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Chinese import competition and the provisions for external debt financing in the US

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Abstract

How does international competition originating from low-wage countries affect domestic financing capacity of firms in high-wage countries? In this article, we use China's entry into the World Trade Organization (WTO) as a quasi-natural experiment to investigate the effects of trade-induced competition originating from China on the price and design of bank-loan contracts for firms in US manufacturing industries. We find that the elevated level of Chinese import competition in the US, following China's WTO entry, is associated with a reduction in the overall cost of bank financing for import-competing US manufacturing firms, evidenced by lower spread, higher amount, longer maturity, and less restrictive non-price contract terms such as collateral and covenants. We show that such reduction in the external financing premiums of import-competing firms is the result of trade-induced productivity gains within firms and a reallocation of financing between firms towards more capital-intensive and technologically advanced firms. These results suggest that engaging in international business activities with a low-wage country via trade openness is likely to ease the provisions of external debt financing for firms in high-wage countries.

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INTRODUCTION

The rise of China as a global manufacturing powerhouse has generated vigorous debate about the merits of globalization in the West.[1] On the one hand, rising Chinese imports have been associated with higher firm exit, higher unemployment, lower labor-force participation, and reduced wages in import-competing manufacturing industries (Acemoglu, Autor, Dorn, Hanson, & Price, 2016; Autor, Dorn, & Hanson, 2013). On the other hand, a consensus has emerged that lower trade barriers induce higher firm productivity (Baldwin & Forslid, 2010; Melitz, 2003; Melitz & Ottaviano, 8; Topalova & Khandelwal, 2011) leading to faster economic growth (Ben-David, 1993; Dollar, 1992; Edwards, 1998; Sachs & Warner, 1995). While the debate on the distributional implications of globalization is still ongoing, there is little evidence in the international business literature on how such realignments in firm dynamics (induced by globalization) have material

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influence on firm-level financial access in the West.[2] The purpose of this article is to fill this gap by examining how a key stakeholder of the firm, the bank, values trade-induced uncertainty originating from a low-wage country into the pricing and design of debt contracts of manufacturing firms in a high-wage country. To this end, we use China's entry into the World Trade Organization (WTO) as a quasi-natural experiment to identify a trade shock originating from a low-wage country and show that engaging in international business activities with a low-wage country via trade openness is likely to ease the provisions of debt financing in high-wage countries. The underlying mechanism through which such amelioration in financial access occurs is the trade-induced productivity gains within firms and a reallocation of financing between firms towards more innovative, capital-intensive, and technologically advanced firms.

Trade openness is a complex and multifaceted construct with profound implications for firm dynamics in both developed and developing countries (Czinkota & Ronkainen, 1997). It is one of the cornerstone economic policies in many countries and is the primary vehicle for local firms to internationalize their product-market reach. Despite the near-universal adoption of trade openness as a means of fostering economic growth and accessing new markets, there is theoretical ambiguity and empirical scarcity on how liberalization affects the cost of capital for firms in developed countries that are at the receiving end of import competition from low-wage countries. If all countries produce the same products and compete in international markets, price-wage arbitrage will lead to reduction in world prices of goods and wages in all countries. Therefore, a key determinant of gains from international business activities via trade openness is how directly countries compete on the world product-market spectrums. In theory, trade-induced competition originating from a low-wage country such as China should disproportionately affect the market-share of low-tech and labor-intensive sectors in high-wage countries. However, the valuation impact of such trade-induced competition on developed countries' firms remains ambiguous, depending on how competitive-intensity influences the import-competing firm's creditworthiness.[3] In sum, whether and to what extent engaging in international business activities with China via trade openness affects the provisions of financing in a high-wage country like the US is an empirical question.

Therefore, the present study is significant to international business research for three reasons: First, we use bank-loan contracting data to shed insight on how a unique creditor, who provides expert monitoring (Diamond, 1984) and has inside knowledge of firms' financial health (Billett, Flannery, & Garfinkel, 2006; Campbell & Kracaw, 1980; Gande & Saunders, 2012), incorporates international competitive pressure originating from a country with different factor endowments (labor-abundant as opposed to capital-abundant) into the valuation of firms. Second, we analyze both price and non-price loan-contract terms providing a multidimensional yet unified perspective on how corporate valuation evolves (from creditors' perspectives) in the face of foreign competition. Finally, absent trade liberalization, firms can overcome segmented markets and other imperfections through a variety of other globalization strategies (Caves, 1971; Errunza & Senbet, 1981). One strand of international business literature investigates the impact of corporate globalization on firm value (Gande, Schenzler, & Senbet, 2009; Li, Qiu, & Wan, 2011; Mansi & Reeb, 2002; Reeb, Mansi, & Allee, 2001; Zhou, Booth, & Chang, 2013). Our analysis, on the financing provisions of US manufacturing firms that are at the receiving end of globalization by Chinese firms, can complement this rich literature by examining whether the positive valuation impact of globalization, as documented in the extant literature, flows both ways.

Using bank-loan contracting information for a sample of US manufacturing firms around China's WTO entry, we document three key results: First, we show (using a longitudinal regression framework) that higher import competition from China is associated with lower cost of bank loans in the US during the post-WTO periods compared to the pre-WTO average. For an import-competing firm experiencing a 14% rise (75th percentile of the post-WTO change in Chinese import-share) in Chinese competition, our results imply a 17.675 basis-points reduction in loan spread. For the average-size loan ($420.45 million) issued in the post-WTO periods, this translates into $0.743 million yearly savings in interest expense. We show that our longitudinal regression results are robust to alternative specifications of the conditional model of loan spread. The pooled OLS regression results, however, could be biased for two reasons: the lower loan cost in the post-WTO periods could be due to

the lower spreads of surviving firms (survivorship bias) or to the exit of firms with higher loan cost (selection bias). To further examine this issue, we decompose the average spread into selection and survivorship components and find that the decline in average spread in the post-WTO periods is primarily due to survivors experiencing lower loan cost over time, not due to high loan-cost firms exiting the industry.

We then focus on a sample of surviving firms that remain active in the loan-market before and after China's WTO entry. Using a within-firm estimator, similar to Khwaja and Mian (2008), to control for changes in firm-level loan-demand shocks, we find results similar to longitudinal regressions. We also find that the post-WTO period rise in Chinese import competition is associated with higher loan amount, longer maturity, and less restrictive non-price terms such as covenants. Next, we investigate the underlying mechanism via which trade-induced import competition engenders an elevated level of within-firm loan-market access. We use the measure of Total Factor Productivity (TFP) to capture the changes in (trade-induced) overall efficiency within a firm. We find that increased exposure to low-wage-country trade resulting from China's WTO entry leads to a higher level of productivity within firms, in turn, facilitating an elevated level of loan-market access for US manufacturers. The within-firm effect of trade openness is robust to controlling for loan-supply shocks, industry-demand shocks, and potential endogeneity of US imports from China in the post-WTO periods. Finally, we show that lower trade barriers with low-wage countries have asymmetric effects on the acquisition of financing by firms in high-wage countries, depending on the *ex ante* technological sophistication of firms' production; *ex ante* high-tech firms observe disproportionately higher supply (amount) of loan financing with lower price (spread) in the post-WTO periods compared to *ex ante* low-tech firms. These results highlight that trade exposure originating from a low-wage country has distributional impact on corporate welfare in high-wage countries towards a more efficient allocation of financial resources.

The novelty of our contribution is threefold. First, we enrich the international business literature by systematically examining a rich set of loan-contracting data and showing that engaging in international business activities with a low-wage country via trade openness can ease the provisions of bank financing for firms in high-wage countries. Of note, a number of studies in the finance literature generally argue that product-market competition limits access to external financing for firms in developed countries. Much of this literature either focuses on competition emanating from peer firms in the local economy or from reduction in import tariffs without specifically focusing on low-wage-country competition (Huang & Lee, 2013; Valta, 2012; Xu, 2012). By contrast, we focus on import competition arising from a low-wage country, i.e., China, and show, contrary to conventional wisdom, that competition originating from China can eventually increase financial access of firms in developed countries. The underlying mechanism via which such amelioration in financial access occurs is the trade-induced enhancement in productivity within firms. In that, our results also contribute to resolving the theoretical ambiguity on how the source of competition affects the ease of financing. Second, our article sheds light on the (beneficial) distributional implications of engaging in international business activities via trade openness by showing that creditors reallocate financing (in the post-WTO periods) away from low-tech and labor-intensive firms towards high-tech and capital-intensive firms, leading to a more efficient allocation of financial resources. Finally, several recent studies such as Acemoglu et al. (2016), Autor et al. (2013), Bernard, Redding, and Schott (2007, 2010), Bloom, Draca, and Van Reenen (2016), and Mion and Zhu (2013) show that import competition from China, particularly after China's WTO entry, generated profound real effects in terms of employment, innovation, and productivity in developed markets. Our article highlights how such real effects of trade openness to China translate into financial consequences for firms in the US by showing that creditors, in general, favorably value such trade-induced realignments in the industrial composition of a developed country's market in the pricing and design of debt contracts and that the key to unlocking the gains from trade openness to China is the locus of a firm in the global productivity and technology spectrum.

The remainder of this article is structured as follows. "Why does Trade with China Matter for Financial Contracting?" section discusses the motivation underlying the empirical design of the article. "Data and Variables" section describes the data and the main variables. "Empirical Analysis" section discusses the longitudinal regression and within-firm and between-firm fixed effects regression estimation strategies and results. "Conclusion" section concludes the article.

WHY DOES TRADE WITH CHINA MATTER FOR FINANCIAL CONTRACTING?

Why should engaging in international business activities with China via trade openness affect the provisions of external financing for US manufacturing firms? Conventional models of international trade (e.g., Dixit & Norman, 1980; Krugman, 1980; Leamer, 1984) suggest that high-wage countries like the US have little to fear but much to gain from the emergence of low-wage countries like China. Driven by their comparative advantages and relative endowments of capital, skill, and labor, highly labor-abundant countries like China are expected to produce and export relatively labor-intensive goods without competing directly in the world market with capital- and skill-abundant countries like the US that ought to manufacture and export capital- and skill-intensive goods. The extent to which countries specialize in different sets of goods is, therefore, a key determinant to understanding the real and financial implications of engaging in international business activities via trade openness.

Melitz (2003) was among the first to show, theoretically, that falling trade barriers between countries generates both winners and losers, as better-performing firms expand into foreign markets and grow, while worse-performing firms contract and exit in the face of foreign competition, leading to an elevated level of productivity. Krugman (2008) argues that such trade-induced disruptions in firm dynamics are likely to be amplified when the competition originates from a low-wage country like China. This is because unlike peer-firm competition, emanating from the local and other developed economies, competition originating from low-wage countries severely disrupts operations of low-tech and labor-intensive firms in developed countries (Acemoglu et al., 2016; de la Torre, Arpan, Jedel, Ogram, & Toyne, 1977). Empirically, many papers have found that trade liberalization increases aggregate industrial productivity, however, the mechanism through which this occurs remains poorly understood (Bloom et al., 2016). One particular mechanism via which trade liberalization induces productivity gain that has been a mainstay of the theoretical trade literature is innovation (Grossman & Helpman, 1992). It has been argued that trade openness to low-wage countries can increase competitive intensity and such competition could foster innovation through reducing agency costs (Schmidt, 1997) and by enabling domestic firms to access better overseas' knowledge (Acharya & Keller, 2008; Coe & Helpman, 1995). While the literature on the real effects of international business activities via trade openness is voluminous, how trade-induced competition originating from low-wage countries affects financing constraints of firms in high-wage countries is relatively little studied.

Rajan and Zingales (2003) argue that a country's openness to trade spurs financial development, international integration, and growth by weakening the power of economic and political incumbencies that may block financial liberalization, thereby expanding financial access for firms. Besides this political interest group theory, falling trade barriers, in general, can increase product market competition (Helpman & Krugman, 1989), although the effects of competition on the cost of debt are theoretically ambiguous. Competition reduces market power and profits making it more difficult for borrowers to raise external financing (Tirole, 2006, p. 283). Firms in import-competing industries face a constant threat of predation by foreign firms, where foreign rivals can adopt aggressive pricing strategies, significantly increasing the default risk of incumbent firms (Bolton & Scharfstein, 1990). Trade-induced competition could also adversely affect an industry's ability to absorb a defaulted firm's assets, magnifying the fire sale effect (Shleifer & Vishny, 1992). The higher default risk and lower liquidation value of firms in import-competing industries imply that the cost of debt for firms in such industries is also higher (Benmelech, Garmaise, & Moskowitz, 2005; Bradley & Roberts, 2004; Fries, Miller, & Perraudin, 1997; Strahan, 1999; Zhdanov, 2007). Alternatively, higher trade-induced competition can increase managerial effort, as the fear of bankruptcy is higher (Bloom & Van Reenen, 2007; Hart, 1983; Schmidt, 1997) and, in turn, can force discipline on managers and act as a substitute for corporate governance mechanisms. As a result, firms are more efficiently run, more profitable, and less risky in import-competing industries, suggesting that the cost of external financing should be lower for such firms.

In summary, the foregoing theories point towards two effects of international business activities via trade openness. First, lower trade barriers can increase the cost of external financing by increasing the default risk and reducing the liquidation value of a firm. However, firms can respond to the heightened competition from low-wage countries by improving efficiency and by switching to a more innovative and high-tech product mix. If

the default-risk and liquidation-value effects exceed the efficiency and innovation effects, the cost of external financing will increase after liberalization. In contrast, if the latter effects exceed the former, we should observe a relatively lower cost of external financing after liberalization. This could be labeled as the "within-firm" effect of trade-related international business activities. Second, if we consider a framework where we keep the menu of products fixed in the economy and trade barriers fall between a high-wage and a low-wage country, the *ex ante* high-tech firms will relatively grow in the high-wage country (where these firms have comparative advantage) and low-tech firms will decline. The opposite will occur in the low-wage country (Bernard et al., 2007, 2010). As a result, *ex ante* high-tech firms will observe a reduction in their external financing costs, whereas *ex ante* low-tech firms will see an increase in such costs. This could be labeled the "between-firm" effect of trade-related international business activities. This argument is similar to that of Melitz (2003), who argues that exposure to trade will induce interfirm reallocations towards more productive firms, and that the aggregate industry productivity growth generated by the reallocations contributes to a welfare gain, thus highlighting a benefit from engaging in international business activities with China.[4]

DATA AND VARIABLES

Sample Construction

We collect bank-loan information from the DealScan database of the Loan Pricing Corporation (LPC), which contains detailed information on US and foreign commercial loans made to corporations since 1987.[5] DealScan gives detailed information on loans as well as deals, where multiple loans are packaged together. We use loan-level information in our analysis, also referred to as a facility or tranche in DealScan. The information about firm financial characteristics is from the Compustat annual files. Information on US imports is from the US Census Bureau and Schott (2008). The database records, for each six-digit NAICS industry, the share of US manufacturing imports originating from more than 200 countries between 1989 and 2012, including China. We follow Chava and Roberts (2008) and merge Compustat and DealScan using their matching file as of August 2012. The basic unit of observation in the merged Compustat–DealScan database is a loan. For each firm-loan pair, we identify the loan initiation year and keep the firm-loan pairs that are in the manufacturing industries (NAICS between 311111 and 339999). We then merge the US Census Bureau and Schott (2008) import data with the Compustat–DealScan merged data by six-digit NAICS and loan initiation year. The final sample spans 1990–2012 with 24,741 unique loans and 3514 unique firms.[6]

Does China's WTO Entry Provide for a Quasi-Natural Experiment?

