Trade Shocks Through Banking Lending Channel*

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Abstract

In this paper, we trace a fully-specified bank lending channel by using a trade shock, the law of the US granting China Permanent Normal Trade Relation Status (PNTR shock) in 2001. Specifically, PNTR shock causes banks to terminate their lending relationships and tighten loan contracts with firms in the trade sector. Next, PNTR shock negatively impacts the bank's performance via lending relationships. Finally, Banks pass this shock to non-trade sector firms in their loan portfolio. Therefore, our empirical results highlight a bank's special role as an inter-industry shock transmitter and have important policy implications.

JEL Code: G30, F14, E50.

Key words: PNTR shock; Banking lending channel; Within-bank estimator; Macro finance.

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1. Introduction

Banks can transmit financial shocks and cause spillover effects through lending relationships, a traditional banking lending channel[1]. However, previous papers focus on how bank-driven shocks are passthrough to real sectors[2], little is known about how real sector-driven shocks are transmitted to banks, and consequently how banks respond to those shocks and pass them back to the real sector. To answer those questions, we can construct a fully-specified banking lending channel. A fully-specified banking lending channel shows a clear pathway of shock transmission in the economic system and furthers our understanding of the bank's role in the interplay between financial intermediation and the real sector.

Prior papers stay muted about a fully-specified banking lending channel because a general macro shock impacts all real sectors simultaneously and makes it hard to isolate two types of sectors: affected and non-affected sectors. To identify a fully-specified banking lending channel, we need an ideal natural experiment satisfying two conditions: (1) it affects partial real sectors but does not directly impact the rest of the real sectors. (2) cannot shift banks' fund supply. With two conditions met, we could delineate a clear and specific route of the shock transmission: from affected real sectors, through banks, to non-affected real sectors, and emphasize a bank's special role as an inter-sector shock transmitter.

In this paper, we trace a fully-specified banking lending channel by using a trade shock, the law of the US granting China the Permanent Normal Trade Relation Status (PNTR shock) in 2001. In the PNTR setting, a fully-specified banking lending channel goes that when PNTR shock hits the trade sector firms directly, banks respond to this shock by adjusting lending relationships with trade sector firms; Banks are affected negatively via the lending relationships and buffer this shock by switching fund allocation from trade sectors to non-trade sectors. PNTR shock offers an ideal natural experiment that enables us to decompose our research purpose into three steps empirical tests: (1) the direct impacts of PNTR shock on lending outcomes between banks and firms in the trade sector; (2) the impacts of PNTR shock on banks via lending relationships; (3) the pass-through impacts of PNTR shock on non-trade sector firms.

Using the setting of the PNTR shock in 2001, we exploit differential variation in trade sector firms' exposure to this PNTR shock in the United States. Specifically, we assume that in the trade sector, a firm exposed to a higher sector Normal Trade Relation tariff (NTR tariff) in 1999 suffers more from the PNTR shock. We highlight three main results: first, PNTR shock causes banks to terminate the lending relationship and write stricter loan contract terms with firms in the United State's trade sector, driven by trade sector firms' bad operating performance; Second, PNTR shock affects the bank's operating performances via the

[1] Theoretical models show that financial system can amplify the shock in the macro economy(Bernanke & Gertler 1989; Kiyotaki & Moore 1997).

[2] Prior literatures on banking lending channel employ bank-driven shocks, which impact a bank's balance sheet, including the bank's liquidity (Khwaja & Mian 2008), the bank's trading activity (Chodorow-Reich 2014), the bank's deposits (Drechsler *et al.* 2017), and the bank's capital (Peek & Rosengren 1997, 2000).

lending channel because PNTR shock drives the rise of the bank's non-performing loan. Banks hedge this lending risk by holding more securities on the asset side in response to this shock; Third, Banks pass this shock to non-trade sector firms in the loan portfolio.

The law of the US granting China Permanent Trade Relation Status in 2001 meets two conditions of our setting. First, this event is an external event from a foreign market and affects the US firms' product market in the trade sector. Due to the Reform and Open policy from 1980, China has improved production capacity and exported more goods to the United States[3]. After the PNTR event, a sharp rise in China's imports to the United States leads to competition with the US's producers and the unemployment of manufactural firms in the United States (Autor *et al.* 2013; Pierce & Schott 2016). Hence, this event directly shocks the trade sector firms but does not directly impact the non-trade sector firms in the United States[4]. Therefore, this event divides the US real sectors into two parts: trade sectors of the affected group and non-trade sectors of the non-affected group[5]. Second, this event does not shift the bank's fund supply. Drechsler *et al.* (2017) find that the deposit is the most important fund supply for banks and transmits monetary policy in the United States. We empirically check this condition, and no evidence shows that PNTR shock directly impacts bank deposits[6].

Two main identification challenges threaten our setting, though we have an exogenous natural experiment meeting two conditions. First, omitted factors might simultaneously shift the firm's fund demand curve and bank's fund supply curve when we examine the impact of PNTR shock on the lending outcomes between banks and firms in the trade sector. Second, Banks' unobservable risk management capacity might confound our estimates when we test the impact of PNTR shock on the banks. Hit by PNTR shock, good risk-managed banks might anticipate and control lending risk to some degree.

Our empirical strategy employs the following approach to mitigate two identification issues. To solve the issue of the shift of bank fund supply curve, in the spirit of Khwaja and Mian (2008), we exploit bank-firm pairs per observation to control bank fixed effects: the within-bank estimator. Using the within-bank estimator, we compare differential outcomes of trade sector firms borrowed from the same bank and leverage variation in trade sector firms' differential exposure to the PNTR shock. Multiple trade sector firms borrow from the same bank and keeping banking fund supply constant rules out unobservable shocks from banks. To mitigate the identification issue of banks' unobservable risk management capacity, we

[3] The rise of China imports to the US comes from the internal policy reform and the improvement of production capacity in China because China imports to other economies such as European Union and Japan also rise a lot.
[4] In other words, trade sector firms are exposed to the first-round shock, and non-trade sector firms are exposed to the second-round shock through the banking lending channel. Our within-firm estimator of non-trade firms can provide an unbiased estimate of the banking lending channel.
[5] In this paper, we define the trade sector as industries importing goods from China in 1999, and define the non-trade sector as industries not importing goods from China in 1999.
[6] Section 2 discusses the background of the PNTR shock in detail and provides visual evidence to support this identification assumption.

exploit granular instrument variables inspired by Gabaix and Koijen (2020) and Galaasen *et al.* (2020). We leverage many granular loans in banks' loan portfolios to construct the granular instrument variable. Our visual evidence shows that the granular instrument variable works well by strongly predicting the potential endogenous variable: bank's exposure to PNTR shock.

We begin our analysis to examine the impact of the PNTR shock on lending outcomes between banks and firms in the trade sector. PNTR shock directly affects firms in the trade sector negatively, and banks would respond to this shock when lending loans to firms in the trade sector. We show that when NTR tariff in 1999 falls by 1 percent, banks could reduce the probability by 1.3 percent to renew the lending relationship with firms in the trade sectors. In terms of loan contract terms, when NTR tariff in 1999 falls by 1 percent, banks would reduce loan growth by 4.4 percent and raise loan spread by 3 basis points to firms in the trade sector from 1999 and 2003. PNTR shock causes banks to terminate the pre-shock lending relationship and write more strict loan contract terms with affected firms in the trade sector.

What is the channel through which PNTR shock affects the firm's banking financing in the trade sector? Lian and Ma (2020) document that 80 percent of non-financial firms in the United States borrow the debt against cash flow, and the firm's cash flow generating capacity determines its' borrowing capacity[7]. We hypothesize a channel of borrowing against cash flow. PNTR shock hits firms in the trade sector and makes them lose an advantage in the product market, leading to a decline in their cash flows. Thus, banks reduce loan financing to firms in the trade sector due to firms' worse operating performance. Our results show that when NTR tariff in 1999 falls by 1 percent, trade sector firms experience a decline in their ROA by 0.2 percent and sales growth by 1 percent from 1999 to 2003. Our results support the channel of borrowing against the cash flow.

What are long-term effects of the PNTR shock on the firm's innovation and employment? Previous papers find that innovation can save manufacturing firms in the United States from the competition with China producers (Hombert & Matray 2018), and trade shock could negatively impact the firm's employment (Autor *et al.* 2013). However, a firm's financing constraint, an unobserved factor, biases the effects of trade shock on employment and innovation. Our within-bank estimator could control the firm's financing constraint to some degree because we compare differential outcomes of firms borrowing from the same bank. We show that when NTR tariff in 1999 decreases by 1 percent, trade sector firms experience an increase in their R&D by 7.5 percent from 1999 to 2003 and 13.3 percent from 1999 to 2005. When NTR tariff in 1999 falls by 1 percent, trade sector firms experience a fall in their employment by 0.9 percent from 1999 to 2003 and by 1.4 percent from 1999 to 2005. The PNTR shock causes firms in the trade sector

[7] In their calculation for non-financial firms in the US, 80% of debt financing are cash flow-based lending, including 57% corporate bonds and 23% cash flow-based loans, while 20% of debt financing are asset-based lending. Including 7% mortgages and 13% asset-based loans.

to invest more R&D expenditures in innovation to compete with China producers, and the PNTR shock leads trade sector firms to lay off their workers. The effect of PNTR shock on the firm's R&D and employment is persistent after the post-shock period.

We continue our analysis to examine the impact of the PNTR shock on banks that have lending relationships with firms in the trade sector. PNTR shock causes firms in the trade sector to have worse operating performance and face higher default risk. In their loan portfolios, banks could suffer loan loss from trade sector firms, driven by the PNTR shock. We exploit the bank's loan holding in the pre-shock period to construct the bank's exposure to the PNTR shock and use granular loans in the bank's loan portfolio to construct an instrumental variable for the bank's exposure to PNTR shock. Our empirical results show that when NTR tariff in bank in 1999 falls by 1 percent, banks experience a decline in their ROA by 0.22 percent from 1999 to 2003. During the pre-shock period, if banks hold more loans from firms affected by PNTR shock, banks would be affected more by PNTR shock via lending relationships[8]. Surprisingly, our measure of NTR tariff in bank in 1999 is not related to the bank's risk.

To explain the surprising finding that PNTR shock impacts the bank's performance but does not impact the bank's risk via the lending relationship, we obtain bank information from Federal Reserve's FR Y-9C report to conduct further tests. We document that when NTR tariff in bank in 1999 falls by 1 percent, banks experience a rise in their non-performing loan ratio by 0.05 percent from 1999 to 2003 and a fall in their security ratio by 1.8 percent. In sum, the PNTR shock drives the bank's non-performing loan to worsen the bank's operating performance. In response to PNTR shock, banks hedge credit risk by holding more security assets.

We continue our analysis to examine the effect of the PNTR shock on firms in the non-trade sector. To see the impact of the PNTR shock on lending outcomes between banks and firms in the non-trade sector, we use bank non-trade-firm pairs to construct the within-firm estimator proposed by Khwaja and Mian (2008). The within-firm estimator can remove potential confounding factors from non-trade firms. When banks suffer from the PNTR shock in the trade sector, they buffer shocks by switching to the non-trade sector. Specifically, banks rely more on pre-shock lending relationships with non-trade sector firms to allocate loans. Banks bear a high information asymmetry cost to search and establish new lending relationships with non-trade sector firms during a short time. Our results show that when granular firm shock from 1999 to 2000 falls by 1 percent, banks raise the probability by 5.9 percent to keep the old lending relationship with firms in the non-trade sector and by 6.7 percent to renew the old lending relationship with

[8] In addition, our test shows that our measure of NTR tariff in bank in 1999 does not contain information from bank default risk because the bank's Merton distance to default does not predict our measure during the pre-shock period. We follow Bharath and Shumway (2008) method to calculate the Merton distance to default for banks. They first use the simulation methods to estimate the market value of asset and the market value of liability based on Black-Scholes option pricing equation. Then they define the probability of asset market value greater than the liability market value, and this probability is the Merton distance to default.

firms in the local industry. In the spirit of Mian and Sufi (2014), we define industries serving local demand(for example, hotel, restaurant, and gas station) as the local industry. The PNTR shock affects the local industry less. Thus, the effect on the local industry is larger than that on the non-trade industry. Darmouni (2020) documents banks would rely more on the old lending relationship induced by information friction when banks were hit by the shock.

What are pass-through impacts of the PNTR shock on firm-level outcomes in the non-trade sector? We answer this question by shifting our tests from bank-firm-pair-level to firm-level in the non-trade sector. In particular, we aggregate the bank's granular firm shock by using the loan portfolio weighted average to construct a non-trade sector firm level variable: granular bank shock. Our results show that when granular bank shock falls by 1 percent, non-trade sector firms experience a fall in their ROA by 6.7 percent and sales growth by 47.7 percent from 1999 to 2003. When firms in the non-trade sector have relationships with banks less affected by the PNTR shock, firms can get more bank financing to promote their operating performance. Therefore, banks pass the PNTR shock, a trade-sector driven shock, to firms in the non-trade sector through lending relationships. In sum, banks play a role as inter-industry shock transmitters.

We extend our analysis to confirm that PNTR shock impacts firms in our sample. In our DID setting analysis, an individual firm's exposure to PNTR shock is NTR tariff in 1999, and this measure is at the firm's four-digit SIC industry level. A potential concern is that the industry-level measure might lead to misspecified firms not being affected by PNTR shock in the trade sector. To address this concern, we follow Greenland *et al.* (2020) to conduct an event study to measure the cumulative abnormal return of trade sector firms in our sample to five big events of PNTR shock. Our results show that the stock market reacts negatively to five big events for firms in the trade sector. For example, When President Clinton signed the law, the cumulative abnormal return of trade sector firms is -1.93 percent in two trading days. Thus, this result addresses the measurement error concern[9].

As a final exercise, we calculate the aggregate loan loss due to the PNTR shock. We obtain a micro estimate of the PNTR shock on the loan amount in our sample and use this micro estimate to do a back-of-the-envelope calculation. In terms of this counterfactual analysis, we have two assumptions: (1) our aggregate implication calculation is the partial equilibrium, and (2) PNTR shock is equivalent to the decrease in the normal trade relation tariff for every industry. Based on two assumptions, when PNTR shock is equivalent to a 0.5 percent decrease in tariff for every industry in 1999, the share of loan loss is 38.44 percent due to the PNTR shock. For the calculation of magnitudes, we get the trade sector loan ratio with 0.29 from our Dealscan sample and the change in total commercial and industrial loans between 1999 and

[9] We also do the event studies for banks and non-trade sector firms in our sample. The stock market reaction to five events for banks are mixed and the stock market reaction to five events for non-trade sector firms are smaller. For results of banks in details, please see Table A 5 and Figure A 4 in the online appendix. For results of non-trade sector firms, please see Table A 6 and Figure A 5 in the online appendix.

2003 with -58.79 billion dollars. With these parameters, we infer that the loan loss due to PNTR shock in the US macroeconomy is 6.46 billion dollars.

This paper is related to the literature on the banking lending channel. Khwaja and Mian (2008) document that a bank's liquidity-driven shock squeezes the loan supply and affects borrowing firms' operating performances. Chodorow-Reich (2014) finds that bank health shock impacts the borrowing firm's employment using the 2008 financial crisis as a laboratory. Building on the work of Chodorow-Reich (2014), recent related papers find that the bank's health shock can affect the firm's product price (Kim 2020)[10], can be transmitted via the firm's supply chain (Costello 2020)[11], and can affect small business employment (Greenstone *et al.* 2020)[12]. In addition, A bank can pass a shock to borrowing firms via the loan covenant channel (Chodorow-Reich & Falato 2017). Our paper contributes to the literature on the banking lending channel by extending the length of the shock transmission route and constructing a fully-specified banking lending channel. We present a clear pathway of the trade shock transmission from trade sectors, through banks, to the non-trade sector and highlight a banks' special role as the inter-industry shock transmitter.

This paper is also related to the literature on trade shocks from China. Autor *et al.* (2013) document that trade shock from China impacts the manufacturing firm's employment in the US. Pierce and Schott (2016) find similar empirical patterns by using the law granting China Permanent Normal Trade Relationship Status as a natural experiment. Acemoglu *et al.* (2015) estimate the effect of trade shock from China on employment in the US manufacturing firms using an input-output network framework. Innovation can improve the competitive capacity of US manufacturing firms corresponding to the trade shock from China (Hombert & Matray 2018). Federico *et al.* (2020) also trace the impacts of trade shocks from China on Italy economy, while our work focuses on the US economy. Both works are complementary because two works show that trade shocks from China are global and affect the real economy via the banking lending channel in different economies. Our paper contributes to trade finance literature by quantifying the effects of trade shock from China on the US banks and their pass-through effects on the US non-trade sector.

This paper informs the literature of the granular instrument variable approach. Gabaix and Koijen (2020) first introduce a novel approach to construct the granular instrumental variable. Galaasen *et al.* (2020) document the granular credit risk by constructing the granular instrument variable. Inspired by two novel papers, our work also applies the granular instrument variable approach in the banking lending channel. Our work is similar to Galaasen *et al.* (2020) because both works document the shock transmission via the

[10] Kim (2020) finds that the firms affected more by bank health risk raise higher output price than their counterparts affected less by bank health risk.
[11] Costello (2020) finds that the suppliers impacted more by their bank credit shock would reduce the volume of trade credit more compared with suppliers impacted less by their bank credit.
[12] Greenstone *et al.* (2020) connect bank's small business lending to small business employment.

lending channel. However, our work is different from Galaasen *et al.* (2020) for two aspects. First, in terms of shock origin, our work leverages PNTR shock, a natural experiment, and it directly affects firms in the trade sector. Galaasen *et al.* (2020) extract the shock from the firm's return function using statistical methods. Hence, they can not clearly split firms into affected and non-affected firms. Second, our work focuses on the US loan market, and their work concentrates on the Norway loan market.

This paper is related to the growing literature on empirical macro finance. This literature empirically documents the interplay between finance and the real economy in the macroeconomy via two channels: the banking lending channel (Khwaja & Mian 2008; Chodorow-Reich 2014) and the household demand level (Mian & Sufi 2011, 2014; Verner & Gyöngyösi 2020). Our work contributes to this strand of literature by using the micro econometrics evidence to infer aggregate effects of the US commercial loan loss due to trade shocks

The remainder of the paper is structured as follows: Section 2 discusses the background of PNTR shock. Section 3 describes the data. Section 4 discusses our research design and identification strategy. Section 5 presents our empirical results. Section 6 presents robustness tests of our results. Section 7 assesses the aggregate implication. And Section 8 concludes the paper.

2. PNTR Shock

The United States imposes two tariffs on goods imported from foreign countries. Non-normal trade relation tariff is imposed on goods imported from non-market economy countries and is called the "Column 2" tariff[13]. Normal trade relation tariff is imposed on goods imported from market-oriented economy countries, also members of the World Trade Organization, and is called "Column 1" tariff for the most flavored counties. Generally, a normal trade relation tariff has a lower rate than a non-normal trade relation tariff. In 1974, the US Trade Act allowed the US president to grant the non-market economy countries the normal trade relation tariff, and this grant is needed to be voted to get approval by the US Congress.

Since 1980, the United States has granted China the normal trade relation status, and this grant has been renewed year by year, approved by the vote of congress. The renewal of the grant creates policy uncertainty. The passage of a law granting China Permanent Normal Trade Relation Status is also an uncertain process. On May 15, 2000, the US House introduced the bill proposed to grant China the Permanent Normal Trade Relation Status. On May 24, 2000, the US House voted to approve this Bill[14]. On July 27, 2000, the US Senate voted to cloture a motion of this Bill. On September 19, 2000, the US Senate voted to approve this Bill[15]. On October 10, 2000, President Clinton signed the law granting China the Permanent Normal Trade

[13] In 1999, two countries, including Afghanistan and North Korea, are imposed the column 2 tariff when exporting goods to the United States. The non-normal trade relation tariff was originally set under the Smoot-Hawley Tariff act in 1930.
[14] In the vote of US House, 237 representatives in the house vote in favor of this law while 197 representatives vote against this law and 1 representative does not vote.
[15] In the vote of US Senate, 83 senators vote in favor of this law, while 15 senators vote against this law and 2 senators do not vote.

Relation Status (PNTR). The law became effective in December 2001[16] and was implemented in January 2002 when China entered WTO. Therefore, the event of PNTR is unexpected to some degree ex-ante.

