adjust exports in response to trade tensions. Exploiting a staggered Chinese loan program that allows exporters to pledge unfulfilled VAT rebate receivables as collateral for short-term bank loans, we compare treated firms in adopting cities to matched firms in never-treated cities, both facing the same anti-dumping tariff investigations. Credit access reduces cross-product, cross-market trade deflection by 62% in value and 48% in volume. The effect concentrates among firms whose working capital is most severely trapped in government receivables. These firms increase short-term borrowing after program adoption but do not export differentially more in aggregate. Our results demonstrate that a meaningful share of trade deflection is not efficient reallocation but financially forced diversion, and that targeted credit provision can substitute for distressed firm adjustment.

Keywords: Geopolitical risk, Trade deflection, Financial constraint, Loans.

JEL Codes: F13, F14, F51, G32, G21

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1. Introduction

Trade tensions have escalated sharply over the past decade, from anti-dumping investigations to broad-based tariff wars and export controls. A growing literature documents that these disruptions impose substantial adjustment costs on firms (Alfaro et al., 2025; Crosignani et al., 2024). When trade barriers shut firms out of a market, they reallocate exports toward non-targeted products and destinations, with efficient reallocation driven by shared production capacity (Bao et al., 2025; Nocke and Yeaple, 2014). While the literature has established that multi-product firms reallocate exports in response to trade barriers, there is no systematic evidence on whether this reallocation is efficient. Observed trade deflection may position firms along their optimal production frontier, or it may reflect financially forced diversification into product-market pairs that would not be chosen under adequate liquidity.

In this paper, we examine whether trade deflection is partly financially forced, and whether credit provision can substitute for costly diversification. China's VAT rebate loan program provides a compelling setting for this test. Chinese exporters are entitled to VAT rebates of approximately 13% of export value, but government payment delays trap a substantial share of this cash in receivables—more than 60% of exporters do not receive their full rebates within the same calendar year (Lu and Ma, 2023). Beginning in the mid-2000s, local governments rolled out a program allowing exporters to pledge unfulfilled receivables as collateral for short-term bank loans, converting frozen government obligations into immediate working capital. Adoption was staggered across prefecture-level cities. Crucially, the program applies to all exporters in adopting cities regardless of firm characteristics, product structures, or destination markets. This distinguishes the loan program from export subsidies that target specific industries and from endogenous firm-level financial decisions such as leverage or cash holdings. This broad eligibility provides plausibly exogenous variation in credit access at the city-year level, which we combine with pre-determined, within-city differences in firms' rebate delay ratios to identify the effect of liquidity on trade adjustment.

We construct a firm–product–destination–year panel for Chinese exporters that combines transaction-level customs records, firm-level tax and financial data from the National Tax Survey, anti-dumping investigations from the World Bank Global Anti-Dumping Database, and hand-collected records of staggered loan program adoption across 325 prefecture-level cities. We document three sets of results. First, multi-product exporters facing anti-dumping investigations deflect exports toward non-targeted products and destinations. Second, when the loan program relaxes financial constraints, this cross-product deflection diminishes: firms with greater pre-treatment rebate delays, those with the most to gain from credit access, reduce their entry into new product-market pairs after the program is adopted. Third, firms with higher rebate delays in loan program adopting cities experience a significant increase in short-term borrowing, confirming that the loan program operates through the intended financing channel. Taken together, our findings suggest that a meaningful share of trade deflection is not efficient reallocation but a financially forced response to trade shocks, and that credit provision can substitute for costly diversification.

We compare how firms in cities that adopt the loan program adjust their exports to anti-dumping investigations, relative to matched firms in cities that never adopt. We implement a stacked difference-in-differences design with two-level propensity score matching, first on city economic characteristics and then on firm size and product-market overlap (Baker et al., 2022). Observable city characteristics do not predict loan program adoption timing. Within our most demanding specifications, all city-level confounders are absorbed by city–year fixed effects, so identification comes from within-city, within-year variation in pre-determined rebate delay ratios across firms facing the same anti-dumping shocks. The delay ratio is measured one year before program adoption, varies continuously across firms, and cannot be manipulated in anticipation of the policy.

We start by validating the baseline tariff effects. Following Bao et al. (2025), we confirm that multi-product exporters facing anti-dumping investigations deflect exports toward non-targeted products and destinations. The cross-product cross-market channel is the strongest:

firms expand exports of non-targeted products to non-AD destinations by approximately 6% in value.

We next examine whether the loan program moderates this cross-product deflection. After program adoption, cross-product cross-market deflection falls by 62% in value and 48% in volume. This reduction is analogous to "fire-sale diversion": the share of trade deflection that is financially forced rather than strategically optimal. The direct tariff hit and within-market product reallocation are unaffected by the program, consistent with financial constraints binding at the margin of entering new markets rather than adjusting within existing ones. If deflection were purely efficient capacity reallocation, more liquidity should enable more reallocation, not less. The fact that deflection falls when credit improves reveals that constrained firms were entering product-market pairs they would not choose under adequate liquidity, analogous to fire sales in asset markets where distressed firms sell assets below fundamental value.

This average effect exhibits distinct heterogeneity. We split firms at the within-city median of the pre-treatment rebate delay ratio. High-delay firms, whose working capital was most severely trapped by government payment delay, exhibit both the largest cross-product deflection and the largest post-program reduction. The loan program eliminates approximately 70% of their cross-product cross-market deflection. Low-delay firms show weaker effects.

Finally, we examine the direct effects of the loan program on firm financing and exports. High-delay firms increase short-term borrowing differentially more after program adoption, confirming that the program operates through the intended financing channel. However, they do not export differentially more in aggregate. Credit access changes how firms make cross-product export adjustment, rather than the intensive margin of exports. This lends support to the notion that loan program substitutes for fire-sale diversion as a source of liquidity.

This paper contributes to three strands of literature. First, we contribute to the literature on firm adjustment to trade policy shocks. Bown and Crowley (2007) document that anti-

dumping duties deflect 5–7% of targeted exports to third markets. Bao et al. (2025) extend this to multi-product firms, showing that AD actions trigger within-firm reallocation across products and destinations driven by shared production capacity. Anti-dumping duties reduce Chinese exports of targeted products (Lu et al., 2013; Felbermayr and Sandkamp, 2020) and trade policy uncertainty discourages firms' entry into foreign markets (Crowley et al., 2018). More recently, Crosignani et al. (2024) show that U.S. export controls impose significant costs on domestic firms, who struggle to form new customer relationships after losing access to Chinese markets. We build on this literature by showing that a substantial share of within-firm trade deflection reflects not efficient adjustment but financially forced diversion. This finding refines our understanding of firm flexibility, revealing that some observed reallocation is a symptom of financial distress rather than optimal capacity redeployment.

Second, we contribute to the literature on financial constraints and international trade. Manova (2013) establishes that credit constraints create a pecking order of trade, limiting firm entry into marginal export destinations. Amiti and Weinstein (2011) show that bank health directly affects export performance. Federico et al. (2025) demonstrate that banks exposed to import competition reduce credit to all borrowers, amplifying trade shocks. Alfaro et al. (2025) show that U.S. importers increase credit demand to finance geographic diversification after the 2018–2019 tariffs, with specialized banks easing both financial and information frictions. Friedrich and Zator (2023) show that firms with low financial leverage can redirect sales to new destinations in response to demand shocks. We complement these studies by examining whether improved short-term liquidity facilitates trade adjustment. While Alfaro et al. (2025) show credit enables reallocation, we show more credit access reduces distressed reallocation (a substitute for forced cross-product adjustment). Our findings also reveal that while credit helps firms maintain existing market presence, it does not enhance their ability to diversify across new markets, underscoring different roles played by financial constraints and non-financial barriers such as product competitiveness, market knowledge, and buyer networks.

Third, we contribute to the literature on government-led credit provision. Lu and Ma (2023) show that VAT rebate delays create substantial export losses, with financially constrained firms suffering more. Barrot and Nanda (2020) demonstrate that faster government payments boost employment in liquidity-constrained firms. Matray et al. (2024) show that the shutdown of the U.S. Export-Import Bank caused an 18% sales drop for dependent firms, establishing that even in developed markets, trade financing is under-supplied and government programs have real effects. A common insight from this literature is that government payment delays create adverse economic impacts, but it remains unclear how governments can alleviate such frictions when facing fiscal constraints. We provide evidence on a loan program, which alleviates liquidity frictions without requiring immediate fiscal outlays by allowing firms to pledge government receivables as collateral.

Taken together, our paper connects the trade finance literature (Manova, 2013; Amiti and Weinstein, 2011; Matray et al., 2024) with the firm adjustment literature (Bown and Crowley, 2007; Bao et al., 2025) by showing that domestic financial policy can reduce forced trade deflection at essentially little fiscal cost.

2. Background

This section provides background on the three institutional features central to our analysis: anti-dumping investigations targeting Chinese exporters, the VAT export rebate system and its refund delays, and the VAT rebate loan program.

2.1. Anti-dumping investigations

Anti-dumping (AD) duties are tariffs imposed by importing countries on foreign products deemed to be sold below fair market value. An AD case typically proceeds through investigation, preliminary determination, and final ruling, with the entire process lasting approximately one year. When an affirmative determination is reached, the importing country

imposes product-specific AD duties on exports from the targeted country.

China has been the world's most frequent target of AD investigations. Figure 1 plots the annual number of AD cases initiated against Chinese exporters and the share resulting in affirmative measures during 2006–2015. AD activity against China intensified over this period, with a notable surge following the 2008 global financial crisis. The majority of initiations lead to affirmative outcomes, consistent with the broader pattern documented in Bown (2015).

Figure 2 shows the distribution of AD cases by targeted industry and initiating country. AD investigations concentrate in metals, chemicals, and plastics — sectors where China's export growth has been most rapid. The most frequent initiators include the United States, the European Union, India, and several Latin American economies. The breadth of AD investigations across both industries and initiating countries means that a substantial fraction of Chinese exporters face AD exposure during our sample period.

FIGURES 1 AND 2 ABOUT HERE

2.2. VAT export rebates and refund delays

Value-added taxes (VAT) are levied at each stage of production in most countries worldwide.[1] Under this system, firms pay tax on sales and receive credits for VAT paid on inputs. Exporters, who face a zero VAT rate on goods sold abroad, are entitled to a refund of accumulated input credits. In China, the VAT rebate system was introduced in 1985, with the rebate rate initially set equal to the standard VAT rate of 17%. Since 1994, the government has adjusted rebate rates across products through several rounds of reform, and the rebate has evolved into a policy tool to encourage or restrain exports of specific products. Lu and Ma (2023) report an average rebate ratio of approximately 12% during 2007–2011. Because rebates are calculated as a statutory share of total export value, VAT refunds constitute a

[1] Most countries adopt a VAT system, with the notable exception of the United States (Bird and Gendron, 2007).

substantial component of exporters' cash flows.

Timely disbursement of VAT refunds is difficult to implement in practice, especially in developing countries (Pineda Pinto et al., 2024). In China, the fiscal burden of export rebates was shared between local and central governments from 2005 to 2014, with local governments financing 7.5% of total rebates.[2] Although rebate funds ultimately originate from the central government, local governments must allocate an annual rebate quota within their approved budgets. At the end of each fiscal year, they report any shortfall, and the central government disburses the remaining funds in the following year. As a result, many firms do not receive their full claimed rebates within the same calendar year. Lu and Ma (2023) document that more than 60% of Chinese exporters experience rebate delays, with the average delay ratio — defined as the fraction of unfulfilled over claimed rebates — equal to approximately 30% in our sample (Table 1).