After 15 years of waiting, China became the 143rd member of the WTO on November 11, 2001. Until late 2001 it was unclear whether China would join the WTO; the BBC reported on July 5, 2001, that "more than a year after China signed bilateral deals with the US and the EU to pave the way for its accession to the WTO, there is still no clear timetable for when it can become a member." This was a momentous event in the history of the multilateral trading system.[7] Accession to the WTO gave China the most-favored nation status among the 153 WTO members (Branstetter & Lardy, 2006). After joining the WTO, China's share of world exports increased from 4.3% in 2001 to 10.6% in 2010, making the country the world's biggest exporter.[8] At the same time, China's trade share with the US increased from 6.5% in 2001 to 14.3% in 2010, making China the country's second-largest trading partner only behind Canada (US Census Bureau, 2011). This highly significant and largely unanticipated (in terms of the exact timing of China's accession to the WTO) economic event provides the ground for a quasi-natural experiment to examine the effect of engaging in international business activities with a low-wage country via trade openness on the external financing capacity of firms in developed countries.

Main Variables of Interest

Loan-contract terms: The primary loan-contract term of our analysis is the cost of loan denoted as $SPREAD_{lijt}$, where l stands for loan, i indexes firm, j indexes industry, and t refers to the loan initiation year. Much of the literature on the cost of bank debt (e.g., Bharath, Dahiya, Saunders, & Srinivasan, 2011; Drucker & Puri, 2005; Graham, Li, & Qiu, 2008) uses the loan spread over LIBOR at the time of the loan origination as a measure of the cost of bank debt. The *All-in-Drawn* variable in the DealScan database describes the amount the borrower pays in basis points over LIBOR for each dollar drawn down. It also adds the spread of the loan with any annual (or facility) fee paid to the bank group. We use the *All-in-Drawn* variable as the measure of the cost of bank

debt in this analysis. Berg, Saunders, and Steffen (2015) propose a new measure for the total cost of corporate borrowing that accounts for fees and the fact that most loans are not immediately drawn down at origination. We examine whether our results are robust to this measure of the total cost of borrowing by constructing a similar cost of bank loan measure. We also examine other loan-contract terms such as loan amount (in millions of dollars), loan maturity (in years), loan security (dummy variable), and number of loan covenants.[9]

Exposure to trade with China: Our key independent variable is a firm's exposure to international trade in terms of imports sourced from China. We proxy firm-level exposure to trade with China using the firm's six-digit NAICS-level exposure. Following Bernard, Jensen, and Schott (2006), we construct two such variables using industry-level trade information. In particular, for each six-digit NAICS, we identify this exposure to trade with China as: $CHN_{jt} = \frac{MCHN_{jt}}{M_{jt}}$, where CHN_{jt} is the fraction of total imports of industry j originating from China in loan initiation year t, $MCHN_{jt}$ is the level of US imports from China in millions of nominal USD, and M_{jt} is the total US imports in millions of nominal USD. We also construct a measure of import penetration by identifying the proportion of Chinese goods in the US market for each of the six-digit NAICS industries as: $penCHN_{jt} = \frac{MCHN_{jt}}{VSHIP_{jt}+M_{jt}-X_{jt}}$, where $penCHN_{jt}$ is the proportion of Chinese manufacturing goods to the value of total product in industry j and loan initiation year t, $VSHIP_{jt}$ is the total value of US shipments in nominal US dollars from the NBER-CES Manufacturing Industry Database (Bartelsman, Becker, & Gray, 2009) and X_{jt} is the level of US exports to China in millions of nominal US dollars. For robustness, we also calculate the share of US imports originating from high-wage countries, HWC_{jt}; we classify a country as a high-wage country if it is listed as one of the high-income countries in the World Development Indicator report by the World Bank.

Sample Description

Panel A of Table 1 describes various loan-contract terms over the sample years. Note that the basic unit of observation in our analysis is a loan. Since firms generally do not initiate loans every year, the number of firms that we observe in the sample varies over the year. Also, loan-to-firm ratio (NL/NF) is always more than unity, implying that the same firm is initiating multiple loans during the course of the sample period. This particular feature of the data is crucial for the empirical estimation strategy that we will develop in "Within-firm Fixed Effects Regression Analysis" section of the article. Most notably, the panel shows that average loan spread is generally lower after China's WTO entry compared to the pre-WTO periods. However, the spread rises considerably during the peak of the global financial crisis in 2007–2009.[10] Panel B of the table shows that our sample loans vary widely in terms of type and primary purpose of loans. These loan characteristics are similar to other recent studies using the same DealScan data (e.g., Aivazian, Qiu, & Rahaman, 2015). For expositional convenience, we standardize the $SPREAD_{lijt}$ with a mean of 0 and variance of 1 so that it is comparable across time and industries. The standardized variable $ZSPREAD_{lijt}$ is defined as $\frac{SPREAD_{lijt}-\overline{SPREAD}}{SD(SPREAD_{lijt})}$, where $SD(SPREAD_{lijt})$ stands for standard deviation of $SPREAD_{lijt}$. Figure 1 shows theacross-time evolution in loan spread as well as within-time heterogeneity across firms. It reveals that average loan spread declined considerably (compared to the historical average) following China's WTO entry except for the periods of elevated capital-market frictions during the peak and the immediate aftermath of the recent financial crisis. The figure also shows that there remains considerable heterogeneity across firms within a given year before and after China's WTO entry.

Table 2 shows the evolution in firm characteristics and Chinese import share over the sample years.[11] It is obvious from the table that US manufacturing firms' trade exposure to China is increasing over time and the intensity of the exposure accelerated after 2001, when China became a WTO member. For expositional convenience, we standardize the CHN_{jt} variable with a mean of 0 and variance of 1 so that it is comparable across time and industries. Figure 2 shows the average (standardized) Chinese import share over time as well as the across-industry heterogeneity within a given year. It is evident from the figure that although trade exposure to China increased over time, it exceeded the historical average only after China's entry into the WTO. The figure also reveals significant inter-industry variations in Chinese import share within a given year. This is important because we proxy firm-level exposure to trade using the industry-level exposure. Thus, the identification of the effect of trade exposure to China on the cost of bank loans is provided primarily by the changes in import competition from China between industries and over time.

Table 1 Sample loans characteristics: 1990–2012

Panel A: Sample loan contract terms

	NFIRMS	NLOANS	NL/NF	SPREAD	TCB	LAMT	LMAT	NCOVS	SECURE	NLENDER	BIG3
1990	365	647	1.77	228.07	309.37	114.31	52.64	0.04	0.47	4.89	0.42
1991	410	692	1.69	250.13	320.69	94.13	44.55	0.01	0.42	4.04	0.41
1992	518	895	1.73	249.57	298.60	93.42	45.25	0.01	0.57	4.56	0.40
1993	599	1043	1.74	217.41	268.02	123.37	45.06	0.65	0.48	4.74	0.45
1994	693	1212	1.75	186.23	206.73	170.62	48.39	1.19	0.41	5.26	0.48
1995	675	1211	1.79	174.09	195.50	200.65	50.98	2.92	0.42	5.70	0.53
1996	838	1472	1.76	187.86	222.56	169.88	49.77	4.15	0.50	5.64	0.49
1997	967	1849	1.91	187.15	239.77	180.57	52.78	4.11	0.51	5.36	0.50
1998	817	1546	1.89	190.48	244.81	180.75	52.03	4.21	0.54	5.59	0.50
1999	749	1421	1.90	200.14	233.13	210.86	48.04	4.06	0.52	6.87	0.55
2000	701	1298	1.85	192.59	191.71	270.42	40.85	3.30	0.43	7.17	0.63
2001	732	1345	1.84	200.39	197.48	290.83	36.37	2.94	0.44	7.31	0.62
2002	733	1318	1.80	228.87	222.29	239.13	36.76	3.38	0.48	6.76	0.57
2003	705	1264	1.79	229.88	218.93	254.36	39.08	3.58	0.51	7.67	0.57
2004	683	1265	1.85	210.32	206.97	327.06	47.53	3.17	0.48	7.67	0.57
2005	671	1259	1.88	175.91	170.69	407.19	52.63	3.06	0.46	8.23	0.65
2006	559	1021	1.83	163.67	163.91	475.97	52.02	2.90	0.46	7.32	0.61
2007	514	945	1.84	164.29	154.82	577.75	52.40	2.68	0.45	7.01	0.66
2008	368	660	1.79	216.34	205.67	506.04	45.94	2.77	0.53	6.64	0.58
2009	300	538	1.79	336.80	320.64	427.81	38.65	2.56	0.50	6.67	0.45
2010	358	601	1.68	289.67	253.85	584.31	46.32	1.98	0.45	8.49	0.57
2011	500	841	1.68	225.16	208.38	596.45	54.70	1.76	0.38	8.37	0.62
2012	247	398	1.61	229.75	206.34	599.23	54.16	2.27	0.39	8.55	0.63
Overall	3514	24,741	1.79	205.89	223.46	281.17	47.15	2.79	0.47	6.48	0.54

Panel B: Sample loan types and purposes

Loan types	Num.	%	Loan purposes	Num.	%
364-day facility	1957	7.91	Acquisition line	1051	4.25
Term loan	7036	28.44	Corporate purposes	8794	35.54
Revolver	12,962	52.39	CP backup	1178	4.76
Bridge loan	438	1.77	Debt repayment	4596	18.58
Acquisition facility	38	0.15	LBO/MBO/Spinoff/Repurchase	892	3.61
Demand loan	134	0.54	Recapitalization	484	1.96
Notes	1074	4.34	Takeover	2618	10.58
Standby LC	402	1.62	Working capital	3695	14.93
Other	700	2.83	Other	1433	5.79
Total	24,741	100	Total	24,741	100

This table provides the description of sample loans. Panel A shows the changes in the number of firms and loans over our sample periods along with other yearly-average loan-contract terms. In Panel A, *NFIRMS* is the number of unique firms in a given year; *NLOANS* is the number of unique loans initiated in a given year; *NL*/*NF* is *NLOANS*/*NFIRMS*; *SPREAD* is the loan spread over LIBOR (in basis points); *TCB* is the total cost of borrowing estimated following Berg et al. (2015); *LAMT* is the loan amount (in millions of dollars); *LMAT* is the loan maturity (in months); *NCOVS* is the number of total covenants associated with a loan; *SECURE* is a dummy variable indicating whether the loan is secured with collateral; *NLENDER* is the number of lenders in a loan syndication; and *BIG*3 is a dummy variable indicating whether the lead agent in the loan syndication is one of the top 3 US banks, i.e., Bank of America, Citigroup, and JPMorgan Chase. Panel B shows various loan types and purposes for the sample years 1990–2012.

EMPIRICAL ANALYSIS

Univariate Analysis

Table 3 shows the mean difference in loan-contract terms, firm characteristics, and China's import share before and after China's WTO entry.[12] Panel A of the table shows that the average spread is 30.175 basis-points lower and the average total cost of borrowing is 35.553 basis-points lower in the post-WTO periods compared to the pre-WTO averages. The decline in spread and the total cost of borrowing become higher in magnitude when we exclude the episodes of the recent financial crisis (2007Q3–2009Q1) from the post-WTO periods. For

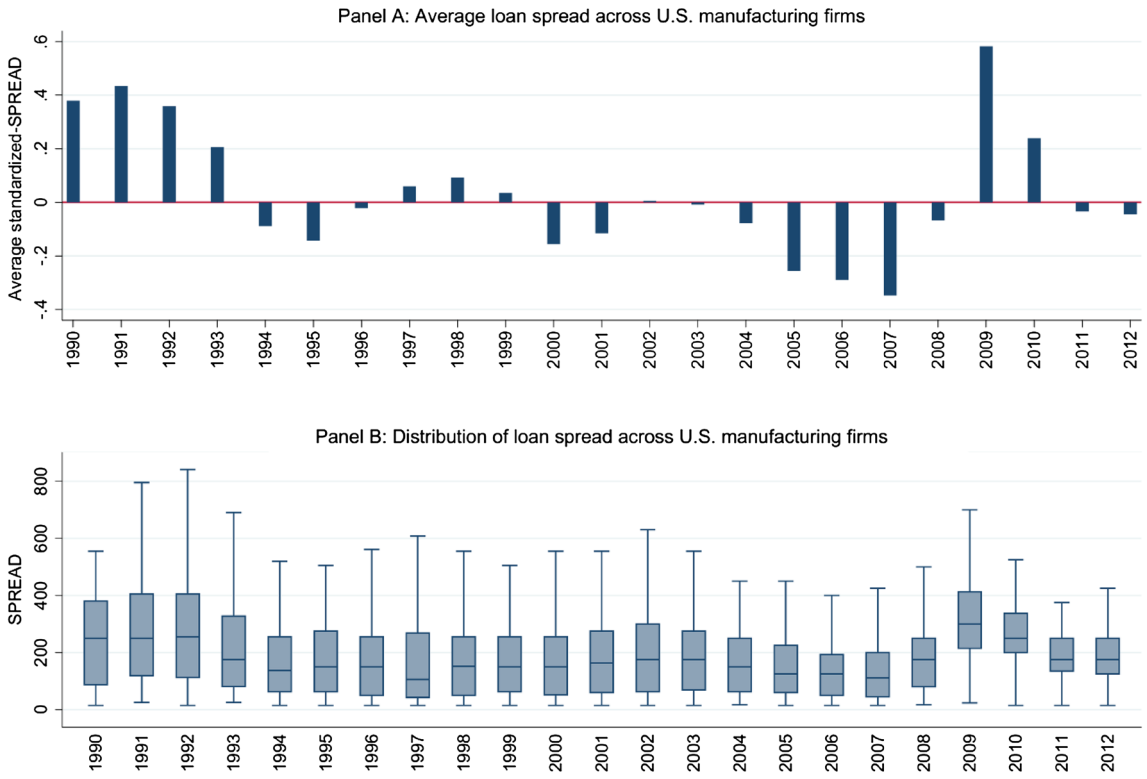

Figure 1 Loan spread across US manufacturing firms over time. Panel **A** of the figure shows the average loan spread (in basis points) across US manufacturing firms over time. Panel **B** shows the heterogeneity of loan spread across US manufacturing firms over the sample years. In Panel **A**, the loan spread variable (*SPREAD*) is standardized with mean "0" and variance "1" for comparability across time.

the average loan size of $420.45 million during the post-WTO periods, a 30.175 basis-points decline in spread implies $1.269 million ($420.450 million × 0.0030175) yearly savings on interest expense. Furthermore, lower spread is also associated with higher loan amount, shorter maturity, more restrictive covenants, less collateral requirement, and a higher likelihood of loan syndication by one of the big three US banks, i.e., Bank of America, Citigroup, and JPMorgan Chase, in the post-WTO periods. Panel B shows that in the post-WTO era firms are bigger in size, have lower leverage, are more profitable, and have higher interest-coverage ratio to support immediate debt obligations. Finally, Panel C shows that the average import share of China is 8.10% higher in the post-WTO periods compared to the pre-WTO average.