The passage of the PNTR removed the policy uncertainty faced by China exporters. After Permanent Normal Trade Relation Status in 2001, China exported more goods to the United States[17]. The US's trade sector firms face product market competition from China. Figure 1 shows the time series of US imports from China between 1995 to 2007. Before 2001, US imports from China rose steadily. After 2001, US imports from China rose sharply[18]. The Permanent Normal Trade Relation Status opens the US market for China, and products from China substitute the US firms' products. In the product market, firms in the US were affected by this PNTR shock and the PNTR shock made firms in the US lose a dominant advantage in the product market.

***Insert Figure 1: PNTR and Imports from China. ***

The PNTR shock is an ideal natural experiment in our setting, and we can use this natural experiment to trace a fully-specified bank lending channel. We define the year from 1999 to 2000 as the pre-shock period and define the year from 2002 to 2003 as the post-shock period. The PNTR shock originates from international trade and causes shocks to trade-sector firms in the US product market. In our setting, the PNTR shock is an exogenous event that cuts the US real sectors into two parts: trade sectors of the affected group and non-trade sectors of the non-affected group. Simultaneously, PNTR shock does not shift the US's bank fund supply curve. Figure 2 shows PNTR shock against bank total deposit in our sample. In the Figure 2, the upper panel shows the time series of total deposits summarized by all banks in our sample, and total deposits increased steadily from 1999 to 2003. So the banking system in the US shields from the liquidity shock and fund supply shortage when the PNTR shock happens. In the Figure 2, the bottom panel shows the average yearly bank deposits for two types of banks: highly affected banks or lowly affected banks from 1999 and 2003. Highly affected banks by PNTR shock have almost the same yearly deposits as lowly affected banks by PNTR. The graphical evidence of figure 2 supports our identification assumption that the PNTR shock does not cause shock in the bank's fund supply directly and supports the validity of our research design.

Insert Figure 2: PNTR Shock and Bank Total Deposit in the Sample.

[16] WTO accession ensures China joins the global economic system, and China can export goods to WTO members with the most favored tariff. After entry into WTO, China lowers its' input tariff, leading to cheaper exports (Amiti *et al.* 2020); For the US, the law of PNTR is the key driver of US imports from China.

[17] Since 1980, China has implemented the Reform and Open policy to improve its production capacities.

[18] For the structure of the US imports from China, final goods account for over 90 percent of the World Integrated Trade Solution database (https://wits.worldbank.org/).

3. Data and Summary Statistics

3.1 Data and Sample

We obtain loan information in the Dealscan[19], which provides detailed loan contract information, including loan amount, loan pricing, collateral, and covenant, in the syndicated loan market. The sample I construct starts by retrieving all loans syndicated in the United States between 1999 and 2003. We restrict our sample to loans with the loan purpose of working capital or corporate purpose. Those two categories of loans flow to real sectors and generate real effects. Further, we only keep term and revolver loans because those two types of loans contain more information about loan pricing.

We merge bank holding company data with lenders in our loans sample. Our data about banking holding companies comes from the Compustat database and the supervisory data: Federal Reserve's FR Y-9C report. We aggregate a lender in the loan contract to its top-level banking holding company by checking the lender's shareholder and ownership structure information at National Information Center[20].

We merge borrowing firm information in the Compustat with borrowers in our loan sample using the link table constructed by Chava and Roberts (2008). Further, we merge trade and tariff information with our loan sample using the borrowing firm's four-digit SIC code. The trade information is from the United Nations Comtrade database, and the tariff information is from Peter Schott's webpage[21]. If the firm's four-digit SIC industry had China imports to the US in 1999, the firm belongs to the trade Sector, and otherwise, the firm belongs to the non-trade Sector. For firms in the non-trade sector, we exclude firms from the financial and real estate industry[22].

Finally, we construct our sample at the bank-firm level. First, we define the pre-shock period from 1999 to 2000 and the post-shock period from 2002 to 2003. We exclude all observations of the year 2001 from our sample because the PNTR shock happened in 2001 and might potentially confound our specifications. Second, we keep all loans issued by the top 46 active banking holding companies ranked by the number of loans during the pre-shock period[23]. Lastly, we collapse our sample from a loan level to a bank-firm level, and the observation of our final sample is a bank-firm pair. To collapse loan contract information at the firm-bank pair level, we apply the following algorithm: during the pre-shock period, each firm-bank pair is

[19] The Dealscan database only contains the largest syndicate loans, so our estimates can at least provide a lower bound of effects.
[20] We first use SAS function to match lenders in the Dealscan to banking holding companies from Compustat, then we manually check the match by checking the information from National information Center of Federal Reserve System. To match banking holding companies in Compustat to banks in FR Y-9C Report, we use the link table from Federal Reserve System in New York.
[21] Peter Schott provides the tariff rate for four digit SIC industry.
[22] SIC industry code of financial firms and real estate firms is between 6000 and 6799.
[23] When we merge 46 active banking holding companies in the Dealscan with Compustat, there are 31 banking holding companies. When merging to banking holding companies in FR Y-9C Report, there are only 25 banking holding companies.

linked with its' last loan sorted by the loan issue date; During the post-shock period, each firm-bank pair is linked with its' first loan sorted by the loan issue date[24].

3.2 Main Variables Construction

Our main variable is the NTR Tariff in 1999, the normal trade relation tariff in 1999 at 4 SIC digit level. The United States International Trade Commission (USITC) sets and implements import tariffs in the United States. USITC posts an annual harmonized tariff schedule every January, in which the tariff is at HS 8 digit product level. In the United States, the normal trade relation tariff, also called "column 1 tariff rate", is the import tariff imposed on countries with the normal trade relation with the United States. We use the link table from Pierce and Schott (2012) to aggregate the normal trade relation tariff from HS 8 digit product level to 4 digit SIC industry level[25].

3.3 Summary Statistics

Table 1 reports the summary statistics of key variables in our study. Panel A of table 1 reports the summary statistics of firms in the trade sector. Almost 20 percent of pre-shock lending relationships between trade-sector firms and banks still exist during the post-shock period. The loan amount falls by 30 percent on average between 1999 and 2003. The loan spread rises by 65 basis points on average between 1999 and 2003. The NTR tariff in 1999 has a mean of 2.7 percentage points and a standard deviation of 4.9 percentage points. Panel B reports the summary statistics of banks in our sample. Bank's return on assets falls by 0.4 percent, while the bank's non-performing loan ratio rises by 0.5 percent, and the bank's security ratio increases by 2.2 percent between 1999 and 2003. NTR tariff exposed by bank in 1999 has a mean of 3 percent with a standard deviation of 2.6 percent. Granular firm shock exposed by the bank has a mean of 0.037 percent. Panel C reports the summary statistics of firms in the non-trade sector. Similarly, 20 percent of pre-shock lending relationships between banks and firms in the non-trade sector still exist during the post-shock period. Granular bank shock has a mean of -0.223 percent. Comparing firm characteristics, firms in the trade sector and firms in the non-trade sector have a similar firm size and firm tangible asset. However, firms in the trade sector are older than those in the non-trade sector.

Insert Table 1: Summary Statistics

4. Empirical Strategy

4.1 Firm in the Trade Sector

The law passage of PNTR in 2001 is a natural experiment and allows China imports to enter the US market with normal trade relation tariff. Firms in the US's trade sector bear aggressive competition from China

[24] In terms of syndicate loan, loan amount of each bank equals total loan amount times loan ratio. If loan ratio is missing value in the raw data, we use 1 over the number of lenders in the syndicate loan to replace the missing value of loan ratio.
[25] For the definitions of all key variables, please see Table A 1 in the online appendix.

producers after the law of PNTR. Our identification assumption is that the normal trade relation tariff in 1999 is predetermined and independent of the PNTR shock. Trade-sector firms with a higher normal trade relation tariff in 1999 will bear weak competition from China producers in the product market than those with a lower normal trade relation tariff in 1999. A potential threat to our identification assumption is that the PNTR shock affects both firm-side fund demand and bank-side fund supply. To exclude this identification threat, we compare outcomes of different firms within the same bank, and we call this identification the within-bank estimator. Our observation in our sample is a bank-firm pair. So our basic specification is following:

$$\Delta y_{b,f} = \alpha + \beta \times NTR\ Tariff\ 1999_f + '\gamma X_f + \delta_s + \delta_b + \epsilon_{b,f} \quad (1)$$

In this specification, Δy is the change or the log change of loan outcomes or firm outcomes between the pre-shock and post-shock periods. Following Khwaja and Mian (2008) specification, we use change or log change to eliminate the time dimension, and our specification only relies on cross-sectional variation. $NTR\ Tariff\ 1999_f$ is the normal trade relation tariff in 1999 and captures trade-sector firms' exposure to the PNTR shock. X_f is a vector of firm characteristics in 1999. δ_s are the one-digit SIC sector fixed effects and δ_b are the bank fixed effects. The standard error is the robust standard error clustered at the firm's four-digit SIC code level. A potential threat to the exogeneity of the normal trade relation tariff in 1999 is that the normal trade relation tariff in 1999 can be related to loan outcomes or firm outcomes. However, Goldsmith-Pinkham *et al.* (2020) argue that in the DID setting, predetermined characteristics can determine the level of outcome variable, but they are exogenous to the change of outcome variables if the experiment is unexpected. Our specification assumes that the PNTR shock is unexpected because the voting process of the law passage in the US House and Congress faces uncertainty. The normal trade relation tariff in 1999, a predetermined characteristics, can be correlated to the level of firm's outcomes in the trade sector but is exogenous to the change of firm's outcome in the trade sector.

4.2 Bank Sample

Banks have lending relationships with firms in the trade sector impacted by the PNTR shock. When trade-sector firms impacted by the PNTR shock bear aggressive product market competition with China producers, they barely meet the covenants in the loan contract or are on the verge of default. In this case, banks would suffer loan loss from trade-sector firms impacted by PNTR shock. PNTR shock is passed to banks through lending relationships. If banks hold a higher ratio of loans lent to firms in the trade sector during the pre PNTR shock period, those banks would be exposed more to the PNTR shock. With this assumption, we construct a variable to measure the shock faced by banks.

$$\text{NTR Tariff in Bank } 1999_b = \sum_f L_{b,f} \times \text{NTR Tariff } 1999_{f,b} \quad (2)$$

$L_{b,f}$ is the loan weight of a bank lending to a trade-sector firm during the pre PNTR shock period and NTR Tariff $1999_{f,b}$ is the normal trade relation tariff in 1999 of a firm in the trade sector borrowing from a bank. So normal trade relation tariff in bank in 1999 is the loan weighted average of the normal trade relation tariff in 1999 faced by the firm borrowing from the bank before the pre-shock period. The variable measures bank's exposure to the PNTR shock by using the bank's loan portfolio. We use the following specification to test the impact of the bank's exposure to PNTR shock on bank-level outcomes.

$$\Delta Y_b = \alpha + \beta \times NTR\ Tariff\ in\ Bank\ 1999_b + {}'\gamma X_b + \epsilon_b \quad (3)$$

In the specification above, ΔY_b is the change or log change of bank outcomes between the pre-shock and post-shock periods. Thus, the first difference of outcome variables can absorb the bank's time-invariant confounding factors. $NTR\ Tariff\ in\ bank\ 1999_b$measures the bank's exposure to the PNTR shock. X_b is a vector of bank characteristics before the pre-shock period.

A potential threat to our estimation is that our measure of the bank's exposure to PNTR shock might be endogenous because good risk-managed banks could anticipate and hedge risk from PNTR shock. Following Gabaix and Koijen (2020) and Galaasen *et al.* (2020), we construct the granular instrument variables. First, the normal trade relation tariff in 1999 of a trade-sector firm in the bank's loan portfolio can be decomposed into two parts.

$$NTR\ Tariff\ 1999_{b,f} = \eta_b + \upsilon_{b,f} \quad (4)$$

η_b is the unobserved factor of the bank, such as bank risk management and bank loan specialization. $\upsilon_{b,f}$ is the idiosyncratic component led by a firm faced with PNTR shock in the bank's loan portfolio. Second, our IV variable is constructed by the following equation:

$$\text{Granular Firm Shock}_b = \sum_f L_{b,f} \times \text{NTR Tariff } 1999_{b,f} - \sum \frac{1}{N_f} \times \text{ NTR Tariff } 1999_{b,f}$$

$$= \sum_f L_{b,f} \times \upsilon_{b,f} - \sum \frac{1}{N_f} \times \upsilon_{b,f} \quad (5)$$

Where N_f is the number of trade sector firms in the bank loan portfolio. Our IV variable of granular firm shock is constructed by using a loan weighted average of normal trade relation tariff subtracting the simple average of normal trade relation tariff. Granular loan holdings in the bank's loan portfolio make the granular instrument variable valid. Figure 3 shows the distribution of loan holdings in a bank's loan portfolio in the trade sector, and many granular loan holdings exist in the loan portfolio. Therefore, figure 3 supports our instrument variable's validity.

Insert Figure 3: the Distribution of Loan Size Weight in Bank's Loan Portfolio,1999-2000

Figure 4 shows the scatter plot of NTR Tariff in Bank,1999 against Granular Firm shock,1999-2000. In Figure 4, the top four banks in the US are marked by color and are in the fitted line[26]. Figure 4 indicates that our instrument variable is highly correlated with the endogenous variable in the first stage, ruling out the weak instrument variable concern.

Insert Figure 4: NTR Tariff in Bank, 1999 and Granular Firm Shock, 1999-2000

4.3 Firm in the Non-Trade Sector

When banks are affected by the PNTR shock from their loan portfolio of firms in the trade sector, banks could pass this shock to non-trade sector firms in loan portfolios. We try to test the impact of banks' exposure to PNTR shock on the lending outcomes with firms in the non-trade sector. When banks suffer from the PNTR shock, they buffer it by relying more on the pre-shock lending relationships with non-trade sector firms to allocate funds. Our specification of the within-firm estimator leverages the bank non-trade-firm pair and is the following:

$$\Delta Y_{b,c} = \alpha + \beta \times G\text{ranual Firm shock}_{\text{b}} + '\gamma X_b + \delta_c + \epsilon_{b,c} \quad (6)$$

In the specification above, b, c indicates the bank and non-trade sector firms in the bank's loan portfolio, respectively. $\Delta Y_{b,c}$ is the change of loan outcomes between pre-shock and post-shock periods. X_b is a vector of bank characteristics variables during pre-shock periods. δ_c are the non-trade sector firm fixed effects. In our setting, we use the within-firm estimator of Khwaja and Mian (2008) to exclude potential confounding factors from non-trade sector firms and cluster the standard error at the bank level.

Moreover, we try to document the pass-through impacts of PNTR shock on outcomes at the non-trade sector firm level. A non-trade sector firm has lending relationships with multiple banks. Hence, we aggregate PNTR shock at a non-trade sector firm level, and we construct the following variable

$$\text{Granular Bank Shock}_{\text{c}} = \sum_{c} L_{b,c} \times G\text{ranular Firm Shoc}k_{b,c} \quad (7)$$

Where $L_{b,c}$ is the loan size weight of a bank lending to a non-trade sector firm during the pre-shock period. We use granular bank shock to test the impact of the bank's PNTR shock on non-trade sector firm outcomes with a specification.

$$\Delta Y_c = \alpha + \beta \times G\text{ranular Bank Shoc}k_c + '\gamma X_c + \delta_s + \epsilon_c \quad (8)$$

ΔY_c is the change or log change of a firm's outcomes in the non-trade sector between the pre-shock and post-shock period. $Granular\ bank\ shock_c$ captures the non-trade sector firms' exposure to the PNTR shock due to lending relationships with banks. X_c is a vector of firm characteristics in

[26] The top four banks in United States are JP Morgan Chase (JPM), Bank of America (BAC), Citi Group (C), and Wells Fargo (WFC). The top four banks are in the fitted line, indicating that our results do not come from outliners of big banks.

the non-trade sector during the pre-shock period. δ_s are one-digit SIC sector fixed effects of non-trade sectors. Those sector fixed effects can exclude the confounding factors at the sector level.

5. Main Results

5.1 Does trade shock directly impact firms' lending in the trade sector?

In this section, we test the direct impact of PNTR shock on lending outcomes between banks and firms in the trade sector. These empirical tests are challenging because PNTR shock could affect the firm's loan demand and bank's loan supply at the same time. To absorb omitted factors from the bank side, we apply the within-bank estimator and compare outcomes of different firms within the same bank.

Table 2 presents the results of PNTR shock on lending relationships between banks and firms in the trade sector from 1999 to 2003. From column 1 to column 4, we progressively add control variables of firm characteristics, and the coefficient of NTR tariff in 1999 is stable and statistically significant at 1 percent level. A one percent decrease in NTR tariff rate in 1999 leads to a 1.3 percent decrease in the probability that the firm in the trade sector resumes the lending relationship with the bank between the pre-shock period and the post-shock period. In terms of magnitudes, a one standard deviation increase in NTR tariff in 1999 is associated with a 6.49 percent increase in the probability of resuming a lending relationship between the pre-shock period and the post-shock period, which is almost 16.53 percent of the lending relationship's standard deviation. In our specification, our key fixed effects are bank fixed effects which absorb the confounding factors from banks, and we also control for the one-digit SIC industry fixed effects to absorb the time-variant unobserved factors from the industry. When firms in the trade sector are hit by the PNTR shock, a bank would not renew the loan or keep the lending relationship with firms hit more by PNTR shock. Our test shows that PNTR shock impacts the lending relationship between banks and firms in the trade sector.

Insert Table 2: Lending Relationship Exist Between 1999 and 2003 in the Trade Sector

Even though a bank renews a lending relationship with a firm affected by the PNTR shock, Bank would adjust the loan contract terms depending on the firm's exposure to the PNTR shock. So we test the impact of PNTR shock on the intensive margin. We also apply the within-bank estimator to absorb confounding factors from the bank because the PNTR shock might affect the banking system in the United States, leading to the bias of our estimates.

Table 3 presents the results of PNTR shock on loan amount and loan pricing in the intensive margin. In the table 3, column 2 shows that NTR Tariff in 1999 decreases by one percent, a bank would reduce growth in loan amount between 1999 and 2003 by 4.4 percent, which is statistically significant at 1 percent level. In terms of magnitudes, a one standard deviation change in NTR Tariff in 1999 is associated with a 22 percent change in growth in loan amount from 1999 to 2003, which is 20 percent of its standard deviation.

When a firm is more hit by PNTR shock, a bank will reduce more loan amounts. In the table 3, column 4 shows that NTR tariff in 1999 falls by one percent, change in loan spread from 1999 to 2003 would rise by 3 basis points. The coefficient of NTR tariff in 1999 is statistically significant at 1 percent level. In terms of magnitudes, a one standard deviation change in NTR tariff in 1999 leads to a 14 basis points change in loan spread from 1999 to 2003, equivalent to 10 percent of its standard deviation. When a firm in the trade sector is impacted more by PNTR shock, the loan spread charged by a bank would rise. In sum, the PNTR shock causes firms in the trade sector to discontinue the lending relationship in the extensive margin. Even though banks renew the lending relationship with firms in the trade sector, firms need to accept stricter contract terms with lower loan amounts and higher loan spreads. Our results are robust because coefficients of NTR tariff in 1999 are similar when we control firm characteristics variables or do not.

*****Insert**

Table 3: Loan Amount and Pricing within Bank Estimator in the Trade Sector***

What channel does the PNTR shock affect the loan financing of firms in the trade sector? We hypothesize an operating channel that the PNTR shock leads to aggressive competition in the product market, and products made in the United States are substituted by those made in China. Hence, the PNTR shock could affect the firm's operating performance in the trade sector, and banks cut off lending relationships and tighten loan contracts with firms in the trade sector. We use firm ROA and firm sales to proxy the operating performance.

Table 4 presents the results of the operating performance channel. In the table 4, column 2 shows that NTR tariff in 1999 decreases by one percent, firm ROA from 1999 to 2003 decreases by 0.2 percent, and the coefficient of NTR tariff in 1999 is statistically significant at 1 percent level. In terms of magnitudes, a one standard deviation change in NTR tariff in 1999 leads to a 1 percent change in firm ROA from 1999 to 2003, almost 10 percent of its standard deviation. The PNTR shock affects the profitability of firms in the trade sector. In the table 4, column 4 shows that when NTR tariff in 1999 falls by one percent, growth in firm sales from 1999 to 2003 drops by 1 percent, and the coefficient of NTR tariff in 1999 is positive and statistically significant at 5 percent level. A one standard deviation change in NTR tariff in 1999 is associated with a 5 percent growth in firm sales from 1999 to 2003, and this magnitude is almost 9 percent of its standard deviation. The PNTR shock affects the sales of firms in the trade sector. Our results are robust with or without controlling firm characteristics, and our key fixed effects are bank fixed effects, which absorb the omitted variables from the bank. Financially constrained firms would have lower operating performance endogenously, and our within-bank estimator fixes this endogenous problem.

