

# The Surprisingly Swift Decline of U.S. Manufacturing Employment

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## Abstract

This paper links the sharp drop in U.S. manufacturing employment after 2000 to a change in U.S. trade policy that eliminated potential tariff increases on Chinese imports. Industries more exposed to the change experience greater employment loss, increased imports from China and higher entry by U.S. importers and foreign-owned Chinese exporters. At the plant level, shifts toward less labor-intensive production and exposure to the policy via input-output linkages also contribute to the decline in employment. Results are robust to other potential explanations of employment loss, and there is no similar reaction in the EU, where policy did not change. (JEL F13, F16, F61, F66, J23)

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U.S. manufacturing employment fluctuated around 18 million workers between 1965 and 2000 before plunging 18 percent from March 2001 to March 2007. This paper finds a link between this sharp decline and the U.S. granting of Permanent Normal Trade Relations (PNTR) to China, which was passed by Congress in October 2000 and became effective upon China's accession to the World Trade Organization (WTO) at the end of 2001.<sup>1</sup>

Conferral of PNTR was unique in that it did not change the import tariff rates the United States actually applied to Chinese goods over this period. U.S. imports from China had been subject to the relatively low NTR tariff rates reserved for WTO members since 1980.<sup>2</sup> But for China, these low rates required annual renewals that were uncertain and politically contentious. Without renewal, U.S. import tariffs on Chinese goods would have jumped to the higher non-NTR tariff rates assigned to non-market economies, which were originally established under the Smoot-Hawley Tariff Act of 1930. PNTR removed the uncertainty associated with these annual renewals by permanently setting U.S. duties on Chinese imports at NTR levels.

Eliminating the possibility of sudden tariff spikes on Chinese imports may have affected U.S. employment through several channels. First, it increased the incentive for U.S. firms to incur the sunk costs associated with shifting operations to China or establishing a relationship with an existing Chinese producer.<sup>3</sup> Second, it similarly provided Chinese producers with greater in-

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<sup>1</sup>Though this paper focuses on the impact of a particular U.S. trade policy, it relates to a substantial body of research documenting a negative relationship between import competition and U.S. manufacturing employment, including Freeman and Katz (1991), Revenga (1992), Sachs and Shatz (1994) and Bernard, Jensen and Schott (2006), as well as studies linking Chinese imports to employment outcomes by Autor, Dorn and Hanson (2013), Utar and Torres Ruiz (2013), Bloom, Draca and Van Reenen (2015), Ebenstein et al. (2011), Groizard, Ranjan and Rodriguez-Lopez (2012) and Mion and Zhu (2013).

<sup>2</sup>Normal Trade Relations is a U.S. term for the familiar principle of Most Favored Nation.

<sup>3</sup>A *New York Times* article reporting on the passage of PNTR noted the link to uncertainty: "U.S. companies expect to benefit from billions of dollars in new business and an

centives to invest in entering or expanding into the U.S. market, increasing competition for U.S. producers. Finally, for U.S. producers, it boosted the attractiveness of investments in capital- or skill-intensive production technologies or less labor-intensive mixes of products that are more consistent with U.S. comparative advantage. Intuition for these channels of adjustment can be derived from the large literature on investment under uncertainty, where firms are more likely to undertake irreversible investments as the ambiguity surrounding their expected profit decreases.<sup>4</sup>

We quantify the transition from annual to permanent normal trade relations via the “NTR gap,” defined as the difference between the non-NTR rates to which tariffs would have risen if annual renewal had failed (which average 37 percent in 1999) and the NTR tariff rates that were locked in by PNTR (which average 4 percent in 1999). Importantly, the NTR gap exhibits substantial variation across industries: in 1999, its mean and standard deviation are 33 and 14 percentage points. Larger responses are expected in industries with higher NTR gaps.