To examine the role of China's WTO entry as a point of inflexion for the long-term relationship between trade exposure to low-wage countries (such as China) and the cost of bank financing, we design a simple piece-wise linear regression centering on that event. The regression design is similar to the one used in Morck, Shleifer, and Vishny (Morck et al. 1988) to study the effect of managerial ownership on firm value. In particular, we define two new variables as follows:

$$\begin{aligned} CHN_{jt}^{preWTO} &= CHN_{jt} && if\ Year < 2001 \\ &= CHN_{J2000} && if\ Year \geq 2001 \\ CHN_{jt}^{postWTO} &= 0 && if\ Year < 2001 \\ &= CHN_{jt} - CHN_{j2000} && if\ Year \geq 2001 \end{aligned}$$

where CHN_{j2000} is the level of CHN_{jt} in the year 2000. The first variable CHN_{jt}^{preWTO} captures the exposure to trade with China before China's WTO entry and the second variable $CHN_{jt}^{postWTO}$ captures the increase in the exposure to trade with China as a result of China's WTO entry relative to the pre-WTO level of exposure. We then estimate the following piece-wise linear regression:

$$SPREAD_{lijt} = \kappa + \lambda_1 \cdot CHN_{jt}^{preWTO} + \lambda_2 \cdot CHN_{jt}^{postWTO} + \varepsilon_{lijt}$$

We find that $\lambda_1 > 0$ and $\lambda_2 < 0$ are both statistically significant at the 1% level. We then estimate the predicted spread from the simple piece-wise

Table 2 Firm characteristics and Chinese import share: 1990–2012

	Firm characteristics							Chinese competition measures	
	TA	TQ	LEVERAGE	PROFIT	TANGIBILITY	INTCOV	EDF	CHN (%)	penCHN (%)
1990	2.323	1.009	0.267	0.099	0.523	1.705	0.125	1.971	0.480
1991	1.936	1.019	0.252	0.081	0.533	1.662	0.213	2.932	0.862
1992	1.764	1.028	0.245	0.086	0.530	1.906	0.077	4.462	1.229
1993	2.340	1.034	0.239	0.095	0.541	2.059	0.075	4.933	1.476
1994	2.735	1.031	0.238	0.114	0.551	2.189	0.054	5.950	1.906
1995	2.899	1.032	0.234	0.115	0.550	2.147	0.091	6.732	2.178
1996	2.676	1.036	0.235	0.089	0.526	2.155	0.095	6.574	2.303
1997	2.659	1.037	0.254	0.085	0.512	2.142	0.102	6.817	2.203
1998	3.273	1.030	0.273	0.076	0.494	2.068	0.111	8.359	2.986
1999	4.387	1.029	0.279	0.095	0.517	2.031	0.133	8.087	2.985
2000	5.144	1.023	0.245	0.103	0.523	1.998	0.139	8.263	2.989
2001	5.773	1.026	0.253	0.083	0.547	1.903	0.170	8.951	3.313
2002	5.050	1.020	0.237	0.077	0.559	2.044	0.141	10.310	3.955
2003	6.783	1.034	0.251	0.084	0.561	2.205	0.140	12.110	4.756
2004	7.849	1.036	0.250	0.114	0.539	2.355	0.076	11.774	4.715
2005	9.297	1.033	0.241	0.133	0.541	2.265	0.074	13.743	5.766
2006	9.566	1.036	0.231	0.125	0.520	2.363	0.118	13.758	5.013
2007	11.237	1.035	0.239	0.133	0.495	2.312	0.073	16.432	6.401
2008	12.690	1.012	0.212	0.103	0.502	2.344	0.162	15.941	5.814
2009	14.520	1.019	0.225	0.095	0.582	2.028	0.231	17.327	6.356
2010	14.774	1.027	0.225	0.131	0.535	2.418	0.081	17.335	6.418
2011	12.280	1.024	0.238	0.144	0.502	2.494	0.072	16.223	
2012	14.113	1.025	0.252	0.146	0.512	2.415	0.124	18.405	

This table provides the yearly-average of sample firm characteristics and Chinese import competition to US manufacturing industries for the period 1990–2012. *TA* is the total assets (in billions of dollars); *TQ* is Tobin's Q and is defined following Duchin (2010); *LEVERAGE* is defined as long-term debt/total liabilities; *PROFIT* is defined as EBITDA/total assets; *TANGIBILITY* is the ratio of net property, plant, and equipment to total assets; *INTCOV* refers to interest coverage ratio and is defined as EBITDA over interest expenses; *EDF* refers to a firm's expected default frequency and is estimated following Bharath and Shumway (2008). *CHN* is the fraction of US imports originating from China, and *penCHN* is a measure of import penetration into US manufacturing industries by Chinese manufacturers.

linear regression and plot the predicted spread in Fig. 3. The figure shows that indeed after China's WTO entry, we observe a secular decline in predicted spread and a simultaneous secular increase in China's import share, except for the brief period of the great financial crisis of 2007–2009.

Longitudinal Regression Analysis

Baseline Analysis

In the first set of regression analyses, we pooled the entire sample of loans to estimate the following longitudinal regression model:

$$SPREAD_{lijt} = \alpha + \beta_1 \cdot CHN_{jt} + \beta_2 \cdot postWTO + \beta_3 \cdot \left(CHN_{jt} \times postWTO\right) + X'_{ijt}\delta + Z'_{lijt}\pi + \mu_j + \nu_t + \varepsilon_{lijt} \quad (1)$$

Model (1) has a simple pooled OLS specification, where *postWTO* is a dummy variable that equals 1 for the periods after China's WTO entry (2002–2012) and 0 for the periods before China's WTO entry (1990–2000),[13] X_{ijt} is a set of time-varying firm characteristics, Z_{lijt} is a set of loan characteristics, μ_j and ν_t are industry- and year-fixed effects, respectively. In the regression model (1) above, the effect of Chinese competition on US manufacturing firms' loan cost before China's WTO entry is captured by β_1 and the same effect after China's WTO entry is captured by $\beta_1 + \beta_3$. Thus, the incremental effect of Chinese competition on average US manufacturing firm's loan cost due to China's WTO entry is captured by the coefficient β_3, which would be the primary focus of our analysis here.

Among the firm-specific control variables, total assets (TA) represent a firm's annual book value of assets. Larger firms tend to have a longer history and be more established, resulting in more favorable contract terms for such firms. LEVERAGE is the ratio of long-term debt to total assets and is typically used to control for the firm's existing debt level. Firms with higher leverage ratios have, on average, higher default risk and are thus

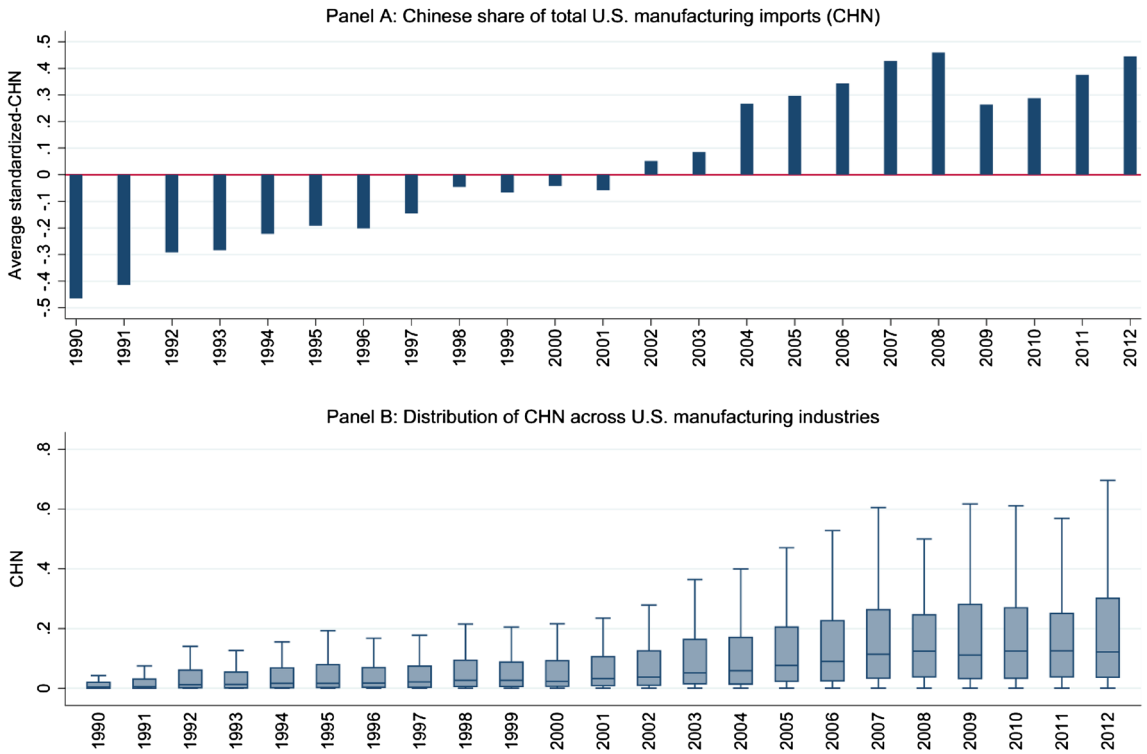

Figure 2 Chinese import share across US manufacturing industries. Panel **A** of the figure shows the yearly-average of US manufacturing imports from China over total US imports (*CHN*). Panel **B** shows the heterogeneity of Chinese import-share (of total US imports) across US manufacturing industries over the sample years. In Panel **A**, the Chinese import-share variable (*CHN*) is standardized with mean "0" and variance "1" for comparability across time.

expected to have higher borrowing costs. Tobin's q (TQ) is the ratio of the market value of assets (market value of equity plus book value of debt) to replacement cost and measured following Duchin (2010). It is a proxy for the firm's growth opportunities. Profitability (PROFIT) is the ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets. Default risk is lower for profitable firms and higher profitability also lowers borrowing costs. TANGIBILITY is defined as the ratio of tangible assets to total assets. It captures the recoverability of tangible assets in the case of default leading to lower borrowing costs for firms with more tangible assets. Interest coverage ratio (INTCOV) is defined as EBITDA over interest expense; a higher coverage ratio indicates a greater ability of a firm to service its existing debt. Finally, the expected default frequency (EDF), following Bharath and Shumway (2008), captures the market-based default risk of a firm; a higher value of EDF indicates worse financial health and higher default risk of debt.

We also control for various non-price loan-contract terms in the longitudinal regression models. S&P's 'A Guide to Loan Markets' (2011) describes the process of loan issuance in several discrete steps. The process starts with the borrower appointing the lead bank, which conducts due diligence and negotiates the non-price loan features such as amount, collateral, maturity, and covenants with the borrower and leaves the final price to be determined. The lead bank then informally polls potential syndicate members to gauge the level of interest in the loan and uses the information to set the interest rate on the loan. Finally, it is launched for syndication. The typical process of syndication suggests that loan price is determined after all other non-price terms have been settled (Bharath et al., 2011). Among the loan-specific control variables, loan amount (LAMT) affects the loss a bank may incur given a borrower's default. If a loan facility is a significant portion of the bank's loan portfolio, the bank is more likely to be under-diversified (Berger, Hasan, & Zhou, 2010), therefore, demand higher return on the loan. Similarly, if a particular loan facility is a significant portion of the firm's debt, it is more likely to be secured (Berger & Udell, 1990; Boot, Thakor, & Udell, 1991; Dennis, Nandy, & Sharpe, 2000). In other words, the loan amount may signal the creditors' assessment of the firm's

Table 3 China's WTO entry and differences in loan and firm characteristics

	Overall: 1990–2012			Pre-WTO: 1990–2000			Post-WTO: 2002–2012			Mean difference	
	Mean	P25	P75	Mean	P25	P75	Mean	P25	P75	Crisis (inc.)	Crisis (exc.)
Panel A: Loan contract terms											
SPREAD	243.12	92.50	305.00	257.38	92.50	305.00	227.20	100.00	300.00	−30.175***	−37.54***
TCB	223.46	75.00	280.00	240.09	75.00	300.00	204.53	79.85	273.23	−35.553***	−41.68***
LAMT	281.17	20.00	275.00	174.26	10.00	152.50	420.45	50.00	450.00	246.190***	239.4***
LMAT	47.15	24.00	60.00	48.54	24.00	61.00	46.86	30.00	60.00	−1.682***	−1.116***
NCOVS	2.791	0.000	5.000	2.707	0.000	5.000	2.880	0.000	5.000	0.173***	0.200***
SECURE	0.475	0.000	1.000	0.483	0.000	1.000	0.468	0.000	1.000	−0.014**	−0.0213***
NLENDER	6.479	1.000	9.000	5.584	1.000	7.000	7.545	2.000	10.000	1.961***	2.081***
BIG3	0.543	0.000	1.000	0.498	0.000	1.000	0.594	0.000	1.000	0.097***	0.106***
Panel B: Firm characteristics											
TA	5.953	0.135	2.879	3.026	0.075	1.334	9.781	0.391	6.168	6.755***	6.254***
TQ	1.029	1.008	1.051	1.030	1.007	1.053	1.029	1.009	1.050	−0.001*	0.001
LEVERAGE	0.246	0.093	0.345	0.251	0.089	0.357	0.238	0.100	0.328	−0.013***	−0.010***
PROFIT	0.102	0.071	0.171	0.094	0.070	0.166	0.114	0.074	0.180	0.0199***	0.022***
TANGIBILITY	0.530	0.289	0.716	0.526	0.292	0.704	0.534	0.282	0.729	0.008	0.008
INTCOV	2.137	1.429	2.681	2.042	1.389	2.521	2.286	1.518	2.894	0.244***	0.255***
EDF	0.113	0.000	0.036	0.108	0.000	0.043	0.111	0.000	0.024	0.004	−0.007
Panel C: Chinese import competition											
CHN	0.097	0.005	0.128	0.062	0.002	0.068	0.143	0.019	0.207	0.081***	0.077***
penCHN	0.033	0.000	0.025	0.021	0.000	0.014	0.052	0.002	0.056	0.0316***	0.030***

This table provides the summary statistics for firm- and loan-specific variables before and after China's WTO entry. In panel A, *SPREAD* is the loan spread over LIBOR (in basis points); *TCB* refers to the total cost of borrowing and is calculated following Berg et al. (2015); *LAMT* is the loan amount (in millions of dollars); *LMAT* is the loan maturity (in years); *SECURE* is a dummy variable indicating whether the loan is secured with collateral; *NCOVS* is the number of total covenants associated with a loan; *NLENDER* is the number of lenders in a loan syndication; and *BIG3* is a dummy variable indicating whether the lead agent in the loan syndication is one of the top 3 US banks, i.e., Bank of America, Citigroup, and JPMorgan Chase. In panel B, *TA* is the total assets (in billions of dollars); *TQ* is Tobin's Q and is defined following Duchin (2010); *LEVERAGE* is defined as long-term debt/total liabilities; *PROFIT* is defined as EBITDA/total assets; *TANGIBILITY* is the ratio of net property, plant, and equipment to total assets; *INTCOV* refers to interest coverage ratio and is defined as EBITDA over interest expense; *EDF* refers to a firm's expected default frequency and is estimated following Bharath and Shumway (2008). The mean differences are shown first for all pre- and post-WTO periods and then between the pre-WTO and the post-WTO periods but excluding the periods of financial crisis. The financial crisis periods are defined between 2007Q3 and 2009Q1 following Kuppuswamy and Villalonga (2016). The symbols "***", "**", and "*" represent statistical significance at the 1%, 5%, and 10% levels, respectively.