Insert Table 4: Channel Outcome in the Trade Sector

What are the long-term effects of the PNTR shock on firms in the trade sector? The PNTR shock affects firms' lending in the trade sector via the operating performance channel. Due to the PNTR shock, firms in

the trade sector got fewer funds from the bank, and the shortage of banking funds will have long-term effects on the firm's R&D and employment.

Table 5 presents the long-term effect of PNTR shock on the firm's R&D. In the table 5, column 2 shows that when NTR tariff in 1999 falls by one percent, growth in firm R&D increases by 7.5 percent from 1999 to 2003, statistically significant at 1 percent level. In terms of magnitude, a one standard deviation change in NTR tariff in 1999 leads to a 37.5 percent change in growth in firm R&D from 1999 to 2003, which is almost half of its standard deviation. In the table 5, column 4 shows that when NTR tariff in 1999 falls by one percent, growth in firm R&D rises by 13.3 percent from 1999 to 2005. The coefficient of NTR tariff in 1999 is statistically significant at 1 percent level. In terms of magnitude, a one standard deviation change in NTR tariff in 1999 is associated with a 66.4 percent change in growth in firm R&D from 1999 to 2005, which is almost half of its standard deviation. The coefficient of NTR tariff in 1999 remains stable when controlling firm characteristics or not controlling by comparing column 1 versa column 2 or column 3 versa column 4. The coefficient in column 4 is larger than that in column 2. So PNTR shock has a long-term and persistent impact on a firm's R&D. When firms in the trade sector bear higher competition from China producers, firms need to invest more R&D to gain an advantage. Hombert and Matray (2018) find that innovation can save the United States firms in the trade sector from the competition with China by differentiating the product.

Table 6 presents the long-term impact of PNTR shock on firm employment. In table 6, column 2 shows that when NTR tariff in1999 falls by one percent, growth in firm employment from 1999 to 2003 drops by 0.9 percent. The coefficient of NTR tariff in 1999 is positive and statistically significant at 5 percent level. In terms of magnitudes, a one standard deviation change in NTR tariff in 1999 is associated with a 4.5 percent change in growth in firm employment from 1999 to 2003, which is 8 percent of its standard deviation. In table 6, column 4 shows that when NTR tariff in 1999 falls by one percent, growth in firm employment drops by 1.4 percent from 1999 to 2003. This relationship is statistically significant at 10 percent level. In terms of economic significance, a one standard deviation change in NTR tariff in 1999 leads to a 7 percent change in growth in firm employment from 1999 to 2005, which is 9 percent of its standard deviation. The coefficient of NTR tariff in 1999 stays unchanged when controlling firm characteristics or not. In addition, the coefficient size of growth in firm employment from 1999 to 2005 is larger than that from 1999 to 2003. In this case, PNTR shock has long-term and persistent impacts on firm employment. When firms in the trade sector face competition from China producers, firms in the trade sector would reduce employment. Many previous papers find that China's trade shock causes the decline in manufacturing employment in the United States (Autor *et al.* 2013; Pierce & Schott 2016).

We find that PNTR shock has long-term and persistent impacts on firm R&D and employment. Our paper is different from previous papers because we use the within-bank estimator to absorb the unobserved variables from banks.

Insert Table 5: Long Term Effect of Firm R&D in the Trade Sector

Insert Table 6: Long Term Effect of Firm Employment in the Trade Sector

In order to show the graphical evidence of the impact of PNTR shock on firm outcomes in the trade sector, we use local projection methods (Jordà 2005; JordÀ *et al.* 2013) to run the following specifications:

$$\Delta_h Y_{b,f,1999+h} = \alpha^h + \beta^h \times NTR\ Tariff\ 1999_f + \gamma^{h\prime} X_f + \delta_s^h + \delta_b^h + \epsilon_{b,f,}^h \quad h = 1,2,3,4 \quad (9)$$

where $\Delta_h Y_{b,f,1999+h}$ is the change in firm outcomes or growth in firm outcomes from 1999 to forward h years. We estimate the specification h times to recover $\{\beta^h\}$, which is the cumulative response of outcomes to the PNTR shock relative to the benchmark year 1999.

Figure 5 shows the dynamic cumulative effect of PNTR shock on firm outcomes in the trade sector. In the Figure 5, the upper left panel shows the cumulative effect of PNTR shock on the change in firm ROA in the trade sector. During the pre-shock period, the cumulative effects of PNTR shock on the change in firm ROA in the trade sector is almost 0, similar to the pre-trend test in the DID setting. The figure indicates no pre trends for change in firm ROA in the trade sector. During the post-shock period after 2001, the response of the change in firm ROA to PNTR shock rises sharply from 2000 to 2001 and falls a little from 2001 to 2003. In the Figure 5, the upper right panel shows the dynamic cumulative effect of PNTR shock on the growth in firm sales in the trade sector. During the pre-shock period from 1999 to 2000, the cumulative response of the growth in firm sales to PNTR shock falls a little, and this result supports no pre trends identification assumption in the DID setting. During the post-shock period from 2001 to 2003, the cumulative effect of the PNTR shock on the growth in firm sales rises persistently. So in the figure 5, the upper panel provides graphical evidence to support the channel test that PNTR shock affects the banking financing of firms in the trade sector via operating performance, including firm ROA and Firm sales.

In the Figure 5, the lower panel shows the dynamic cumulative effect of PNTR shock on the firm's long-term outcome. The left lower panel shows the dynamic cumulative response of growth in firm R&D to PNTR shock. Firms in the trade sector react early to PNTR shock by inputting more resources into R&D to increase their competence in the competition with China producers. The lower right panel shows the dynamic cumulative effect of PNTR shock on the growth in firm employment. During the pre-shock period from 1999 to 2000, firms in the trade sector keep growth in firm employment at almost 0. During the post-shock period from 2001 to 2003, when firms in the trade sector are affected more by the PNTR shock, firms in the trade sector would reduce firm employment more.

Insert Figure 5: Cumulative Effect of PNTR shock on Firm Outcome in the Trade Sector.

5.2 Does trade shock affect banks through lending relationships?

In this section, we test the impact of PNTR shock on bank outcomes. In section 5.1, we find that the PNTR shock negatively affects firms in the trade sector, which have a lending relationship with banks. In a bank's loan portfolio, trade-sector firms are affected by a negative shock, and this negative shock can be transmitted to banks via the lending relationship. Our identification assumption is that banks are affected differentially in the cross-sectional variation because banks hold differential loan amounts of firms in the trade sector during the pre-shock period.

Table 7 presents results of PNTR shock on change in bank ROA from 1999 to 2003. In the Table 7, column 2 shows that when NTR tariff in bank in 1999 falls by one percent, the change in bank ROA from 1999 to 2003 falls by 0.13 percent. The coefficient of PNTR tariff in bank in 1999 is positively significant at 5 percent level. In terms of magnitude, a one standard deviation change in NTR tariff in bank in 1999 is associated with a 0.35 percent change in bank ROA from 1999 to 2003, which is 36 percent of its standard deviation. The results are robust in column 1 in table 7 without bank characteristic control variables. So when banks held more loans of firms affected by PNTR shock in the trade sector, the bank's performance is affected more negatively by PNTR shock via the lending relationship.

A concern to our bank-level specification in column 2 of Table 7 is that some banks specialize in trade-sector lending, and those banks are affected more by the PNTR shock endogenously. In order to solve this concern, we control the variable: the number of loans in the trade sector during the pre-shock period. A further threat to our bank-level specification is that we can not observe the bank's risk management capacity. Better risk-managed banks can be affected gently by the shock and have better performance. To rule out this endogenous problem, we construct an instrument variable: granular firm shock from 1999 to 2000 following the approach of Gabaix and Koijen (2020) and Galaasen *et al.* (2020). In the table 7, column 3 presents the reduced form of IV estimation. When granular firm shock between 1999 and 2000 drops by one percent, change in bank ROA from 1999 to 2003 drops by 0.387 percent. In the table 6, column 4 presents the IV results of the change in bank ROA from 1999 to 2003 on NTR tariff in bank in 1999, instrumented by Granular firm shock between 1999 and 2000. When NTR tariff in bank in 1999 falls by one percent, the change in bank ROA from 1999 to 2000 decreases by 0.22 percent. The coefficient is positive and statistically significant at 5 percent level. For economic significance, a one standard deviation change in NTR tariff leads to a 0.6 percent change in bank ROA from 1999 to 2000, which is almost over the half of its standard deviation. When instrumenting the NTR Tariff in bank in 1999, we still find that PNTR shock impacts the bank performance negatively.

Insert Table 7: Change in Bank ROA,1999-2003 in the Bank Sample

The other potential concern about the validity of our explanatory variable NTR tariff in bank in 1999 is that NTR tariff in bank in 1999 might only contain the information of bank default probability and the

explanatory power of NTR tariff in bank in 1999 comes from the bank default probability. NTR Tariff in bank in 1999 impacts the bank performance via the bank default channel. To shut down this alternative channel, we construct the bank's Merton distance to default to measure the bank's default risk using a method of Bharath and Shumway (2008). In the table A2, we run regressions of the bank's Merton distance to default in 1999 or in 2000 and change in it from 1999 to 2000. Table A2 shows that bank Merton distance to default has no relationship with NTR tariff in bank in 1999 and indicates that bank default risk does not reflect the PNTR shock impacting bank during the pre-shock period.

Insert Table A 2: Exogenous Test of Our Variable in the Bank Sample

Now we find that the PNTR shock impacts the bank performance negatively, but we find no evidence that the PNTR shock impacts the bank risk. Table A3 in the appendix shows no significant relationship between NTR tariff in bank in 1999 and bank risk, measured by bank ROA standard deviation. To explain this finding, we use banking holding company's information from Federal Reserve Y-9C quarterly reports and try to test which channel causes the bad bank performance but no effects on bank risk. We explain that the PNTR shock impacts bank performance negatively by raising the non-performing loans because the PNTR shock causes trade sector firms in the bank's loan portfolio to have bad performance in the product market, and firms face loan default risk. When faced with loan default risk from trade sector firms in the loan portfolio, banks can hedge this lending risk by increasing the non-lending activities to some extent.

Insert Table A 3: Change in Bank Risk, 1999-2003 in the Bank Sample

Table 8 presents the results of the PNTR shock on change in bank outcomes from 1999 to 2003. In table 8, column 2 shows that when NTR tariff in bank in 1999 falls by one percent, change in bank non-performing loan ratio rises by 0.047 percent. The coefficient of our variable of interest is negative and statistically significant at 5 percent level. In terms of magnitudes, a one standard deviation change in NTR tariff in bank in 1999 leads to a 0.125 percent change in bank NPL from 1999 to 2003, which is almost the half of its standard deviation. So PNTR shock leads to an increase in the bank's non-performing loan ratio. In the table 8, column 4 shows that when NTR Tariff in bank in 1999 rises by one percent, change in bank security ratio increases by 1.8 percent, which is statistically significant at 5 percent level. In terms of economic significance, a one standard deviation change in NTR tariff in bank in 1999 leads to a 4.8 percent change in bank security ratio from 1999 to 2003, which is almost the half of its standard deviation. So PNTR shock makes banks hold more securities. Results in tables 8 support our hypothesis that PNTR shock worsens bank performances by the increases in non-performing loan ratio, and banks hedge this lending risk by holding more securities.

Insert Table 8: Change in Bank Outcome,1999-2003 in the Bank Sample

To show dynamic graphical evidence of PNTR shock on outcomes in the bank sample. We apply the local projection method (Jordà 2005; JordÀ *et al.* 2013) and run the following regression.

$$\Delta_h Y_{b,1999+h} = \alpha^h + \beta^h \times NTR\ Tariff\ in\ Bank\ 1999_b + \gamma^{h\prime} X_B + \epsilon_b, h = 1,2,3,4 \quad (10)$$

where $\Delta_h Y_{b,1999+h}$ is the change in bank outcomes or growth in bank outcomes from 1999 to forward h years. We estimate the specification h times to recover $\{\beta^h\}$, which is the cumulative response of bank outcome variable to PNTR shock relative to the benchmark year 1999.

Figure 6 shows the dynamic cumulative effect of PNTR shock on bank outcomes from 1999 to 2003. In the Figure 6, the upper right panel shows the dynamic response of PNTR shock on change in bank ROA from 1999 to 2003. During the pre-shock period, the impact of PNTR shock on change in bank ROA changes little. During the post-shock period, the dynamic response of change in bank ROA to PNTR shock rises sharply. In the Figure 6, the upper left panel shows the cumulative effect of PNTR shock on change in bank NPL ratio. Bank non-performing loan reacts to PNTR shock in advance during the pre-shock period. In the figure 6, the bottom panel shows the dynamic cumulative effect of PNTR shock on change in bank security ratio. During the pre-shock period, the bank security ratio remains unchanged. After the post-shock period, banks raise more security ratio sharply.

Insert Figure 6: Cumulative Effect of PNTR Shock on Bank Outcome.

5.3 Does the bank pass trade shocks to firms in the non-trade sector?

In this section, we test the impact of PNTR shock on firms in the non-trade sector. In section 5.2, we find that the PNTR shock worsens the bank performance because the PNTR shock hits trade sector firms, which is transmitted to banks via banks' lending relationships with trade sector firms. Consequentially, we would like to test whether banks impacted by PNTR shock unevenly pass this shock to non-trade sector firms in their loan portfolio. First, we test the impact of the bank shock caused by PNTR shock on the lending outcomes between banks and non-trade firms at the bank non-trade sector pair level. Second, we examine the impact of this bank shock caused by the PNTR shock on firms' outcomes at the non-trade sector firm level.

Table 9 presents the results of bank's shock caused by PNTR shock on the lending relationship between banks and non-trade firms from 1999 to 2003. In table 9, column 1 and 2 report empirical results for all firms in the non-trade sector. Column 2 shows that when granular firm shock between 1999 and 2000 falls by one percent, the probability that banks and non-trade sector firms keep the lending relationship between the pre-shock period and the post-shock period rises by 5.9 percent, which is negative and statistically significant at 5 percent level. In terms of magnitudes, a one standard deviation change in granular firm shock between 1999 and 2000 is associated with a 5.9 percent change in probability of lending relationship renewal from 1999 to 2003, which is equivalent to 14 percent of its standard deviation. We use Khwaja and Mian (2008) within-firm estimator to control the non-trade firm fixed effect, and the non-trade firm fixed effect can absorb the unobserved factors from the non-trade firm. We find that when banks suffer more by

the PNTR shock, banks have a higher probability of renewing the old lending relationship and allocating funds from the trade sector to the non-trade sector. Darmouni (2020) finds that when banks encounter an unexpected shock, banks rely more on the old lending relationship due to the asymmetric information.

In the non-trade sector, some particular industries serve the local town or local county and are sensitive to local demand. Those industries (for example, restaurants, gas stations, hotels) are affected less by global demand shocks such as the PNTR shock than the rest of the non-trade sectors. In the spirit of Mian and Sufi (2014), we define industries serving local demand as local industry. Local Industries are affected less by PNTR shock than other industries in the non-trade sector. When affected by PNTR shock, banks prefer to keep lending relationships with firms from local industries. In table 9, column 4 shows that when granular firm shock between 1999 and 2000 falls by one percent, the probability of keeping the lending relationship between banks and firms in the local industry increases by 6.7 percent, which is negative and statistically significant at 5 percent level. In terms of economic significance, a one standard deviation change in granular firm shock between 1999 and 2000 is associated with a 6.7 percent change in keeping the lending relationship between banks and firms in the local industry from 1999 to 2003. Comparing coefficient size and economic significance, granular firm shock between 1999 and 2000 is larger in the local industry than that in the non-trade sector. These results support our argument above. Hence, when banks encounter shock from the trade sector, banks would rely more on the old lending relationship to allocate funds in the non-trade sector or local industry.

Insert: Table 9: Lending Relationship Exist in the Non-Trade Sector

What are the impacts of bank shock caused by PNTR shock on firm-level outcomes in the non-trade sector? So far, we find that when bank suffers the PNTR shock, banks rely on the old lending relationship with firms in the non-trade sector. This bank shock can be passthrough to firms in the non-trade sector, but non-trade sector firms can cushion this shock by borrowing from multiple banks. To quantify the effect of this shock on non-trade sector firms, we need to aggregate data at the non-trade sector firm level by calculating loan weighted bank's shock to construct the variable of Granular bank shock and then examine the impact of granular bank shock on outcomes of the firm in the non-trade sector.

Table 10 presents the results of bank shock on firm outcomes in the non-trade sector. In table 10, column 2 shows that when granular bank shock falls by one percent, change in firm ROA in the non-trade sector drops by 6.7 percent, which is positive and statistically significant at 5 percent level. In terms of magnitude, a one standard deviation change in granular bank shock leads to a 2.4 percent change in firm ROA in the non-trade sector from 1999 to 2003, which is equivalent to 15 percent of its standard deviation. When firms in the non-trade sector establish a lending relationship with less affected banks by PNTR shock, firms would have better operating performance than those establishing lending relationships with more affected banks by PNTR. In table 9, column 4 shows that when granular bank shock falls by one percent, growth in firm

sales from 1999 to 2003 decreases by 47.7 percent, which is positive and statistically significant at 10 percent level. In terms of economic significance, a one standard deviation change in granular bank shock is associated with a 17.3 percent change in growth in firm sales from 1999 to 2003, which is equivalent to 19 percent of its' standard deviation. When firms in the non-trade sector establish a lending relationship with less affected banks by PNTR shock, firms would have higher sales than those that establish a lending relationship with the more affected banks by PNTR. So banks pass shock to firms in the non-trade sector. When firms in the non-trade sector have a lending relationship with banks less affected by PNTR shock, firms in the non-trade sector have better operating performance. We define the local industry above, and local industry serves the local demand. So the local industry is insensitive to competition from China imports, and banks are willing to hedge this risk by allocating funds to local industry. Table A4 presents results of bank shock on firm outcomes in the local industry. The coefficient size of granular bank shock in the local industry is larger than that in the non-trade sector. The evidence supports the local industry effect.

Insert Table 10: Bank Shock on Firm Outcome in Non-Trade Sector

Insert Table A 4: Bank Shock on Firm Outcome in the Local Industry

To present visual evidence of bank shock caused by PNTR shock on firm outcomes in the non-trade sector, we apply the local projection method (Jordà 2005; JordÀ *et al.* 2013) and run the following specification.

$$\Delta_h Y_{c,1999+h} = \alpha^h + \beta^h \times Granular\ Bank\ Shock_c + \gamma^{h\prime} X_c + \delta_s^h + \epsilon_c^h,\ \mathrm{h} = 1,2,3,4 \quad (11)$$

where $\Delta_h Y_{c,1999+h}$ is the change in firm outcomes or growth in firm outcomes in the non-trade sector from 1999 to forward h years. We estimate the specification h times to recover $\{\beta^h\}$, which is the cumulative response of the firm outcome variable to PNTR shock relative to the benchmark year 1999.

Figure 7 shows the dynamic cumulative effect of PNTR shock on the outcome of the firm in the non-trade sector. In Figure 7, the left panel shows the firm ROA response to bank shock caused by PNTR shock. During the pre-shock period, the coefficient even decreases. During the post-shock period, firm ROA reacts to PNTR shock. In figure 7, the right panel shows the response of firm sales to bank shock caused by PNTR shock. Firms' sales in the non-trade sector respond to the PNTR shock.

***Insert Figure 7: Cumulative Effect of PNTR Shock on Outcomes of Firm in the Non-trade Sector ***

5.4 Does the stock market reflect trade-sector firms' exposure to the shock?

In this section, we examine the stock market response to PNTR shock by using the event study in the trade sector. In our main specification, we use NTR tariff in 1999 at four SIC digit level to measure trade-sector firms' exposure to the PNTR. A potential concern arises that industry-level measures might have measurement errors, and trade-sector firms in our sample might be misspecified affected by PNTR shock.

To empirically check whether trade-sector firms in our sample are affected by PNTR shock, we use an event study to confirm that they are indeed affected by PNTR shock by calculating their cumulative abnormal return. The stock market can aggregate information from all aspects and reflect information in the market price. Five big events are milestones of the law PNTR passage, and we use the event study method to examine the stock market reaction to five big events: On May 15, 2000, the US House introduced the bill; On May 24, 2000, the US House voted to approve the bill; On July 27, 2000, the US Senate voted to closure motion of the bill; On September 19, the US Senate voted to approve the bill. On October 10, 2000, President Clinton signed the law[27].