Our generalized difference-in-differences identification strategy exploits this cross-sectional variation in the NTR gap to test whether employment in man-

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end to years of uncertainty in which they had put off major decisions about investing in China” (Knowlton 2000). Section A below and Section A of the online appendix contain additional anecdotes describing the effect of PNTR-related uncertainty on U.S. and Chinese firms’ behavior.

<sup>4</sup>The effect of uncertainty on investment can be positive or negative depending upon a range of firm and market characteristics, including adjustment costs, product market competition and production technology. The negative association between PNTR and employment found here is consistent with a range of theoretical (e.g., Rob and Vettas 2003) and empirical (e.g., Guiso and Pirigi 1999, Bloom, Bond and Van Reenen 2007) applications. A theoretical framework closely related to our setting is Pindyck (1993), which shows that uncertainty over input costs increases the value of waiting before undertaking sunk investments. For example, using this framework, Schwartz and Zozaya-Gorostiza (2003) show that input cost uncertainty lowers incentives to invest in new information technology. Handley (2014) and Handley and Limao (2014, 2015) show that reduction in destination-country trade policy uncertainty is associated with increased entry into exporting.

ufacturing industries with higher NTR gaps (first difference) is lower after the change in policy relative to employment in the pre-PNTR era (second difference). An attractive feature of this approach is its ability to isolate the role of the change in policy. While industries with high and low gaps are not identical, comparing outcomes within industries over time isolates the differential impact of China's change in NTR status.

Regression results reveal a negative relationship between the change in U.S. policy and subsequent employment in manufacturing that is both statistically and economically significant. The baseline specification implies that moving an industry from an NTR gap at the 25th percentile of the observed distribution to the 75th percentile increases the implied relative loss of employment by 0.08 log points.

The relationship between PNTR and U.S. manufacturing employment remains statistically and economically significant after controlling for policy changes in China associated with its accession to the WTO that may be spuriously correlated with the NTR gap, including a reduction in import tariffs, the phasing out of export licensing requirements and production subsidies, and the elimination of barriers to foreign investment. Furthermore, the results are robust to controlling for other U.S. economic developments contemporaneous with PNTR, such as the bursting of the 1990s information technology bubble, the expiration of the global Multi-Fibre Arrangement governing Chinese textile and clothing export quotas, and declining union membership in the United States. To further verify that the U.S. reaction can be attributed to the change in U.S. policy, we compare U.S. employment before and after PNTR to that in the European Union, which gave China the equivalent of PNTR much earlier, in 1980. We find no relationship between the U.S. NTR gap and EU manufacturing employment after the U.S. granting of PNTR to

China.

We use data from a range of sources to explore the potential mechanisms behind the U.S. response. Using U.S. trade data, we find that PNTR is associated with relative increases in the value of U.S. imports from China as well as the relative number of U.S. importers, Chinese exporters and U.S.-China importer-exporter pairs. These outcomes demonstrate that U.S. imports from China surge in the high-NTR gap products most affected by PNTR, suggesting that the decline in U.S. employment is due in part to substitution of Chinese imports for U.S. output. They also offer a deeper understanding of the impact of reducing uncertainty in international trade. That is, while our finding of a positive association between the NTR gap and Chinese exporters is consistent with models of exporting under trade policy uncertainty<sup>5</sup>, the surge in U.S. importers and U.S.-importer and Chinese-exporter pairs found here highlights a rich set of potential responses among firms in the importing country, e.g., within-firm offshoring. Toward that end, we use Chinese microdata to show that PNTR is associated with a relative increase in Chinese exports to the United States among foreign-owned Chinese firms, and U.S. microdata to demonstrate that PNTR is associated with a relative increase in the number of U.S. and Chinese firms engaged in related party trade. Each of these outcomes is consistent with within-firm relocation of U.S. production to China.