creditworthiness. Highly creditworthy firms are likely to get more financing (larger loan size) compared to less creditworthy firms. Loan maturity (LMAT) affects the borrower's financial flexibility and refinancing costs. Barclay and Smith (1995) show that short-term bank loans enhance the effectiveness of creditors' monitoring. Banks can maintain a strong bargaining position in the choice of loan terms, and frequently evaluate a firm's capability of debt repayment through a short-term debt-renewal process by reducing the maturity of debt. Brockman, Martin, and Unlu (2010) show that short-term debt mitigates the agency costs of debt arising from compensation risk. Jensen and Meckling (1976), Myers (1977), Smith and Warner (1979), Aivazian and Callen (1980), and Smith (1993) point out that the use of collateral as loan security (SECURE) and the number of debt covenants (NCOV) can curb a borrowing firm's opportunism and reduce agency costs of debt.[14]

Table 4 reports results from various specifications of the longitudinal regression model (1). For the first 4 specifications we use the *All-in-Drawn* loan-cost variable (SPREAD) as the dependent variable and in the last 4 specifications we use the total cost of borrowing (TCB) as our dependent variable. We also use Chinese import share (CHN) as well as Chinese import penetration as alternative measures of trade-induced competition originating from China. Irrespective of alternative specifications of regression model (1), the table shows that the β_3 coefficient, i.e., the incremental effect of Chinese competition on average US manufacturing firms' loan cost, is statistically significant across all specifications; it is statistically significant at the 1% level in 7 of 8 specifications and at the 5% level in rest of the specifications. To get a sense of economic significance, we focus on the first specification where the estimated coefficient for β_3 is −126.248 (conditional on various firm characteristics) and the incremental effect of Chinese trade-induced competition is captured by $-126.248 \times \Delta CHN$, where ΔCHN is the change in *CHN* after China's WTO entry. In Table 3, we report that the average Chinese import share (of total US imports), i.e., ΔCHN, increases by 8.10% after China's WTO

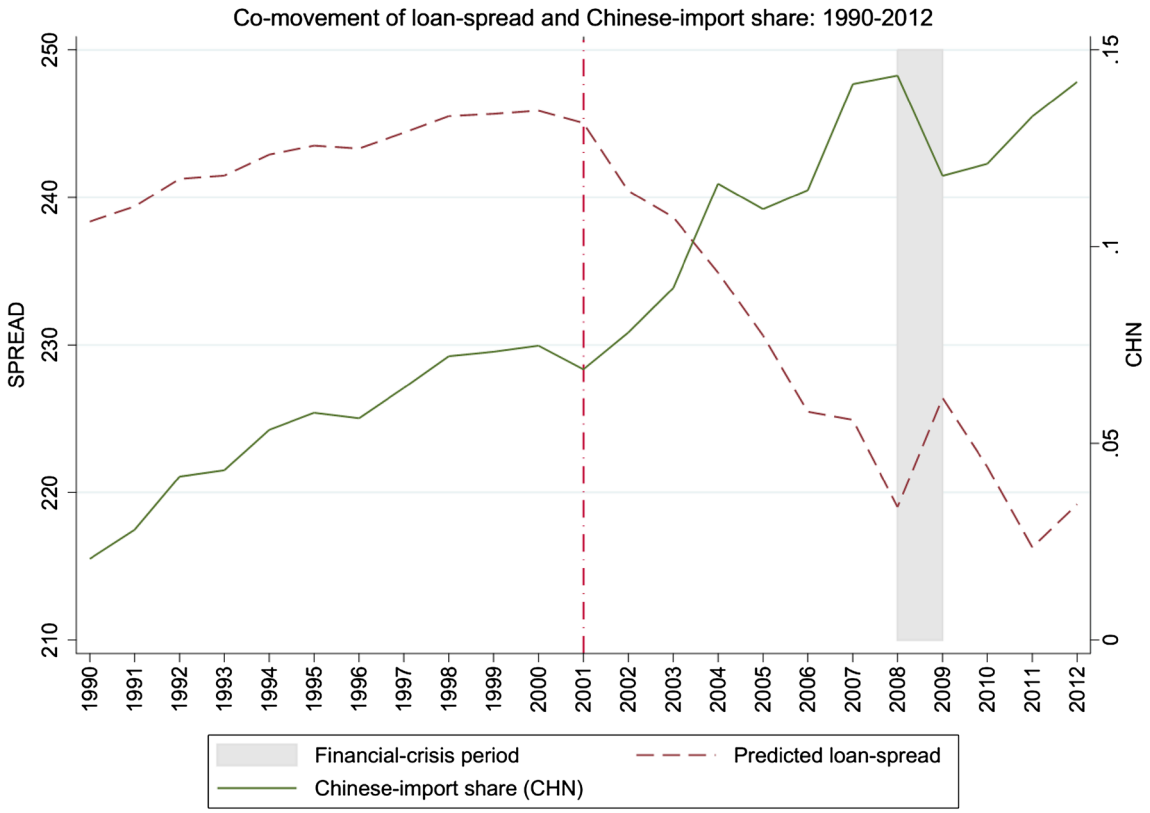

Figure 3 China's WTO entry, import share, and loan spread: 1990–2012. The *left axis* of the figure shows the yearly-average fitted values from a piece-wise linear regression of sample loan spreads (*SPREAD*) on the Chinese import-share of total US imports (*CHN*). The inflexion point of the piece-wise linear regression is set at year 2001, the year of China's World Trade Organization (WTO) entry. The *right axis* of the figure shows the yearly-average *CHN* over the sample years.

entry compared to the pre-WTO average. Given this average change in *CHN* and the estimated β_3 coefficient (at the mean) of -126.248, the average sample US manufacturing firm observes a 10.218 basis-points (-126.248×0.081) reduction in loan spread due to China's WTO entry and the resulting trade-induced competition. Given the average loan size of \$420.45 million, this translates into \$0.430 million ($\$420.45\text{m} \times 0.0010218$) yearly savings in loan cost for the average import-competing manufacturing firm in our sample. From Table 3, we can also observe that the difference in *CHN* before and after China's WTO entry at the 75th percentile is 14%. Using the logic outlined above, for the average manufacturing firm in the sample experiencing a 14% increase in Chinese import share after China's WTO entry, the loan cost reduces by 17.675 basis-points resulting in \$0.743 million yearly savings in loan cost. Results on the effects of firm- and loan-specific control variables are similar to ones that have been suggested in the literature.

Robustness Analysis

In this section, we examine the robustness of our pooled OLS regression results discussed earlier by estimating the following additional regression models:

$$\begin{aligned} SPREAD_{lijt} = {} & \alpha + \rho_1 \cdot CHN_{jt} + \rho_2 \cdot CHN_{jt}^2 + postWTO \\ & \cdot \left(\rho_3 + \rho_4 \cdot CHN_{jt} + \rho_5 \cdot CHN_{jt}^2\right) \\ & + X_{ijt}^{'}\delta + Z_{lijt}^{'}\pi + \mu_j + \nu_t + \varepsilon_{lijt} \end{aligned} \tag{2}$$

$$\begin{aligned} SPREAD_{lijt} = {} & \alpha + \pi_1 \cdot CHN_{jt} + \pi_2 \cdot postWTO \\ & + \pi_3 \cdot CRISIS \\ & + \pi_4 \cdot \left(CHN_{jt} \times postWTO \times CRISIS\right) \\ & + X_{ijt}^{'}\delta + Z_{lijt}^{'}\pi + \mu_j + \nu_t + \varepsilon_{lijt} \end{aligned} \tag{3}$$

Table 4 Chinese import competition and the cost of bank loans: Pooled OLS regressions

	All-in-drawn spread (SPREAD)				Total cost of borrowing (TCB)			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
CHN × postWTO	−126.248***		−93.811***		−128.904***		−99.062***	
	[−3.61]		[−2.81]		[−3.55]		[−2.88]	
CHN	131.356***		94.736***		131.394***		98.535***	
	[3.63]		[2.79]		[3.49]		[2.79]	
penCHN × postWTO		−159.746***		−160.030***		−148.414**		−155.452***
		[−2.79]		[−2.89]		[−2.41]		[−2.60]
penCHN		185.842***		144.031***		173.062***		140.319**
		[3.29]		[2.69]		[2.86]		[2.42]
postWTO	61.369***	113.553**	0.067	112.796***	28.327	80.520*	−14.868	86.047***
	[3.02]	[2.53]	[0.00]	[6.90]	[1.33]	[1.67]	[−0.83]	[5.11]
TA	−0.373***	−0.340***	0.026	0.111	−0.202*	−0.161	0.077	0.171
	[−3.42]	[−2.89]	[0.25]	[1.07]	[−1.88]	[−1.39]	[0.74]	[1.63]
TQ	−331.275***	−314.498***	−44.438	−51.167	−305.268***	−296.183***	−34.852	−47.778
	[−4.14]	[−4.78]	[−0.57]	[−0.83]	[−3.67]	[−4.27]	[−0.43]	[−0.73]
LEVERAGE	97.426***	71.370***[6.72]	34.621**	17.690*	94.775***	68.684***	32.059**	14.258
	[7.13]		[2.53]	[1.69]	[6.66]	[6.12]	[2.26]	[1.28]
PROFIT	−160.334***	−148.151***	−151.858***	−119.206***	−110.431***	−100.559***	−120.204***	−90.459***
	[−4.95]	[−5.82]	[−4.83]	[−5.16]	[−3.27]	[−3.72]	[−3.67]	[−3.63]
TANGIBILITY	−36.534***	−29.964***	−44.091***	−33.096***	−33.597***	−27.497***	−43.020***	−32.810***
	[−5.44]	[−4.96]	[−6.72]	[−5.78]	[−4.84]	[−4.40]	[−6.34]	[−5.50]
INTCOV	−31.146***	−28.914***	−30.822***	−27.972***	−30.107***	−27.931***	−29.880***	−27.210***
	[−12.02]	[−12.96]	[−12.51]	[−13.69]	[−11.50]	[−12.27]	[−11.97]	[−12.88]
EDF	102.030***	94.669***	90.547***	81.051***	94.106***	84.885***	86.424***	75.194***
	[10.56]	[11.91]	[9.43]	[10.38]	[9.08]	[9.95]	[8.45]	[8.99]
LAMT			−0.051***	−0.049***			−0.046***	−0.044***
			[−17.29]	[−17.38]			[−15.50]	[−15.66]
LMAT			2.135***	1.579***			2.367***	1.853***
			[19.13]	[17.89]			[20.87]	[20.45]
SECURE			43.843***	53.283***			31.751***	40.948***
			[10.26]	[14.80]			[7.32]	[11.05]
NCOVS			−2.915***	−1.774***			−3.879***	−2.776***
			[−4.57]	[−3.37]			[−5.89]	[−5.06]
BIG3			−82.754***	−70.406***			−85.518***	−73.016***
			[−22.42]	[−22.41]			[−22.53]	[−22.27]
Constant	617.940***	472.379***	261.214***	165.355***	573.005***	436.259***	232.587**	147.233**
	[7.53]	[7.32]	[3.16]	[2.72]	[6.37]	[6.41]	[2.58]	[2.29]
Industry & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan types & purposes dummies	No	No	Yes	Yes	No	No	Yes	Yes
N	11,607	10,706	11,188	10,294	11,607	10,706	11,188	10,294
R^2	0.17	0.20	0.35	0.39	0.14	0.16	0.33	0.36

This table shows the pooled OLS regression results on the effect of Chinese competition on the cost of bank loans for US manufacturing firms using a difference-in-difference framework. *CHN* is the fraction of US imports originating from China. *penCHN* is the measure of import penetration by Chinese firms in US manufacturing industries. *postWTO* equals 1 for the period after China's WTO entry (2002–2012) and 0 for the period before China's WTO entry (1990–2000). Among the firm-level controls, *TA* is the total assets (in billions of dollars); *TQ* is Tobin's Q and is defined following Duchin (2010); *LEVERAGE* is defined as long-term debt/total liabilities; *PROFIT* is defined as EBITDA/total assets; *TANGIBILITY* is the ratio of net property, plant, and equipment to total assets; *INTCOV* refers to interest coverage ratio and is defined as EBITDA over interest expense; *EDF* refers to a firm's expected default frequency and is estimated following Bharath and Shumway (2008). Among the loan-level controls, *LAMT* is the loan amount (in millions of dollars); *LMAT* is the loan maturity (in years); *SECURE* is a dummy variable indicating whether the loan is secured with collateral; *NCOVS* is the number of total covenants associated with a loan; and *BIG*3 is a dummy variable indicating whether the lead agent in the loan syndication is one of the top 3 US banks, i.e., Bank of America, Citigroup, and JPMorgan Chase. The symbols "***", "**", and "*" represent statistical significance at the 1%, 5%, and 10% levels, respectively.

$$SPREAD_{lijt} = \alpha + \gamma_1 \cdot HighCHN_{jt} + \gamma_2 \cdot postWTO + \gamma_3 \cdot (HighCHN_{jt} \times postWTO) + X_{ijt}^{'}\delta + Z_{lijt}^{'}\pi + \mu_j + \nu_t + \varepsilon_{lijt} \quad (4)$$

$$SPREAD_{lijt} = \alpha + \theta_1 \cdot CHN_{jt}^{preWTO} + \theta_2 \cdot CHN_{jt}^{postWTO} + X_{ijt}^{'}\delta + Z_{lijt}^{'}\pi + \mu_j + \nu_t + \varepsilon_{lijt} \quad (5)$$

Model (2) is a simple quadratic variation of the baseline regression model and captures the non-linearity in the effect of Chinese competition on the loan cost of US manufacturing firms. Model (3) examines whether the lower loan cost due to China's WTO entry remains robust after controlling for the financial crisis of 2007–2009, captured by the π_4 coefficient in the regression model. Following Kuppuswamy and Villalonga (2016), we create three crisis dummy variables; $CRISIS^{Full}$ is a dummy variable that captures the full extent of the crisis 2007Q3–2009Q4; $CRISIS^{Phase1}$ is a dummy variable that indicates the start to the peak of the crisis 2007Q3–2009Q1; $CRISIS^{Phase2}$ is a dummy variable that captures the immediate aftermath of the crisis 2009Q2–2009Q4. Model (4) has a difference-in-difference specification, where CHN_{jt}^{High} is a dummy variable indicating high exposure to import competition from China[15] and the coefficient γ_3 captures the difference-in-difference effect of Chinese competition on the cost of bank loans after China's WTO entry relative to the loan cost prior to China's WTO entry. Finally, model (5) is a piece-wise-linear regression specification in Chinese import share, where the coefficient θ_1 captures the effect of Chinese competition prior to China's WTO entry and the coefficient θ_2 captures the similar effect after China's WTO entry.