Table 11 presents the event study results of the firm in the trade sector. For all five big events of PNTR shock, the stock market reacts negatively to firms in the trade sector of our sample with all event windows. The economic magnitude of the stock market reaction to firms in the trade sector is very large. For example, on October 10, 2000, President Clinton signed the law. The cumulative abnormal return of two trading days is -1.93 percent and the cumulative abnormal return of six trading days is -3.41 percent. Those results indicate that when President Clinton signed the law granting China Permanent Normal Trade Relation Status, the trade sector firms in our sample lost 1.93 percent market value after two trading days and 3.41 percent after six trading days on average. The significantly negative stock market reaction to trade sector firms in our sample indicates that the trade sector firms in our sample are indeed affected by PNTR shock and supports the validity of our results. The stock market reflects the negative effect of the PNTR shock on firms in the trade sector.

Insert Table 11: Event Study of Firms in Trade Sector for the PNTR

Figure 8 shows the graphical evidence of event study results for all firms in the trade sector. For five big events, the average cumulative abnormal return remains unchanged before the event, and it falls sharply after the event. This trend is very significant for three events of approval vote from the US House, approval vote from US Senate, and approval signature of the president.

Insert Figure 8: Cumulative Abnormal Return of all Firms in the Trade Sector for PNTR Event

6. Robustness and Heterogenous Results

In this Section, we present placebo test results and heterogeneous results of the PNTR shock on lending outcomes between banks and firms in the trade sector. First, we present the placebo test results. Second, we present heterogeneous results.

[27] For event study methods, we follow MacKinlay (1997) to define the abnormal return and the cumulative abnormal return. For details of event study, please see section B of online appendix

6.1 Placebo Test Results

In this subsection, we present placebo test results of lending outcomes between banks and firms in the trade sector. In our setting, our identification strategy builds on a DID approach by using the PNTR shock. NTR tariff in 1999 measures the trade sector firm's exposure to PNTR shock, and NTR tariff in 1999 is a continuous treatment status variable for firms in the trade sector. Hence, we conduct a placebo test by manipulating this continuous treatment status variable. The specific procedure is the following: for each trade sector firm in our sample, we randomize its' NTR tariff in 1999 and then run the main regression to obtain a placebo coefficient of NTR tariff in 1999. We repeat this procedure for 1000 times, and finally, we can plot the distribution of placebo coefficients of NTR tariff in 1999. For this placebo test, the null hypothesis for the coefficient of NTR tariff in 1999 is 0, and we construct a P-value by calculating the ratio of the number of placebo coefficients greater than the true coefficient to the total number of placebo coefficients.

Figure A1 shows the placebo test of PNTR shock. In the figure A1, the upper left panel shows a placebo test of the lending relationship between banks and firms in the trade sector from 1999 to 2003 on NTR tariff in 1999. The mean of placebo coefficient distribution is 0, and the P-value is less than 0, which indicates that the true coefficient of NTR tariff is not driven by random, and the treatment effect of the true coefficient is large than the placebo effect. The upper right panel shows the placebo test of growth in loan amount from 1999 to 2003 on the NTR tariff in 1999. The mean of the placebo coefficient is 0, and the p value is 0.003, which shows that the treatment effect is not picked up by random. The bottom panel shows the placebo test of change in loan spread from 1999 to 2003 on NTR tariff in 1999. The placebo test validates our research design and confirms that the impact of PNTR shock on lending outcomes between banks and firms in the trade sector is not picked up by random.

Insert Figure A 1: Placebo Test of PNTR Shock

6.2 Heterogenous Results

In this subsection, we present heterogeneous results of PNTR shock. We split the sample into upper 50% half subsample and bottom 50% half subsample based on trade sector firm characteristics: Firm Size in 1999, Firm Tang in 1999, and Firm Age in 1999. Then we estimate coefficients of NTR tariff in 1999 for two half samples, respectively. Finally, we plot coefficients and their confidence intervals constructed by standard errors.

Figure A2 shows heterogeneous effects of PNTR shock on lending outcomes between banks and firms in the trade sector. In the figure A2, the upper left panel shows the heterogeneous effect of lending relationships between banks and firms in the trade sector from 1999 to 2003 on NTR tariff in 1999, which indicates that bigger, more tangible, and older firms in the trade sector can renew the lending relationship with banks than their counterparties when facing PNTR shock. The upper right panel shows the

heterogeneous effect of growth in loan amount from 1999 to 2003 on NTR tariff in 1999, which indicates that smaller, less tangible, and young firms need more loans than their counterparties when facing PNTR shock. The bottom panel shows the heterogeneous effect of change in loan spread from 1999 to 2003 on NTR Tariff in 1999, which indicates that smaller, less tangible, and young firms in the trade sector are charged higher loan spread by the bank than their counterparties facing PNTR shock. So PNTR shock affects lending outcomes of firms in the trade sector unevenly.

Insert Figure A 2: Heterogeneous Effect of PNTR Shock

7. Aggregate Results

In this section, we do a back-of-the-envelope analysis of the aggregate loan loss due to PNTR shock. We use our micro econometric estimate to infer the macro loan loss in the trade sector due to PNTR shock. We need to estimate the ratio of loan loss in the trade sector due to PNTR shock in the sample, and then we use this loan loss ratio to infer total loan loss in the trade sector at the macroeconomy level. The calculation can answer the extent to which the PNTR shock causes the loan loss in the trade sector.

This analysis is equivalent to a counterfactual experiment using a micro estimate with the partial equilibrium assumption. The calculation builds on the partial equilibrium effect without considering the general equilibrium effect. For this counterfactual experiment, we assume that when the PNTR shock was not to happen, this event would be equivalent to an increase in the NTR tariff rate because the NTR tariff rate can protect firms in the trade sector from the competition of China producers. With those assumptions met above, we can define the loan's counterfactual growth rate in the trade sector from 1999 to 2003 as follows

$$g_{i,t,t+h}(\tau) = E\left[g_{i,t,t+h} \middle| NTR + \tau\right]$$
$$= \widehat{g_{i,t,t+h}} + \hat{\beta} \times \tau \quad (12)$$

Where $g_{i,t,t+h}(\tau)$ is a counterfactual growth rate of the loan for trade-sector firm i when PNTR shock was not to happen, $\widehat{g_{i,t,t+h}}$ is the fitted growth rate of the loan in our model for firm i. $\hat{\beta}$ is the coefficient estimate from column 1 of table 3. Then, we can use the following equation to map the growth rate to end level

$$V(x) = (1 + x) \times y_{i,t} \quad (13)$$

Next, we can aggregate the counterfactual change of loan for each firm and the real loan change for each firm to get the share of loan loss due to PNTR shock in the sample. The equation is following:

$$Loan\ Loss\ Ratio = \frac{\sum_i y_{i,t+h}(\tau) - \widehat{y_{i,t+h}}}{\sum_i y_{i,t} - y_{i,t+h}} \quad (14)$$

Finally, we get the loan loss ratio from our sample above. We use the loan in our sample form Dealscan to estimate the trade sector loan ratio with 0.29. From Federal Reserve System in Saint Louis to get the

change in total commercial and industrial loan from 1999 to 2003 with -59.79 billion dollars. With these parameters in hand, we can calculate the number of loan losses in the trade sector due to PNTR in the United States[28].

Table 14 presents the aggregate loan loss of the PNTR shock. If the event of PNTR shock were equivalent to a 0.1 percent change of NTR tariff rate for every industry, the loan loss ratio due to PNTR shock would be 7.69 percent. Loan loss level in the trade sector would be 1.29 billion dollars in the macroeconomy. If the event of PNTR shock were equivalent to a 0.5 percent change of NTR tariff rate for every industry, the loan loss ratio due to PNTR shock would be 38.44 percent, and the loan loss level in the trade sector would be 6.46 billion dollars in the macroeconomy. If the event of PNTR shock were equivalent to a 0.8 percent change of NTR tariff rate for every industry, the loan loss ratio due to PNTR shock would be 61.41 percent, and the loan loss level in the trade sector would be 10.33 billion dollars in the macroeconomy. So PNTR shock has a great impact on aggregate loan loss in the trade sector in the United States. Figure A3 shows the aggregate effect of the PNTR with the real value path and the counterfactual value path.

Insert Table 12: Aggregate Implication of Loan Loss For PNTR

Insert Figure A 3: Aggregate Effect of PNTR

8. Conclusion

We document a fully-specified banking lending channel using the PNTR shock. The PNTR shock meets our ideal setting's two conditions and enables us to decompose our research design into three steps. To mitigate two main identification concerns, we apply the within-bank estimator and granular instrumental variable approach. We document the following main empirical results.

First, PNTR shock affects firms in the trade sector negatively. PNTR shock causes the bank to terminate the lending relationship and adjust the strict loan contract with firms in the trade sector, driven by the worse operating performance. PNTR shock has a long-term and persistent effect on the R&D and employment of firms in the trade sector.

Second, PNTR shock affects banks negatively via the lending relationships with trade sector firms affected by PNTR shock. Specifically, the PNTR shock negatively impacts the bank's operating performance by the increase in the non-performing loans. However, banks hedge this risk by holding more security assets.

[28] We use this equation to do calculation: $Loan\ Loss = Loan\ Loss\ Ratio \times trade\ sector\ loan\ ratio \times Change\ in\ Total\ \ C\&I\ Loan\ 1999-2003$.

Third, banks suffer from PNTR shock, and banks pass this shock to firms in the non-trade sector. Due to the PNTR shock, banks rely more on old lending relationships to allocate funds. Firms in the non-trade sector will have better operating performance when having lending relationships with less affected banks.

Finally, we assess the aggregate implication. According to our calculation, when PNTR shock is equivalent to a 0.5 percent decrease in tariff for each industry, the share of loan loss due to shock is 38.44 percent, and loan loss of total commercial and industrial loan in the United States is 6.46 billion dollars.

Our paper has policy implications for bank regulators in the United States. When a macro shock hits the real economy but not the bank system, bank regulators still need to assist banks to stabilize the bank system. Without assistance and guidance from regulators, banks contrast the loan supply to some parts of the real economy, leading to negative pass-through effects on the rest of the real economy. A macro shock hits a firm's operating performance, and the model of borrowing against the cash flow in the United States puts more financial constraints on the firm hit by the macro shock. Bank regulators need to inject funds into banks and guide banks' credit supply when facing a macro shock.

Our paper has policy implications for commercial banks in the United States. Commercial banks monitor risk from loan portfolios, especially when a real sector-driven shock hits firms in their portfolio, and hedge this loan portfolio risk by adjusting the structure of their assets.

Our paper has policy implications for firms in the trade sector in the United States. Trade sector firms in the United States could innovate to differentiate products and compete with China products.

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Table 1: Summary Statistics

variable	N	Mean	Median	STD
Panel A: Trade Sector				
Lending Relationship Exist,1999-2003	656	0.191	0.000	0.393
Change in Firm ROA,1999-2003	515	-0.023	-0.016	0.101
Growth in Firm Sales,1999-2003	520	0.154	0.157	0.576
Growth in Firm R&D,1999-2003	521	-0.024	0.000	0.810
Growth in Firm R&D,1999-2005	469	0.156	0.000	1.119
Growth in Firm Employment,1999-2003	510	-0.055	-0.018	0.548
Growth in Firm Employment,1999-2005	458	0.005	0.019	0.732
NTR Tariff,1999 %	656	2.739	1.209	4.996
Firm Size,1999	656	13.849	13.889	2.088
Firm Tang,1999	656	0.311	0.268	0.197
Firm Age,1999	656	22.479	15.000	17.604
Growth in Loan Amount,1999-2003	125	-0.291	-0.223	1.031
Change in Loan Spread,1999-2003	107	64.855	50.000	137.891
Panel B: Banking Holding Company				
Change in Bank ROA,1999-2003 %	31	-0.392	-0.238	0.969
Change in Bank NPL,1999-2003 %	25	0.486	0.500	0.289
Change in Bank Security Ratio,1999-2003	25	0.022	0.009	0.082
Bank Distance Default,1999	33	0.447	0.348	0.418
Bank Distance Default,2000	32	0.379	0.166	0.400
Change in Bank Distance Default,1999-2000	32	-0.074	0.000	0.330
NTR Tariff in Bank,1999 %	34	3.004	2.424	2.666
Granular Firm Shock,1999-2000 %	34	0.037	-0.083	0.993
Bank Size,1999	34	17.766	17.975	1.527
Bank Capital,1999	34	0.075	0.075	0.017
Number of Loan in Trade Sector,1999-2000	34	39.235	15.500	54.774
Panel C: Non-trade Sector				
Lending Relationship Exist,1999-2003	884	0.206	0.000	0.405
Change in Firm ROA,1999-2003	319	-0.004	-0.003	0.157
Growth in Firm Sales,1999-2003	322	0.383	0.314	0.909
Granular Bank Shock %	426	-0.223	-0.303	0.362
Firm Size,1999	442	13.164	13.023	1.919
Firm Tang,1999	442	0.327	0.258	0.256
Firm Age,1999	442	13.032	7.000	14.203

Note: This table reports the summary statistics of all key variables. Summary statistics contain the number of observations, mean in the sample, median in the sample, and standard deviation in the sample. Panel A reports the summary statistics of firms in the trade sector. Panel B reports the summary statistics of banks. Panel C reports the summary statistics of firms in the non-trade sector. All key variables are defined in the table A1:variable definition.

Table 2: Lending Relationship Exist Between 1999 and 2003 in the Trade Sector

	Lending Relationship Exist,1999-2003			
	(1)	(2)	(3)	(4)
NTR Tariff,1999	0.012***	0.012***	0.012***	0.013***
	(0.003)	(0.004)	(0.004)	(0.003)
Firm Size,1999		-0.004	-0.004	-0.011
		(0.012)	(0.012)	(0.014)
Firm Tang,1999			0.042	0.049
			(0.135)	(0.133)
Firm Age, 1999				0.001
				(0.002)
Observations	651	651	651	651
R^2	0.09	0.09	0.09	0.09
SIC1 FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes

Note: This table reports the regression of lending relationship exist from 1999 to 2003 on NTR tariff in 1999 in the trade sector. Lending relationship exist between 1999 and 2003 is an indicator variable equal to 1 when a bank lends at least one loan to the firm during both the pre-shock period:1999 to 2000 and the post-shock period:2002 to 2003; otherwise, the value is 0. NTR tariff in 1999 is normal trade relation tariff rate at four-digit SIC sector level faced by the firm. All other control variables are defined in table A1: variable definition. The observation unit is a bank-firm relationship pair. Heteroskedasticity robust standard errors clustered at the four-digit SIC sector level faced by the firm are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 3: Loan Amount and Pricing within Bank Estimator in the Trade Sector

	Lending Relationship Sample			
	Growth in Loan Amount,1999-2003		Change in Loan Spread,1999-2003	
	(1)	(2)	(3)	(4)
NTR Tariff,1999	0.042***	0.044***	-2.942**	-2.819**
	(0.010)	(0.012)	(1.179)	(1.191)
Firm Size,1999		0.032		-4.400
		(0.132)		(11.350)
Firm Tang,1999		0.671		-43.287
		(0.697)		(111.803)
Firm Age, 1999		0.009		-0.171
		(0.010)		(1.366)
Observations	119	119	101	101
R^2	0.23	0.26	0.26	0.27
SIC1 FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes

Note: This table reports the regression of growth in loan amount from 1999 to 2003 and change in loan spread from 1999 to 20003 on NTR tariff in 1999 in the trade sector. The growth in loan amount is defined as the natural logarithm of loan amount times loan ratio for the first loan between the firm and bank during the post-shock period: 2002 to 2003 minus the natural logarithm of loan amount times loan ratio for the last loan between bank and firm during the pre-shock period: 1999 to 2000. The change in loan spread from 1999 to 2003 is defined as the loan spread for the first loan between bank and firm during the post-shock period:2002 to 2003 minus the loan spread for the last loan between firm and banks during the pre-shock period:1999 to 2000. NTR tariff in 1999 is normal trade relation tariff rate at four-digit SIC sector level faced by the firm. All other control variables are defined in table A1: variable definition. In this table, column 1 and column 2 report the results of growth in loan amount from 1999 to 2003; Column 3 and column 4 report the results of change in loan spread from 1999 to 2003. The observation unit is a bank-firm relationship pair. Heteroskedasticity robust standard errors clustered at the four-digit SIC sector level faced by the firm are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 4: Channel Outcome in the Trade Sector

	Lending Relationship Sample			
	Change in Firm ROA,1999-2003		Growth in Firm Sales,1999-2003	
	(1)	(2)	(3)	(4)
NTR Tariff,1999	0.002***	0.002***	0.008**	0.010**
	(0.001)	(0.001)	(0.004)	(0.004)
Firm Size,1999		-0.005		-0.051**
		(0.005)		(0.023)
Firm Tang,1999		0.003		0.539*
		(0.042)		(0.278)
Firm Age, 1999		0.000		0.001
		(0.000)		(0.003)
Observations	511	511	516	516
R^2	0.16	0.17	0.26	0.29
SIC1 FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes

Note: This table reports the regression of change in firm ROA from 1999 to 2003 and growth in firm sales from 1999 to 20003 on NTR tariff in 1999 in the trade sector. The change in firm ROA is defined as the firm's return on asset ratio in 2003 minus the firm's return on asset ratio in 1999. The growth in firm sales from 1999 to 2003 is defined as the natural logarithm of a firm's total sales in 2003 minus the natural logarithm of the firm's total sales in 1999. NTR tariff in 1999 is normal trade relation tariff rate at four-digit SIC sector level faced by the firm. All other control variables are defined in table A1: variable definition. In this table, column 1 and column 2 report the results of the change in firm ROA from 1999 to 2003; Column 3 and column 4 report the results of growth in firm sales from 1999 to 2003. The observation unit is a bank-firm relationship pair. Heteroskedasticity robust standard errors clustered at the four-digit SIC sector level faced by the firm are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 5: Long Term Effect of Firm R&D in the Trade Sector

	Lending Relationship Sample			
	Growth in Firm R&D,1999-2003		Growth in Firm R&D,1999-2005	
	(1)	(2)	(3)	(4)
NTR Tariff,1999	-0.074***	-0.075***	-0.129***	-0.133***
	(0.018)	(0.017)	(0.039)	(0.039)
Firm Size,1999		-0.028		0.038
		(0.037)		(0.077)
Firm Tang,1999		-0.038		-0.712
		(0.331)		(0.509)
Firm Age, 1999		-0.005		-0.008
		(0.004)		(0.005)
Observations	517	517	463	463
R^2	0.27	0.29	0.26	0.28
SIC1 FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes

Note: This table reports the regression of growth in firm R&D from 1999 to 2003 and growth in firm R&D from 1999 to 2005 on NTR tariff in 1999 in the trade sector. The growth in firm R&D from 1999 to 2003 is defined as the natural logarithm of a firm's R&D expenditure in 2003 minus the natural logarithm of the firm's R&D expenditure in 1999. The growth in firm R&D from 1999 to 2005 is defined as the natural logarithm of a firm's R&D expenditure in 2005 minus the natural logarithm of the firm's R&D expenditure in 1999. NTR tariff in 1999 is normal trade relation tariff rate at four-digit SIC sector level faced by the firm. All other control variables are defined in table A1: variable definition. In this table, column 1 and column 2 report the results of growth in firm R&D from 1999 to 2003; Column 3 and column 4 report the results of growth in firm R&D from 1999 to 2005. The observation unit is a bank-firm relationship pair. Heteroskedasticity robust standard errors clustered at the four-digit SIC sector level faced by the firm are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * $p<0.1$; ** $p<0.05$; *** $p<0.01$.