Additional insight into possible mechanisms explaining our main result comes from examining U.S. outcomes at the plant level. Comparison of plant employment and plant death regressions reveals that some plants were able to adapt to the change in U.S. policy rather than die. Further analysis of

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<sup>5</sup>Handley and Limao (2015) note that their framework could be used to examine a link between PNTR and China's export boom, and Handley and Limao (2014) examine such a link using product-level trade data.

surviving plants’ factor usage shows that PNTR is associated with increased capital intensity, a reaction that is consistent with two mechanisms of trade-induced adaptation: changes in product composition (as in Khandelwal 2010) and adoption of labor-saving technologies (as in Bloom, Draca and Van Reenen 2015), with the latter suggesting that PNTR may be associated with employment reductions beyond those attributable to replacement of U.S. production by Chinese imports. Finally, we find that employment among continuing plants and plant survival respond negatively to exposure to PNTR in downstream (customer) industries, providing indirect evidence of the sort of trade-induced supply-chain disruptions modeled by Baldwin and Venables (2013).

The paper proceeds as follows: Section 1 describes our data, Section 2 describes our empirical strategy and main results, Sections 3 and 4 present additional results, and Section 5 concludes. An online appendix provides additional empirical results as well as information about dataset construction and sources.

## **I Data**

### **A Measuring the Effect of PNTR: The NTR Gap**

#### **A.1 Policy Background**

U.S. imports from non-market economies such as China are subject to relatively high tariff rates originally set under the Smoot-Hawley Tariff Act of 1930. These rates, known as “non-NTR” or “column 2” tariffs, are often substantially larger than the “NTR” or “column 1” rates the United States offers fellow members of the WTO. However, the U.S. Trade Act of 1974 allows the President of the United States to grant NTR tariff rates to non-market

economies on an annually renewable basis subject to approval by the U.S. Congress, and U.S. Presidents began granting such waivers to China annually in 1980.

While these waivers kept the tariff rates applied to Chinese goods low, the need for annual approval by Congress created uncertainty about whether the low tariffs would continue, particularly after the Tiananmen Square incident in 1989. In fact, the U.S. House of Representatives introduced and voted on legislation to revoke China’s temporary NTR status every year from 1990 to 2001. These votes succeeded even in 1990, 1991 and 1992, but China’s status was not overturned because the U.S. Senate failed to sustain the House votes. From 1990 to 2001, the average House vote against annual NTR renewal was 38 percent.<sup>6</sup>

Anecdotal evidence indicates that Congressional threats to withdraw China’s NTR status were taken seriously. Media reports, Congressional testimony and government reports make clear that firms viewed renewal of China’s NTR status as uncertain, and that this uncertainty suppressed investment needed to source goods from China. Indeed, in a 1994 report by the U.S. General Accounting Office (U.S. GAO), U.S. firms “cited uncertainty surrounding the annual renewal of China’s most-favored-nation trade status as the single most important issue affecting U.S. trade relations with China” and indicated that “uncertainty over whether the U.S. government will withdraw or place further conditions on the renewal of China’s most-favored-nation trade status affects the ability of U.S. companies to do business in China” (U.S. GAO 1994). These findings echoed a letter to President Clinton from the CEOs of 340 firms, including General Motors, IBM, Boeing, McDonnell Douglas and Caterpillar, in which they stated that “[t]he persistent threat of MFN withdrawal does little

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<sup>6</sup>Table A.1 of the online appendix summarizes the House votes by year.

more than create an unstable and excessively risky environment for U.S. companies considering trade and investment in China, and leaves China’s booming economy to our competitors” (Rowley 1993). Moreover, the anecdotes underscore the idea that uncertainty can have a chilling effect on investment even if the probability of rescinding NTR is low. Testifying before the House Ways and Means Committee, a representative from Mattel asserted that “[w]hile the risk that the United States would withdraw NTR status from China may be small, if it did occur the consequences would be catastrophic for U.S. toy companies given the 70 percent non-MFN U.S. rate of duty applicable to toys” (St. Maxens 2000).<sup>7</sup> After passage of PNTR, the Congressional Commission created to track its effects reported that: “In the months since the enactment of PNTR legislation with China there has been an escalation of production shifts out of the U.S. and into China...[B]etween October 1, 2000 and April 30, 2001 more than eighty corporations announced their intentions to shift production to China, with the number of announced production shifts increasing each month from two per month in October to November to nineteen per month by April” (U.S. Trade Deficit Review Commission 2001).