Table 5 reports results from the foregoing alternative specifications of the baseline pooled OLS regression model. Results show that the post-WTO reduction in loan cost due to increased Chinese competition is robust to non-linearity in Chinese competition and the elevated level of capital-market frictions associated with the recent financial crisis. Furthermore, a firm embedded in a high-exposure industry is likely to get a greater loan-cost reduction compared to a firm embedded in a low-exposure industry. Finally, the piece-wise linear specification clearly suggests that loan costs of US manufacturing firms declined significantly as a result of increased Chinese (trade-induced) competition after China's WTO entry.

Survivorship and Selection Biases

It has been noted in the literature that US manufacturing industries have experienced a massive exodus of firms (e.g., textile) since 2000, in part due to rising competition from Chinese producers (Acemoglu et al., 2016). This empirical observation can confound the estimated effects of Chinese (trade-induced) competition on the loan spreads of US manufacturing firms in the longitudinal regressions because the lower spread in the post-WTO periods could be due to surviving firms experiencing lower spread compared to their pre-WTO spreads (survivorship bias), or it could be due to the exit of firms with higher loan cost in the post-WTO periods (selection bias).[16] To examine the survivorship and selection issues in our sample, we follow Pinto (2008) and Huynh, Petrunia, and Voia (2010) and decompose the average loan spread into survival and selection components for a cohort of firms as follows:[17]

$$\underbrace{\frac{1}{N(S_\tau)}\sum_{i\in S_\tau} Y_{i,\tau} - \frac{1}{N(S_0)}\sum_{i\in S_0} Y_{i,0}}_{\text{Overall}} = \underbrace{\frac{1}{N(S_\tau)}\sum_{i\in S_\tau} Y_{i,\tau} - \frac{1}{N(S_\tau)}\sum_{i\in S_\tau} Y_{i,0}}_{\text{Survivor}} + \underbrace{\frac{N(D^\tau)}{N(S_0)}\left(\frac{1}{N(S_\tau)}\sum_{i\in S_\tau} Y_{i,0} - \frac{1}{N(D^\tau)}\sum_{i\in D^\tau} Y_{i,0}\right)}_{\text{Selection}} \quad (6)$$

where τ is the firm's age since the cohort base year, $Y_{i,\tau}$ is the loan spread of firm i in period τ, S_τ is the set of age-τ surviving firms, D^τ is the set of age-τ non-surviving firms, so that $\{S_\tau, D^\tau\}$ is a partition of S_0, and $N(S)$ is the number of firms in set S. In general, the decline in a cohort's average spread can originate from lower spread of survivors (survivor component) or from the exit of higher loan-cost firms (selection components). In 6, the survivor component compares the current average loan spread of period τ survivors with their initial average spread at date 0, so that it measures how much survivors' cost of financing changed over time. The selection component compares the average initial (date 0) loan spread of period τ survivors with the average initial spread of non-survivors until period τ, so that it measures (at each date) whether surviving firms at date τ, on average, had higher/lower initial loan spread compared to all firms that did not survive until date τ.

Table 5 Chinese import competition and the cost of bank loans: Pooled OLS robustness

	[1]	[2]	[3]	[4]	[5]	[6]
CHN × postWTO	−79.032**					
	[−2.05]					
CHN^2 × postWTO	17.315					
	[0.23]					
CHN	10.007	−6.51	−8.178	0.763		
	[0.31]	[−0.55]	[−0.71]	[0.06]		
CHN^2	59.186					
	[0.90]					
CHN × postWTO × $CRISIS^{PAHSE1}$		−70.403***				
		[−2.68]				
$CRSIS^{PHASE1}$		22.043***				
		[2.71]				
CHN × postWTO × $CRISIS^{PAHSE2}$			−156.104***			
			[−3.46]			
$CRSIS^{PHASE2}$			126.904***			
			[5.22]			
CHN × postWTO × $CRISIS^{FULL}$				−81.931***		
				[−3.82]		
$CRISIS^{FULL}$				19.855*		
				[1.72]		
CHN^{High} × postWTO					−16.216***	
					[−2.61]	
CHN^{High}					0.718	
					[0.14]	
$CHN^{postWTO}$						−108.976***
						[−4.75]
CHN^{preWTO}						29.954**
						[2.29]
postWTO	45.934***	49.602***	50.053***	48.779***	30.259**	
	[5.24]	[5.44]	[5.50]	[5.35]	[2.44]	
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Industry & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan types and purposes dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	11,188	11,188	11,188	11,188	5644	11,188
R^2	0.56	0.53	0.53	0.53	0.49	0.53

This table shows various robustness tests on the effects of Chinese competition on the cost of bank loans for US manufacturing firms. *CHN* is the fraction of US imports originating from China. *postWTO* equals 1 for the period after China's WTO entry (2002–2012) and 0 for the period before China's WTO entry (1990–2000). $CRISIS^{Phase1}$ is a dummy variable indicating periods between 2007Q3–2009Q1. $CRISIS^{Phase2}$ is a dummy variable indicating periods between 2009Q2–2009Q4. $CRISIS^{Full}$ is a dummy variable indicating periods between 2007Q3–2009Q4. The financial crisis dummy variables are constructed following Kuppuswamy and Villalonga (2016). CHN^{High} is a dummy variable indicating high-level of import competition from China; import competition is defined as high if it is above the 75th percentile of the sample distribution of *CHN*. CHN^{preWTO} is equal to *CHN* if the sample year is less than 2001; it is equal to the CHN_{2001} for sample year greater than or equal to 2001, where is CHN_{2001} refers to the value of *CHN* in year 2001. $CHN^{postWTO}$ is equal to 0 for sample year less than or equal to 2001; it is equal to $CHN - CHN_{2001}$ for sample year greater than 2001. The symbols "***", "**", and "*" represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6 reports the survivorship and selection components of the first three cohorts (1990, 1991, and 1992) of sample firms. For expositional purpose, if we focus on the 1990-cohort firms, we can see (from Table 1) that our sample has 365 unique firms in 1990. Table 6 shows that 10 of those 365 firms did not survive in the Compustat-DealScan universe in 1990 and the rest of the 355 firms remained active. Therefore we include those 355 firms only in our 1990-cohort of firms. The *NST* column shows the number of surviving firms from that cohort in a given year and the *NDT* column shows the number of non-surviving firms from that cohort in a given year. By 2012, only 92 of those initial 355 firms are still active, and the rest of the 263 firms in our sample ultimately did not survive.[18] The $\Delta OVERALL$ column shows that the difference between the current average spread (in

2012) of the 92 surviving firms and the initial average spread (in 1990) of all 355 firms is −85.65 basis-points, suggesting that the 1990-cohort of firms together experienced significant reduction in loan cost over the past 22 years. The $\Delta SURV$ column shows that the difference between the current average spread of the 92 surviving firms (in 2012) and the initial average spread of those 92 firms (in 1990) is −53.84 basis-points, suggesting that most of the reduction in the overall loan cost is due to surviving firms experiencing lower loan cost. Finally, the $\Delta SELT$ column shows that the difference between the initial average spread (in 1990) of the 92 surviving firms and the initial average spread (in 1990) of all non-surviving firms until 2012 (263 firms) is −31.82 basis-points, implying that part of the overall loan-cost reduction is due to non-surviving firms with higher loan cost exiting the sample. The decomposition analysis suggests that the lower loan spread in the post-WTO period is primarily due to surviving firms experiencing a gradual reduction in their loan spreads. In subsequent analysis, we focus only on a sample of surviving firms before and after China's WTO entry to investigate the within- and between-firm effects of globalization by Chinese firms on the loan cost of US manufacturing firms and the underlying mechanism through which such effects materialize.

Within-firm Fixed Effects Regression Analysis

Baseline Analysis

We exclude all firms that exit the sample before China's WTO entry and also exclude all firms that enter the sample only after China's WTO entry. The new sample consists of firms that remain active in the sample before and after China's WTO entry and also initiate loans in both periods.[19] The key challenge in estimating the within-firm effect of Chinese trade-induced competition is that there could be other factors contemporaneous to China's WTO entry that can affect firms' demand for and banks' supply of liquidity in the private credit market. To achieve identification, one needs to separate the effects of demand for and supply of bank loans from the effect of increased trade exposure due to China's WTO entry. To this end, we follow Khwaja and Mian (2008) and adapt their within-firm estimator to account for this and other potential confounding effects related to time-varying shocks to firm-level demand for credit. This estimator exploits the fact that some firms have multiple loans and also have loans before and after China's WTO entry. Specifically, we estimate the following "within-firm" fixed effect regression model:

$$SPREAD_{lijt}^{postWTO} - \overline{SPREAD}_{lijt}^{preWTO} = \alpha_i + \beta \cdot \left(CHN_{jt}^{postWTO} - \overline{CHN}_{jt}^{preWTO}\right) + \varepsilon_{lijt} \quad (7)$$

where l indexes loan, i indexes firm, j indexes industry, and t indexes loan initiation year. On the left-hand side, $SPREAD_{lijt}^{postWTO}$ refers to the loan spreads for loans initiated after China's entry into the WTO and $\overline{SPREAD}_{lijt}^{preWTO}$ is the average loan spread of all loans initiated before China's entry. The first right-hand-side variable, α_i is the firm-fixed effect. Since the fixed effects α_i are introduced after mean-differencing the data, they absorb all firm-specific loan-demand shocks that vary across firms and over time. This approach thus tests whether the same firm experiences systematically different loan-contract terms after China's entry into the WTO compared to those before China's WTO entry. The second right-hand-side variable $CHN_{jt}^{postWTO}$ refers to the share of Chinese imports for a firm in industry j (at the six-digit NAICS level) after China's WTO entry, and $\overline{CHN}_{jt}^{preWTO}$ is the average import share of China for the same firm before China's entry. Finally, ε_{lijt} captures random noise. In this set-up, the β coefficient captures the "within-firm" effect of China's entry into the WTO. However, we can only estimate the "within-firm" effect coefficient β in the sample of firms with multiple loans after 2001.[20]

Panel A of Table 7 presents the results from the within-firm fixed effect regression approach. In specifications (1) to (3), the dependent variable is the change in loan spread ($\Delta SPREAD$) after China's WTO entry relative to the pre-WTO average. In specifications (1) and (2), the primary explanatory variable of interest is the elevated level of trade-induced competition due to China's WTO accession, measured by ΔCHN_{jt} and $\Delta penCHN_{jt}$. In both cases, results show that higher trade-induced competition from China after its WTO entry is associated with lower loan cost for US manufacturing firms during the post-WTO period compared to the pre-WTO average. In terms of economic significance, the estimated within-firm regression coefficient in specification (1) suggests that the 8.10% increase[21] in the post-WTO period CHN_{jt} (compared to the pre-WTO average) is associated with a 14.476 basis-points reduction in loan spread. These

Table 6 Chinese competition and the loan spread: Survivorship and selection biases

	1990-Cohort						1991-Cohort						1992-Cohort					
	NT	NST	NDT	ΔOVERALL	ΔSURV	ΔSELT	NT	NST	NDT	ΔOVERALL	ΔSURV	ΔSELT	NT	NST	NDT	ΔOVERALL	ΔSURV	ΔSELT
1990	355	355	0	0.00	0.00	0.00												
1991	354	346	8	3.55	8.72	−5.17	396	396	0	0.00	0.00	0.00						
1992	346	329	17	−3.73	4.66	−8.39	395	381	14	−7.79	−7.07	−0.72	504	504	0	0.00	0.00	0.00
1993	330	314	16	−11.02	−4.18	−6.85	382	362	20	−28.01	−26.62	−1.39	501	484	17	−5.00	−3.43	−1.57
1994	313	300	13	−40.38	−35.44	−4.93	361	348	13	−59.56	−57.99	−1.57	487	462	25	−42.54	−39.36	−3.18
1995	298	285	13	−48.52	−44.75	−3.77	347	326	21	−71.53	−66.93	−4.60	459	444	15	−52.23	−43.94	−8.29
1996	286	265	21	−49.01	−49.70	0.69	325	307	18	−68.09	−66.12	−1.96	447	423	24	−40.90	−35.94	−4.95
1997	265	245	20	−52.45	−58.78	6.33	309	284	25	−80.83	−83.12	2.29	422	389	33	−63.25	−56.32	−6.92
1998	245	223	22	−59.36	−58.31	−1.04	284	256	28	−93.59	−90.05	−3.55	388	348	40	−68.98	−63.14	−5.85
1999	224	194	30	−64.40	−62.47	−1.93	257	233	24	−81.46	−83.95	2.49	349	317	32	−61.62	−52.41	−9.21
2000	194	172	22	−72.14	−64.01	−8.12	233	213	20	−86.16	−92.76	6.61	318	286	32	−71.26	−62.71	−8.55
2001	172	165	7	−66.69	−59.14	−7.54	213	205	8	−83.49	−89.50	6.01	285	268	17	−55.65	−42.23	−13.42
2002	165	159	6	−66.98	−54.74	−12.24	203	196	7	−85.49	−86.13	0.64	268	251	17	−52.14	−39.67	−12.47
2003	159	154	5	−74.59	−59.28	−15.31	198	192	6	−85.78	−89.22	3.44	252	239	13	−69.18	−49.47	−19.71
2004	155	143	12	−79.81	−59.92	−19.88	192	180	12	−104.00	−102.71	−1.29	239	224	15	−74.05	−53.76	−20.28
2005	143	134	9	−98.78	−79.25	−19.53	180	172	8	−126.70	−124.70	−2.00	223	211	12	−91.02	−75.30	−15.72
2006	134	123	11	−125.46	−113.01	−12.45	172	157	15	−150.42	−149.04	−1.38	210	193	17	−102.44	−81.43	−21.02
2007	122	112	10	−137.25	−108.71	−28.54	157	154	3	−166.13	−156.42	−9.71	194	185	9	−119.53	−92.57	−26.96
2008	113	110	3	−130.56	−102.27	−28.29	153	147	6	−154.76	−141.31	−13.45	184	178	6	−105.05	−76.95	−28.10
2009	110	105	5	−107.38	−79.21	−28.16	148	139	9	−134.66	−127.67	−6.99	180	165	15	−91.63	−66.11	−25.52
2010	105	101	4	−98.64	−71.20	−27.44	139	133	6	−124.06	−119.12	−4.94	165	157	8	−87.01	−61.78	−25.23
2011	101	97	4	−90.47	−64.64	−25.83	133	127	6	−112.21	−100.19	−12.03	157	147	10	−88.83	−62.63	−26.20
2012	97	92	5	−85.65	−53.84	−31.82	127	123	4	−113.48	−102.65	−10.83	147	139	8	−87.70	−51.38	−36.31

This table decomposes the annual average spread into survivorship and selection biases for three different cohorts of firms. A firm belongs to a specific year-cohort if it held IPO prior to that year and remained active in the industry (survived) at least until that year. For example, 1990-cohort firms held IPO before the year 1990 and remained active in the industry at least until 1990 and beyond. The loan spread is quoted in basis points. *NT* is the number of firms in a given year that belongs to the same cohort. *NST* is the number of surviving firms in a given year that belongs to the same cohort. *NDT* is the number of non-surviving firms in a given year that belongs to the same cohort. *ΔOVERALL* in year "t" is the change in the average spread of all surviving firms in year "t" compared to the average spread across all firms (surviving and non-surviving) at the beginning of the cohort year (1990, 1991, and 1992). *ΔSURV* in year "t" is the change in the average spread of all surviving firms in year "t" compared to the average spread of those survivor firms at the beginning of the cohort year (survivorship). *ΔSELT* in year "t" is the change in the average spread at the beginning of the cohort-year (selection) of all surviving firms in year "t" compared to that of all non-surviving firms up until year "t", normalized by the ratio of total surviving and non-surviving firms up until year "t".