Table 6: Long Term Effect of Firm Employment in the Trade Sector

	Lending Relationship Sample			
	Growth in Firm Employment,1999-2003		Growth in Firm Employment,1999-2005	
	(1)	(2)	(3)	(4)
NTR Tariff,1999	0.008**	0.009**	0.013**	0.014*
	(0.004)	(0.004)	(0.006)	(0.008)
Firm Size,1999		-0.028		-0.046
		(0.024)		(0.038)
Firm Tang,1999		0.524**		0.062
		(0.251)		(0.389)
Firm Age, 1999		0.001		-0.003
		(0.003)		(0.004)
Observations	506	506	452	452
R^2	0.11	0.13	0.13	0.16
SIC1 FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes

Note: This table reports the regression of growth in firm employment from 1999 to 2003 and growth in firm employment from 1999 to 2005 on NTR tariff in 1999 in the trade sector. The growth in firm employment from 1999 to 2003 is defined as the natural logarithm of a firm's total employment in 2003 minus the natural logarithm of a firm's total employment in 1999. The growth in firm employment from 1999 to 2005 is defined as the natural logarithm of a firm's total employment in 2005 minus the natural logarithm of the firm's total employment in 1999. NTR tariff in 1999 is normal trade relation tariff rate at four-digit SIC sector level faced by the firm. All other control variables are defined in table A1: variable definition. In this table, column 1 and column 2 report the results of growth in firm employment from 1999 to 2003; Column 3 and column 4 report the results of growth in firm employment from 1999 to 2005. The observation unit is a bank-firm relationship pair. Heteroskedasticity robust standard errors clustered at the four-digit SIC sector level faced by the firm are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 7: Change in Bank ROA,1999-2003 in the Bank Sample

	Bank Sample			
	OLS	OLS	OLS	IV
	(1)	(2)	(3)	(4)
NTR Tariff in Bank,1999	0.088*	0.131**		0.222**
	(0.047)	(0.055)		(0.095)
Bank Size,1999		-0.214**	-0.234**	-0.251**
		(0.101)	(0.092)	(0.109)
Bank Capital,1999		16.567	17.428	18.369
		(16.982)	(15.842)	(13.986)
Number of Loan in Trade Sector,1999-2000		0.004	0.006*	0.005*
		(0.003)	(0.003)	(0.003)
Granular Firm Shock,1999-2000			0.387**	
			(0.173)	
Constant	-0.660**	1.612	2.224	1.814
	(0.262)	(1.740)	(1.598)	(2.207)
Observations	31	31	31	31
R^2	0.06	0.27	0.28	0.20

Note: This table reports the regression results of the change in bank ROA from 1999 to 2003 on NTR tariff in Bank in 1999 in the bank sample. Change in Bank ROA from 1999 to 2003 is defined as bank's return on asset in 2003 minus the bank's return on asset in 1999. NTR tariff in bank in 1999 is defined as bank's loan portfolio weighted average of normal trade relation tariff rate, where bank's loan portfolio is loan portfolio in the trade sector during pre-shock period:1999 to 2000, and normal trade relation tariff rate is the normal trade relation rate in 1999 at four-digit SIC level faced by the firm in the bank loan portfolio. All other control variables are defined in table A1: variable definition. Column 1 and column 2 report the OLS regression results; Column 3 reports reduce form results; Column 4 reports instrumental variable results. The observation unit is a unique bank. Heteroskedasticity robust standard errors are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 8: Change in Bank Outcome,1999-2003 in the Bank Sample

	Bank Sample			
	Change in Bank NPL,1999-2003		Change in Bank Security Ratio,1999-2003	
	(1)	(2)	(3)	(4)
NTR Tariff in Bank,1999	-0.055***	-0.047**	0.018***	0.018**
	(0.014)	(0.018)	(0.005)	(0.008)
Bank Size,1999		0.084		-0.011
		(0.052)		(0.010)
Bank Capital,1999		4.327		-0.248
		(4.560)		(1.487)
Number of Loan in Trade Sector,1999-2000		-0.001		0.000
		(0.001)		(0.000)
Constant	0.600***	-1.193	-0.026	0.192
	(0.067)	(0.911)	(0.021)	(0.214)
Observations	25	25	25	25
R^2	0.17	0.31	0.24	0.27

Note: This table reports the regression results of change in bank NPL from 1999 to 2003 and change in bank security ratio from 1999 to 2003 on NTR tariff in Bank in 1999 in the bank sample. The change in Bank NPL from 1999 to 2003 is defined as the bank's non-performing loan ratio in 2003 minus its non-performing loan ratio in 1999. The change in bank security ratio is the bank's security asset over the total asset in 2003 minus its security asset over the total asset in 1999. NTR tariff in bank in 1999 is defined as bank's loan portfolio weighted average of normal trade relation tariff rate, where bank's loan portfolio is loan portfolio in the trade sector during pre-shock period:1999 to 2000, and normal trade relation tariff rate is the normal trade relation rate in 1999 at four-digit SIC level faced by the firm in the bank loan portfolio. All other control variables are defined in table A1: variable definition. Column 1 and column 2 report the results of the change in bank NPL from 1999 to 2003; Column 3 and column 4 report the results of the change in bank security ratio from 1999 to 2003. The observation unit is a unique bank. Heteroskedasticity robust standard errors are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 9: Lending Relationship Exist in the Non-Trade Sector

	Lending Relationship Exist,1999-2003			
	Non-Trade Sector		Local Industry	
	(1)	(2)	(3)	(4)
Granular Firm Shock,1999-2000	-0.073***	-0.059**	-0.083***	-0.067**
	(0.023)	(0.026)	(0.027)	(0.032)
Bank Size,1999		0.013		0.009
		(0.015)		(0.017)
Bank Capital,1999		-0.391		-0.598
		(1.085)		(1.271)
Number of Loan in Trade Sector,1999-2000		0.000		0.000
		(0.000)		(0.000)
Observations	674	674	564	564
R^2	0.70	0.70	0.69	0.69
Borrower FE	Yes	Yes	Yes	Yes

Note: This table reports the regression of lending relationship exist from 1999 to 2003 on granular firm shock from 1999 to 2000 in the non-trade sector. Lending relationship exist between 1999 and 2003 is an indicator variable equal to 1 when a bank lends at least one loan to a firm in the non-trade sector during both the pre-shock period:1999 to 2000 and the post-shock period: 2002 to 2003; Otherwise, the value is 0. Granular firm shock from 1999 to 2000 is defined as bank's loan portfolio weighted average of normal trade relation tariff rate minus bank's simple average of normal trade relation rate in 1999, where bank's loan portfolio is loan portfolio in the trade sector during the pre-shock period:1999 to 2000, and normal trade relation tariff rate is the normal trade relation tariff at four-digit SIC level faced by the firm in the bank loan portfolio. All other control variables are defined in table A1: variable definition. The observation unit is a bank-firm relationship pair in the non-trade sector. Heteroskedasticity robust standard errors clustered at the bank level are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 10: Bank Shock on Firm Outcome in Non-Trade Sector

	All industries in Non-Trade Sector			
	Change in Firm ROA,1999-2003		Growth in Firm Sale,1999-2003	
	(1)	(2)	(3)	(4)
Granular Bank Shcok	0.077**	0.067**	0.554**	0.477*
	(0.034)	(0.031)	(0.274)	(0.262)
Firm Size,1999		-0.011*		-0.034
		(0.007)		(0.029)
Firm Tang,1999		0.030		0.330*
		(0.025)		(0.182)
Firm Age,1999		-0.000		-0.015***
		(0.000)		(0.003)
Constant	0.014	0.154*	0.507***	1.053***
	(0.014)	(0.093)	(0.093)	(0.398)
Observations	309	309	312	312
R^2	0.04	0.06	0.09	0.16
SIC1 FE	YES	YES	YES	YES

Note: This table reports the regression of the change in firm ROA from 1999 to 2003 and growth in firm sales from 1999 to 2003 on granular bank shock in the non-trade sector. The change in firm ROA is defined as the firm's return on asset ratio in 2003 minus the firm's return on asset ratio in 1999. The growth in firm sales from 1999 to 2003 is defined as the natural logarithm of a firm's total sales in 2003 minus the natural logarithm of the firm's total sales in 1999. Granular bank shock is defined as a firm's loan portfolio weighted average of Granular Firm Shock,1999-2000, where a firm's loan portfolio in the non-trade sector is the individual loan over total loans borrowed from multiple banks during the pre-shock period:1999 to 2000. All other control variables are defined in table A1: variable definition. In this table, column 1 and column 2 report the results of the change in firm ROA from 1999 to 2003; Column 3 and Column 4 report the results of growth in firm sales from 1999 to 2003. The observation unit is a unique firm in the non-trade sector. Heteroskedasticity robust standard errors are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table 11: Event Study of Firms in Trade Sector for the PNTR

Event Date	Cumulative Abnormal Return(CAR)	Number of Firms	Standard Error of CAR	T Statistics of CAR	Event Window
Panel A: Event Window [0,1]					
15-May-2000	-0.49%	242	0.32%	-1.56	[0,1]
24-May-2000	-2.07%	242	0.41%	-5.07	[0,1]
27-Jul-2000	-2.05%	235	0.51%	-4.05	[0,1]
19-Sep-2000	-0.93%	229	0.40%	-2.32	[0,1]
10-Oct-2000	-1.93%	229	0.48%	-4.03	[0,1]
Panel B: Event Window [0,2]					
15-May-2000	-0.58%	242	0.37%	-1.59	[0,2]
24-May-2000	-2.43%	241	0.51%	-4.73	[0,2]
27-Jul-2000	-1.31%	235	0.60%	-2.20	[0,2]
19-Sep-2000	-1.86%	229	0.45%	-4.16	[0,2]
10-Oct-2000	-1.97%	228	0.57%	-3.48	[0,2]
Panel C: Event Window [0,3]					
15-May-2000	-0.46%	242	0.43%	-1.06	[0,3]
24-May-2000	-2.48%	241	0.56%	-4.42	[0,3]
27-Jul-2000	-1.87%	235	0.60%	-3.11	[0,3]
19-Sep-2000	-2.89%	229	0.52%	-5.51	[0,3]
10-Oct-2000	-2.11%	228	0.59%	-3.55	[0,3]
Panel D: Event Window [0,4]					
15-May-2000	-0.95%	242	0.48%	-1.99	[0,4]
24-May-2000	-2.70%	241	0.65%	-4.14	[0,4]
27-Jul-2000	-1.01%	235	0.61%	-1.65	[0,4]
19-Sep-2000	-3.28%	229	0.52%	-6.30	[0,4]
10-Oct-2000	-2.51%	228	0.62%	-4.05	[0,4]
Panel D: Event Window [0,5]					
15-May-2000	-1.82%	242	0.54%	-3.35	[0,5]
24-May-2000	-2.46%	241	0.76%	-3.23	[0,5]
27-Jul-2000	-2.28%	235	0.65%	-3.48	[0,5]
19-Sep-2000	-4.05%	229	0.61%	-6.61	[0,5]
10-Oct-2000	-3.41%	228	0.76%	-4.46	[0,5]

Note: This table reports the event study results of the firm in the trade sector for PNTR. Column 1 indicates the event date for five big events for PNTR shock; Column 2 indicates the cumulative abnormal return; Column 3 shows the number of firms in the sample. Column 4 shows standard error of cumulative abnormal return; Column 4 shows the T statistics of cumulative abnormal return; Column 5 indicates the event window. We use the market model to estimate the abnormal return and cumulative abnormal return using 200 previous trading days as the estimation window and 20 previous trading days as the gap window. For more details, please see section B of the appendix.

Table 12: Aggregate Implication of Loan Loss For PNTR

Hypothetical Tariff Change: %	Share of Loan Loss of Shock: %	Trade Loan Ratio in 1999	Change in Total C&I Loan 1999-2003: Billions	Loan Loss of Shock in Economy: Billions
0.1	7.69	0.29	-58.79	-1.29
0.5	38.44	0.29	-58.79	-6.46
0.8	61.51	0.29	-58.79	-10.33

Note: This table reports the aggregate implication of loan loss for PNTR. Column 1 shows the hypothetical tariff change in our analysis. Column 2 shows the share of loan loss led by PNTR shock in our sample. Column 3 shows the ratio of total loans in the trade sector to total loans in 1999, estimated from our sample of Dealscan. Column 4 shows the change in total commercial and industrial loans from 1999 to 2003, and we retrieve this data from the website of the Federal Reserve System in Saint Louis. Column 5 shows the loan losses of the Economy wide due to PNTR shock.

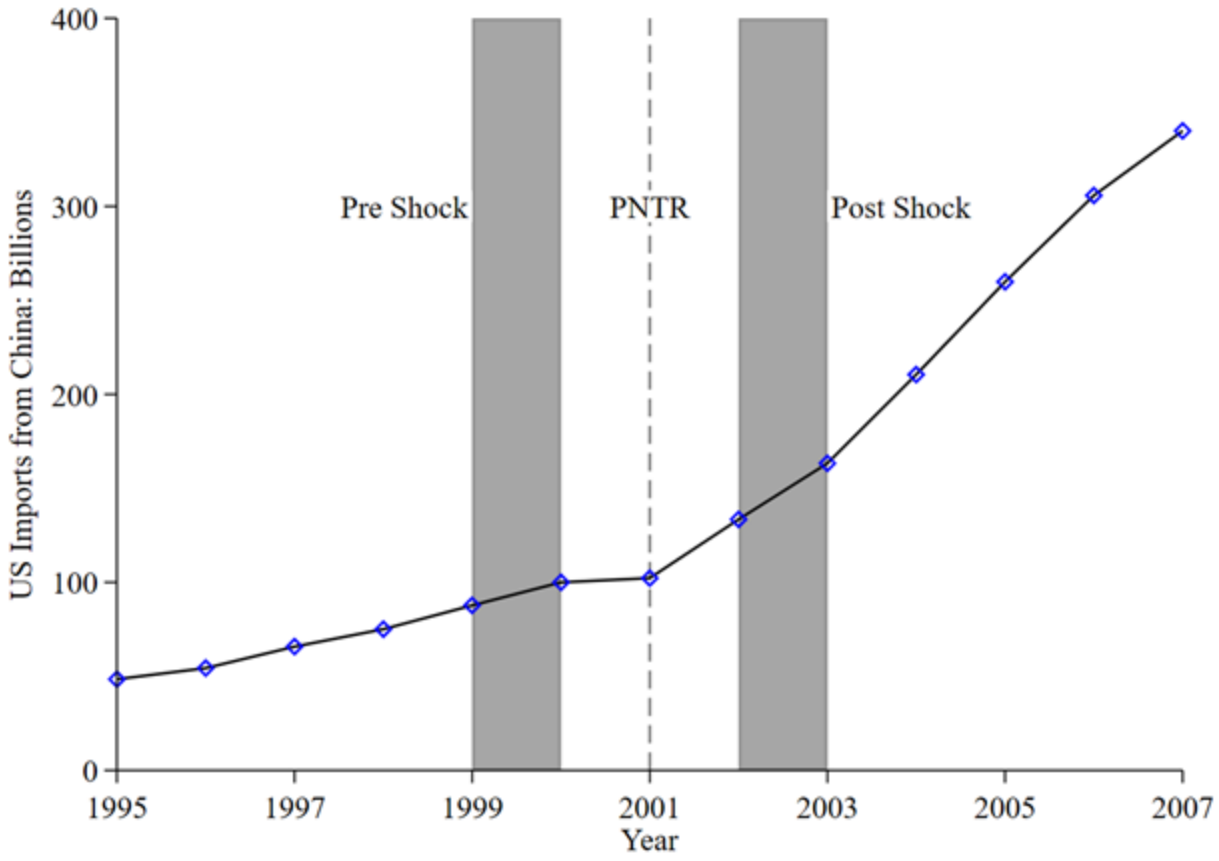

Figure 1: PNTR and Imports from China.

Note: This figure shows yearly US imports from China from 1995 and 2007. PNTR shock happened in 2001; the Pre-shock period is from 1999 to 2000; the Post-shock period is from 2002 to 2001.

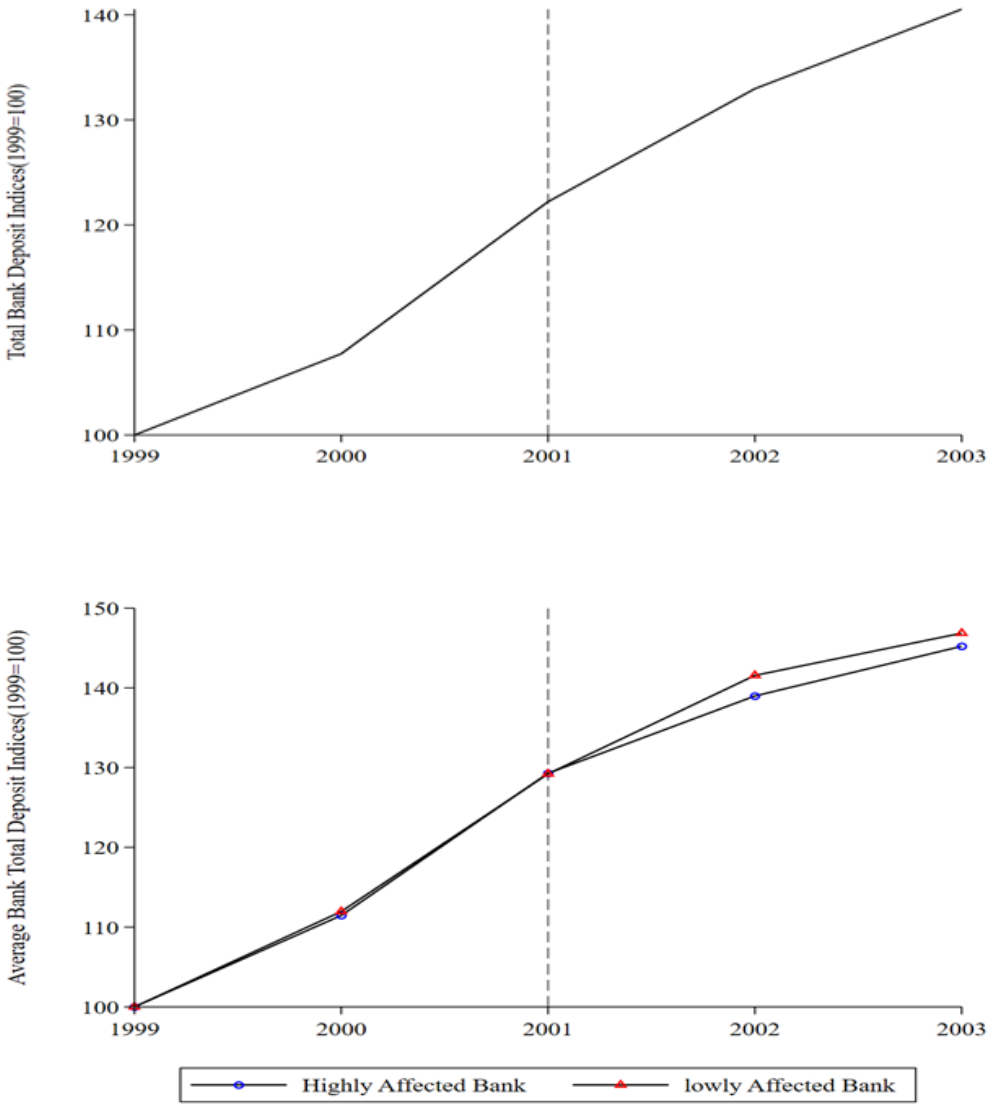

Figure 2: PNTR Shock and Bank Total Deposit in the Sample.

Note: The top panel shows the annual total bank deposit in our sample (normalized to 100 in 1999). The bottom panel shows the yearly average bank total deposit across the highly affected bank and lowly affected bank from 1999 to 2003(normalized to 100 in 1999). Highly affected bank is the bank whose granular firm shock from 1999 to 2000 is less than the sample median value. Lowly Affected bank is the bank whose granular firm shock from 1999 to 2000 is larger than the sample median.

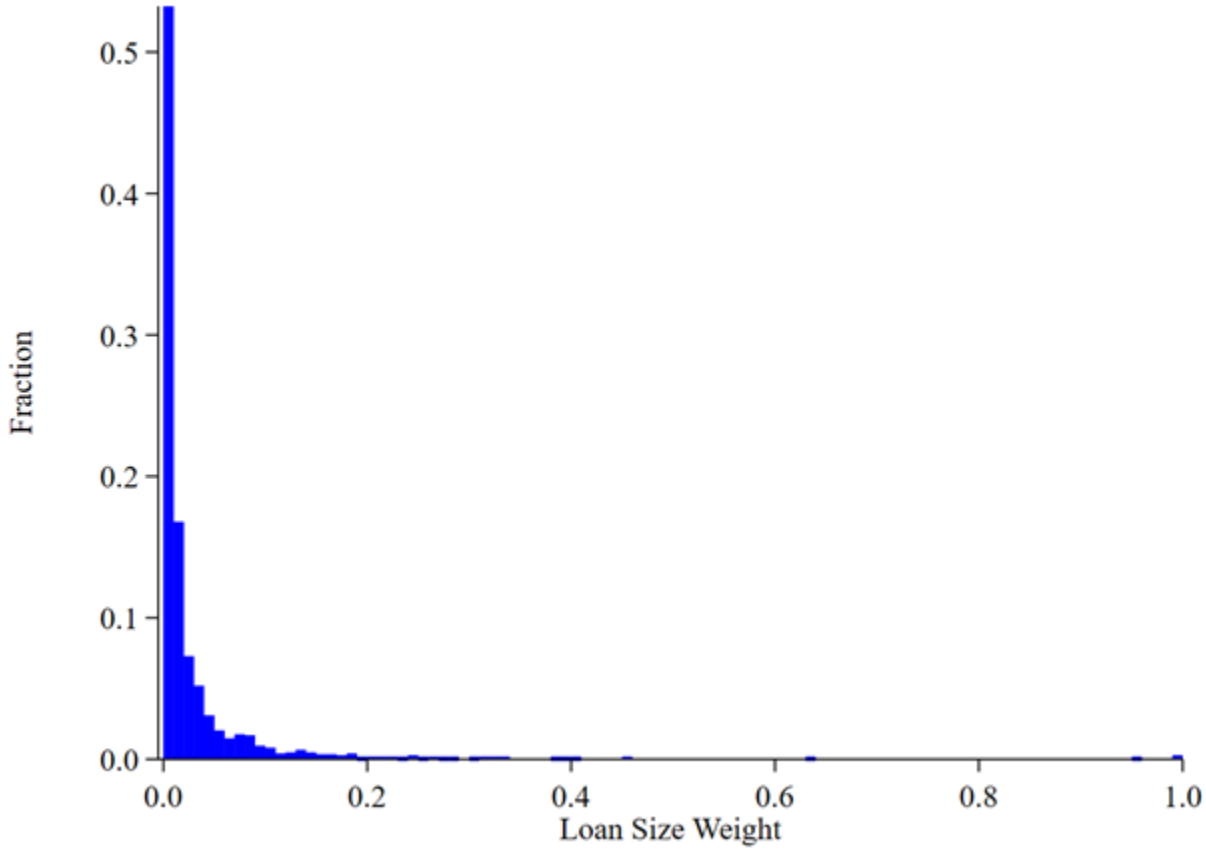

Figure 3: the Distribution of Loan Size Weight in Bank's Loan Portfolio,1999-2000

Note: This figure shows the distribution of loan size weight in a bank's loan portfolio from 1999 to 2000.