Uncertainty associated with annual renewals of China’s NTR status is also apparent in a simplified version of the well-known Baker, Bloom and Davis (2015) policy uncertainty index, which we calculate to relate specifically to China’s NTR renewals. In constructing this index, a research assistant searched the database Proquest for articles that contain the words “China,” “uncertain” or “uncertainty,” and “most favored nation” or “normal trade relations,” for the years 1989 to 2013. The search was limited to articles in *The Wall Street Journal*, *The New York Times*, and *The Washington Post*, and

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<sup>7</sup>Additional anecdotes are provided in Section A of the online appendix.

irrelevant articles were manually screened from the search results.<sup>8</sup> Following Baker, Bloom and Davis (2015), article counts are summed by year and then divided by the total number of articles produced by the three newspapers. The resulting index is displayed in Figure 1. As shown in the figure, the policy uncertainty index spikes in periods of tension in U.S.-China relations, with the highest levels observed in the early 1990s after Tiananmen Square and in 2000 during the debate over PNTR.<sup>9</sup> After passage of PNTR in 2000, the index goes essentially to zero indicating that uncertainty regarding China’s NTR status was effectively resolved.

*[Note: Location of Figure 1 approximately here]*

The U.S. Congress passed a bill granting PNTR status to China in October 2000 following the November 1999 agreement between the United States and China governing China’s eventual entry into WTO. PNTR became effective upon China’s accession to the WTO in December 2001, and was implemented on January 1, 2002.<sup>10</sup> The baseline analysis in Section II treats years from 2001 forward as being “post-PNTR.” Alternate specifications in Section B relax this assumption by allowing the relationship between the NTR gap and employment to differ in each year.

The change in China’s PNTR status had two effects. First, it ended the uncertainty associated with annual renewals of China’s NTR status, thereby eliminating any option value of waiting for U.S. or Chinese firms seeking to

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<sup>8</sup>A list of the articles included in the index as well as those that were screened out manually is available from the authors upon request.

<sup>9</sup>Additional peaks occur around the time of China’s transfer of missile technology to Pakistan (1993) and the Taiwan Straits Missile Crisis (1996).

<sup>10</sup>While each of these milestones likely contributed to the overall reduction in policy uncertainty, both the anecdotal evidence and the policy uncertainty index described above indicate that passage of PNTR in 2000 played a key role in the elimination of uncertainty for U.S. firms.

incur sunk costs associated with greater U.S.-China trade.<sup>11</sup> Second, it led to a substantial reduction in *expected* U.S. import tariffs on Chinese goods. We discuss channels through which the change in policy affected U.S. manufacturing employment in Section IV.

## A.2 Calculating the NTR Gap

We quantify the impact of PNTR on industry  $i$  as the difference between the non-NTR rate to which tariffs would have risen if annual renewal had failed and the NTR tariff rate that was locked in by PNTR,

$$(1) \quad NTR\ Gap_i = Non\ NTR\ Rate_i - NTR\ Rate_i,$$

and we expect industries with larger NTR gaps to be more affected by the change in U.S. policy. One attractive feature of this measure is its plausible exogeneity to employment after 2000. Seventy-nine percent of the variation in the NTR gap across industries arises from variation in non-NTR rates, set 70 years prior to passage of PNTR. This feature of non-NTR rates effectively rules out reverse causality that would arise if non-NTR rates could be set to protect industries with declining employment. Furthermore, to the extent that NTR tariffs were set to protect industries with declining employment prior to PNTR, these *higher* NTR rates would result in *lower* NTR gaps, biasing our results away from finding an effect of PNTR.