These delays create a liquidity wedge. With a standard rebate rate of 13% for most industrial goods, a firm with a delay ratio of 0.5 has roughly 6.5% of its export revenue trapped in government receivables. For financially constrained exporters, this trapped liquidity can bind precisely when firms need working capital most — for instance, when an AD tariff shock destroys revenue on a major product line and the firm must decide whether to absorb the loss or reallocate exports to new product-market pairs.

2.3. Rebate loan program

The VAT rebate loan program allows eligible exporters to pledge their unfulfilled VAT rebate receivables as collateral to obtain short-term bank loans. These loans have maturities of up to one year, and the loan amount is typically capped at 70–90% of the outstanding receivable. In some cities, local governments provide interest subsidies, and the annual interest rate ranges from 4 to 5%, approximately 200–300 basis points below standard short-term lending rates. Figure 3 compares the standard VAT rebate process (Panel A) with the process under

[2] After 2014, the central government assumed full responsibility for VAT rebates.

the loan program (Panel B).

FIGURE 3 ABOUT HERE

The program was first introduced in China in 2001, but banks rarely participated until local governments began actively promoting it from 2007 onward. The main obstacle was information asymmetry: without access to firms' export and tax records held by local bureaus, banks could not verify the legitimacy of rebate claims and were unwilling to lend. Effective implementation therefore requires coordination among four parties — firms, commercial banks, local tax bureaus, and local branches of the People's Bank of China (PBoC). After a firm submits a loan application, customs and tax bureaus verify the rebate claims, the tax bureau designates an escrow account, and the PBoC branch registers the loan. Once the government disburses the VAT refund, funds are deposited into the escrow account, and the bank deducts principal and interest before releasing any remaining balance to the firm.[3] Despite this institutional coordination, banks retain full discretion over lending decisions under China's Commercial Bank Law.

The liquidity provided by this program is economically meaningful. With a standard rebate rate of 13% and an average lending cap of 80%, the program provides short-term liquidity equal to roughly 10% of a firm's total export sales — a magnitude comparable to the share of trade credit typically obtained by firms in the United States (Barrot and Nanda, 2020).

Staggered adoption. The rollout of the loan program was staggered across Chinese prefecture-level cities from 2007 to 2015. We hand-collect a city-year panel documenting adoption timing and motives for 325 cities using official government documents, following the narrative approach of Romer and Romer (2010). We classify adoption motives into four categories: promoting long-term economic growth, responding to export slowdowns, alleviating credit constraints, and addressing refund delays due to local fiscal pressures. Figure 4

[3]Figure A1 details the step-by-step administrative process for obtaining a rebate-backed loan.

maps the geographic distribution of adoption, showing that early adopters were concentrated in coastal export hubs, with inland cities adopting later. By 2015, approximately half of all prefecture-level cities had implemented the program.[4]

FIGURE 4 ABOUT HERE

3. Data and Sample Construction

3.1. VAT Rebate Loan Program Data

We construct a prefecture–year panel to identify the earliest implementation of the VAT rebate loan program across prefecture-level jurisdictions in China during 2005–2015. Data are collected through a systematic web search protocol with the goal of recovering the earliest adoption year for each prefecture. For each year, we query "[VAT rebate loan program] + [prefecture/province name] + [year]" (in Chinese) and screen the top 100 results. We conduct searches at both the prefecture and province levels. Province-level policies are assigned to subordinate prefectures unless prefecture-level evidence indicates an earlier adoption, in which case the latter prevails. We prioritize information from official government sources, including provincial and municipal government websites and local branches of the People's Bank of China, over media coverage. Two annotators independently review the search results to determine whether the VAT rebate loan program is implemented in a given year. The interrater agreement exceeds 0.9, and discrepancies are resolved through discussion and consensus.

[4]Table A1 reports the full list of province- and city-level adoption with their classified motives. Figure A2 presents two case studies to illustrate the heterogeneity in adoption motives across cities: Shenzhen (2009), which introduced interest subsidies on rebate loans to support exporters during the global financial crisis, and Urumqi (2011), which partnered with commercial banks to ease liquidity conditions for inland exporters.

3.2. Trade Data

Our trade data come from China's General Administration of Customs (CGAC), which records the universe of Chinese export and import transactions during 2007–2015. For each transaction, the data record the exporting firm, product (at the HS8 level), destination country, year, value, quantity, and trade type (ordinary versus processing trade), among other fields.

We clean the data in several steps following standard practice in the literature (Bao et al., 2025; Lu et al., 2013). First, we drop transactions with missing or zero values for firm identifiers, product codes, destination countries, quantities, or values. Second, we restrict to ordinary exports, excluding processing trade transactions, which use imported intermediate inputs provided by foreign firms and may receive differential treatment in AD investigations (Ludema et al., 2021). Third, we aggregate the data to the firm–destination country–product(HS6)–year level, computing export value and volume at this level.

3.3. Anti-Dumping Data

Data on AD investigations come from the World Bank Global Antidumping Database, constructed and maintained by Bown (2016).[5] For each AD case, the database records the initiating country, target country, target product (at the HS4–HS12 level), initiation date, decision date, and outcome. We restrict to cases initiated against China during 2006–2015 and harmonize product codes to the HS6 level to match our trade data.

3.4. Firm Financial Data

We merge the Customs data with the National Tax Survey (NTS) Database, a comprehensive firm-level dataset spanning 2007 to 2016 (Giannetti et al., 2021; Lu and Ma, 2023). The NTS Database offers several advantages over other widely used Chinese firm datasets, in-

[5]The database is available at https://www.chadpbown.com/global-antidumping-database/.

cluding the Annual Survey of Industrial Firms (ASIF). First, it is jointly collected by the State Administration of Taxation and the Ministry of Finance for tax monitoring and policy evaluation, ensuring high data quality. Second, it provides more complete coverage of small firms and maintains robust representation of large firms across all thirty-one provinces and eighty-four industries. Third, it contains detailed information on firms' taxation (including VAT tax, claimed rebates, and unfulfilled rebates), financing (including cash flow, bank loans, and trade credit), and business operations (sales, exports, and profits). This allows us to measure firm-level VAT rebate delay ratio, defined as the proportion of unfulfilled over claimed rebates at the end of a year.

Information on city characteristics comes from the CSMAR China Economy Database, including export-to-GDP ratio, total export value, GDP, real estate investment, fiscal revenue and expenditure, population, and year-end outstanding loan balance of financial institutions.

3.5. Sample Construction

We construct our estimation sample in three steps. First, we restrict to manufacturing firms engaged in ordinary trade that export at least two HS6 products to at least two destination countries, ensuring that firms have scope for within-firm adjustment across products and markets in response to AD shocks.

Second, we implement the two-level matching procedure described in Section 4.3. For each policy adoption cohort $t \in \{2008, \ldots, 2014\}$, we match treated cities to never-treated cities on pre-treatment economic characteristics via propensity score matching, and then match firms within matched city pairs based on product-market overlap and firm size. The matched sample is assembled into a stacked panel spanning 2007–2015, with all observations tagged by cohort and relative event time.

Third, we construct two analysis panels from the matched sample. The *product-country panel* is at the firm–HS6 product–destination country–year level and is used to estimate the effects of AD shocks and their interaction with the loan program. The *firm panel* collapses

the data to the firm–year level and is used to estimate the effects of the loan program on firm financing and aggregate export outcomes. For the firm panel, $Delay\ Ratio_f$ is fixed at its value in the year immediately prior to the firm's cohort adoption year, ensuring it is pre-determined. All continuous variables are winsorized at the 1st and 99th percentiles.

3.6. Summary Statistics

Table 1 reports summary statistics for the main variables. Panel A presents statistics at the firm–product–country–year level. The mean of $AD\_Prod\_Mkt_{t-1}$ is 0.014, indicating that direct AD hits are relatively rare at the transaction level, while $AD\_OthProd\_OthMkt_{t-1}$ has a mean of 0.758, reflecting the pervasive indirect reach of AD investigations. Panel B presents statistics at the firm–year level. The median firm exports to 5 destination countries and 5 HS6 products. The mean *Delay Ratio* is 0.299, with substantial cross-firm variation (standard deviation of 0.387), indicating that VAT rebate delays are economically meaningful and heterogeneous across firms.

Table 1 About Here

4. Empirical strategy

Our identification strategy exploits the staggered adoption of VAT rebate loan programs across Chinese cities in a stacked difference-in-differences design, comparing firms' export responses to AD investigations in adopting cities versus matched firms in never-treated cities. Within each cohort, two-level propensity score matching, first on city economic characteristics, then on firm size and product-market overlap, ensures that treated and control firms are comparable in both their local economic environment and their export trajectory. We further exploit the fact that the loan program differentially affects firms with higher pre-treatment rebate delays (those with greater latent demand for liquidity) both in moderating their export adjustment to AD shocks, and in relaxing their financing constraints.

4.1. Stacked difference-in-differences

The VAT rebate loan program was promoted across provinces and cities starting in 2007 in a staggered fashion. Due to staggered policy adoption, a standard differences-in-differences model may produce biased estimates of treatment effects.[6] To address concerns about heterogeneous treatment timing effects in generalized DID regressions, we follow Baker et al. (2022) and estimate stacked event regressions. Specifically, for each adoption cohort , we match each treated firm to firms headquartered in cities that never adopted the loan program. The set of treated firms sharing the same program adoption year and their matched control units is a "cohort". We stack all cohorts together to form our sample. Control firms are sampled with replacement. We interact all fixed effects with cohort indicators to ensure that comparisons occur strictly within cohort.

4.2. Policy adoption

Cities adopt the rebate loan program for different reasons, including long-term economic development, recent export slowdowns or external shocks, credit constraints of exporters, and local government financial distress. Policy adoption can therefore be related to city characteristics, raising concerns that a comparison of firms in adopting versus never-adopting cities would conflate the program's effects with pre-existing differences across cities. For this reason, we do not rely solely on across-city comparisons. Instead, our most demanding specifications exploit variation in VAT rebate delay ratios across firms within the same city and year by controlling for city–year fixed effects, so that identification comes from predetermined, within-city differences in trapped liquidity. To avoid contamination, we measure firm delay ratios one year prior to policy adoption.

Nonetheless, we first test whether city characteristics predict policy adoption. Table 2 reports results from regressions of a binary adoption indicator on lagged city-year charac-

[6] Roth et al. (2023) provide a detailed review of the recent literature on staggered differences-in-differences designs.

teristics, controlling for year and province fixed effects. Once a city adopts the policy, it exits the sample. The outcome in column (1) is whether a city adopts the loan program in a given year; columns (2)–(4) decompose adoption by stated motive: long-term economic development, export slowdown, and credit constraints.[7]

TABLE 2 ABOUT HERE

We find no predictive power of city-level characteristics in explaining whether a city adopts the rebate loan program, whether for long-term economic development, to resolve export slowdowns, or to alleviate exporters' credit constraints. This finding is consistent with the assumption that firms are unable to anticipate policy adoption. The one exception is that cities with higher outstanding loan balances are marginally more likely to promote the program to alleviate credit constraints (column 4, $p < 0.10$), suggesting that sufficient liquidity in local financial institutions enables governments to channel funds to exporters through the program.