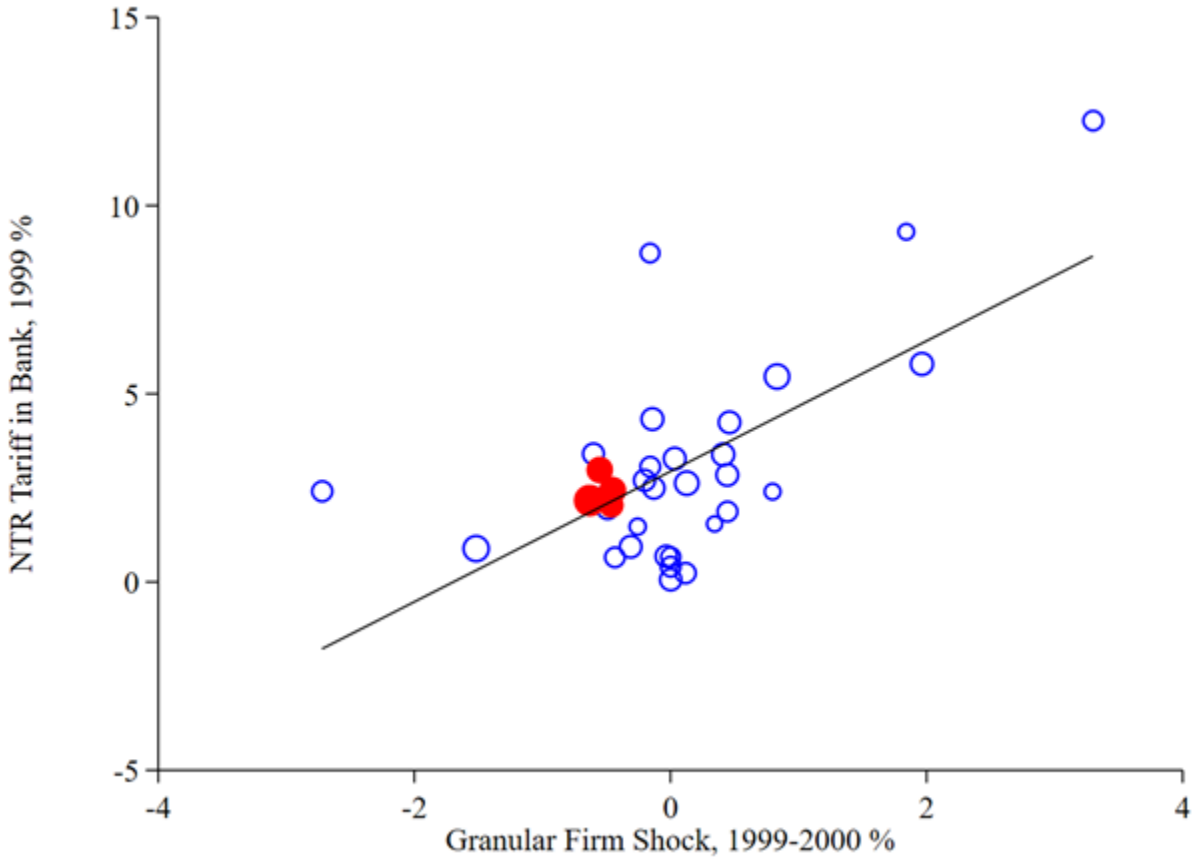

Figure 4: NTR Tariff in Bank, 1999 and Granular Firm Shock, 1999-2000

Note: This figure shows the scatterplot of NTR tariff in bank in 1999 against granular firm shock from 1999 to 2000. The size of circles is the bank capital ratio. Red circles are the top four banks in the United States, including JP Morgan Chase, Bank of America, Citi Group, and Wells Fargo.

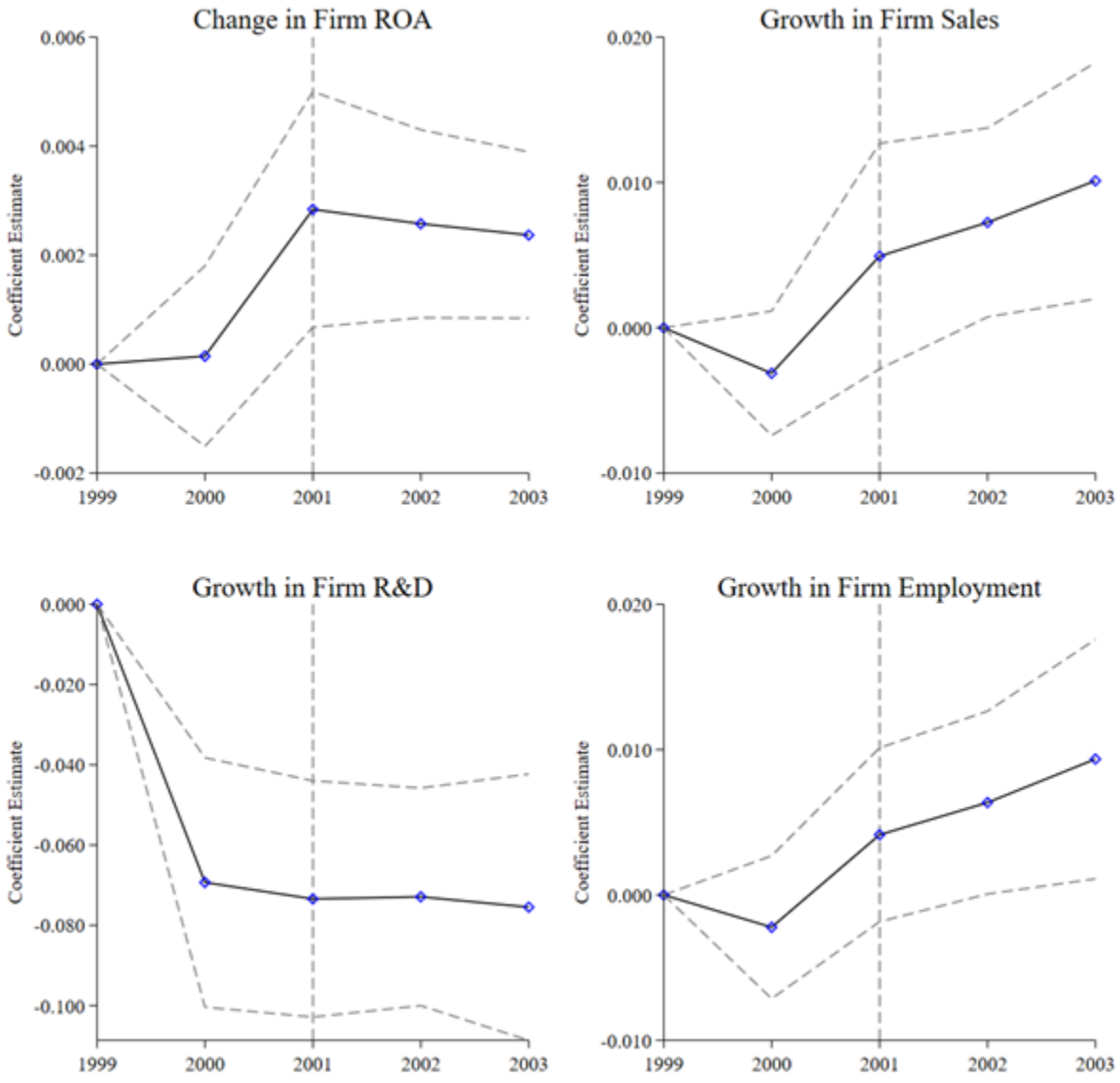

Figure 5: Cumulative Effect of PNTR shock on Firm Outcome in the Trade Sector.

Note: This figure presents the estimates of $\{\beta^h\}$ from $\Delta_h Y_{b,f,1999+h} = \alpha^h + \beta^h \times \text{NTR Tariff } 1999_f + \gamma^{h\prime} X_f + \delta_s^h + \delta_b^h + \epsilon_{b,f,}^h$ h = 1,2,3,4. Dashed line represents 95% confidence intervals calculated from standard error.

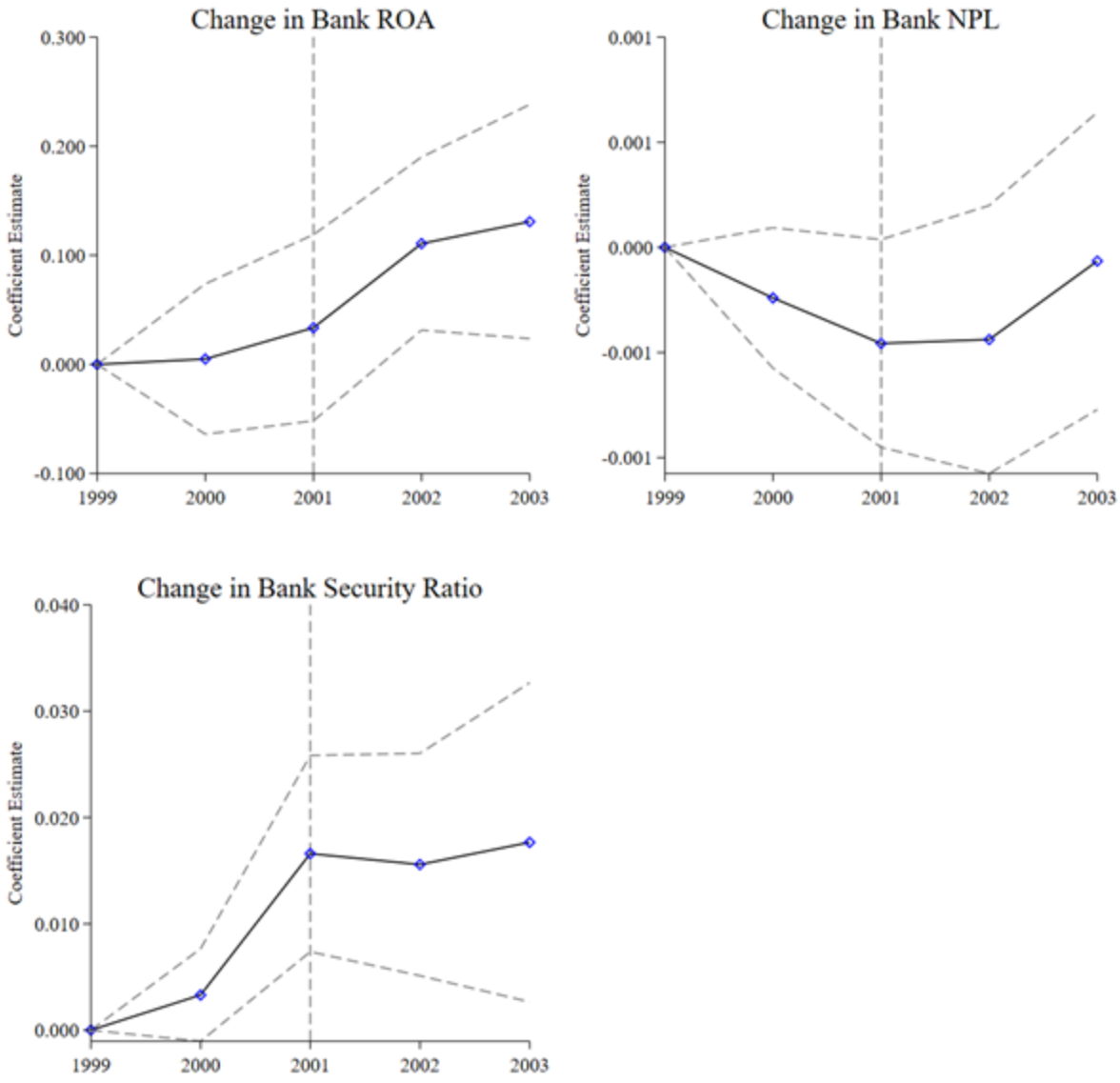

Figure 6: Cumulative Effect of PNTR Shock on Bank Outcome.

Note: This figure presents the estimates of $\{\beta^h\}$ from $\Delta_h Y_{b,1999+h} = \alpha^h + \beta^h \times$ NTR Tariff in Bank $1999_b + \gamma^{h\prime} X_b + \epsilon_b^h$, $h = 1,2,3,4$. Dashed line represents 95% confidence intervals calculated from standard error.

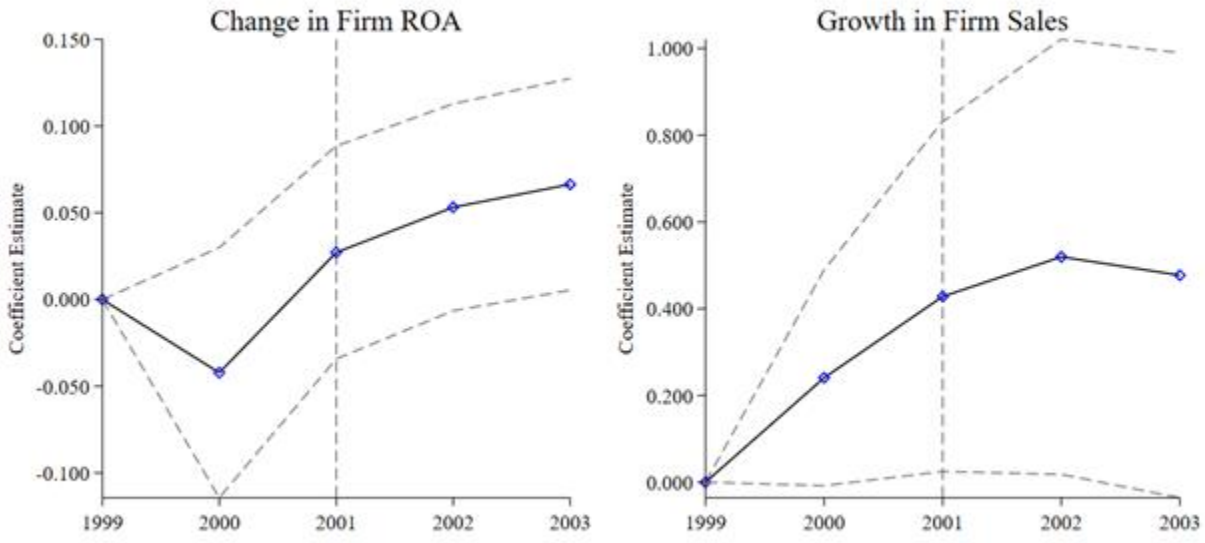

Figure 7: Cumulative Effect of PNTR Shock on Outcomes of Firm in the Non-trade Sector

Note: This figure presents estimates of $\{\beta^h\}$ from $\Delta_h Y_{c,1999+h} = \alpha^h + \beta^h \times \text{Granular Bank Shock}_c + \gamma^{h\prime} X_c + \delta_s^h + \epsilon_c^h$, $h = 1,2,3,4$. Dashed line represents 95% confidence intervals calculated from standard error.

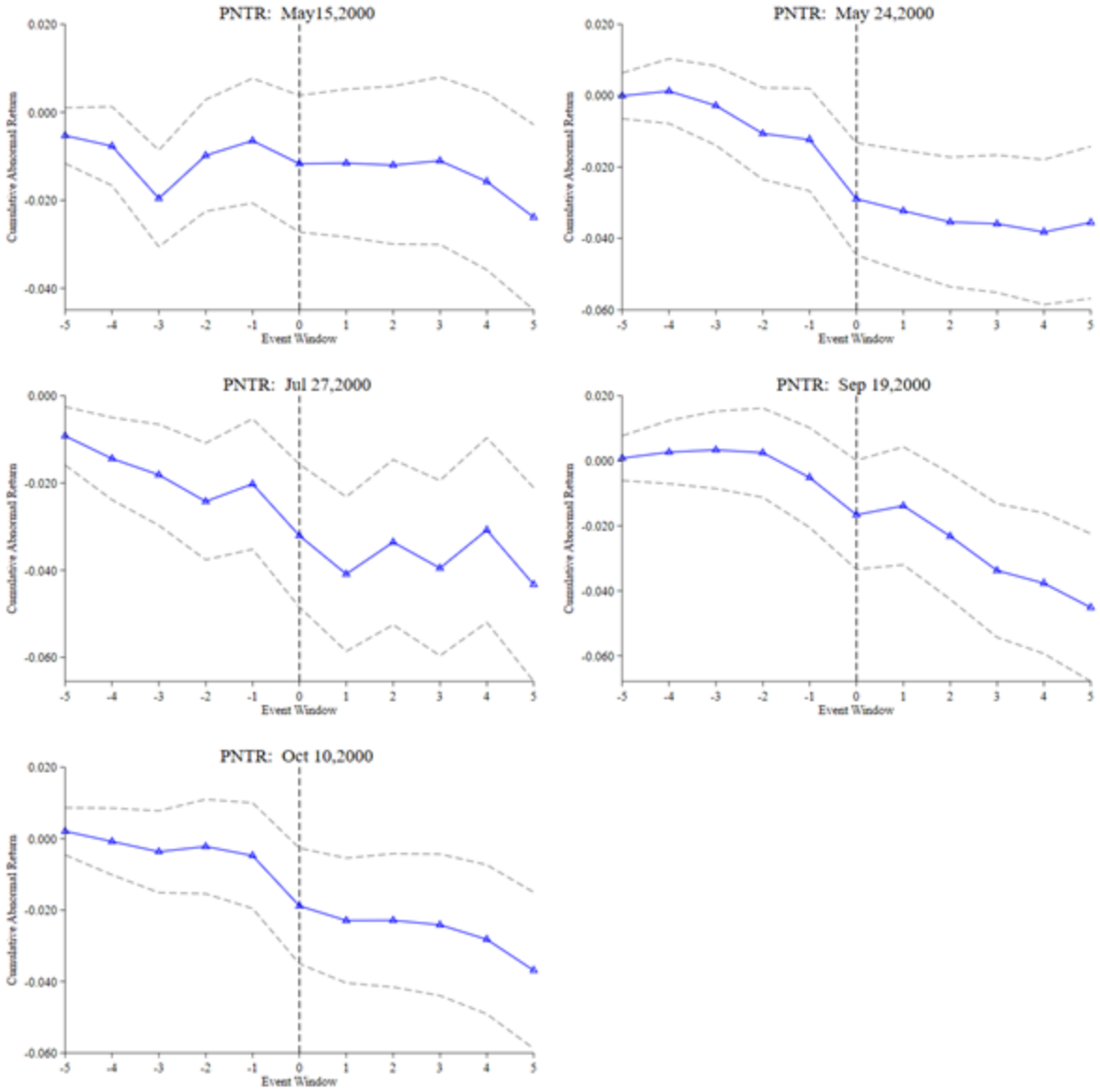

Figure 8: Cumulative Abnormal Return of all Firms in the Trade Sector for PNTR Event

Note: This figure shows the cumulative abnormal return of all firms in the trade sector for the PNTR shock. The solid line is the cumulative abnormal return, and the dashed line is the 95% confidence interval calculated by standard error. We use the market model to estimate the abnormal return and cumulative abnormal return using 200 previous trading days as the estimation window and 20 previous trading days as the gap window. For more details, please see section B of the appendix.