We compute NTR gaps using *ad valorem* equivalent NTR and non-NTR

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<sup>11</sup>To our knowledge, no other U.S. trade policy generates similar uncertainty with respect to China. For example, while the Omnibus Trade and Competitiveness Act of 1988 requires the U.S. Treasury Secretary to provide semiannual reports indicating whether any major trading partner of the United States is manipulating its currency, such a designation only requires the Secretary to initiate negotiations to have the exchange rate adjusted “promptly” (U.S. Department of the Treasury 2012).

tariff rates from 1989 to 2001 provided by Feenstra, Romalis and Schott (2002). Both types of tariffs are set at the eight-digit Harmonized System (HS) level, also referred to as “tariff lines.” We compute industry-level NTR gaps using concordances provided by the U.S. Bureau of Economic Analysis (BEA); the gap for industry  $i$  is the average NTR gap across the eight-digit HS tariff lines belonging to that industry. Further detail on the construction of NTR gaps is provided in Section B.1 of the online appendix.

We use the NTR gaps for 1999 – the year before passage of PNTR in the United States – in our regression analysis, but note that the baseline results are robust to using the NTR gaps from any available year (see Section B). Furthermore, the baseline empirical specification explicitly controls for industries’ NTR *rates*. In 1999, the average NTR gap across industries is 0.33 with a standard deviation of 0.14, and its distribution is displayed in Figure 2. The corresponding statistics are 0.04 and 0.07 for the NTR rate and 0.37 and 0.16 for the non-NTR rate.

*[Note: Location of Figure 2 approximately here]*

## **B U.S. Manufacturing Employment**

Our principal source of data is the U.S. Census Bureau’s Longitudinal Business Database (LBD), assembled and maintained by Jarmin and Miranda (2002). These data track the employment and major industry of virtually every establishment with employment in the non-farm private U.S. economy annually as of March 12.<sup>12</sup> In these data, “establishments” correspond to facilities in

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<sup>12</sup>The LBD definition of employment includes both full- and part-time workers; in Section C we show that our main employment results are robust to examining production hours instead of employment. While the use of staffing services by manufacturing firms was increasing during the 2000s, Dey, Houseman and Polivka (2012) show that this trend does not account for the steep decline in manufacturing employment after 2000.

a given geographic location, such as a manufacturing plant or retail outlet, and their major industry is defined at the four-digit Standard Industrial Classification (SIC) or six-digit North American Industry Classification System (NAICS) level. Longitudinal identifiers in the LBD allow establishments to be followed over time.

The long time horizon considered in this paper presents two complications for analyzing the evolution of manufacturing employment. The first complication is that the industry classification scheme used to track establishments' major industries changes from the SIC to the NAICS in 1997 and to subsequent versions of NAICS in 2002 to 2007. Because we need time-consistent industry definitions to track employment over our sample period, we use the algorithm developed in Pierce and Schott (2012a) to create "families" of four-digit SIC and six-digit NAICS codes that are linked through the SIC and NAICS industry classification systems. Further detail on the creation of time-consistent industry codes is provided in Section B.3 of the online appendix. Unless otherwise noted, all references to "industry" in this paper refer to these families.

The second complication is that some activities (e.g., logging and publishing) are re-classified out of "manufacturing" in the SIC to NAICS transition and, moreover, some plants are sometimes classified within manufacturing and sometimes outside manufacturing. We construct a "constant manufacturing sample" that excludes any families that contain SIC or NAICS industries that are ever classified outside manufacturing. In addition, we exclude any plants that are ever classified outside manufacturing. Use of this constant manufacturing sample ensures that our results are not driven by any changes in classification system.<sup>13</sup> We note, however, that qualitatively identical re-

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<sup>13</sup>The results are also robust to use of a beta version of time-consistent NAICS codes

sults can be obtained using the simple NAICS manufacturing definition in the publicly available NBER-CES Manufacturing Industry Database from Becker, Gray and Marvakov (2013), and that neither of these drops has a material impact on the general trend of manufacturing employment over the past several decades.<sup>14</sup>