While these results support the exogeneity of adoption timing, cities that eventually adopt the loan program may nonetheless differ systematically from cities that never adopt — for instance, adopting cities may be larger, more export-oriented, or more fiscally constrained. To address this concern, we implement a two-level matching procedure.

4.3. Matching

To improve comparability between treated and control groups, we refine the sample using a two-level propensity score matching procedure.[8] First, we match cities on economic charac-

[7] We do not report estimates using local government fiscal distress as the outcome due to insufficient observations.

[8] At the city level, for each cohort year t, we estimate a logit model predicting adoption on pre-treatment log GDP (at $t-1$) and fiscal stress (expenditure-to-revenue ratio at $t-1$). Each treated city is matched to up to three never-treated cities using nearest-neighbor matching with replacement. At the firm level, within matched city pairs, we first require product-market overlap (a control firm must share at least one HS6 product–destination country pair with a treated firm in the pre-treatment period) and then match on firm size (log assets) and log total exports using the same nearest-neighbor procedure. All cohort-specific matched panels are stacked into a single dataset, with standard errors clustered at the firm level to account for control firms appearing in multiple cohorts.

teristics so that treated and control firms operate in comparable local environments. Second, we match firms on size and product-market overlap so that treated and control firms face similar AD tariff exposure and have similar capacity to adjust. Appendix Appendix C provides full details on the matching procedure and covariate balance.

4.4. Estimation

We present results from three progressively richer specifications that correspond to the building blocks of the paper.

Specification 1: AD tariff effects. Our baseline specification at the firm–HS6 product–destination country–year level follows the framework of Bao et al. (2025), which captures the comprehensive set of within-firm adjustments to an AD investigation across all products and export destinations simultaneously:

$$y_{fpct} = \sum_{k=1}^{4} \alpha_k \, \mathrm{AD}_{k,f,t-1} + \gamma \mathbf{X}_{ft} + \theta_{fpc} + \delta_{ct} + \varepsilon_{fpct}, \tag{1}$$

where y_{fpct} is log export value or log export volume of product p of firm f exported to country c in year t. The four AD regressors, each lagged one year, decompose a firm's AD exposure across all its products and export markets.

The first regressor, $AD\_Prod\_Mkt_{fpc(t-1)}$, equals one if firm f's product p faces an AD investigation from country c in period $t-1$. Its coefficient α_1 captures the direct effect of an AD action on the targeted product in the market undertaking the investigation. The second regressor, $AD\_Prod\_OthMkt_{fpc(t-1)}$, equals one if product p faces an AD investigation from any country *other than* c. Its coefficient α_2 captures the cross-market spillover: whether an AD action in one destination affects exports of the same product to other destinations. The third regressor, $AD\_OthProd\_Mkt_{fpc(t-1)}$, equals one if *any other product* of firm f faces an AD investigation from country c. Its coefficient α_3 captures within-market cross-product reallocation: whether an AD action against one of a firm's products affects the exports of

its other products to that same market. The fourth regressor, $AD\_OthProd\_OthMkt_{fpc(t-1)}$, equals one if any other product of firm f faces an AD investigation from any country other than c. Its coefficient α_4 captures the broadest form of trade deflection—cross-product, cross-market reallocation—whereby an AD action on one product in one market affects the firm's exports of a different product to a different destination. This last channel is the margin most relevant for our analysis, as it captures the type of costly reallocation into unfamiliar product-market pairs that we hypothesize to be partly driven by financial distress.

The specification includes firm–product–country–cohort fixed effects (θ_{fpc}), which absorb all time-invariant characteristics of each export relationship, and destination country–year–cohort fixed effects (δ_{ct}), which absorb destination-specific demand shocks. $\mathbf{X}_{ft}$ includes firm-level controls (log assets and leverage ratio). Following Bao et al. (2025), we do not include product–year or firm–year fixed effects: the former would absorb the cross-country variation needed to identify α_2, while the latter would absorb the cross-product variation needed to identify α_3 and α_4.

Specification 2: Loan program and AD responses. To examine whether the loan program moderates tariff-induced adjustment, we interact each AD variable with $PostPolicy_{ft}$, an indicator equal to one after the loan program is adopted in firm f's city:

$$y_{fpct} = \sum_{k=1}^{4} \left(\alpha_k \, \mathrm{AD}_{k,f,t-1} + \phi_k \, \mathrm{AD}_{k,f,t-1} \times PostPolicy_{ft} \right) + \gamma \mathbf{X}_{ft} + \theta_{fpc} + \delta_{ct} + \mu_{gt} + \varepsilon_{fpct}, \quad (2)$$

where μ_{gt} is a city–year–cohort fixed effect. The inclusion of city–year effects absorbs the main effect of *PostPolicy* as well as all city-level time-varying confounders, so that the ϕ_k coefficients are identified purely from variation in AD exposure across firm-product-country cells within the same city-year. A negative ϕ_4 on $AD\_OthProd\_OthMkt \times PostPolicy$ would indicate that the loan program reduces cross-product cross-market trade deflection—what we term fire-sale diversion.

Specification 3: Firm-level mechanism. To examine the direct effects of the loan program on firm financing and exports, we estimate at the firm–year level:

$$y_{ft} = \beta \left(DelayRatio_f \times PostPolicy_{ft} \right) + \alpha_f + \mu_{gt} + \varepsilon_{ft}, \tag{3}$$

where y_{ft} is log current liabilities or log total exports; $DelayRatio_f$ is the firm's pre-treatment VAT rebate delay ratio, measured at $t = -1$ relative to its cohort year and held fixed during sample period; and α_f is a firm–cohort fixed effect. The city–year–cohort fixed effect μ_{gt} absorbs the direct effect of the loan program on all firms in a given city-year, so the coefficient β captures whether firms with higher pre-treatment rebate delays — those with greater trapped liquidity — experience differentially larger changes in financing and export outcomes after program adoption. Standard errors are clustered at the firm level throughout.

5. Loan Program and Firm Response to AD Tariffs

5.1. AD Tariffs and Firm Adjustment

We begin by validating, in our matched sample, the within-firm export adjustments documented by Bao et al. (2025). Table 3 reports estimates from Equation (1) with log export value and log export volume as dependent variables. All regressions include firm–product–country and country–year fixed effects interacted with cohort indicators.

Table 3 About Here

5.1.1. Within-Product Adjustments

The coefficient on *AD_Prod_Mkt* in the export value regression is significantly negative, indicating that an AD action reduces export value of the targeted product in the AD-imposing market by approximately 9.3%.[9] The corresponding coefficient in the volume

[9] Our dependent variables are in log form, so $\exp(-0.098) - 1 \approx -9.3\%$ gives the marginal effect.

regression is economically small and statistically zero. Since export value equals price times quantity, the decline in value with no change in volume implies that the effect operates primarily through lower prices. This is consistent with firms absorbing part of the AD duty by compressing margins in the targeted market (Blonigen and Park, 2004).

The coefficient on *AD_Prod_OthMkt* is negative and statistically significant for both export value and volume. This means that when a product faces AD duties in one destination, exports of the same product to *other* destinations also decline in both value and volume. The trade deflection literature (Bown and Crowley, 2007) predicts the opposite: that firms will redirect the targeted product to non-AD markets by increasing volume there. Instead, our negative estimates suggest that the chilling effect dominates: firms restrain exports of the targeted product across all destinations, likely to avoid triggering AD investigations in additional markets. This is consistent with the broader evidence on AD chilling effects documented in Vandenbussche and Zanardi (2010) and Egger and Nelson (2011).

5.1.2. Cross-Product Adjustments

The final two rows of Table 3 reveal a striking pattern of within-firm cross-product deflection. The coefficient on *AD_OthProd_Mkt* is positive for both export value and volume. This indicates that when one of a firm's products is hit by an AD action in a particular market, the firm increases exports of its *other* products to that same market. The effect is even stronger for *AD_OthProd_OthMkt*). This means that AD actions on one product in one market lead firms to expand exports of non-targeted products to other destinations as well.

This pattern of positive quantity effects for non-targeted products across *all* markets is the signature of within-firm cross-product trade deflection driven by shared fixed factors of production with capacity constraints, as formalized in Nocke and Yeaple (2014) and first documented in Bao et al. (2025). When AD duties reduce production and sales of the targeted product, capacity of shared factors (factory space, equipment, management attention, sales teams) is freed up, lowering the marginal cost of the firm's other products

and enabling expanded output. Because this mechanism operates through the supply side, it predicts quantity increases across all destinations, not just the AD-imposing market.

Several features of the estimates merit further discussion. First, the value effect for non-targeted products is smaller in the AD-imposing market (*AD_OthProd_Mkt*) than in other markets (*AD_OthProd_OthMkt*. This asymmetry is consistent with a within-firm chilling effect: firms that have already faced an AD action in a particular destination exercise pricing restraint on their other products in that same market, for fear of attracting further AD scrutiny. Second, the volume effects are larger in absolute magnitude than the value effects. This reflects the firm redirecting not only production capacity but also non-price resources, including marketing, after-sales service, and trade-show attendance, toward non-targeted products.

In summary, consistent with Bao et al. (2025), we find AD tariffs reduce export value of targeted product-market pairs, and multi-product firms respond through sizable within-firm cross-product deflection. These baseline estimates establish the firm adjustments under tariff shock that we exploit in the subsequent analysis to test whether government-led credit provision moderates these responses.

5.2. Credit Access and Trade Adjustment

We now turn to the central question of the paper: does the VAT rebate loan program moderate how firms adjust their exports in response to AD tariff shocks? Table 4 reports estimates from Equation (2), which interacts each of the four AD exposure variables with *PostPolicy*, an indicator equal to one after the loan program is adopted in the firm's city. We progressively saturate the model: column (1) includes city fixed effects, column (2) adds city $\times$ year fixed effects, and column (3) further includes firm-level controls.

TABLE 4 ABOUT HERE

The headline result is the coefficient on *AD_OthProd_OthMkt* $\times$ *PostPolicy*, which cap-

tures whether the loan program changes the magnitude of cross-product cross-market trade deflection. The negative estimates in columns (3) and (6) indicates that, after the loan program is adopted, the cross-product cross-market deflection documented in Section 5.1 shrinks substantially.

The economic magnitude is large. Before the loan program, firms facing AD actions on one product in one market expand exports of their other products to other markets by approximately 6.0% in value and 4.9% in volume. After the program, the deflection effect falls to 2.2% in value and 2.5% in volume. In other words, the loan program reduces cross-product cross-market deflection by approximately 62% in value and 48% in volume. This is the fire-sale diversion result: when firms gain access to credit, they no longer need to chase revenue through costly reallocation into unfamiliar product-market pairs.

The revealed-preference logic behind this interpretation is straightforward. If cross-product deflection were purely efficient capacity reallocation driven by shared fixed factors, relaxing financial constraints should not reduce it. If anything, more resources should enable firms to reallocate more effectively. The fact that deflection *falls* when credit improves reveals that a substantial share of the reallocation observed in the pre-program period was financially forced, not strategically optimal.

The interaction terms for the other three AD channels provide helpful contrasts. *AD_Prod_Mkt* $\times$ *PostPolicy* is economically small and statistically insignificant for both value and volume. This suggests that the loan program does not mitigate the direct tariff hit on the targeted product-market pair.