Online Appendix

Trade Shocks Through Banking Lending Channel

A. Additional Tables and Figures

Table A 1: Variable Definition

Variable	Variable Name	Definitions	Source
		Panel A: Trade Sector	
Firm Bank Exist	Lending Relationship Exist,1999-2003	An indicator variable equal to 1 when bank lends at least one loan to firm during both pre-shock period:1999 to 2000 and post-shock period: 2002 to 2003; Otherwise, the value is 0.	Dealscan
Loan Amount	Growth in Loan Amount, 1999-2003	Natural logarithm of loan amount times loan ratio for the first loan between the firm and bank during the post-shock period: 2002 to 2003 minus natural logarithm of loan amount times loan ratio for the last loan between the firm and bank during pre-shock period:1999 to 2000.	Dealscan
Loan Spread	Change in Loan Spread, 1999-2003	Loan spread for the first loan between the firm and bank during the post-shock period: 2002 to 2003 minus loan spread for the last loan between the firm and bank during the pre-shock period: 1999 to 2000.	Dealscan
ROA9903	Change in Firm ROA,1999-2003	Firm's return on asset ratio in 2003 minus firm's return on asset ratio in 1999.	Compustat

Sale9903	Growth in Firm Sales,1999-2003	Natural logarithm of firm's total sales in 2003 minus natural logarithm of firm's total sales in 1999.	Compustat
R&D9903	Growth in Firm R&D, 1999-2003	Natural logarithm of firm's R&D expenditure in 2003 minus natural logarithm of firm's R&D expenditure in 1999.	Compustat
R&D9905	Growth in Firm R&D, 1999-2005	Natural logarithm of firm's R&D expenditure in 2005 minus natural logarithm of firm's R&D expenditure in 1999.	Compustat
Emp9903	Growth in Firm Employment, 1999-2003	Natural logarithm of firm's total employment in 2003 minus natural logarithm of firm's total employment in 1999.	Compustat
Emp9905	Growth in Firm Employment, 1999-2005	Natural logarithm of firm's total employment in 2005 minus natural logarithm of firm's total employment in 1999.	Compustat
NTR_Rate	NTR Tariff,1999 %	Normal trade relation tariff rate at four-digit SIC sector level faced by the firm.	Peter Schott's webpage
Firm_Size99	Firm Size, 1999	Natural logarithm of firm's total asset in 1999.	Compustat
Firm_Tang99	Firm Tang, 1999	Firm's total tangible asset over the total asset in 1999.	Compustat
Firm_Age99	Firm Age, 1999	Year 1999 minus the first year when the firm exists in the Compustat database.	Compustat
		Panel B: Banking Holding Company	
Bank_ROA9903	Change in Bank ROA, 1999-20003 %	Bank's return on asset in 2003 minus bank's return on asset in 1999.	Compustat
NPL9903	Change in Bank NPL,1999-2003 %	Bank's non-performing loan ratio in 2003 minus bank's return on asset in 1999	FR Y-9C

Security Ratio9903	Change in Bank Security Ratio,1999-2003	Bank's security asset over the total asset in 2003 minus bank security asset over the total asset in 1999.	FR Y-9C
Bank_DD99	Bank Distance Default,1999	Bank's Merton distance to default in 1999.	CRSP
Bank_DD00	Bank Distance Default, 2000	Bank's Merton distance to default in 2000.	CRSP
Bank_DD9900	Change in Bank Distance Default, 1999-2000	Bank's Merton distance to default in 2000 minus bank's Merton distance to default in 1999.	CRSP
SBank_Ntrrate	NTR Tariff in Bank, 1999 %	Bank's loan portfolio weighted average of normal trade relation tariff rate, where bank's loan portfolio is loan portfolio in the trade sector during the pre-shock period: 1999 to 2000, and normal trade relation tariff rate is the normal trade relation tariff rate in 1999 at four-digit SIC level faced by the firm in the bank loan portfolio.	Author's Calculation
GIV	Granular Firm Shock,1999-2000 %	Bank's loan portfolio weighted average of normal trade relation tariff rate minus bank's simple average of normal trade relation rate in 1999, where bank's loan portfolio is loan portfolio in the trade sector during the pre-shock period: 1999 to 2000, and normal trade relation tariff rate is the normal trade relation tariff rate in 1999 at four-digit SIC level faced by the firm in the bank loan portfolio.	Author's Calculation
Bank_Size99	Bank Size, 1999	Natural logarithm of bank's total asset in 1999.	Compustat
Bank_Capital99	Bank Capital, 1999	Bank's total equity over the total asset in 1999.	Compustat
PreLoan_Num	Number of Loan in Trade Sector, 1999-2000	Bank's total number of loans in the trade sector during pre-shock Period:1999 to 2000.	Dealscan

		Panel C: Non-Trade Sector	
Firm Bank Relationship	Lending Relationship Exist, 1999-2003	An indicator variable equal to 1 when bank lends at least one loan to firm during the pre-shock period:1999 to 2000 and the post-shock period: 2002 to 2003; Otherwise, the value is 0.	Dealscan
Firm_ROA9903	Change in Firm ROA, 1999-2003	Firm's return on asset ratio in 2003 minus firm's return on asset ratio in 1999,	Compustat
Firm_Sale9903	Growth in Firm Sale, 1999-2003	Natural logarithm of firm's total sales in 2003 minus natural logarithm of firm's total sales in 1999.	Compustat
Nonfirm_Shock	Granular Bank Shock %	Non-trade sector firm's loan portfolio weighted average of Granular Firm Shock, 1999-2000 %, where non-trade sector firm's loan portfolio is the induvial loan over total loans borrowed from multiple banks during the pre-shock period: 1999 to 2000.	Author's Calculation
Firm_Size99	Firm Size, 1999	Natural logarithm of firm's total asset in 1999.	Compustat
Firm_Tang99	Firm Tang, 1999	Firm's total tangible asset over the total asset in 1999.	Compustat
Firm_Age99	Firm Age, 1999	Year 1999 minus the first year when the firm exists in the Compustat database.	Compustat

Note: This table reports variable definitions of all key variables in our paper. Column 1 indicates the variable; Column2 indicates the variable name; Column 3 indicates the variable definitions; Column 4 indicates the data source.

Table A 2: Exogenous Test of Our Variable in the Bank Sample

	Bank Sample					
	Bank Distance Default,1999		Bank Distance Default,2000		Change in Bank Distance Default,1999-2000	
	(1)	(2)	(3)	(4)	(5)	(6)
NTR Tariff in Bank,1999	-0.022	-0.031	-0.018	-0.033	0.002	0.003
	(0.039)	(0.028)	(0.024)	(0.022)	(0.034)	(0.034)
Bank Size,1999		0.054		0.057		0.011
		(0.056)		(0.058)		(0.028)
Bank Capital,1999		-10.724***		-10.650***		1.145
		(2.787)		(2.841)		(2.666)
Number of Loan in Trade Sector,1999-2000		0.001		0.001*		0.000
		(0.001)		(0.001)		(0.001)
Constant	0.508***	0.331	0.426***	0.177	-0.079	-0.364
	(0.126)	(1.043)	(0.111)	(1.120)	(0.109)	(0.492)
Observations	33	33	32	32	32	32
R^2	0.01	0.32	0.01	0.37	0.00	0.01

Note: This table reports the regression results of the bank's Merton distance to default on NTR tariff in Bank in 1999 in the bank sample. Bank's Merton distance to default is defined as the natural logarithm of the probability that the bank's market value of the asset is greater than the bank's market value of the liability. NTR tariff in the bank in 1999 is defined as bank's loan portfolio weighted average of normal trade relation tariff rate, where bank's loan portfolio is loan portfolio in the trade sector during pre-shock period:1999 to 2000, and normal trade relation tariff rate is the normal trade relation rate in 1999 at four-digit SIC level faced by the firm in the bank loan portfolio. All other control variables are defined in table A1: variable definition. Column 1 and column 2 report results of the bank's Merton distance to default in 1999; Column 3 and column 4 report the bank's Merton distance to default in 2000; Column 5 and column 6 report results of the change in bank's Merton distance to default between 1999 and 2000. The observation unit is a unique bank. Heteroskedasticity robust standard errors are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table A 3: Change in Bank Risk, 1999-2003 in the Bank Sample

	Bank Sample			
	OLS	OLS	OLS	IV
	(1)	(2)	(3)	(4)
NTR Tariff in Bank,1999	-0.063	-0.120		0.063
	(0.170)	(0.259)		(0.294)
Bank Size,1999		-0.538	-0.619	-0.630
		(0.626)	(0.584)	(0.565)
Bank Capital,1999		-62.859	-58.430	-57.635
		(50.439)	(53.670)	(51.485)
Number of Loan in Trade Sector,1999-2000		-0.015	-0.013	-0.013
		(0.011)	(0.011)	(0.010)
Granular Firm Shock,1999-2000			0.110	
			(0.570)	
Constant	-2.041*	13.148	13.782	13.721
	(1.037)	(12.364)	(12.512)	(11.870)
Observations	30	30	30	30
R^2	0.00	0.11	0.11	0.10

Note: This table reports the regression results of change in bank risk from 1999 to 2003(bank risk is measured by bank ROA standard deviation estimated by 3 previous years window) on NTR tariff in Bank in 1999 in the bank sample. The change in Bank ROA from 1999 to 2003 is defined as the bank's ROA standard deviation in 2003 minus its ROA standard deviation in 1999. NTR tariff in the bank in 1999 is defined as bank's loan portfolio weighted average of normal trade relation tariff rate, where bank's loan portfolio is loan portfolio in the trade sector during pre-shock period:1999 to 2000, and normal trade relation tariff rate is the normal trade relation rate in 1999 at four-digit SIC level faced by the firm in the bank loan portfolio. All other control variables are in table A1: variable definition. Column 1 and column 2 report the OLS regression results; Column 3 reports reduce form results; Column 4 reports instrumental variable results. The observation unit is a unique bank. Heteroskedasticity robust standard errors are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table A 4: Bank Shock on Firm Outcome in the Local Industry

	Local Industry in Non-Trade Sector			
	Change in Firm ROA,1999-2003		Growth in Firm Sale,1999-2003	
	(1)	(2)	(3)	(4)
Granular Bank Shcok	0.113**	0.099**	0.669*	0.556
	(0.045)	(0.043)	(0.377)	(0.368)
Firm Size,1999		-0.011		-0.048
		(0.007)		(0.036)
Firm Tang,1999		0.021		0.298
		(0.029)		(0.205)
Firm Age,1999		-0.000		-0.015***
		(0.000)		(0.004)
Constant	0.026	0.162	0.550***	1.284***
	(0.017)	(0.105)	(0.121)	(0.468)
Observations	244	244	247	247
R^2	0.06	0.07	0.10	0.18
SIC1 FE	YES	YES	YES	YES

Note: This table reports the regression of change in firm ROA from 1999 to 2003 and growth in firm sales from 1999 to 20003 on granular bank shock in the local industry of non-trade sector. The change in firm ROA is defined as the firm's return on asset ratio in 2003 minus the firm's return on asset ratio in 1999. The growth in firm sales from 1999 to 2003 is defined as the natural logarithm of a firm's total sales in 2003 minus the natural logarithm of the firm's total sales in 1999. Granular bank shock is defined as a firm's loan portfolio weighted average of Granular Firm Shock,1999-2000, where a firm's loan portfolio in the non-trade sector is the individual loan over total loans borrowed from multiple banks during the pre-shock period:1999 to 2000. All other control variables are defined in table A1: variable definition. In this table, column 1 and column 2 report the results of the change in firm ROA from 1999 to 2003; Column 3 and Column 4 report the results of growth in firm sales from 1999 to 2003. The observation unit is a unique firm in the local industry of the non-trade sector. Heteroskedasticity robust standard errors are in parentheses. Significance level with 0.1,0.05,0.01 level is indicated following respectively: * p<0.1; ** p<0.05; *** p<0.01.

Table A 5: Event Study of Banks for the PNTR

Event Date	Cumulative Abnormal Return(CAR)	Number of Banks	Standard Error of CAR	T Statistics of CAR	Event Window
Panel A: Event Window [0,1]					
15-May-2000	-2.13%	32	0.36%	-5.89	[0,1]
24-May-2000	-0.38%	32	0.78%	-0.48	[0,1]
27-Jul-2000	1.77%	32	0.52%	3.39	[0,1]
19-Sep-2000	-0.03%	32	0.55%	-0.05	[0,1]
10-Oct-2000	-2.92%	32	0.42%	-6.99	[0,1]
Panel B: Event Window [0,2]					
15-May-2000	-2.16%	32	0.69%	-3.13	[0,2]
24-May-2000	0.77%	32	0.92%	0.83	[0,2]
27-Jul-2000	1.87%	32	0.64%	2.90	[0,2]
19-Sep-2000	-1.25%	32	0.61%	-2.03	[0,2]
10-Oct-2000	-5.44%	32	0.52%	-10.55	[0,2]
Panel C: Event Window [0,3]					
15-May-2000	0.32%	32	0.82%	0.38	[0,3]
24-May-2000	-1.50%	32	1.03%	-1.45	[0,3]
27-Jul-2000	2.61%	32	0.71%	3.67	[0,3]
19-Sep-2000	-0.83%	32	0.94%	-0.88	[0,3]
10-Oct-2000	-3.11%	32	0.66%	-4.69	[0,3]
Panel D: Event Window [0,4]					
15-May-2000	0.42%	32	0.91%	0.47	[0,4]
24-May-2000	-0.37%	32	1.00%	-0.37	[0,4]
27-Jul-2000	2.95%	32	0.51%	5.84	[0,4]
19-Sep-2000	1.36%	32	1.19%	1.14	[0,4]
10-Oct-2000	-2.64%	32	0.94%	-2.80	[0,4]
Panel C: Event Window [0,5]					
15-May-2000	2.70%	32	1.13%	2.40	[0,5]
24-May-2000	0.43%	32	1.21%	0.35	[0,5]
27-Jul-2000	5.41%	32	0.46%	11.82	[0,5]
19-Sep-2000	1.25%	32	1.35%	0.93	[0,5]
10-Oct-2000	-4.50%	32	1.05%	-4.28	[0,5]

Note: This table reports the event study results of the bank in our sample for PNTR. Column 1 indicates the event date for five big events for PNTR shock; Column 2 indicates the cumulative abnormal return; Column 3 shows the number of firms in the sample. Column 4 shows standard error of cumulative abnormal return; Column 4 shows the T statistics of cumulative abnormal return; Column 5 indicates the event window. We use the market model to estimate the abnormal return and cumulative abnormal return using 200 previous trading days as the estimation window and 20 previous trading days as the gap window. For more details, please see section B of the online appendix.

Table A 6: Event Study of All Firms in Non-trade Sector for PNTR

Event Date	Cumulative Abnormal Return(CAR)	Number of Firms	Standard Error of CAR	T Statistics of CAR	Event Window
Panel A: Event Window [0,1]					
15-May-2000	-0.63%	363	0.41%	-1.52	[0,1]
24-May-2000	-1.84%	362	0.45%	-4.07	[0,1]
27-Jul-2000	-1.52%	348	0.38%	-4.02	[0,1]
19-Sep-2000	-1.39%	344	0.34%	-4.06	[0,1]
10-Oct-2000	-0.87%	343	0.40%	-2.18	[0,1]
Panel B: Event Window [0,2]					
15-May-2000	-0.70%	362	0.47%	-1.47	[0,2]
24-May-2000	-1.67%	362	0.47%	-3.58	[0,2]
27-Jul-2000	-1.02%	347	0.47%	-2.17	[0,2]
19-Sep-2000	-1.96%	344	0.43%	-4.56	[0,2]
10-Oct-2000	-1.90%	343	0.48%	-3.96	[0,2]
Panel C: Event Window [0,3]					
15-May-2000	-1.04%	362	0.53%	-1.95	[0,3]
24-May-2000	-2.14%	362	0.55%	-3.91	[0,3]
27-Jul-2000	-1.47%	347	0.55%	-2.70	[0,3]
19-Sep-2000	-2.64%	344	0.52%	-5.04	[0,3]
10-Oct-2000	-1.08%	343	0.56%	-1.92	[0,3]
Panel D: Event Window [0,4]					
15-May-2000	-1.11%	362	0.54%	-2.05	[0,4]
24-May-2000	-2.20%	362	0.57%	-3.90	[0,4]
27-Jul-2000	-1.29%	347	0.62%	-2.09	[0,4]
19-Sep-2000	-2.66%	344	0.62%	-4.32	[0,4]
10-Oct-2000	-1.75%	343	0.56%	-3.14	[0,4]
Panel E: Event Window [0,5]					
15-May-2000	-2.14%	362	0.61%	-3.50	[0,5]
24-May-2000	-1.75%	361	0.60%	-2.92	[0,5]
27-Jul-2000	-1.71%	347	0.62%	-2.74	[0,5]
19-Sep-2000	-3.35%	344	0.72%	-4.68	[0,5]
10-Oct-2000	-2.45%	343	0.64%	-3.82	[0,5]

Note: This table reports the event study results of the firm in the non-trade sector for PNTR. Column 1 indicates the event date for five big events for PNTR shock; Column 2 indicates the cumulative abnormal return; Column 3 shows the number of firms in the sample. Column 4 shows standard error of cumulative abnormal return; Column 4 shows the T statistics of cumulative abnormal return; Column 5 indicates the event window. We use the market model to estimate the abnormal return and cumulative abnormal return using 200 previous trading days as the estimation window and 20 previous trading days as the gap window. For more details, please see section B of the appendix.

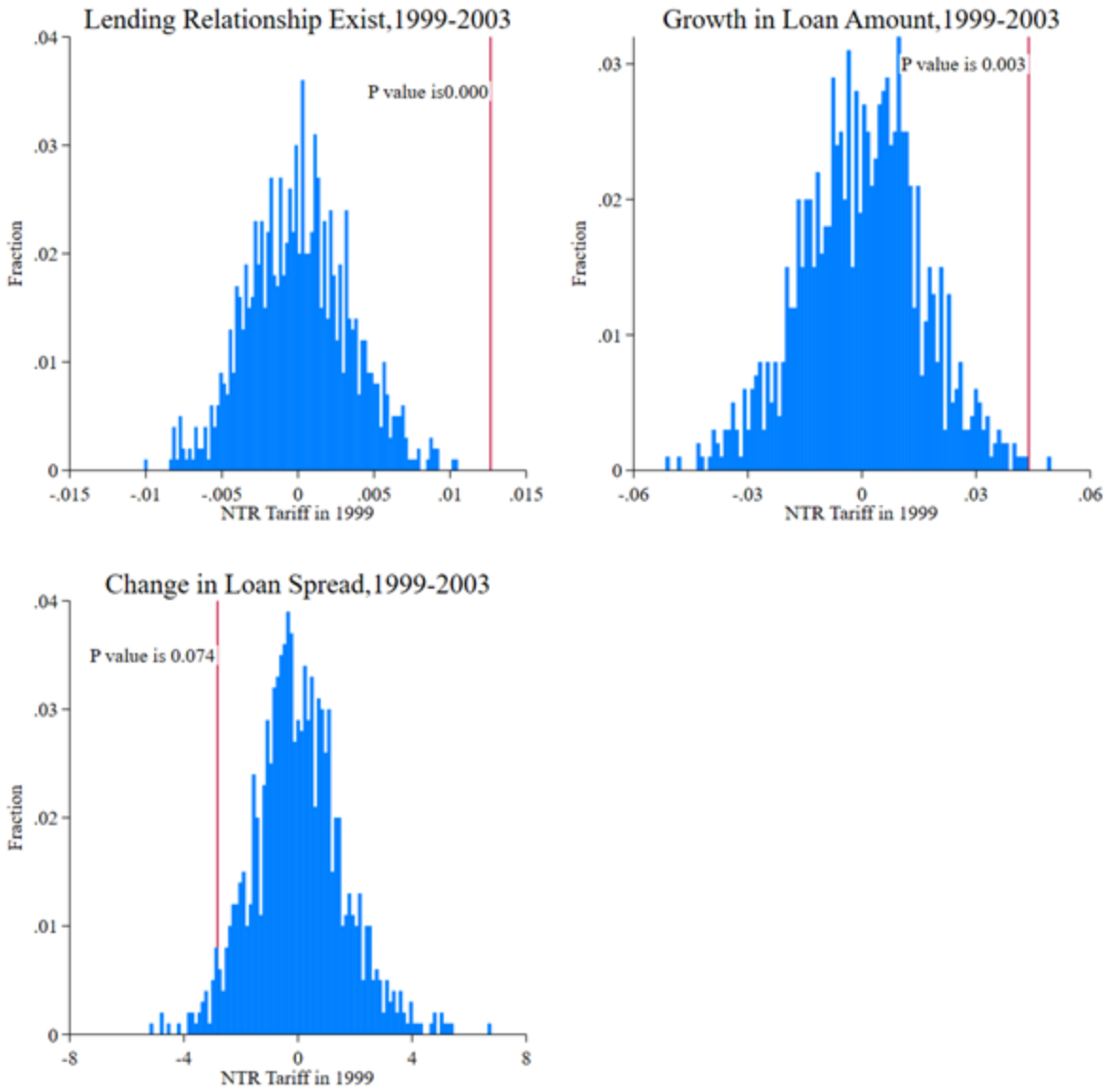

Figure A 1: Placebo Test of PNTR Shock

Note*:* This figure shows the distribution of placebo coefficients on NTR tariff in 1999. The red line plots the actual coefficient. The p value is the ratio: the number of placebo coefficients greater than the absolute value of the actual coefficient over the total number of placebo coefficients. The simulation number is 1000 times.