While the loss of U.S. manufacturing employment after 2000 is dramatic, we note that it is *not* accompanied by a similarly steep decline in value added. Indeed, as illustrated in Figure 3, real value added in U.S. manufacturing, as measured by the BEA, continues to increase after 2000, though at a slower rate (2.8 percent) compared with the average from 1948 to 2000 (3.7 percent).<sup>15</sup>

*[Note: Location of Figure 3 approximately here]*

## C Data for Alternate Explanations

We consider a wide array of alternate explanations for the observed decline in U.S. manufacturing employment. To be plausible, these alternate explanations must explain why the decline in employment coincides with the timing of PNTR and why it is concentrated in industries most affected by the policy change. Descriptions and sources of the data used to capture these explanations are presented in Section D of the online appendix. Here, we provide a brief overview of the three classes of alternate explanations we consider: a decline in the U.S. competitiveness of labor-intensive goods, policy changes in China, and other notable macroeconomic events in the United States.

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developed for the LBD by Teresa Fort and Shawn Klimek.

<sup>14</sup>Section B.3 of the online appendix compares annual employment in our “constant” manufacturing sample against the manufacturing employment series available publicly from the U.S. Bureau of Labor Statistics. Both display a stark drop in employment after 2000.

<sup>15</sup>Houseman et al. (2011) argue that gains in manufacturing value-added in the later years of Figure 3 may be overstated as purchases of low-cost foreign materials are not fully captured in input price indexes.

U.S. manufacturing employment may have fallen after 2000 due to a decline in the competitiveness of U.S. labor-intensive industries for some reason other than the change in U.S. trade policy, such as a general movement towards offshoring encouraged by the 2001 recession or a positive productivity shock in labor-abundant China.<sup>16</sup> We control for these explanations by including measures of industry capital and skill intensity in our specification and by allowing the impact of these industry factor intensities to vary before and after PNTR.

As part of its accession to the WTO, China agreed to institute a number of policy changes which could have influenced U.S. manufacturing employment, including liberalization of its import tariff rates, export licensing rules, production subsidies and barriers to foreign investment. We control for these policy changes using data on Chinese import tariffs from Brandt et al. (2012), data on export licensing requirements from Bai, Krishna, and Ma (2015), and data on production subsidies from China's National Bureau of Statistics. Because China's reduction of barriers to foreign investment may have affected industries differently based on the nature of contracting in their industry, we also include Nunn's (2007) measure of the proportion of intermediate inputs that require relationship-specific investments.

Finally, the granting of PNTR to China overlaps with several notable events in the United States. The first was the abolishment of import quotas on some textile and clothing imports in 2002 and 2005 under the global Multi-Fibre Arrangement (MFA). The second was the bursting of the U.S. tech "bubble" and the subsequent recovery. A third is a steady decline in unionization in

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<sup>16</sup>We show in Section E of the online appendix that China's TFP growth is uncorrelated with the NTR gap. Furthermore, we demonstrate in Section 4 that the EU does not experience a similar decline in manufacturing employment in high NTR gap industries after 2000.

the manufacturing sector. We control for the potential impact of these events using data on U.S. textile and clothing quotas from Khandelwal, Schott and Wei (2013), definitions of advanced technology products posted on the U.S. Census Bureau’s website, and industry-level unionization rates from Hirsch and Macpherson (2003).

Table A.2 of the online appendix summarizes the relationships between the NTR gap and the industry-level control variables we employ in the baseline specification, described in greater detail below. The strongest relationship among these variables is a negative relationship with capital intensity ( $R^2 = 0.23$ ).

## II PNTR and U.S. Manufacturing Employment

### A Baseline Specification

We examine the link between PNTR and U.S. manufacturing employment using a generalized OLS difference-in-differences (DID) specification that examines whether employment losses in industries with higher NTR gaps (first difference) are larger after the imposition of PNTR (second difference). Industry fixed effects capture the impact of any time-invariant industry characteristics, and year fixed effects account for aggregate shocks that affect all industries equally. The sample includes annual industry-level data from 1990 to 2007.