Table 7 Chinese competition and loan-contract terms: Within-firm effects

Panel A: Within-firm fixed effects regression results

	ΔSPREAD			ΔLAMT			ΔLMAT			ΔNCOVS		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
ΔCHN	−178.721***			1373.644***			68.755***			−4.897***		
	[−4.00]			[7.88]			[9.28]			[−5.80]		
ΔpenCHN		−314.964**			1967.749***			155.661***			−10.764**	
		[−2.12]			[4.47]			[7.92]			[−2.11]	
ΔHWC			107.019***			−891.424***			−35.027***			3.270***
			[3.26]			[−6.90]			[−6.30]			[5.23]
Constant	119.150***	154.831***	118.596***	54.392***	60.353***	58.881***	−7.197***	−7.551***	−5.977***	0.933***	0.950***	0.927***
	[11.74]	[11.55]	[11.02]	[3.96]	[4.55]	[4.02]	[−12.22]	[−12.59]	[−9.45]	[14.03]	[9.90]	[13.06]
N	4376	3705	4376	5186	4328	5186	4909	4113	4909	5186	4328	5186
R^2	0.68	0.71	0.68	0.41	0.41	0.41	0.60	0.60	0.59	0.58	0.61	0.58

Panel B: Total factor productivity (TFP) channel results

	SPREAD eqn.			LAMT eqn.			LAMT eqn.			NCOVS eqn.		
	ΔSPRD	ΔTFP	ΔSPRD	ΔLAMT	ΔTFP	ΔLAMT	ΔLMAT	ΔTFP	ΔLMAT	ΔNCOVS	ΔTFP	ΔNCOVS
$\Delta TFP(\delta)$	−55.978***			330.791***			17.104***			−1.266***		
	[−5.18]			[7.56]			[9.33]			[−5.87]		
$\Delta CHN(\gamma)$	−179.359***			773.813***			41.755***			−3.157***		
	[−3.99]			[4.06]			[5.21]			[−3.36]		
$\Delta CHN(\phi)$		1.730***			1.675***			1.678***			1.675***	
		[24.03]			[26.44]			[25.72]			[26.44]	
$\Delta CHN(\beta^* = \delta.\phi + \gamma)$			−178.913***			1328.041***			70.455***			−5.278***
			[−3.96]			[7.50]			[9.41]			[−6.06]
N	4178	4178	4178	4883	4883	4883	4655	4655	4655	4883	4883	4883
R^2	0.68	0.82	0.68	0.43	0.83	0.42	0.61	0.82	0.60	0.59	0.83	0.58

This table provides the within-firm effects of Chinese competition on various loan-contract terms using the fixed-effect regression approach. Δ*CHN* is the difference between the fraction of US imports originating from China after China's WTO entry (2002–2012) and the average imports from China to the US before China's WTO entry. Δ*penCHN* is defined in a similar fashion to Δ*CHN* and it captures the difference between import penetration by Chinese manufacturing firms into the US before and after China's entry into the WTO. Δ*HWC* is the difference between the fraction of US imports originating from high-wage countries after China's WTO entry and the average imports from high-wage countries before China's WTO entry. A country is defined as a high-wage country if it is one of the high-income countries listed in World Development Indicator (WDI) report by the World Bank. Δ*SPREAD* stands for changes in loan spread, Δ*LAMT* stands for changes in loan amount, Δ*LMAT* stands for changes in loan maturity, and Δ*NCOVS* refers to changes in the number of covenants associated with a loan. Δ*TFP* is a measure Total Factor Productivity, estimated following Olley and Pakes (1996). These changes are defined the same way as the Δ*CHN* variable. The symbols "***", "**", and "*" represent statistical significance at the 1%, 5%, and 10% levels, respectively.

results suggest that after controlling for firm-specific observed and unobserved heterogeneity related to loan-demand shocks, trade-induced import competition from a low-wage country such as China reduces the cost of bank loans in a high-wage country like the US. The question remains, do we observe a similar reduction in loan cost if the trade-induced competition originates from a high-wage country? In other words, does it matter whether the import competition originates from a high-wage country as opposed to a low-wage country? In specification (3) of the table, we find that if the competition originates from high-wage countries (ΔHWC_{jt}), it is likely to increase the cost of bank loans in a high-wage country such as the US. This result is consistent with Krugman (2008) who argues that import competition from a low-wage country is more likely to disrupt market structure in a high-wage country than a similar level of competition from another high-wage country.[22]

The rest of the results reported in Panel A of Table 7 show that trade-induced competition from a low-wage country also significantly affects other non-price contract terms. In particular, an elevated level of trade-induced competition from China (in the post-WTO period) is associated with higher loan amount, longer maturity, and fewer restrictive covenants. By contrast, import competition from high-wage countries is more likely to reduce the amount of bank financing, with shorter maturity and more restrictive covenants. Note that the interdependencies between the price and non-price terms of a loan contract may confound identification of the effect of the trade shock. To address this issue, we follow Dennis et al. (2000) and estimate the fixed effect regression for each of the price and non-price loan contract terms without including other contract terms as explanatory variables. This approach is similar to Berger and Udell's (1995) study of pricing small business loans and Guedes and Opler's (1996) study of the maturity of public debt issues. In sum, the results in Table 7 suggest that Chinese firms engaging in international business activities in the US via trade openness likely engendered profound structural adjustments in the industrial compositions in the US by inducing US firms to be more productive, efficient, and innovative (e.g., Autor et al., 2013; Bernard et al., 2007, 2010; Bloom et al., 2016), and as a result, creditors favorably value these trade-induced efficiency gains into the pricing and design of loan contracts.

Baseline Analysis: The Productivity Channel

In this section, we examine empirically the underlying mechanism via which trade openness to a low-wage country leads to better loan-market access for firms in a high-wage country. Specifically, we focus on the idea of Total Factor Productivity (TFP), which generally encompasses overall efficiency gain within firms resulting from trade-induced enhancement in innovation, productivity, resource allocation, governance, and other firm-specific policies. To isolate the effect of Chinese competition on US manufacturing firms' loan-market access via the TFP channel we use the following regression framework (Baron & Kenny, 1986; James & Brett, 1984; Judd & Kenny, 1981):

$$\Delta SPREAD_{lijt} = \alpha_i + \delta \cdot \Delta TFP_{ijt} + \gamma \cdot \Delta CHN_{jt} + \varepsilon_{lijt} \quad (8)$$

$$\Delta TFP_{ijt} = \omega + \phi \cdot \Delta CHN_{jt} + \varepsilon_{ijt} \quad (9)$$

where $\Delta SPREAD_{lijt} = SPREAD_{lijt}^{postWTO} - \overline{SPREAD}_{lijt}^{preWTO}$, $\Delta CHN_{jt} = CHN_{jt}^{postWTO} - \overline{CHN}_{jt}^{preWTO}$, and $\Delta TFP_{ijt} = TFP_{ijt}^{postWTO} - \overline{TFP}_{ijt}^{preWTO}$. Equation (9) captures the effect of import competition from China on the firm-level productivity gain and Eq. (8) decomposes the changes in spread due to trade-induced productivity gain and other factors (independent of productivity gain) related to import competition from China. By plugging (9) into (8), we get:

$$\begin{aligned} \Delta SPREAD_{lijt} &= \alpha_i + \delta \cdot \omega + (\delta \cdot \phi + \gamma)\Delta CHN_{jt} + \delta \cdot \varepsilon_{ijt} + \varepsilon_{lijt} \\ &= \alpha^* + \beta^* \Delta CHN_{jt} + \varepsilon^*_{lijt} \end{aligned} \quad (10)$$

where $\alpha^* = \alpha_i + \delta \cdot \omega$, $\beta^* = \delta \cdot \phi + \gamma$, and $\varepsilon^*_{lijt} = \delta \cdot \varepsilon_{ijt} + \varepsilon_{lijt}$. In Eq. (10), β^* is the same as the within-firm effect of ΔCHN_{jt}, however, the decomposition in Eq. (10) shows that $\delta \cdot \phi$ of the effect is channeled through trade-induced changes in firm-level productivity and γ is the remaining effect of ΔCHN_{jt} on spread. To measure a firm's total factor productivity (TFP), we assume that all firms have access to the Cobb–Douglas production technology that exhibits constant returns to scale: $Y_{ijt} = A_{ijt} \times K_{ijt}^{\alpha} L_{ijt}^{1-\alpha}$, in which Y_{ijt} is the sales revenues, K_{ijt} is the capital stocks, L_{ijt} is the number of employees, and A_{ijt} is the idiosyncratic total factor productivity of firm i in industry j and at time t. By taking the natural logarithm of both sides, we get: $y_{ijt} = a_{ijt} + \alpha k_{ijt} + (1 - \alpha) l_{ijt}$. We use the log of flow of investment (measured by capital expenditures) to proxy

for k_{ijt} and the log of the number of employees to proxy for l_{ijt}; both variables are collected from Compustat. To address a potential survivorship bias (more productive firms are more likely to survive), which may lead to overestimating the *TFP*, we use the estimation methodology developed by Olley and Pakes (1996). They correct for survivorship bias by controlling for firm survival probability. The survival probability is estimated with a polynomial expansion in investment and capital stock with the full set of interactions in a probit model.

Panel B of Table 7 shows the decomposition of trade-induced effects on various loan-contract terms. First, increased trade-induced competition originating from China's WTO entry induces a higher level of TFP within a surviving manufacturing firm in the US as the ϕ coefficient is always positive and statistically significant at the 1% level. Second, a higher degree of import competition from China (in the post-WTO period) increases loan-market access for US manufacturing firms by inducing within-firm productivity gain as shown by the expected signs and statistical significance of the δ coefficient. Finally, for loan spread equation, 54% $\left(\frac{\delta \cdot \phi}{\beta^*}\right)$ of the effect of increased Chinese import-share on the cost of bank loans (in the post-WTO period) is channeled through the within-firm TFP gain. Results are similar for other loan-contract terms. These results establish that the elevated loan-market access for US manufacturers in the post-WTO era is partially channeled through trade-induced overall efficiency, measured by the TFP gains within firms.[23]

Robustness Analysis

Loan-level supply shocks: The concern here is that the estimated coefficient β in the within-firm fixed effect model (7) may still be influenced by loan-level supply shocks. To address this identification issue, we use two proxies for negative shocks to bank-loan supply during the post-WTO periods and incorporate them in our fixed-effect regression model. The first loan-supply-shock variable is a dichotomous variable, $JAPBANK^{postWTO}$, indicating whether the lead bank in a given loan contract is a subsidiary of a Japanese parent bank. KPMG (2011, p. 3) noted that real estate loan balances in Japanese banks' portfolios declined "from 1999 through 2003 when Japanese companies implemented balance sheet restructuring after the conclusion of the bubble era (which came to an abrupt end in the early 1990 s)." Benmelech, Bergman, and Seru (2011) and Peek and Rosengren (2000) show that the collapse of the real estate market in Japan adversely affected the lending of Japanese banks and their subsidiaries in the real-estate and industrial sectors in the US. The second loan-supply shock is another dichotomous variable, *FCRISIS*, indicating whether a loan was initiated between 2007Q3 and 2009Q1, the beginning and the end of the 2007–2009 financial crisis. Panel A of Table 8 shows the within-firm effect of the trade shock when we control for loan-level supply shocks. Results show that negative shocks to bank-loan supply and the associated disruptions in the credit market, on average, reduces the loan-market access for US manufacturing firms; however, the positive within-firm effect of increased Chinese competition remains statistically and economically significant at the 1% level although the magnitude of the coefficients shrink compared to what is reported in panel A of Table 7.

Industry-level growth shocks: The concern here is that the post-WTO shift in Chinese import share may be correlated with industry-level demand shocks. In other words, the rise in post-WTO Chinese import share is more likely to happen in US manufacturing industries that experienced expansion even before China's WTO entry and, as a result, are more likely to experience lower loan cost in the post-WTO era. Thus, the challenge is to separate the effect of Chinese import competition on the cost of bank loans from the effects of other forces operating on the industry-level demand side, in addition to the loan-level supply shocks. To address this issue, we identify US manufacturing industries that are more likely to experience a surge of Chinese imports after China's WTO entry (in an *ex ante* sense). To this end, we focus on the import quotas imposed by the US government on Chinese exporters under the Multi-fibre Arrangement (MFA) and WTO's Agreement on Textiles and Clothing (ATC). We collect the average utilization rate of US apparel and textile quotas ($FILLRATE_{j,pre\text{-}WTO}$) under the MFA and ATC by Chinese exporters during the pre-WTO periods from Brambilla, Khandelwal, and Schott (2010). We then match each of the MFA classes with six-digit NAICS codes using the concordance provided by the authors.[24] The $FILLRATE_{j,pre\text{-}WTO}$ varies across industries and years and ranges between 0 and 1. A higher $FILLRATE_{j,pre\text{-}WTO}$ for an industry indicates that Chinese manufacturers are exhausting their allocated quota for that industry and it also signals that the post-MFA[25] trade entry by Chinese firms into the industry is likely to be high. We then calculate $\Theta_{jt} = (1 - FILLRATE_{j,pre\text{-}WTO})$ and use it to identify industries with little indication that post-WTO trade entry by

Table 8 Chinese competition and loan-contract terms: Within-firm fixed effects robustness