AD_OthProd_Mkt $\times$ *PostPolicy* is also insignificant for both value and volume, suggesting that the loan program does not alter within-market cross-product reallocation, i.e., how firms shift exports toward other products in the same AD-imposing destination. This is consistent with the view that within-market reallocation leverages the firm's existing distribution network, buyer relationships, and regulatory knowledge in that destination, requiring primarily variable-cost adjustments rather than new fixed-cost investments that depend on

working capital availability.

The most notable finding beyond the headline result is $AD\_Prod\_OthMkt \times PostPolicy$, which is positive and highly significant for volume. Before the loan program, firms facing AD on a product experience a volume decline of 4.7% for that same product in other destinations, reflecting the chilling effect documented in Section 5.1. After the program, this negative spillover is completely eliminated: the net effect is $-0.048 + 0.051 \approx 0$. Credit access thus allows firms to maintain export volumes of the targeted product in non-AD markets, rather than preemptively retreating from those markets.

Taken together, the pattern of results reveals a clear asymmetry in how credit access interacts with different adjustment margins. The loan program has no effect on the direct tariff hit (which is determined by foreign policy) or on within-market product reallocation (which requires little incremental financial investment). It significantly reduces cross-product cross-market deflection (which requires financing new fixed costs of entering unfamiliar product-market pairs) and eliminates the cross-market chilling effect on the targeted product's volume (which reflects firms' inability to maintain existing trade relationships when liquidity is trapped). This asymmetry is consistent with the theoretical prediction that financial constraints bind primarily at the extensive margin of market entry, not at the intensive margin of existing relationships (Manova, 2013; Paravisini et al., 2015).

5.3. Trapped-Liquidity Channel

We next analyze whether the reduction in fire-sale diversion concentrates among firms whose working capital was most constrained by government rebate delays. If the loan program operates by releasing trapped liquidity, firms with higher pre-treatment delay ratios should exhibit the largest reduction in cross-product cross-market deflection after program adoption, while firms with low delay ratios, whose working capital was never severely trapped, should show little change. We test this prediction by splitting the sample at the within-city median of the pre-treatment delay ratio, measured one year before loan program adoption, and re-

estimating Equation (2) separately on each subsample.

TABLE 5 ABOUT HERE

Table 5 presents the results. We focus on the key coefficient, *AD_OthProd_OthMkt* × *PostPolicy*, which captures whether the loan program reduces fire-sale diversion. For firms with high pre-treatment delay ratios, the coefficient on *AD_OthProd_OthMkt* × *PostPolicy* is significantly negative for export value and export volume. Before the loan program, export value of non-targeted products in non-AD markets increased by 7.6% and volume by 6.6% in response to AD investigations on other products. After the program, deflection falls to 2.2% in value and 1.7% in volume. The loan program thus eliminates approximately 70% of the cross-product cross-market deflection for the most financially constrained firms.

For firms with low pre-treatment delay ratios, the pattern is weaker. Compared with high-delay firms, these firms have smaller baseline deflection to begin with: 5.9% in value and 4.0% in volume. The significant value effect suggests that even firms with relatively low delay ratios benefit from the broader credit environment the loan program creates in treated cities. However, the insignificant volume result indicates that for firms whose liquidity was never severely trapped, the program does not meaningfully change how they reallocate physical quantities across product-market pairs.

Two features of the split-sample results support the trapped-liquidity channel. First, high-delay firms exhibit both larger pre-program deflection *and* a larger post-program reduction. Before the loan program, these firms diverted 7.6% of export value through the cross-product cross-market channel, compared to 5.9% for low-delay firms. This 1.7 percentage point gap is consistent with the view that financially constrained firms engage in more fire-sale diversion because they are more desperate for revenue to replace cash flows lost to AD tariffs. After the program releases their trapped liquidity, this excess diversion disappears. Second, the volume result is significant only for high-delay firms, confirming that the reallocation of goods across product-market pairs is what the loan program reduces, not just

a value effect driven by price adjustments.

These results are not driven by high- and low-delay firms operating in different industries or facing different AD shocks. The within-city median split ensures that in every city, roughly half the firms are classified as high-delay and half as low-delay. Moreover, all specifications include city–year–cohort fixed effects, so the comparison is between high- and low-delay firms within the same city at the same time, facing the same local economic conditions. The only systematic difference is the share of working capital trapped in government receivables prior to the program.

6. Unlocking Trapped Liquidity

Our final analysis examines whether the loan program directly releases trapped liquidity. The program allows exporters to pledge unfulfilled VAT rebate receivables as collateral for short-term bank loans with maturities of up to one year. If the program works as intended, firms in treated cities should increase short-term borrowing after adoption, and this increase should be larger for firms with higher pre-treatment delay ratios.

6.1. Firm Financing

We thus examine whether firms with more liquidity trapped in rebate delay see higher increase in loan take-up. Unfortunately, our dataset does not allow us to precisely discriminate between the take-up of rebate-backed loan and other current liabilities. To capture the impact of loan program on firm financing behavior, we step back by regressing *log current liabilities* on *PostPolicy* and the interaction of *Delay Ratio* and *PostPolicy*, as specified in Equation (3). Column (1) includes firm and city fixed effects. Column (2) replaces city fixed effects with city × year fixed effects, absorbing the main effect of *PostPolicy* and all city-level time-varying confounders.

Table 6 reports the results. Firms in treated cities increase current liabilities by approx-

imately 22.7% after program adoption. A one-standard-deviation increase in the delay ratio (38.7%) is associated with an additional 3.5 percentage point increase in current liabilities. In column (2), with city–year fixed effects, the interaction coefficient remains positive and significant. Within the same city and year, firms whose working capital was more severely trapped borrow differentially more after the program arrives.

Table 6 About Here

Figure 5 plots the dynamic effects using an event-study specification. The coefficients are flat and close to zero before program adoption, confirming parallel pre-trends. After loan program adoption, the coefficients turn positive and grow, consistent with the program progressively unlocking trapped liquidity for the most constrained firms.

Figure 5 About Here

6.2. Firm Exports

We next examine whether the additional credit translates into higher exports for constrained firms. We regress log total export value on the same specification.

Table 7 reports the results. In column (2), which includes city × year fixed effects, the coefficient on *Delay Ratio* × *PostPolicy* is positive but statistically insignificant. This suggests that within the same city and year, high-delay firms do not export more than low-delay firms after the program.

Table 7 About Here

The contrast between Tables 6 and 7 points to a substitution mechanism. The program enables constrained firms to borrow more, but they do not necessarily use the credit to expand total exports. Instead, as shown in Tables 4 and 5, they use it to sustain existing export relationships. More access to credit replaces fire-sale diversion as a source of liquidity. Firms that previously chased revenue through costly reallocation can now bridge the cash

flow gap through short-term borrowing, without diverting exports to product-market pairs they would not otherwise serve.

7. Conclusion

Financial constraints distort how multi-product firms adjust exports to trade shocks. When anti-dumping tariffs shut firms out of a product-market pair, constrained exporters diversify into unfamiliar products and destinations not because expected returns justify the cost, but because they need revenue. China's VAT rebate loan program, which allows exporters to pledge frozen government receivables as collateral for short-term bank loans, reduces this cross-product cross-market deflection by 62% in value and 48% in volume. The reduction concentrates among firms whose working capital was most severely trapped in government receivables. These firms borrow more after program adoption but do not export differentially more in aggregate, pointing to a substitution mechanism: credit replaces fire-sale diversion as a source of liquidity. Our results suggest that a meaningful share of the trade deflection documented in prior literature reflects financial distress rather than efficient capacity reallocation. From a policy perspective, the loan program alleviates this distortion at essentially zero fiscal cost, converting existing government obligations into collateral-backed financing without requiring immediate outlays. Whether this design extends to other settings where government payment delays trap firm liquidity, and whether reduced fire-sale diversion translates into improved long-run firm performance, are questions we leave for future research.