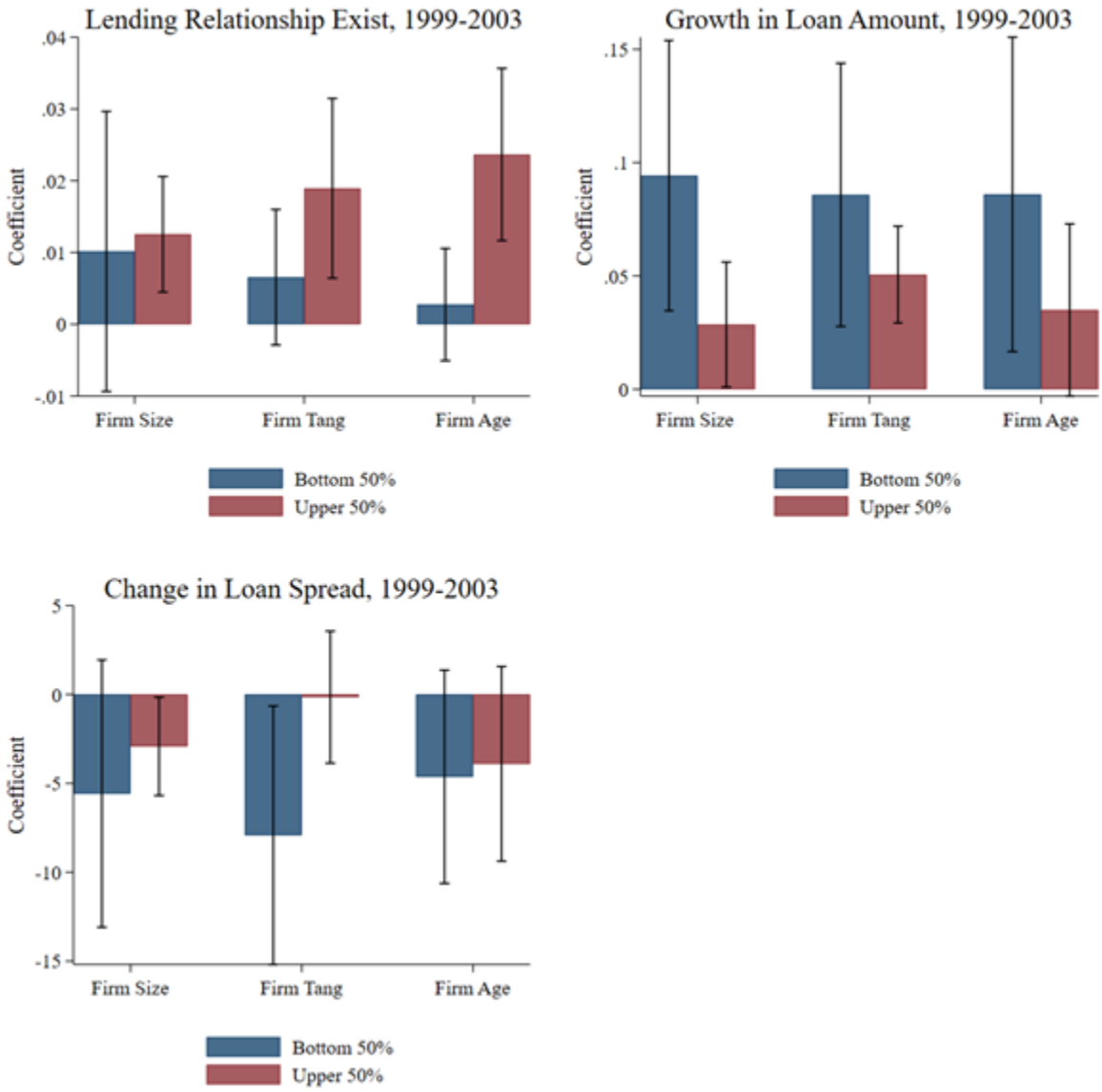

Figure A 2: Heterogeneous Effect of PNTR Shock

Note: This figure shows the heterogeneous effect of PNTR shock on loan contract outcomes between banks and firms in the trade sector. We split the sample into two subsamples: bottom 50% and upper 50% based on firm characteristics in 1999: firm size, firm tang, and firm age. We estimate the equation to obtain the coefficient and coefficient standard error of NTR tariff in 1999. The blue bar represents the coefficient of NTR tariff in 1999 in the bottom 50% subsample, and the red bar represents the coefficient of NTR Tariff in 1999 in the upper 50% subsample. The black line represents the 95% confidence interval of the coefficient of NTR Tariff in 1999.

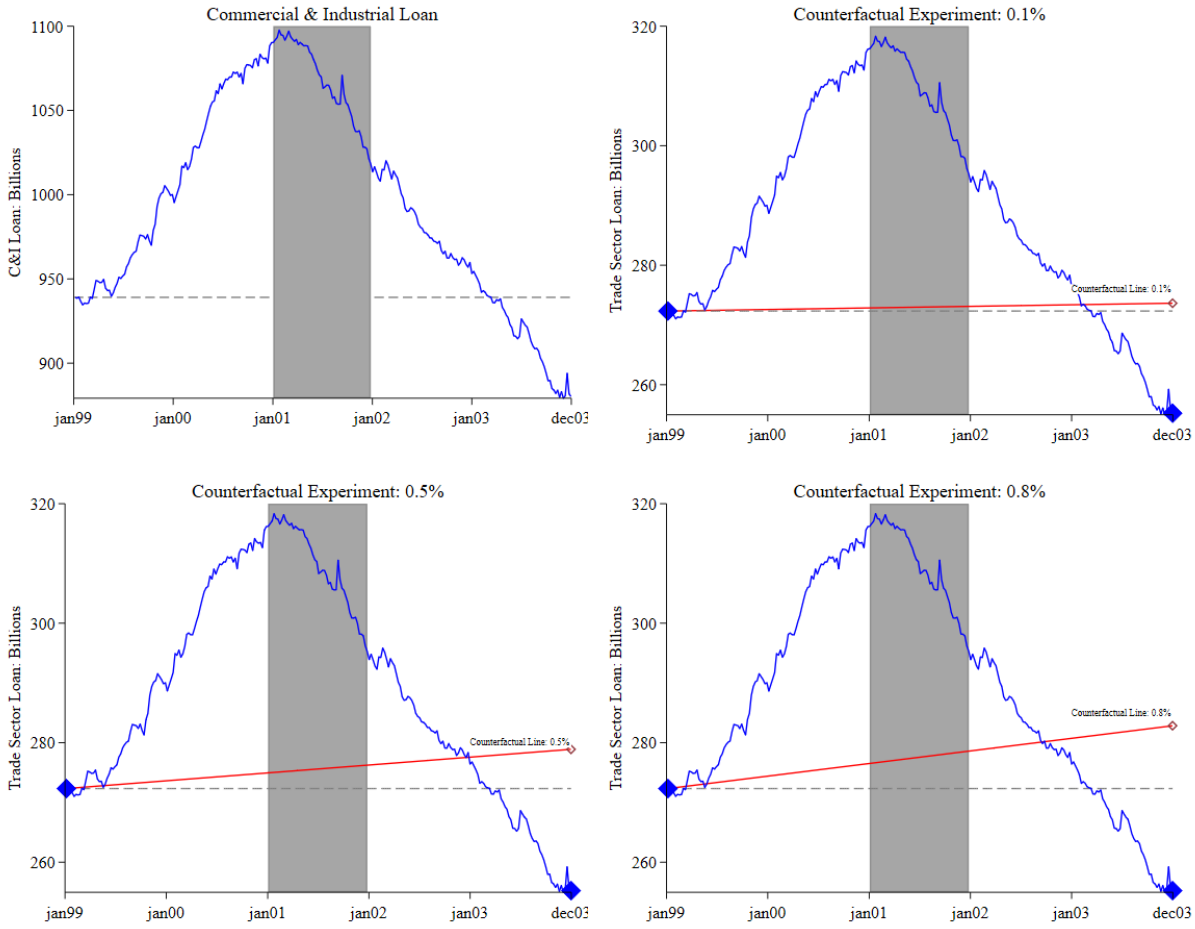

Figure A 3: Aggregate Effect of PNTR

Note: This figure shows the aggregate effect of the PNTR. The upper left panel shows the time series of total commercial and industrial loans in the United States. The upper right panel shows the counterfactual experiment with the given hypothetical tariff rate of 0.1 percent. The bottom left panel shows the counterfactual experiment with the given hypothetical tariff rate of 0.5 percent. The bottom right panel shows the counterfactual experiment with the given hypothetical tariff rate of 0.8 percent. The gray shade indicates the year 2001. The blue line shows the real value path. The red line shows the counterfactual value path.

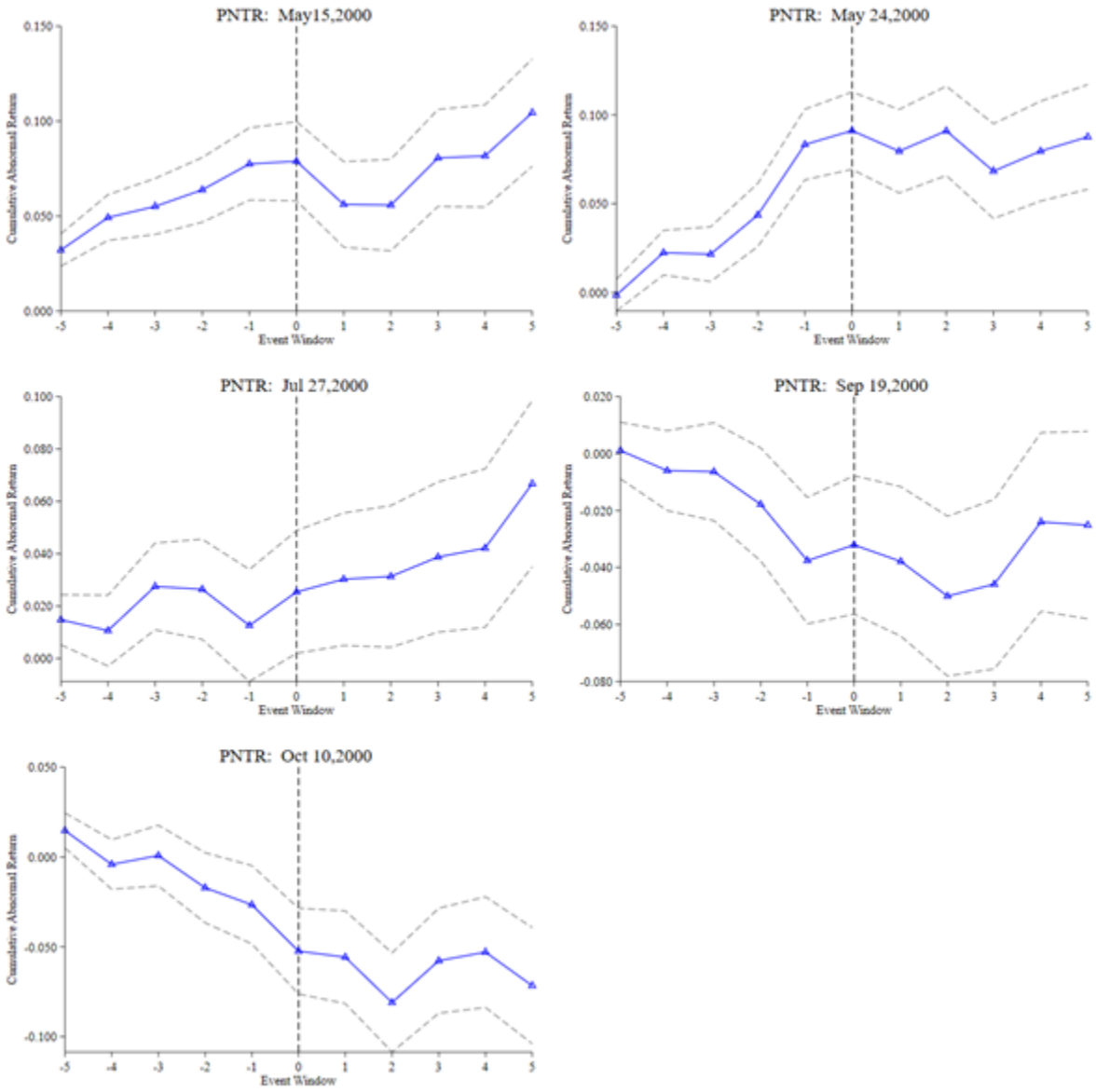

Figure A 4: Cumulative abnormal Return of Banks for PNTR Event

Note: This figure shows the cumulative abnormal return of banks in our sample for PNTR shock. The solid line is the cumulative abnormal return, and the dashed line is the 95% confidence interval calculated by standard error We use the market model to estimate the abnormal return and cumulative abnormal return using 200 previous trading days as estimation window and 20 previous trading days as gap window. For more details, please see section B of the appendix.

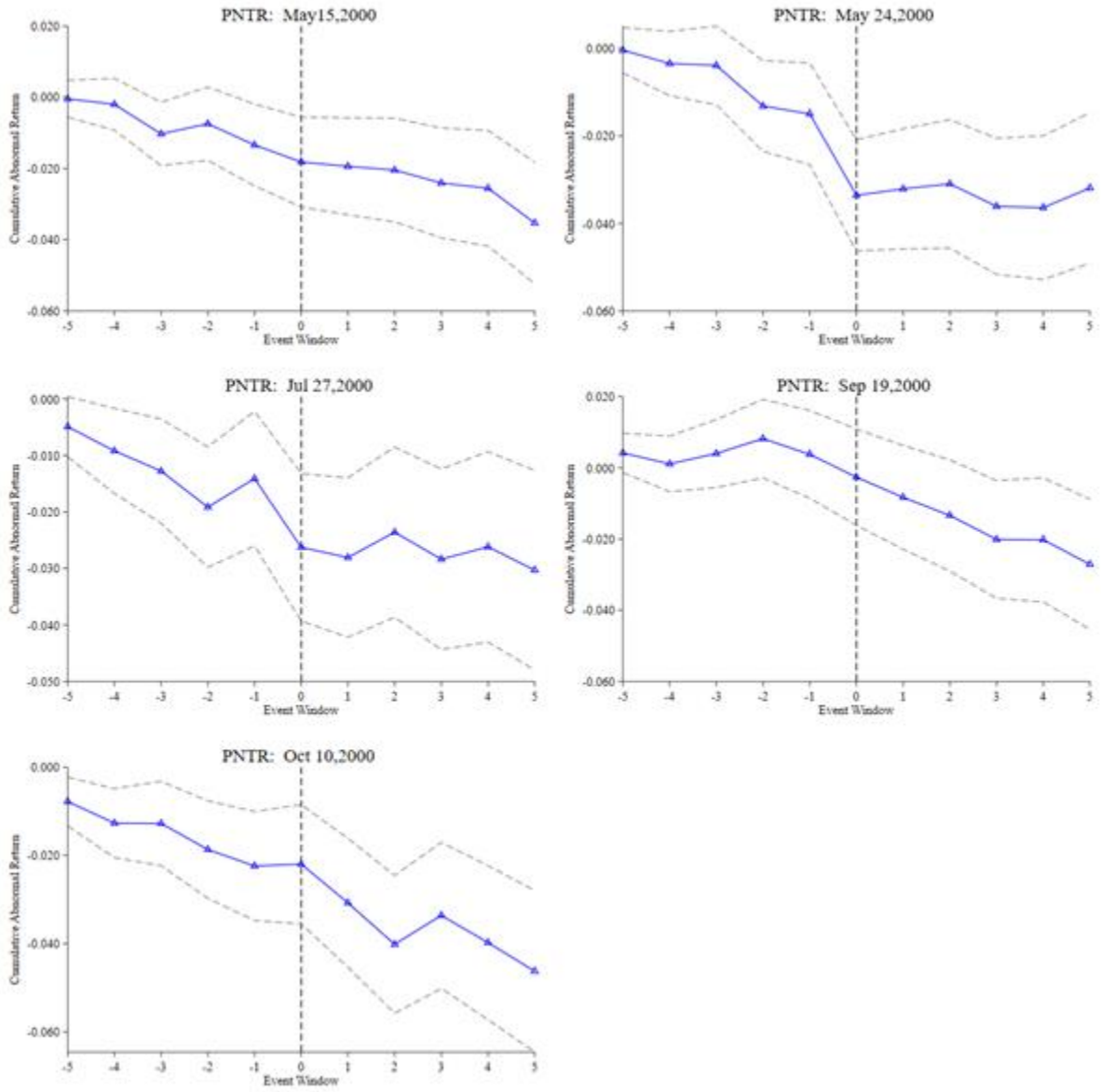

Figure A 5: Cumulative Abnormal Return of all firms in the Non-trade Sector for PNTR Event

Note: This figure shows the cumulative abnormal return of all firms in the non-trade sector for PNTR shock. The solid line is the cumulative abnormal return, and the dashed line is the 95% confidence interval calculated by standard error. We use the market model to estimate the abnormal return and cumulative abnormal return using 200 previous trading days as the estimation window and 20 previous trading days as the gap window. For more details, please see section B of the appendix.

B. Event Study Design

In section 5.4, we use event study design to test the stock market reaction to the five big events associated with PNTR shock based on methods illustrated in Mackinlay (1997). We define abnormal return of firm i at time t as following

$$\mathrm{A}R_{it} = R_{it} - \mathrm{E}(R_{it}|X_t) \quad (A.1)$$

Where AR_{it} is the abnormal return of firm i at time t, R_{it} is the actual return of firm i at time t, and $E(R_{it}|X_t)$ is the expected return of firm i at time t given the information set X_t.

To estimate the firm's expected return given the information, we take advantage of the market model to estimate the firm's expected return using an estimation window of 200 previous trading days and the gap window of 20 previous trading days relative to the event date. When the event date is not a trading day, we use the closest trade day after the actual event date as the event date in the test.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$
$$E(\varepsilon_{it}) = 0 \quad var(\varepsilon_{it}) = \sigma_i^2$$
$$E(R_{it}|X_t) = \alpha_{it} + \beta_i R_{mt} \quad (A.2)$$

where R_{it} is the firm i's daily stock return at trading day t and R_{mt} is the market return at trading day t, measured by CRSP value-weighted market portfolio return. The expectation of error term in the market model is 0, and the variance of the error term is σ_i^2.

We define the cumulative abnormal return of firm i from time t_1 to time t_2 as following:

$$CAR_{i,t_1,t_2} = \sum_{t=t_1}^{t_2} AR_{it} \quad (A.3)$$

We use sample mean of all firms' abnormal return at time t to estimate the abnormal return of event at time t, and the sample mean estimator is following:

$$\overline{AR_t} = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \quad (A.4)$$

So the variance of the abnormal return of event is this:

$$var(\overline{AR_t}) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_i^2 \quad (A.5)$$

In this case, we know that the distribution of abnormal return of event at time t is the normal distribution with a mean of 0 and variance of $var\overline{AR_t}$. We construct the t statistics to test the significance of the event's anormal return at time t.

Further, we define the cumulative abnormal return of the event from t_1 to t_2 as following:

$$\overline{CAR_{t_1,t_2}} = \sum_{t=t_1}^{t_2} AR_t \ (A.6)$$

The variance of the cumulative abnormal return of the event from t_1 to t_2 is like this:

$$var\left(\overline{CAR_{t_1,t_2}}\right) = \sum_{t=t_1}^{t_2} var\overline{AR_t} \ (A.7)$$

So the cumulative anormal return of event from t_1 to t_2 is the normal distribution with a mean of 0 and variance of $var\overline{CAR_{t_1,t_2}}$, and we can construct the t statistics to test the significance of the cumulative abnormal return of the event from t_1 to t_2.