We estimate the following equation:

$$\begin{aligned}
(2) \quad \ln(Emp_{it}) &= \theta PostPNTR_t \times NTRGap_i + \\
&\quad \gamma PostPNTR_t \times \mathbf{X}_i + \lambda \mathbf{X}_{it} + \\
&\quad \delta_t + \delta_i + \alpha + \varepsilon_{it},
\end{aligned}$$

where the dependent variable is the log level of employment in industry  $i$  in year  $t$ . The first term on the right hand side is the DID term of interest, an interaction of the NTR gap and an indicator for the post-PNTR period, i.e., years from 2001 forward. The second term on the right hand side is an interaction of the post-PNTR dummy variable and time-invariant industry characteristics, such as initial year (1990) industry capital and skill intensity or the degree to which industries encompass high-technology products. This term allows for the possibility that the relationship between employment and these characteristics changes in the post-PNTR period. The third term on the right-hand side of equation 2 captures the impact of time-varying industry characteristics, such as exposure to MFA quota reductions, union membership and the NTR tariff rate.<sup>17</sup>  $\delta_i$ ,  $\delta_t$  and  $\alpha$  represent industry and year fixed effects and the constant. Regressions are weighted by industry employment in 1990.

Results are reported in Table 1 with robust standard errors clustered by industry. The first column includes only the DID term and the necessary fixed effects, while the second column adds industry initial factor intensities. The third column includes all covariates capturing the effect of the alternate

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<sup>17</sup>NTR tariff rates from Feenstra, Romalis and Schott (2002) are unavailable after 2001 and so are assumed constant after that year. As discussed in Section B, we obtain nearly identical results using analogously computed “revealed” tariff rates from public U.S. trade data for all years but use the Feenstra, Romalis and Schott (2002) measures because they are available for a larger set of industries.

explanations discussed in Section C and represents the “baseline” specification to which we refer throughout the remainder of the paper.

As indicated in the first row of Table 1, estimates of  $\theta$  are negative and statistically significant in all specifications, indicating that the imposition of PNTR coincides with lower manufacturing employment. Moving across the columns from left to right shows that the estimate for  $\theta$  decreases in absolute value as additional covariates are added, but remains statistically significant at conventional levels.

The estimated effects are also economically significant. The difference-in-differences coefficient in the baseline specification in column 3 indicates that moving an industry from an NTR gap at the 25th (0.23) to the 75th percentile (0.40) of the observed distribution increases the implied relative loss of employment by -0.08 ( $=-0.47*(0.40-0.23)$ ) log points. We also perform a two-step calculation of the implied impact of PNTR that takes into account the employment weights of industries across the distribution of NTR gaps. First, for each industry  $i$ , we multiply  $\theta$  by the industry’s NTR gap. This yields an implied effect of PNTR (versus the pre-period) on employment for each industry *relative to* a hypothetical industry with a zero NTR gap. Second, we average the implied relative effects for all manufacturing industries, using initial industry employment as weights. As reported in the final row of the third column of the table, the baseline specification implies a *relative* decline in manufacturing employment of -0.15 log points.<sup>18</sup>

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<sup>18</sup>Though our difference-in-differences identification strategy precludes estimation of the overall share of employment lost to the change in U.S. policy, we note that several prominent studies of the impact of trade liberalization on manufacturing employment have found large effects. Autor, Dorn and Hanson (2013), using an alternate means of identification, find that depending on assumptions used to isolate the Chinese supply shock, Chinese import penetration explains 26 to 55 percent of the overall decline in U.S. manufacturing employment from 2000 to 2007, or -5 to -11 percentage points of the overall -20 percent decline. In a different setting, Treffer (2004) finds that the Canada-U.S. Free Trade Agreement reduced