	[1] ΔSPREAD	[2] ΔLAMT	[3] ΔLMAT	[4] ΔNCOVS	[5] ΔSPREAD	[6] ΔLAMT	[7] ΔLMAT	[8] ΔNCOVS
Panel A: Loan-level supply shocks regressions								
ΔCHN	−169.523***	813.869***	22.500***	−2.603***	−182.313***	1035.629***	71.708***	−4.688***
	[−2.84]	[4.24]	[2.81]	[−2.79]	[−4.01]	[10.04]	[10.43]	[−5.92]
$JAPBANK^{postWTO}$	48.399***	−174.059***	−11.807***	0.518***				
	[3.68]	[−7.76]	[−12.50]	[4.75]				
$\Delta CHN \times JAPBANK^{postWTO}$	−48.935	559.519*	−2.288	1.267				
	[−0.59]	[1.76]	[−0.17]	0.82]				
FCRISIS					1.402	27.419	−3.757***	0.215
					[0.13]	[1.56]	[−3.22]	[1.59]
ΔCHN × FCRISIS					116.423**	−284.067**	−13.373	0.267
					[2.45]	[−2.23]	[−1.59]	[0.27]
Constant	−17.356	135.669***	−0.697	0.617***	72.872***	29.489***	−6.649***	0.859***
	[−1.24]	[7.68]	[−0.94]	[7.19]	[7.33]	[3.75]	[−12.56]	[14.24]
N	4376	5186	4909	5186	4376	5186	4909	5186
R^2	0.71	0.42	0.62	0.59	0.73	0.42	0.57	0.56
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	ΔSPREAD		ΔLAMT		ΔLMAT		ΔNCOVS	
Panel B: Industry-level demand shock regressions								
ΔCHN × (1 − FILLRATE)	−145.152***		1375.971***		65.267***		−4.803***	
	[−2.63]		[8.20]		[9.07]		[−5.73]	
ΔpenCHN × (1 − FILLRATE)		−296.452**		1933.891***		156.369***		−3.670*
		[−2.14]		[4.60]		[8.21]		[−1.67]
Constant	75.305***	152.472***	52.520***	59.483***	−6.846***	−7.416***	0.913***	0.844***
	[6.05]	[12.29]	[4.05]	[4.78]	[−12.19]	[−13.01]	[14.10]	[12.95]
N	4376	3705	5186	4328	4909	4113	5186	4328
R^2	0.71	0.71	0.41	0.41	0.59	0.59	0.58	0.61
Panel C: Instrumental variables regression analysis								
ΔCHN	−326.458***		2404.957***		164.887***		−7.221***	
	[−3.50]		[11.16]		[10.61]		[−3.74]	
ΔpenCHN		−460.360***		5540.477***		375.268***		−15.036***
		[−2.74]		[11.51]		[10.27]		[−3.40]
Constant	25.057***	16.344***	−74.080***	−60.462***	−13.589***	−12.846***	1.186***	1.075***
	[4.25]	[3.58]	[−5.27]	[−4.75]	[−13.23]	[−13.15]	[9.42]	[9.20]
First-Stage Results								
ΔRURALMIGRANTS	0.002***	0.001***	0.002***	0.001***	0.002***	0.001***	0.002***	0.001***
	[34.76]	[30.14]	[43.19]	[31.86]	[41.74]	[30.91]	[43.19]	[31.86]
First-stage F-stat	827.22	908.2	1865.65	1015.35	1742.10	955.47	1865.65	1015.35
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Hausman χ^2	46.04	4.36	55.18	91.68	53.96	52.94	14.92	8.52
	[0.00]	[0.04]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N	4376	2874	5186	4328	4909	4113	5186	4328

This table provides various robustness exercises on the within-firm effects of Chinese competition on various loan-contract terms. ΔCHN is the difference between the fraction of US imports originating from China after China's WTO entry (2002–2012) and the average imports from China to the US before China's WTO entry. ΔpenCHN is defined in a similar fashion to ΔCHN and it captures the difference between import penetration into the US by Chinese manufacturing firms before and after China's WTO entry. $JAPBANK^{postWTO}$ is a dummy variable indicating whether a loan is initiated during 2002 or 2003 and the lead lender in the loan contract is a Japanese bank or a subsidiary of one. FCRISIS is a dummy variable indicating whether the loan is initiated during the recent financial crisis between 2007Q3–2009Q1. ΔSPREAD is changes in loan spread, ΔLAMT is changes in loan amount, ΔLMAT is changes in loan maturity, and ΔNCOVS is changes in the number of covenants associated with a loan. FILLRATE is the utilization of MFA import quotas by Chinese exporters to the US prior to China's entry into the WTO. ΔRURALMIGRANTS is defined as the difference between the number of rural migrant workers (in millions) in Chinese export industries after China's WTO entry and the average number of rural migrant workers before China's WTO entry. The symbols "***", "**", and "*" represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Chinese manufacturers is motivated by pre-WTO expansion of industries. We then estimate the following regression:

$$\Delta SPREAD_{lijt} = \alpha_i + \beta \cdot \left(\Delta CHN_{jt} \times \Theta_{jt}\right) + \varepsilon_{lijt} \quad (11)$$

where $\Delta CHN_{jt} \times \Theta_{jt}$ measures import share of Chinese manufacturers in US industries where there is little indication that import shift is driven by pre-WTO industry expansions.

Panel B of Table 8 reports the results from the within-firm fixed effects regression model (11). The results are similar to what is reported in Table 7. These results suggest that after controlling for shocks related to firm-level demand for loans and other forces operating on the loan supply and industry demand side, trade-induced import competition from China independently leads to a reduction in the cost of bank loans.

Instrumental variables regressions: There may still be unobserved shocks that can affect both the post-WTO reduction in loan spread and the rise in Chinese import share. To address the potential endogeneity issue, we exploit the exogenous component of Chinese import share that stems from the rising competitiveness of Chinese manufacturers as a result of contemporaneous increase in temporary rural migrant workers in China's export industries. Since China primarily exports low-tech and labor-intensive products, access to a massive pool of low-cost rural workers is a source of comparative advantage for Chinese manufacturers in those product-market segments. Furthermore, internal migration in China is highly regulated, and it has been an important part of the national industrialization strategy (Chan, 2009). More generally, internal migration in China falls into two categories: migration with "local" residency rights (*hukou* migration) and migration without *hukou* residency rights (*non-hukou* migration). The *hukou* migration is generally open only to a very select group (usually, the rich and highly educated), and immediate family members of residents with local *hukou* (Chan & Buckingham, 2008). The *non-hukou* migrants are generally known as "rural migrant labor" (*nongmingong*) and make up the largest constituent group of "floating population" in the world (UNDP, 2005). This group includes only the working population with rural-*hukou* and does not have local *hukou* at the destination. This pool of low-skill temporary rural migrant workers is the primary source of low-wage labor for Chinese export industries. Thus, growth in the influx of temporary rural migrant workers in Chinese export industries is likely to be positively related to the rise in China's import share in the US in the post-WTO era, but is unlikely to be related to US firms' cost of bank loans since the flow of these migrant workers is highly regulated by Chinese authorities. We use the increase in the supply of temporary rural migrant workers in the post-WTO years (relative to the pre-WTO average) as an instrument for the rise in China's import share in US manufacturing industries in the post-WTO period.[26]

Panel C of Table 8 reports the within-firm effect estimates using instrumental variables regression. In the first stage, the instrument is significantly positively correlated with Chinese import share, measured by (ΔCHN_{jt}) and ($\Delta penCHN_{jt}$) variables, with high t-statistics and F-statistics. In the second stage, results show that exposure to trade with China is significantly related to loan spread and other loan-contract terms and these relationships are significant at the 1% level. To test for the existence of endogeneity, we use the Hausman specification test (Hausman, 1978). The Hausman test is based on the difference between the fixed-effect OLS estimator (which is consistent and efficient under the null hypothesis of no endogeneity, but inconsistent under the alternative) and the IV estimator (which is consistent under both, but inefficient under the null). We can reject the null hypothesis of no endogeneity at the 1% level of significance, suggesting that the IV specification is more efficient than the simple fixed-effect OLS specification. In summary, the results show that the association between an elevated level of Chinese import competition and favorable loan-contract terms for US manufacturing firms is robust to endogeneity.

Trade-induced Reallocation of Financing between Firms

The foregoing analyses of our results raise an important question: Do all manufacturing firms in high-wage countries benefit financially the same way by engaging in international business activities via trade openness with low-wage countries? To examine the distributional impact (in terms of access to external financing) of trade-induced competition originating from a low-wage country on corporate welfare in high-wage countries, in this section we investigate the between-firm fixed effects of Chinese import competition. Campbell, Lettau, Malkiel, and Xu (2001) show that there is considerable heterogeneity across firms even within the same four-digit SIC industry. Following

their argument, we focus on the *ex ante* (pre-WTO period) heterogeneity across sample firms in the technology spectrum. Compositional models of trade (Bernard et al., 2006; Bloom et al., 2016) suggest that when trade barriers fall between high- and low-wage countries, the high-tech industries will grow relatively faster than low-tech industries in the high-wage country; the opposite will occur in the low-wage country. Capital markets, therefore, should reallocate financing from (*ex ante*) low-tech to high-tech firms. This recalibration of scarce economic resources between firms as a result of a trade exposure to low-wage countries should also be priced into financial assets by the capital market. To examine whether increased trade exposure to China in the post-WTO period reallocated financing between firms, we first analyze price and non-price loan-contract terms in an univariate framework followed by regression analysis.

Univariate Analysis

In practice, it is difficult to quantify the *ex ante* level of technological sophistication in firms' production processes. To address this concern, we use three different measures to quantify the locus of a firm in the technology spectrum and average these measures for (up to) 10 years prior to China's WTO entry. The first measure of technological sophistication is the capital–labor ratio (CLR^{preWTO}). This is a standard variable researchers use in the literature to characterize the production technology of a firm. MacKay and Phillips (2005) used this ratio to identify how technologically advanced or mediocre a firm is relative to the average firm in the industry. We follow MacKay and Phillips (2005) and use the fixed-capital stock (net plant, property, and equipment; in millions of dollars) divided by the total number of employees of a firm as a proxy for its capital intensity. A high CLR^{preWTO} ratio implies a high-tech firm while a low ratio indicates a low-tech firm (in an *ex ante* sense). The second measure of technical sophistication is the number of patents granted (normalized by total number of employees) to the firm during the years prior to China's WTO entry. Patents play an increasingly important role in innovation and economic performance. The use of patent data as a measure of innovation and technical change dates back to path-breaking analyses of Schmookler (1966) and Scherer (1965).[27] Further, the advantage of patent data is that they are available in great detail over a wide range of time periods, geographic areas, and technological sectors (Griliches, 1990). Although there is a strong correlation between the size of a firm's R&D effort and its patenting output, patents are usually rated as important primarily for blocking and defensive purposes to safeguard a firm's technology from being expropriated by others (Hall, 2008: 309). Thus, this measure, $\left(\frac{PATGR}{EMP}_{ijt}\right)^{preWTO}$, captures the extent of innovation within a firm and the ability of the firm to protect its core competencies against competitors. Finally, we also use the number of patents that the firm applied for (normalized by total number of employees) to measure the level of innovation activities within a firm.

Panel A of Table 9 describes the univariate relationship between the pre-WTO technical sophistication of a firm and its post-WTO trade exposure and various loan-contract terms using the CLR^{preWTO} measure.[28] We first classify sample firms into two mutually exclusive categories: a firm is defined as an *ex ante* high-tech ($HCLR^{preWTO}$) firm if the 10-year average CLR^{preWTO} ratio (calculated one year prior to China's WTO entry) of the firm is above the 75th percentile of the cross-sectional distribution of 10-year average CLR^{preWTO} ratios across all firms in the sample. Similarly, a firm is defined as an *ex ante* low-tech ($LCLR^{preWTO}$) firm if the 10-year average CLR^{preWTO} ratio (calculated one year prior to China's WTO entry) of the firm is below the 25th percentile of the cross-sectional distribution of 10-year average CLR^{preWTO} ratios across all firms in the sample. We then calculate the post-WTO differences in trade exposure and loan characteristics between these two groups. Results show that *ex ante* high-tech firms face significantly less import competition from China after China's WTO entry compared to *ex ante* low-tech firms. Furthermore, (*ex ante*) high-tech firms have lower loan spreads, higher loan amounts, longer loan maturity, and less restrictive other non-price contract terms such as collateral and covenants in the post-WTO period compared to (*ex ante*) low-tech firms. These univariate statistics suggest that the pre-WTO technological sophistication of firms is an important determinant of the post-WTO reallocation of financing between firms towards more capital-intensive and technologically advanced firms.

Table 9 Pre-WTO capital and innovation intensity and post-WTO loan-contract terms

Panel A: Pre-WTO technical sophistication and post-WTO import competition and loan terms (summary statistics)

	$HCLR^{preWTO}$		$LCLR^{preWTO}$		*HML*	
	Mean	Median	Mean	Median	Mean-diff	Median-diff
Import competition						
CHN	0.059	0.022	0.171	0.120	−0.112***	−0.098***
penCHN	0.015	0.001	0.070	0.031	−0.055***	−0.029***
Loan-contract terms						
SPREAD	192.611	150.000	243.825	200.000	−51.214***	−50.000***
LAMT	627.795	265.854	228.303	82.800	399.492***	183.054***
LMAT	46.995	51.000	43.953	44.000	3.042***	7.000***
SECURE	0.353	0.000	0.585	1.000	−0.232***	−1.000***
NCOVS	2.248	0.000	3.685	3.000	−1.437***	−3.000***
NLENDER	9.258	7.000	6.247	4.000	3.011***	3.000***
BIG3	0.621	1.000	0.589	1.000	0.032*	0.000

Panel B: Pre-WTO technical sophistication and post-WTO loan terms (between-firm effects)

	$HCLR^{preWTO}$		$LCLR^{preWTO}$		*HML*	
	(Δ*SPRD*)	(Δ*LAMT*)	(Δ*SPRD*)	(Δ*LAMT*)	(Δ*SPRD*)	(Δ*LAMT*)
$\Delta CHN \times CLR^{preWTO}$	−44.926***	389.841***				
	[−2.95]	[8.54]				
$\Delta CHN \times \left(\frac{PATGR}{EMP}\right)^{preWTO}$			−19.349**	112.516***		
			[−2.13]	[3.74]		
$\Delta CHN \times \left(\frac{PATAP}{EMP}\right)^{preWTO}$					−15.079**	61.942***
					[−2.55]	[3.13]
Constant	77.106***	50.959***	137.879***	99.922***	68.049***	98.237***
	[6.21]	[3.87]	[11.91]	[12.30]	[7.05]	[13.45]
N	4247	4980	2372	2806	2588	3059
R^2	0.71	0.41	0.70	0.41	0.72	0.41

This table provides summary statistics and between-firm effects of Chinese competition on loan-contract terms after China's WTO entry conditional on the pre-WTO technological and innovation intensity of firms. $HCLR^{preWTO}$ refers to a firm that had a high capital–labor ratio (*CLR*), a proxy for high-tech and capital intensity, at the time of China's WTO entry. The pre-WTO *CLR* is defined as high if the 10-year average *CLR* prior to China's WTO entry for a firm is above the 75th percentile of the sample distribution of pre-WTO *CLR*. $LCLR^{preWTO}$ refers to a firm that had a low capital–labor ratio (*CLR*), a proxy for low-tech and labor intensity, at the time of China's WTO entry. The pre-WTO *CLR* is defined as low if the 10-year average *CLR* prior to China's WTO entry for a firm is below the 25th percentile of the sample distribution of pre-WTO *CLR*. *HML* is defined as $HCLR^{preWTO} - LCLR^{preWTO}$. *CHN* is defined as the fraction of US imports originating from China and *penCHN* is defined as a measure of import penetration into the US manufacturing industries by Chinese manufacturers. *SPREAD* is the loan spread over LIBOR (in basis points); *LAMT* is the loan amount (in millions of dollars); *LMAT* is the loan maturity (in years); *SECURE* is a dummy variable indicating whether the loan is secured with collateral; *NCOVS* is the number of total covenants associated with a loan; *NLENDER* is the number of lenders in a loan syndication; and *BIG*3 is a dummy variable indicating whether the lead agent in the loan syndicate is any of the top 3 US banks, i.e., Bank of America, Citigroup, and JPMorgan Chase. Δ*CHN* is the difference between the fraction of US imports originating from China after China's WTO entry (2002–2012) and the average imports from China to the US before China's WTO entry (1990–2000). $\left(\frac{PATGR}{EMP}\right)^{preWTO}$ is the total number of patents granted to a US manufacturing firm five years prior to China's WTO entry (1995–2000) normalized by the average number of employees in the firm. $\left(\frac{PATAP}{EMP}\right)^{preWTO}$ is the total number of patents applied for by US manufacturing firm five years prior to China's WTO entry (1995–2000) normalized by the average number of employees in the firm. The symbols "***", "**", and "*" represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Regression Analysis