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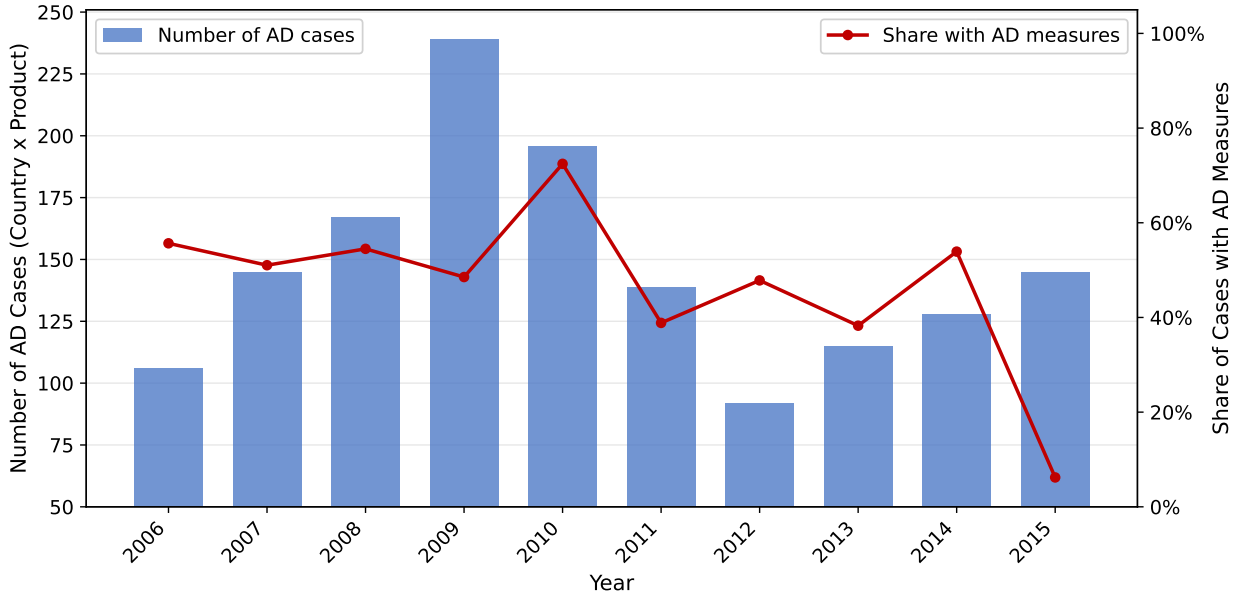
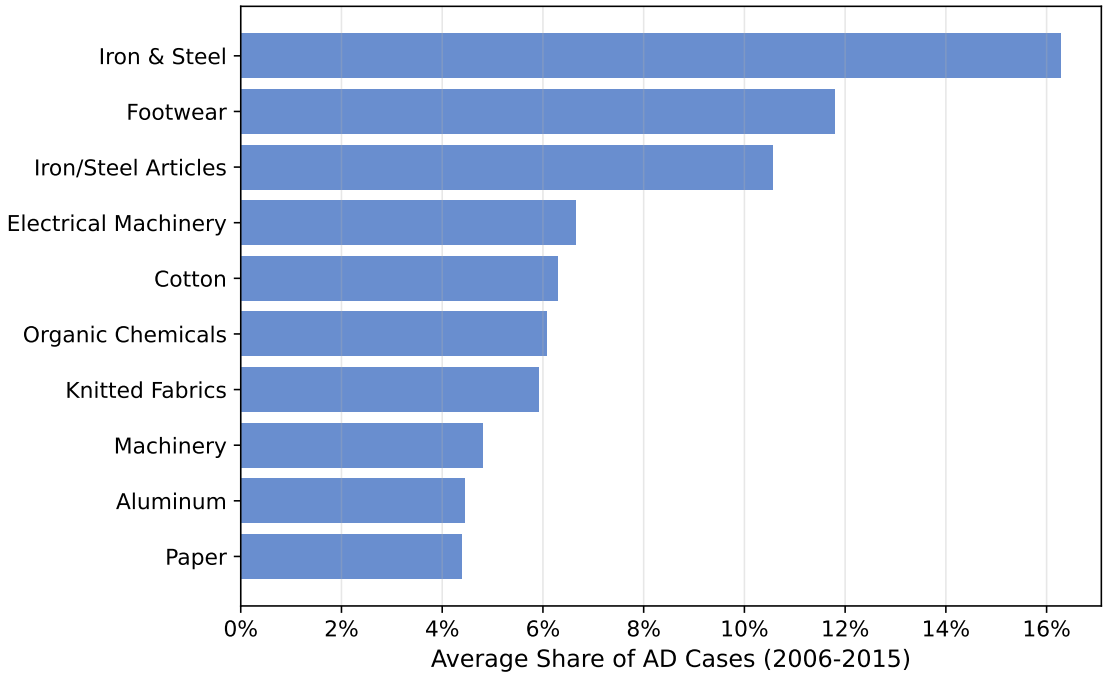
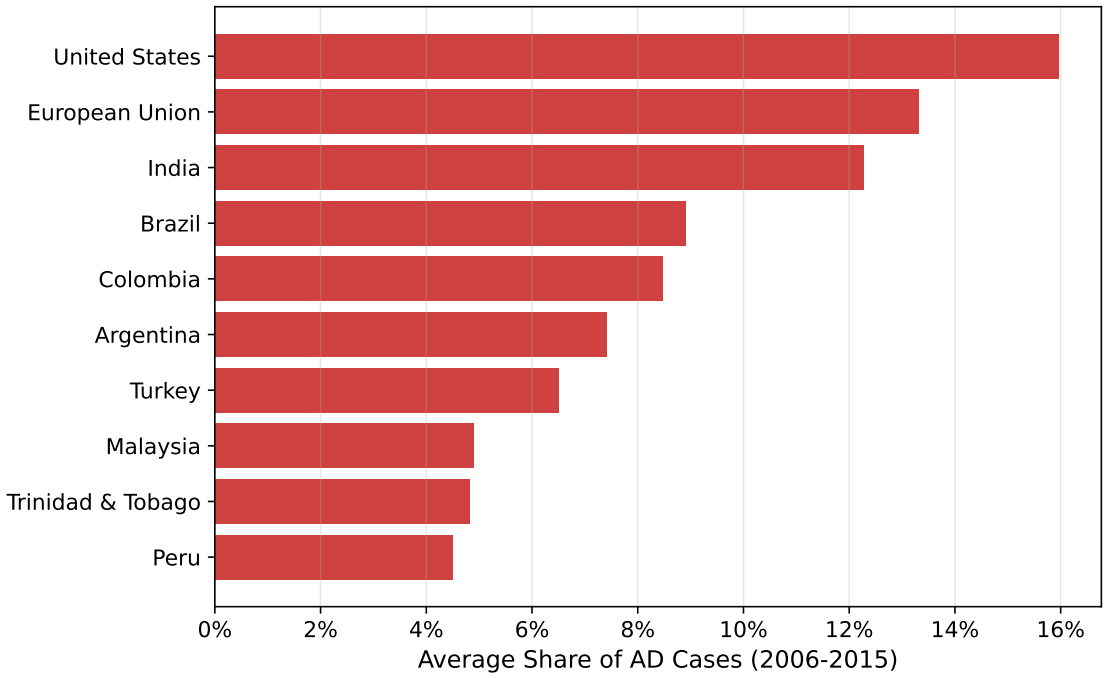


Figure 1: **Anti-Dumping Investigations Targeting China Over Time.** This figure plots the annual number of anti-dumping (AD) cases initiated against Chinese exporters (country × product pairs, left axis) and the share of cases resulting in affirmative AD measures (right axis) during 2006–2015. Data are from the World Bank Global Anti-dumping Database.



Panel A: Top Targeted Industries



Panel B: Top Initiating Countries

Figure 2: **Anti-Dumping Investigations Targeting China by Industry and Country.** This figure summarizes the distribution of anti-dumping (AD) investigations initiated against Chinese exporters during 2006–2015 using the World Bank Global Anti-dumping Database. Panel A reports the average share of AD cases by targeted 2-digit Harmonized System (HS) industry. Panel B reports the average share of AD cases by initiating country.

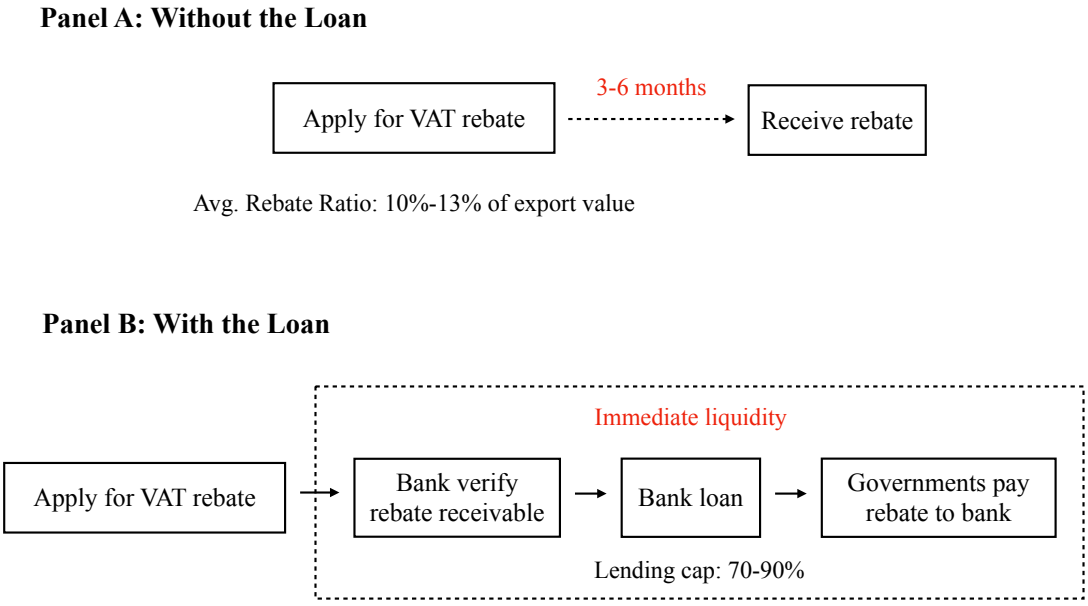


Figure 3: **VAT Rebate Process.** This figure illustrates the VAT rebate process for Chinese exporters under two scenarios. Panel A depicts the standard process without rebate-backed loan program, where exporters typically wait 3–6 months to receive VAT refunds from the government, creating a liquidity gap equal to roughly 10%–13% of export value. Panel B shows the process with rebate receivable-backed loans, under which exporters pledge their unfulfilled VAT rebate receivables as collateral to obtain short-term working capital loans from commercial banks, with a typical lending cap of 70%–90% of the receivable amount. The government rebate, once disbursed, is automatically deposited into an escrow account to repay the loan.

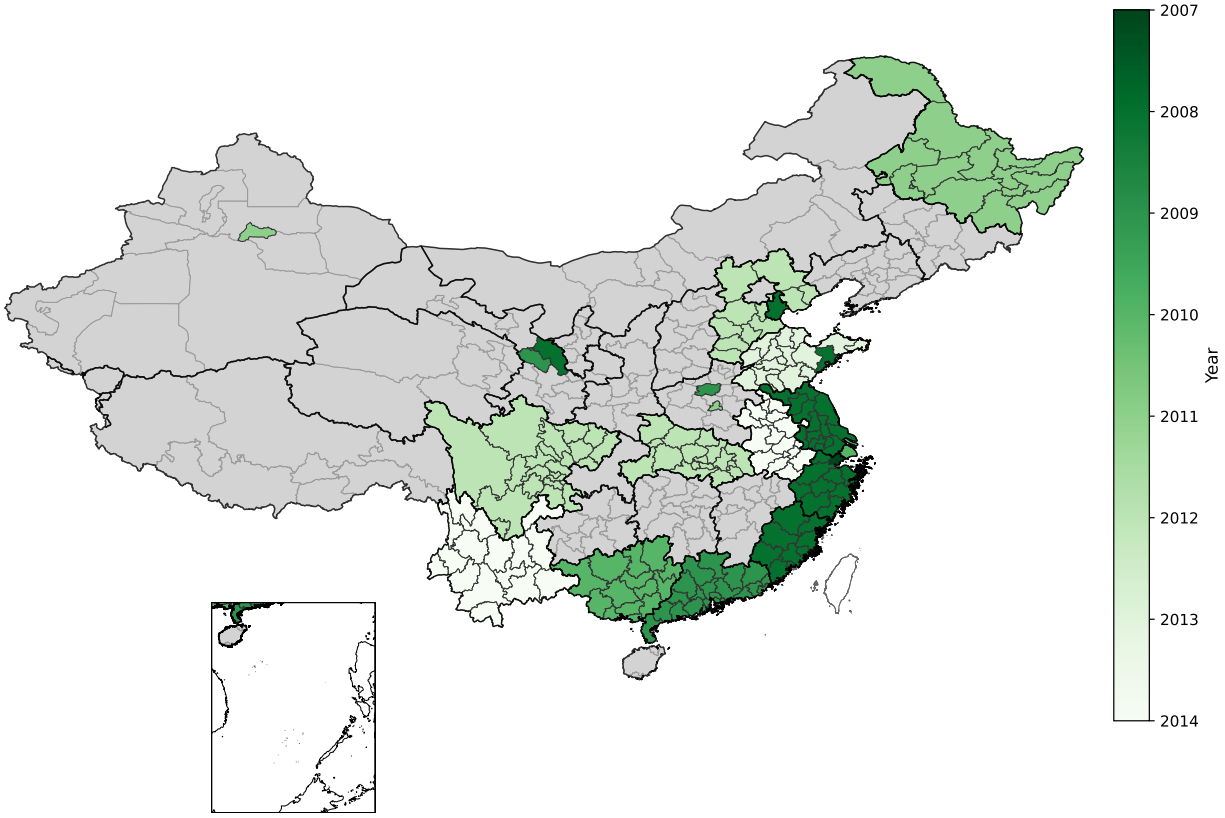


Figure 4: **VAT Rebate Loan Program in China.** This figure maps the staggered adoption of VAT rebate receivable loan program across Chinese prefecture-level cities from 2007 to 2015. Darker shading indicates earlier adoption. Cities in gray had not adopted the policy by the end of the sample period.

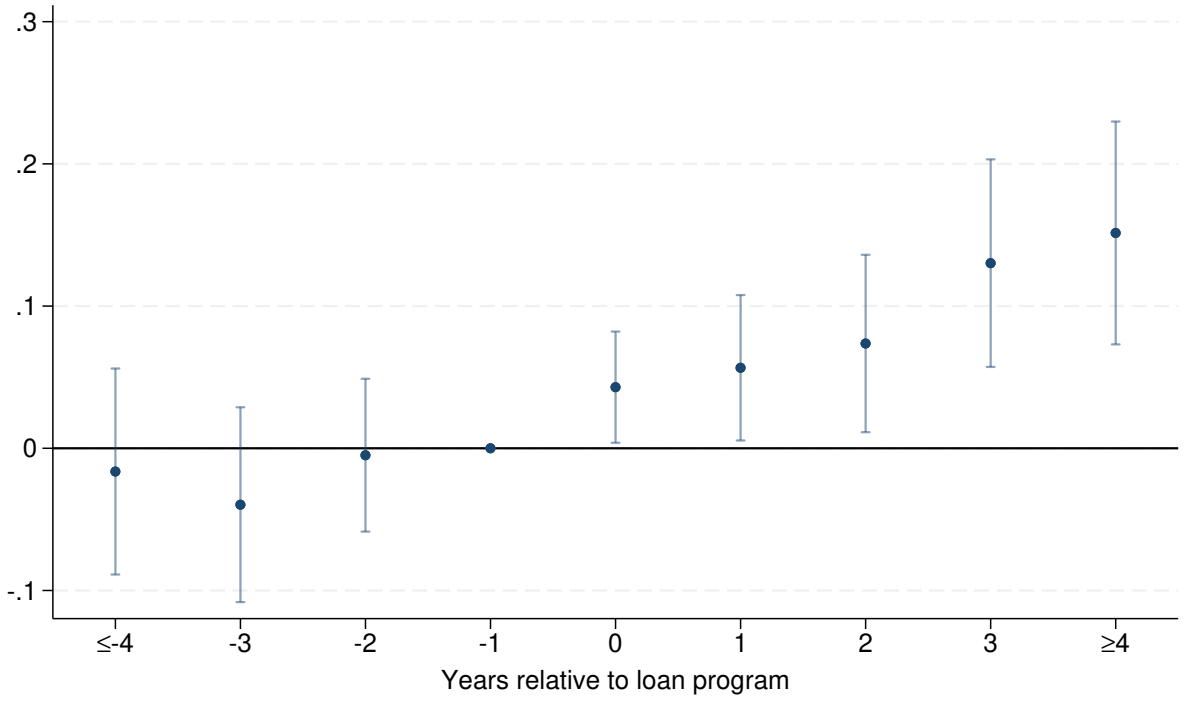


Figure 5: **Dynamic Effects of VAT Rebate Loan Program on Firm Financing.** This figure plots event-study coefficient estimates from a regression of *log(Current Liabilities)* on the interaction of *Delay Ratio* and indicators at each year relative to loan program adoption, controlling for treated × event-time indicators. The reference period is $t = -1$. The vertical intervals represent 95 percent confidence intervals.

Table 1: **Summary Statistics**
This table presents summary statistics for the main variables. Panel A reports statistics at the firm-product-market-year level. Panel B reports statistics at the firm-year level. *Delay Ratio* is defined as the fraction of unfulfilled VAT rebates over claimed rebates at the end of a year, measuring how quickly a firm receives its claimed rebates. Firm Size is measured as the logarithm of total assets. All continuous variables are winsorized at 0.1% and 99.9%.

Variable	N	Mean	Median	SD	P25	P75
Panel A: Firm-Product-Market-Year Level						
log(Export Value)	6,909,418	9.590	9.721	2.619	7.929	11.378
log(Export Volume)	6,909,418	7.037	7.326	3.512	4.605	9.649
AD_Prod_Mkt	6,909,418	0.014	0.000	0.119	0.000	0.000
AD_Prod_OthMkt	6,909,418	0.187	0.000	0.390	0.000	0.000
AD_OthProd_Mkt	6,909,418	0.186	0.000	0.389	0.000	0.000
AD_OthProd_OthMkt	6,909,418	0.758	1.000	0.429	1.000	1.000
Panel B: Firm-Year Level						
Firm Size	234,023	10.696	10.680	2.113	9.159	12.169
Delay Ratio	153,615	0.299	0.112	0.387	0.000	0.466
log(Total Export Value)	234,581	14.139	14.349	1.985	12.994	15.507
log(Total Export Volume)	234,581	12.094	12.525	2.828	10.579	14.172
log(Current Liabilities)	228,340	10.002	10.013	2.216	8.522	11.474
Number of Markets per Firm	234,581	8.505	5.000	9.815	2.000	11.000
Number of HS6 Products per Firm	234,581	12.742	5.000	28.361	3.000	12.000

Table 2: **City-Level Predictors of Loan Program Adoption**
This table examines whether observable city-level characteristics predict adoption of the VAT rebate loan program and its stated motives. The dependent variable is an indicator for a city adopting the loan program in a given year, categorized by the stated adoption motive: general policy adoption (column 1), long-term economic development (column 2), export slowdown (column 3), and credit constraint (column 4). Once a city adopts the policy, it exits the sample. t-statistics based on standard errors clustered at the province level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	*1(Policy)*	*1(Long-term Econ. Dev.)*	*1(Export Slowdown)*	*1(Credit Constraint)*
	(1)	(2)	(3)	(4)
Log(Exports)	0.000	−0.001	−0.001	0.002
	(0.000)	(−0.200)	(−1.000)	(1.000)
Log(GDP)	0.018	0.034	−0.009	−0.028
	(0.514)	(1.360)	(−1.125)	(−1.333)
Fiscal Expenditure/Revenue	−0.006	0.003	−0.002	−0.001
	(−0.667)	(0.429)	(−1.000)	(−0.333)
Log(Fiscal Revenue)	−0.017	0.010	−0.006	0.004
	(−0.340)	(0.222)	(−1.500)	(0.333)
Log(Fiscal Expenditure)	−0.046	−0.054	0.004	−0.014
	(−0.630)	(−0.771)	(1.000)	(−0.824)
Log(Real Estate Investment)	−0.004	−0.003	0.001	−0.002
	(−0.167)	(−0.143)	(0.250)	(−0.167)
Real Estate Investment/GDP	0.102	0.274	−0.020	−0.124
	(0.406)	(1.202)	(−0.455)	(−1.512)
Log(Outstanding Bank Loans)	0.029	−0.001	0.010	0.034*
	(1.115)	(−0.059)	(1.429)	(2.000)
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Observations	1,319	1,319	1,319	1,319
Adj. R^2	0.308	0.359	0.476	0.386

Table 3: **Anti-Dumping Effects on Exports**

This table reports the effects of antidumping (AD) investigations on Chinese exporters' intensive margin outcomes, following the decomposition in Bao et al. (2026). The unit of observation is firm × HS6 product × destination country × year × cohort. The dependent variable is log(export value) in columns (1)–(2) and log(export volume) in columns (3)–(4). The four AD variables, each lagged one year, capture whether the firm's product-country pair is subject to AD from different channels: *AD_Same Prod_Same Mkt* (same product, same market), *AD_Same Prod_Other Mkt* (same product, other markets), *AD_Other Prod_Same Mkt* (other products, same market), and *AD_Other Prod_Other Mkt* (other products, other markets). This stacked samples consist of treated firms located in cities that adopted the VAT rebate loan program and control firms in matched never-treated cities. All fixed effects are interacted with cohort indicators. Columns (2) and (4) add firm-level controls (log assets and leverage ratio). t-statistics based on standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	*log(Export Value)*		*log(Export Volume)*	
	(1)	(2)	(3)	(4)
AD_Prod_Mkt	−0.096***	−0.098***	0.006	0.005
	(−3.587)	(−3.643)	(0.212)	(0.150)
AD_Prod_OthMkt	−0.021**	−0.020**	−0.024**	−0.023*
	(−2.140)	(−2.045)	(−2.009)	(−1.949)
AD_OthProd_Mkt	0.016*	0.013	0.024***	0.022**
	(1.806)	(1.477)	(2.649)	(2.404)
AD_OthProd_OthMkt	0.054***	0.048***	0.041***	0.036***
	(7.145)	(6.468)	(4.659)	(4.081)
Firm × Product × Country FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Firm Controls		Yes		Yes
Observations	4,454,139	4,443,812	4,454,139	4,443,812
Adj. R^2	0.626	0.627	0.759	0.759

Table 4: **Anti-Dumping Effects and the VAT Rebate Loan Program**
This table examines how the VAT rebate loan program moderates the effects of anti-dumping (AD) investigations on firms' export decisions. The unit of observation is firm × product × destination country × year. The dependent variable is *log(export value)* in columns (1)–(2) and *log(export volume)* in columns (3)–(4). *PostPolicy* equals one after the loan program is adopted in the firm's city, and zero otherwise. Interaction terms capture the differential AD effect after loan program adoption. This stacked samples consist of treated firms located in cities that adopted the VAT rebate loan program and control firms in matched never-treated cities. All fixed effects are interacted with cohort indicators. Firm controls include *log(assets)* and *leverage ratio*. *t*-statistics based on standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	*log(Export Value)*			*log(Export Volume)*		
	(1)	(2)	(3)	(4)	(5)	(6)
PostPolicy	0.031**			−0.002		
	(2.191)			(−0.113)		
AD_Prod_Mkt	−0.101***	−0.095***	−0.095***	−0.009	−0.013	−0.013
	(−2.683)	(−2.588)	(−2.580)	(−0.213)	(−0.311)	(−0.311)
AD_Prod_OthMkt	−0.020	−0.018	−0.017	−0.055***	−0.049***	−0.048***
	(−1.628)	(−1.516)	(−1.378)	(−3.541)	(−3.345)	(−3.262)
AD_OthProd_Mkt	0.015	0.011	0.007	0.028**	0.022*	0.019
	(1.250)	(0.961)	(0.632)	(2.344)	(1.869)	(1.596)
AD_OthProd_OthMkt	0.064***	0.064***	0.058***	0.049***	0.054***	0.048***
	(6.888)	(7.300)	(6.638)	(4.419)	(5.193)	(4.586)
AD_Prod_Mkt × *PostPolicy*	0.008	0.001	−0.001	0.025	0.019	0.016
	(0.258)	(0.034)	(−0.019)	(0.708)	(0.530)	(0.460)
AD_Prod_OthMkt × *PostPolicy*	−0.003	−0.010	−0.011	0.066***	0.051***	0.051***
	(−0.220)	(−0.811)	(−0.864)	(3.858)	(3.062)	(3.015)
AD_OthProd_Mkt × *PostPolicy*	0.003	0.003	0.006	−0.009	−0.004	−0.002
	(0.251)	(0.261)	(0.482)	(−0.668)	(−0.338)	(−0.136)
AD_OthProd_OthMkt × *PostPolicy*	−0.031***	−0.040***	−0.036***	−0.020	−0.027**	−0.023*
	(−2.852)	(−3.564)	(−3.280)	(−1.555)	(−2.119)	(−1.820)
Firm × Product × Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes			Yes		
City × Year FE		Yes	Yes		Yes	Yes
Firm Controls			Yes			Yes
Observations	4,454,128	4,454,031	4,443,701	4,454,128	4,454,031	4,443,701
Adj. R^2	0.626	0.627	0.627	0.759	0.760	0.760

Table 5: **Anti-Dumping Effects and the VAT Rebate Loan Program by Rebate Delay Ratio**