To examine the extent of bank-loan financing reallocation between firms in the post-WTO periods, we estimate the following variation of the firm fixed-effects regression model:

$$\Delta SPREAD_{lijt} = \alpha_i + \phi \cdot \left(\Delta CHN_{jt} \times \overline{TECH}_{ijt}^{preWTO}\right) + \varepsilon_{lijt} \quad (12)$$

This is similar to the "within-firm" specification except for the interaction effect between the ΔCHN_{jt} and the (*ex ante*) technological sophistication of the firm, captured by $\overline{TECH}_{ijt}^{preWTO}$. The ϕ coefficient captures the "between-firm" effect of Chinese competition depending on the pre-WTO level of technical sophistication of a US manufacturing firm. Similar to specification (7), we can only

estimate the coefficient ϕ in the sample of firms with multiple loans before and after China's WTO entry.[29]

Panel B of Table 9 shows the estimated between-firm effects of trade-induced competition originating from China on the price (loan spread) and quantity (loan amount) of bank loans after China's WTO entry. The results show that a higher level of trade-induced competition from China is associated with lower price (spread) and higher quantity of bank financing (loan amount) for (*ex ante*) capital-intensive and technologically advanced US manufacturing firms. In terms of economic significance, when the CLR^{preWTO} measure is evaluated at the 10th percentile, a 8.10% increase in ΔCHN is associated with 10.473 basis-points decrease in loan spread and \$90.880 million increase in loan amount. In contrast, when the CLR^{preWTO} measure is evaluated at the 90th percentile, the same 8.10% increase in ΔCHN is associated with 18.60 basis-points decrease in loan spread and \$161.390 million increase in loan amount.[30] The results are consistent for all three measures of *ex ante* technological sophistication of firms. These results highlight the asymmetric effect of trade openness to low-wage countries on the external financial access of high-wage countries' firms. Highly capital-intensive and technologically advanced firms in high-wage countries are more likely to benefit financially from falling trade barriers with low-wage countries. Creditors price this asymmetric effect of a trade shock from low-wage countries into loan contracts, creating distributional consequences of lower trade barriers for investors in the capital market.

Two caveats are in order. First, relying on the mean-difference fixed-effect model for identification means a significant drop in sample size and, as a result, biases towards large firms with multiple loans before and after China's WTO entry. Second, the DealScan database covers primarily syndicated loans and, as a result, small firms that are financially constrained and most reliant on bank loans may not be represented in the current sample. These data-related limitations are more likely to underestimate the within- and between-firm effects of trade liberalization. Since small firms are more likely to be financially constrained than large firms, the marginal reduction in loan cost is likely to be higher for small firms arising from the trade-induced efficiency gain within a firm. Thus, the estimated within-firm effect in the current sample is likely to underestimate the within-firm effect in a small-firm sample. Furthermore, to the extent that the between-firm heterogeneity is higher among small firms compared to large firms, the extent of trade-induced reallocation of financing by financial intermediaries is likely to be stronger in a small-firm sample. Hence, the between-firm effect in the current sample is likely to underestimate the between-firm effect in a small-firm sample. In sum, although the generality of the intuition developed in this article is potentially constrained by data-related limitations, it is a step towards understanding how falling trade barriers between rich and poor countries are likely to affect the financial structure of firms in high-wage countries.

CONCLUSION

The value of annual US goods imports from China has increased by an astounding 3062.49% from 1990 to 2015, with most of the rise occurring after China's WTO entry (US Census Bureau, 2015). This rapid increase in US exposure to trade with China raises an important question: How does engaging in international business activities with China via trade openness affect the provisions of external financing for import-competing firms in the US?

In this article, we use China's entry into the World Trade Organization (WTO) as a quasi-natural experiment to estimate the effect of trade-induced import competition originating from a low-wage country such as China on the price and design of bank-loan contracts in a high-wage country like the US. We report three key results: First, the elevated level of trade-induced import competition following China's WTO entry is associated with a higher level of loan-market access for US manufacturers, manifested by lower spread, higher loan amount, longer maturity, and less restrictive non-price contract terms such as collateral and covenants. Second, we show that the mechanism underlying the ease in the provisions of external debt financing in import-competing industries is the (trade-induced) overall productivity gains within firms in high-wage countries. Finally, trade-induced import competition from low-wage countries engenders an efficient allocation of financial resources in high-wage countries by channeling financing away from low-productivity, low-tech, and labor-intensive firms towards high-productivity, high-tech, and capital-intensive firms that are set to gain the most from falling trade barriers between low- and high-wage countries.

These results suggest that engaging in international business activities via trade openness with a

low-wage country is likely to ease the provisions of external financing for import-competing firms in high-wage countries. Furthermore, these results highlight that international business activity via trade liberalization is indeed a positive-sum game for both low- and high-wage countries and the key to unlocking the gains from globalization for firms in high-wage countries is to move up in the global technology and productivity spectrum.

APPENDIX

See Table 10.

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Table 10 Definitions of variables

Variables	Definitions
Firm characteristics	
TA	Total book assets (in $ billions); Compustat data item: *at*
TQ	It stands for Tobin's Q measured as: (Market value of equity plus the book value of debt)/Total assets; Compustat data items: $(at - ceq + prcc \times csho)/at$
LEVERAGE	(Long-term Debt + Debt in current liabilities)/Total assets; Compustat data items: $(dltt + dlc)/at$
PROFIT	EBITDA/Total assets; Compustat data items: $oibdp/at$
TANGIBILITY	Net Property, plant, and equipments/Total assets; Compustat data items: $ppent/at$
INTCOV	Interest coverage ratio measured as: EBITDA/Interest expenses; Compustat data items: $oibdp/xint$
EDF	Expected default frequency (EDF) is calculated following Bharath and Shumway's (2008) naive *EDF* estimation procedure
Loan characteristics	
SPREAD	Loan spread based on All-in-Drawn spread over LIBOR (in basis points); All-in-Drawn is the spread charged by the bank over LIBOR for the drawn portion of the loan facility obtained from the LPC database
TCB	The total cost of borrowing, including various fees associated with a loan. It is estimated based on the algorithm outlined in Berg et al. (2015)
LAMT	Loan facility amount (in $ millions) obtained from the LPC database
LMAT	Loan maturity period (in months) of the bank loan obtained from the LPC database
SECURE	Dummy variable that takes on the value of 1 if the loan facility is secured with collateral and 0 otherwise. For firms with missing collateral information in DealScan, we replace the dummy variable with zero
NCOVS	Total number of general, financial, and net worth covenants in a loan. General covenants are restrictions on prepayment, dividend, and voting rights. Prepayment covenants usually specify that a loan must be repaid from a specific source such as equity issuance, excess cash flow, excess asset sales, excess debt issuance, or insurance proceeds related to the collateral. The dividend covenant limits the payment of dividends. The covenants on voting rights mandate the percentage of lenders required to approve the changes of the items in the loan agreement, such as term changes and collateral release. Financial covenants count the number of limits placed on the level of different accounting variables or ratios that must be maintained while the debt is outstanding
NLENDER	Total number of lenders in a loan contract
BIG3	A dummy variable indicating whether the lead bank is any of the three major US banks, i.e., the Bank of America, Citigroup, and JPMorgan Chase
Loan-type Dummies	Dummy variable indicating loan types such as term loan, revolver greater than one year, revolver less than one year, and 364-day facility
Loan-purpose Dummies	Dummy Variable for each loan purpose, including Debt repayment, Corporate purpose, and Working capital
Independent variables	
CHN	Six-digit NAICS level Chinese import share over total US imports
penCHN	Six-digit NAICS level import penetration by Chinese producers in US manufacturing industries
TFP	Total factor productivity measure for a firm, estimated following Olley and Pakes (1996)

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NOTES

[1]China's share of world manufacturing exports has grown from 2.3% in 1991 to an astounding 18.8% in 2013, making the country the biggest exporter in the world with an export value of $2.3 trillion (Autor, Dorn, & Hanson, forthcoming).

[2]Levine (2005) offers a survey of the extant empirical literature on financial development and growth. Baltagi, Demetriades, and Law (2009), Beck (2002), Chor and Manova (2012), Demetriades and Rousseau (2010), and Manova (2008) pursue the nexus between financial development and trade. Moser and Rose (2014) investigate stock-market reaction to bilateral trade agreements between countries.

[3]We elaborate the theoretical underpinnings of trade-finance nexus in "Why does Trade with China Matter for Financial Contracting?" section.

[4]For expository purpose, the online appendix provides a simple economic framework to illustrate the link between the cost of bank loans and lower trade barriers.

[5]Strahan (1999) and Chava and Roberts (2008) provide a good description of the LPC DealScan database, which was originally compiled from the Securities and Exchange Commission (SEC) corporate financial filings and through direct research on banks.

[6]DealScan coverage of bank loans is not representative of the number of bank loans in the US before 1990 (Chava & Roberts, 2008; Strahan, 1999).

[7]Robert B. Zoellick, US Trade Representative, was quoted in the *New York Times* on November 11, 2001: "I believe that as this century unfolds and people look back on this day, they will conclude that in admitting China to the WTO we took a decisive step in shaping a global economic and commercial system."

[8]*The Economist*, July 7, 2011: www.economist.com/node/18925947.

[9]Information on loan security is limited in the DealScan. We use information on loan security in the univariate analysis only, not in the regression analysis.

[10]Ivashina and Scharfstein (2010) and Kahle and Stulz (2013) argue that the financial crisis of 2007–2009 peaked during 2008Q4 and 2009Q1. It is also evident from the table that loan spread increases during the immediate aftermath of China's WTO entry (2002–2004) compared to prior years (2000–2001). This could be due to increased capital market frictions in the US prior to and during China's WTO entry. For instance, the 'dot.com' collapse in which the Nasdaq Composite lost 78% of its value as it fell from March 2000, high of 5046.86 to October 2002, low of 1114.11. The 'dot.com' collapse was further accelerated by the September 11, 2001, terrorist attacks leading to a severe disruption in the US interbank payment system (Lacker, 2004; McAndrews & Potter, 2002) and followed by a brief period of macroeconomic recession (2001Q1–2001Q4). This phenomenon may also be attributed to short-term adjustment costs of trade openness, particularly for low-productivity firms (e.g., Trefler, 2004). However, we are not aware of any study that systematically examines these issues in the context of bank loans or debt financing during the immediate aftermath of trade openness to a low-wage country.

[11]Data on import penetration are only available until year 2010 due to the limited availability of the value of US shipments from the NBER-CES Manufacturing Industry Database.

[12]Year 2001 is defined as the year of China's WTO entry. Any year prior to that year is defined as 'before' (1990–2000) and any year after that is defined as 'after' (2002–2012).

[13]Note that we do not use any loans initiated during the year of China's WTO entry (2001) in our OLS estimation for identification purpose.

[14]Table 10 in the appendix gives definitions of all firm- and loan-specific variables.

[15]The variable returns 1 for high-exposure industry and 0 for low-exposure industry. An industry is defined as a high-exposure one if the Chinese import share (CHN) in the industry is more than the 75th percentile of the cross-sectional distribution of CHN across all manufacturing industries in the US. Similarly, an industry is defined as a low-exposure one if the CHN in the industry is less than the 25th percentile of the cross-sectional distribution of CHN across all manufacturing industries in the US.

[16]Survivorship bias is easier to address empirically since we observe the survivors' spreads in the post-WTO periods. It is, however, difficult to address the selection issue because non-survivors' post-WTO spread is unobservable.

[17]For example, we define firms that held IPOs prior to 1990 and survived until 1990 and beyond as the 1990-cohort of firms. For those firms, the year 1990 is defined as the base year, which is set at 0.

[18]Firms can exit the Compustat-DealScan universe for many reasons such as bankruptcy, LBO, MBO, and M&A. We do not differentiate between the various reasons for firm exit because we are simply interested

in the survivorship and selection biases specific to our sample. Also, a firm may not initiate a loan every single year it survives in our sample. If a surviving firm does not initiate a loan in a given year, we use the average spread of the firm's two-digit SIC industry to approximate the spread for the firm in that year.

[19]The new sample consists of 1190 unique firms and 15,128 loans. Summary statistics and other characteristics of the within-firm estimation sample are not reported here for brevity but are available upon request. While the new sample is similar to the initial one, it does not have the sample attrition bias due to exit and entry of firms before and after the trade shock.

[20]The fixed-effect strategy does not require that a firm's trade-related exposure to China and its demand for bank financing be uncorrelated since the latter is absorbed by the firm-fixed effect. However, concern remains if China's entry into the WTO were anticipated by US firms and banks. This may lead banks to adjust their lending practices or firms to adjust their borrowing behaviors prior to China's WTO entry, making it difficult to identify the effect of elevated trade exposure due to China's WTO entry on the cost of bank loans. Since we previously argued that the timing of China's WTO entry was largely unanticipated by the capital market, such concern is less of an issue in our setting. Nonetheless, to alleviate any residual reverse causality issue, we remove all loans initiated during 2001 when the terms of China's entry into the WTO were negotiated.

[21]Note that the average level of increase in CHN_{jt} between pre- and post-WTO periods in Table 3 is 8.10%.

[22]Valta (2012) finds that competition in general increases the cost of bank debt but does not disentangle the origin of the competition. To reconcile our finding with that of Valta (2012), it is possible that when competition is not associated with significant disruptions in industry composition, it should in general increase the cost of bank financing.

[23]For robustness, we also use two alternative measures of Total Factor (TFP), i.e., four-factor TFP and five-factor TFP, available from the NBER-CES Manufacturing Industry Database Productivity and the results are qualitatively and quantitatively the same as what we report here.

[24]The first concordance is from the MFA to ten-digit US Harmonized System Codes and then from the US HS to six-digit NAICS. When more than one MFA class matches a six-digit NAICS in a given year, we take the average across all MFA classes in that year within the six-digit NAICS industry to get the $FILLRATE_{j,pre-WTO}$ of the industry in that year.

[25]Under the ATC and WTO agreements, the MFA quotas were fully abolished on January 1, 2005.

[26]See Chan (2012) for a detailed description of these data.

[27]Please see OECD (1994) for an overview of this.

[28]We obtain similar univariate results using the other two measures of technical sophistication.

[29]Note that $\overline{TECH}_{ijt}^{preWTO}$ is an *ex ante* measure that does not vary within a firm in the post-WTO period. For this reason $\overline{TECH}_{ijt}^{preWTO}$ enters the regression model (12) as an interaction term. If we control for $\overline{TECH}_{ijt}^{preWTO}$ in (12) independently it will simply be dropped during estimation since $\overline{TECH}_{ijt}^{preWTO}$ and α_i are perfectly co-linear in the post-WTO period.

[30]From Table 3 we can see that the average ΔCHN in the post-WTO periods is 8.10%. The 10th and the 90th of of the CLR^{preWTO} easure are 2.878 and 5.111, respectively. To calculate the change in loan spread at the 10th percentile of CLR^{preWTO} we use $-44.926 \times 0.081 \times 2.878 = -10.473$. The other changes are calculated in a similar way.

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