This table replicates Table 4 restricting the sample to firms with high and low pre-treatment VAT rebate delay. *Delay Ratio* is the ratio of unfulfilled to claimed VAT rebates measured one year prior to loan program adoption in the firm's city. Firms are classified as *High Delay* (*Low Delay*) if their pre-treatment delay ratio is above (below) the within city × cohort median. The unit of observation is firm × product × destination country × year. *PostPolicy* equals one after the loan program is adopted in the firm's city, and zero otherwise. This stacked samples consist of treated firms located in cities that adopted the VAT rebate loan program and control firms in matched never-treated cities. All fixed effects are interacted with cohort indicators. t-statistics based on standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	*log(Export Value)*		*log(Export Volume)*	
Sample: Delay Ratio	High	Low	High	Low
	(1)	(2)	(3)	(4)
AD_Prod_Mkt	−0.051	−0.156***	0.016	−0.047
	(−1.215)	(−3.425)	(0.338)	(−0.822)
AD_Prod_OthMkt	−0.012	−0.010	−0.038**	−0.035*
	(−0.802)	(−0.681)	(−2.097)	(−1.806)
AD_OthProd_Mkt	0.011	0.014	0.020	0.026
	(0.604)	(0.802)	(1.089)	(1.394)
AD_OthProd_OthMkt	0.073***	0.057***	0.064***	0.039***
	(5.339)	(4.718)	(3.928)	(2.708)
AD_Prod_Mkt × *PostPolicy*	−0.018	0.056	−0.028	0.072
	(−0.390)	(1.276)	(−0.592)	(1.384)
AD_Prod_OthMkt × *PostPolicy*	−0.027	−0.011	0.021	0.049**
	(−1.579)	(−0.639)	(1.032)	(2.113)
AD_OthProd_Mkt × *PostPolicy*	−0.004	−0.005	−0.005	−0.014
	(−0.196)	(−0.269)	(−0.232)	(−0.675)
AD_OthProd_OthMkt × *PostPolicy*	−0.051***	−0.040**	−0.047**	−0.023
	(−2.775)	(−2.192)	(−2.333)	(−1.130)
Firm × HS6 × Country FE	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
City × Year FE	Yes	Yes	Yes	Yes
Observations	1,541,346	1,577,678	1,541,346	1,577,678
Adj. R^2	0.622	0.634	0.751	0.756

Table 6: **Loan Program and Firm Financing**
This table reports the effects of the VAT rebate loan program on firm short-term liability take-up. The unit of observation is firm × year. The dependent variable is *log(Current Liability)*. *PostPolicy* equals one after the loan program is adopted in the firm's city, and zero otherwise. *Delay Ratio* is the ratio of unfulfilled to claimed VAT rebates measured one year prior to loan program adoption in the firm's city. This stacked samples consist of treated firms located in cities that adopted the VAT rebate loan program and control firms in matched never-treated cities. All fixed effects are interacted with cohort indicators. *t*-statistics based on standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	*log(Current Liability)*	
	(1)	(2)
PostPolicy	0.205***	
	(22.102)	
Delay Ratio × *PostPolicy*	0.090***	0.079***
	(4.525)	(3.703)
Firm FE	Yes	Yes
City FE	Yes	
City × Year FE		Yes
Observations	150,768	150,333
Adj. R^2	0.895	0.902

Table 7: **Loan Program and Firm Exports**
This table reports the effects of the VAT rebate loan program on firm export performance. The unit of observation is firm × year. *log(Exports)* is the logarithm of firm total export value in USD. *PostPolicy* equals one after the loan program is adopted in the firm's city, and zero otherwise. *Delay Ratio* is the ratio of unfulfilled to claimed VAT rebates measured one year prior to loan program adoption in the firm's city. This stacked samples consist of treated firms located in cities that adopted the VAT rebate loan program and control firms in matched never-treated cities. All fixed effects are interacted with cohort indicators. *t*-statistics based on standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var.:	*log(Exports)*	
	(1)	(2)
PostPolicy	0.088***	
	(5.677)	
Delay Ratio × *PostPolicy*	−0.043	0.039
	(−1.367)	(1.189)
Firm FE	Yes	Yes
City FE	Yes	
City × Year FE		Yes
Observations	154,785	154,359
Adj. R^2	0.641	0.659

Appendix A. Variable Definitions

- *log(Export Value)*: Logarithm of export value (in USD) at the firm-HS6 product-destination country-year level.
- *log(Export Volume)*: Logarithm of export volume (in quantity units) at the firm-HS6 product-destination country-year level.
- *log(Exports)*: Logarithm of firm-level total export value (in USD) aggregated across all products and destinations in a given year. Also reported as *log(Total Export Value)* in the summary statistics.
- *log(Total Export Volume)*: Logarithm of firm-level total export volume aggregated across all products and destinations in a given year.
- *log(Current Liabilities)*: Logarithm of firm-level current liabilities (debt due within one year).
- *AD_Prod_Mkt*: Indicator equal to one if firm f's product i faces an anti-dumping (AD) investigation from destination country c in period $t-1$. Its coefficient captures the direct effect of an AD action on the targeted product in the market undertaking the action. Source: World Bank Global Antidumping Database, following Bao et al. (2025).
- *AD_Prod_OthMkt*: Indicator equal to one if firm f's product i faces an AD investigation from any country other than c in period $t-1$. Its coefficient captures the third-country effect—whether an AD action in one market affects sales of the same product in other markets.
- *AD_OthProd_Mkt*: Indicator equal to one if firm f has any product other than i that faces an AD investigation from country c in period $t-1$. Its coefficient captures the cross-product effect within the same destination market—whether an AD action against one of a firm's products affects its exports of other products to that same market.
- *AD_OthProd_OthMkt*: Indicator equal to one if firm f has any product other than i that faces an AD investigation from any country other than c in period $t-1$. Its coefficient captures the cross-product, cross-country effect—whether an AD action against the firm on another product in another market affects its sales of product i in country c.
- *PostPolicy*: Indicator equal to one after the VAT rebate loan program is adopted in the firm's city, and zero before adoption or for cities that never adopt the program.
- *Delay Ratio*: Ratio of unfulfilled VAT rebates to claimed VAT rebates at the end of a year, measuring how quickly a firm receives its claimed rebates.
- *High Delay* (*Low Delay*): Binary indicator equal to one if the firm's pre-treatment *Delay Ratio* is above (below) the within city median. Used to split the sample in Table 5.
- *Firm Size*: Logarithm of total assets.
- *Leverage*: Ratio of total liabilities to total assets.
- *Number of Markets per Firm*: Number of distinct destination countries to which a firm exports in a given year.

- *Number of HS6 Products per Firm*: Number of distinct HS6 product codes a firm exports in a given year.
- *Log(Exports)*: Logarithm of city-level total export value, capturing the scale of local export activity.
- *Log(GDP)*: Logarithm of city-level gross domestic product.
- *Fiscal Expenditure/Revenue*: Ratio of local government budgetary expenditure to budgetary revenue, capturing fiscal pressure faced by the local government.
- *Log(Fiscal Revenue)*: Logarithm of local government budgetary revenue, reflecting fiscal capacity.
- *Log(Fiscal Expenditure)*: Logarithm of local government budgetary expenditure, reflecting the scale of public spending. Source: City Statistical Yearbooks.
- *Log(Real Estate Investment)*: Logarithm of city-level real estate development investment.
- *Real Estate Investment/GDP*: Ratio of real estate development investment to GDP, indicating for the extent to which local growth and credit allocation are oriented toward the real estate sector.
- *Log(Outstanding Bank Loans)*: Logarithm of the year-end outstanding balance of loans issued by financial institutions within the city, indicating for local credit supply.
- $\mathbf{1}$*(Policy)*: Indicator equal to one if a city adopts the VAT rebate loan program in a given year, for any stated motive.
- $\mathbf{1}$*(Long-term Econ. Dev.)*: Indicator equal to one if a city adopts the program citing long-term economic development as the stated motive.
- $\mathbf{1}$*(Export Slowdown)*: Indicator equal to one if a city adopts the program citing export slowdown as the stated motive.
- $\mathbf{1}$*(Credit Constraint)*: Indicator equal to one if a city adopts the program citing credit constraints as the stated motive.

Appendix B. Figures and Tables

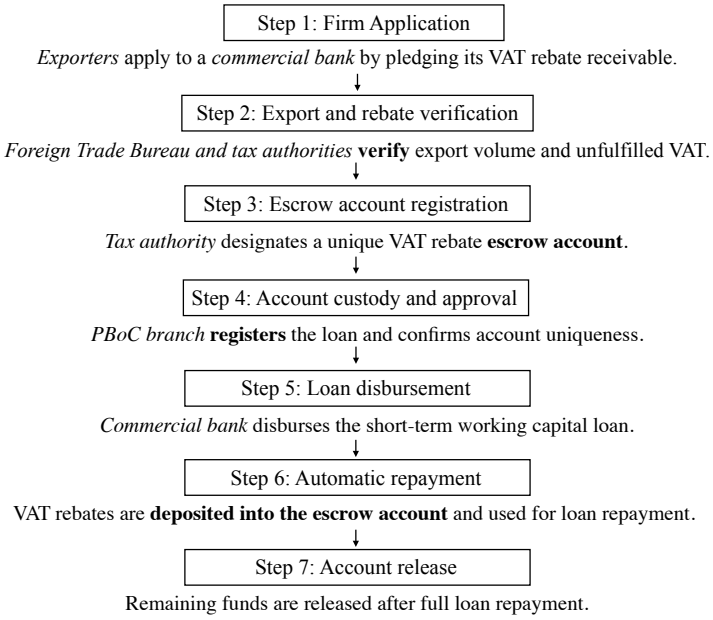


Figure A1: **VAT Rebate Receivable Loan Application and Disbursement Process.** This figure illustrates the seven-step process for exporters to obtain rebate-backed loans, from initial application to final account release. The process involves coordination among exporters, commercial banks, tax authorities, and the local branch of the People's Bank of China (PBoC). The key mechanism is an escrow account where VAT rebates are automatically applied to loan repayment.

退税质押缓解乌鲁木齐外贸企业资金紧缺压力

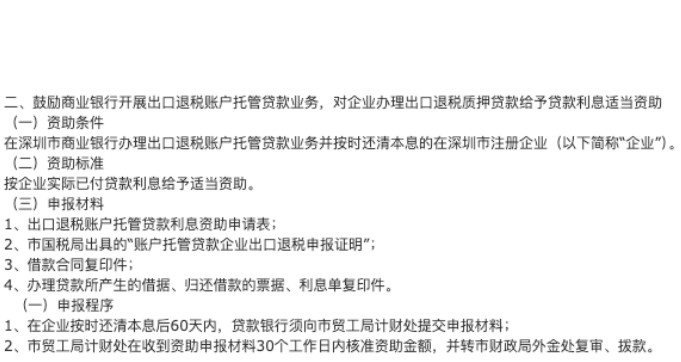
商务微新闻
中华人民共和国商务部新闻办 2011.07.11 16:40

由于央行连调存款准备金率，在资金面紧张的局面下，乌鲁木齐市进出口企业纷纷把目光转向了出口退税质押贷款。目前，乌鲁木齐市国税局已和乌鲁木齐市多家银行联合推出了出口退税质押贷款业务，银行由最初的1家扩至6家，包括建设银行、华夏银行、招商银行等。实行出口退税账户质押贷款后，企业申请质押贷款占其应得退税款的最高比例为90%，有效缓解了外贸企业流动资金紧缺的压力；出口退税账户质押贷款利率在同期商业银行基准贷款利率的基础上适当下浮，降低了企业的融资成本。

Export VAT Rebate Loans Alleviate Liquidity Constraints for Exporters in Urumqi (2011)

Following successive increases in the required reserve ratio by the People's Bank of China, liquidity conditions tightened. This prompted import and export firms in Urumqi to rely on VAT rebate loans for financing. In cooperation with several commercial banks, expanding from one to six, the local tax authority implemented a program allowing firms to borrow up to 90% of their VAT rebate receivables as collateral. This program eased working capital constraints for exporters, with loan rates set below the benchmark lending rate, thereby lowering financing costs.

Panel A: Policy Document from Shenzhen (2009)



二、鼓励商业银行开展出口退税账户托管贷款业务，对企业办理出口退税质押贷款给予贷款利息适当资助
（一）资助条件
在深圳市商业银行办理出口退税账户托管贷款业务并按时还清本息的在深圳市注册企业（以下简称"企业"）。
（二）资助标准
按企业实际已付贷款利息给予适当资助。
（三）申报材料
1、出口退税账户托管贷款利息资助申请表；
2、市国税局出具的"账户托管贷款企业出口退税申报证明"；
3、借款合同复印件；
4、办理贷款所产生的借据、归还借款的票据、利息单复印件。
（一）申报程序
1、在企业按时还清本息后60天内，贷款银行须向市贸工局计财处提交申报材料；
2、市贸工局计财处在收到资助申报材料30个工作日内核准资助金额，并转市财政局外金处复审、拨款。

II. Encourage Commercial Banks to Provide Export VAT Rebate Loans and Grant Interest Subsidies

(I) Eligibility

Firms registered in Shenzhen that have VAT rebate loans and repay both principal and interest on time from Shenzhen Commercial Bank.

(II) Subsidy Standard

Subsidies are based on the actual interest paid on the loan.

(III) Application Materials

1. Application form for the interest subsidy;
2. Export VAT Rebate Certificate issued by the Tax Bureau;
3. Copy of the loan contract;
4. Copies of loan receipts, repayment vouchers, and interest statements.

(IV) Application Procedures

1. Within 60 days of full repayment, the lending bank shall submit the application materials to the Bureau of Trade and Industry;
2. Within 30 working days of receipt, the Bureau determines the subsidy amount and forwards it to the Finance Bureau for review and disbursement.

Panel B: Media Coverage from Urumqi (2011)

Figure A2: **Examples of VAT Rebate Loan Program Announcements.** This figure presents two examples of local government announcements promoting VAT rebate loan programs. Panel A shows a policy document from Shenzhen outlining program requirements and procedures. Panel B shows media coverage of export VAT rebate loans in Urumqi in 2011.

Table A1: **Loan Program Adoption by City**

This table reports the timing and characteristics of VAT rebate loan program adoption across Chinese cities. We use a narrative approach following Romer and Romer (2010) to classify policies into three categories: *Long Term* (long-term development), *Export Slowdown* (response to export decline or external shocks), and *Credit Constraint* (alleviating exporter financing constraints).

City	Year	*Long-Term*	*Export Slowdown*	*Credit Constraint*
Qingdao, Shandong	2008	✓	✓	
Cities in Shandong other than Qingdao	2013		✓	
Dongguan, Guangdong	2009		✓	✓
Shenzhen, Guangdong	2009		✓	
Cities in Guangdong other than Dongguan and Shenzhen	2009			✓
Jiaxing, Zhejiang	2007			✓
Wenzhou, Zhejiang	2004	✓		✓
Cities in Zhejiang other than Jiaxing and Wenzhou	2008	✓		
Suizhou, Hubei	2000	✓		
Cities in Hubei other than Suizhou	2012	✓		
Urumqi, Xinjiang	2011			✓
Luohe, Henan	2011	✓		✓
Zhengzhou, Henan	2009	✓		✓
Baiyin, Gansu	2008	✓		
Lanzhou, Gansu	2009		✓	✓
Tianjin	2008	✓		
Shanghai	2010	✓		
Cities in Fujian	2008	✓		
Cities in Jiangsu	2008	✓	✓	✓
Cities in Guangxi	2010	✓		
Cities in Heilongjiang	2011	✓		
Cities in Sichuan	2012			
Cities in Hebei	2012	✓		
Cities in Anhui	2014	✓		
Cities in Yunnan	2014			✓

Appendix C. Matching Procedure

Appendix C.1. City-Level Matching

For each cohort year t, we estimate a logit model predicting loan program adoption:

$$\Pr(\text{Adopt}_t = 1) = \Lambda\left(\beta_0 + \beta_1 \log(\text{GDP})_{t-1} + \beta_2 \log(\text{GDP})_{t-2} + \beta_3 \text{Fiscal Stress}_{t-1}\right), \tag{A3}$$

where $\Lambda(\cdot)$ is the logistic function and Fiscal Stress is the ratio of fiscal expenditure to fiscal revenue. Each treated city is matched to up to three never-treated cities using nearest-neighbor matching with replacement, imposing a caliper of 0.05 on the propensity score.

Appendix C.2. Firm-Level Matching

Within matched city pairs, we match firms in two stages. First, we require product-market overlap: a control firm must share at least one HS6 product $\times$ destination country pair with a treated firm in the pre-treatment period. This ensures that treated and control firms face comparable AD tariff exposure. Second, among eligible control firms, we estimate a propensity score on firm size (log assets) and log total exports, and match each treated firm to up to three controls using nearest-neighbor matching with replacement and a caliper of 0.05.

Appendix C.3. Stacked Panel Construction

For each cohort t, all matched treated and control firms are retained across the full sample period (2007–2015). Each observation is tagged with the cohort year and relative event time $k = \text{year} - t$. Because matching is performed with replacement, the same control firm may appear in multiple cohort-specific panels. We cluster standard errors at the firm level throughout.

Appendix C.4. Covariate Balance

Table A2 reports the standardized mean differences (SMD) for all matching variables before and after matching. At the city level, the SMD on fiscal stress falls from -0.447 to -0.005 and on log GDP from 0.124 to 0.047. At the firm level, the SMD on log exports falls from 0.246 to 0.024 and on firm size from 0.217 to 0.124. All covariates fall within or near the conventional $|\text{SMD}| < 0.1$ threshold after matching. Figure A3 presents these results graphically.

Table A2: **Covariate Balance Before and After Matching**

Level	Variable	SMD Before	SMD After
	City-Level Covariates		
City	Fiscal Stress	-0.447	-0.005
City	Log(GDP)	0.124	0.047
	Firm-Level Covariates		
Firm	Firm Size	0.217	0.124
Firm	Log(Exports)	0.246	0.024

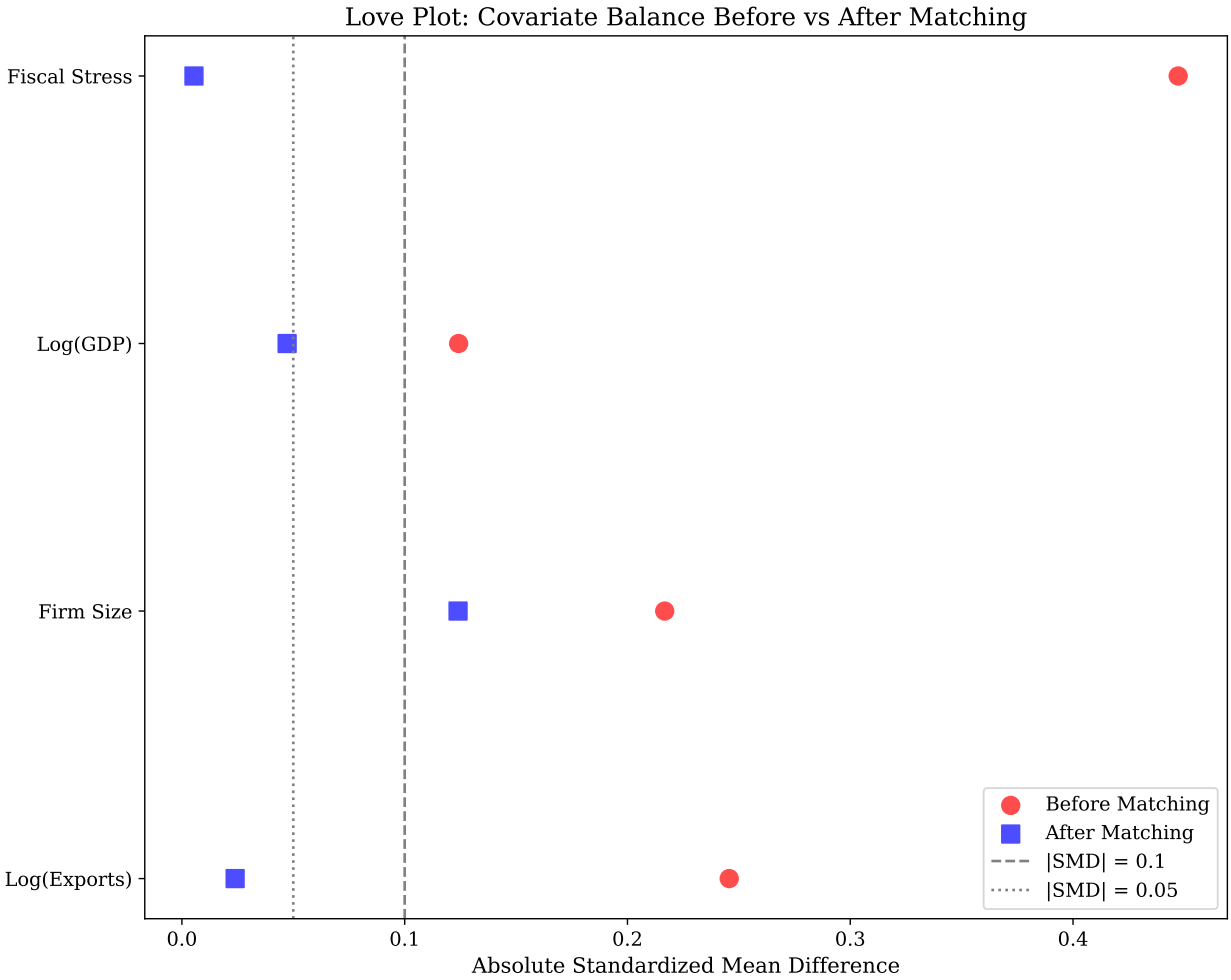


Figure A3: **Covariate Balance Before and After Matching.** This figure plots the absolute standardized mean differences (SMD) for city-level covariates (fiscal stress, log GDP) and firm-level covariates (firm size, log exports) before and after the two-level propensity score matching described in Section 4.3. For each cohort, treated cities are matched to up to three never-treated cities on pre-treatment economic characteristics, and firms within matched cities are further matched on product-market overlap and size. The vertical dashed and dotted lines indicate $|\text{SMD}| = 0.10$ and $|\text{SMD}| = 0.05$, respectively. After matching, all covariates fall close to or within the $|\text{SMD}| < 0.10$ threshold, indicating that the matched sample is well balanced.