The remaining rows of the third column of Table 1 display a positive and statistically significant relationship between employment and industries' initial skill intensity (defined as the ratio of non-production workers to total employment), and negative and statistically significant relationships between employment and industries' exposure to tariff reductions in China and MFA quota reductions.<sup>19</sup> The positive coefficient for skill intensity indicates that skill-intensive industries more in line with U.S. comparative advantage do relatively well in terms of employment after 2000. The negative point estimate on exposure to Chinese import tariffs reveals that U.S. employment rises in relative terms in industries where Chinese import tariffs decline. The negative coefficient for  $MFA\ Exposure_{it}$  indicates that textile and clothing industries more exposed to the elimination of quotas experience greater relative employment loss.<sup>20</sup>

*[Note: Location of Table 1 approximately here]*

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Canadian manufacturing employment by 12 percent among industries in the top tercile of import tariff declines, i.e. those with an average reduction of -10 percent. Moreover, the growth in Chinese exports to the U.S. during our sample period dwarfs that of U.S. exports to Canada during the period studied by Treffer (2004). According to the U.S. International Trade Commission website, Chinese exports to the United States grew by \$223 billion from 2000 to 2007 (from \$100 billion to \$323 billion), while U.S. exports to Canada grew by \$44 billion between 1989 and 1996 (from \$75 billion to \$119 billion), in nominal terms.

<sup>19</sup>As discussed further in Section D.3 of the online appendix, the negative and statistically significant relationship between PNTR and manufacturing employment is also robust to simply dropping industries that contain products subject to the MFA.

<sup>20</sup>Following Brambilla, Khandelwal and Schott (2009), we measure the extent to which industries' quotas were binding under the MFA as the import-weighted average fill rate of the textile and clothing products that were under quota, where fill rates are defined as the actual imports divided by allowable imports under the the quota. Industries containing textile and clothing products with higher fill rates faced more binding quotas and are therefore more likely to experience employment reductions when quotas are eliminated. Fill rates are set to zero for unbound products. See Section D.3 of the online appendix for additional information regarding construction of the MFA variable.

## B Robustness and Extensions

This section assesses the the timing and linearity assumptions inherent in the baseline specification, the exogeneity of the NTR gap, and the sensitivity of our results to alternate controls for business-cycle fluctuations and an alternate measure of tariffs.

*Timing:* For the decline in employment to be attributable to PNTR, our policy measure, the NTR gap, should be correlated with employment after PNTR, but not before. To determine whether there is a relationship between the NTR gap and employment in the years before 2001, we replace the *PostPNTR* indicator used in equation 2 with interactions of the NTR Gap and the full set of year dummies,

$$\begin{aligned} \mathcal{J}\eta(Emp_{it}) = & \sum_{y=1991}^{2007} (\theta_y 1\{y = t\} \times NTR\ Gap_i) + \sum_{y=1991}^{2007} (\beta_y 1\{y = t\} \times \mathbf{X}_i) \\ & + \lambda \mathbf{X}_{it} + \delta_t + \delta_i + \alpha + \varepsilon_{it}. \end{aligned}$$

As above, we estimate equation 3 both with and without the industry controls.

Results for the difference-in-differences coefficients,  $\theta_y$ , are displayed visually along with their 90 percent confidence intervals in Figure 4, as well as numerically in Table A.4 of the online appendix. Coefficient estimates for the remaining covariates are omitted to conserve space. As indicated in both the figure and the table, point estimates are statistically insignificant at conventional levels until after 2001, at which time they become statistically significant and increasingly negative.<sup>21</sup> This pattern is consistent with the parallel trends

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<sup>21</sup>Results are similar for an event study version of this specification that compares outcomes across years for industries in the top versus bottom quintiles of the NTR gap distribution.

assumption inherent in our difference-in-differences analysis, lending further support for the baseline empirical strategy.

[Note: Location of Figure 4 approximately here]

*Exogeneity:* Though nearly all of the variation in the NTR gap arises from non-NTR rates set in 1930, and increases in NTR rates to protect declining industries would result in *smaller* NTR gaps, we examine two alternate specifications designed to evaluate the exogeneity of the NTR gaps. First, we estimate a two-stage least squares specification in which we instrument the baseline DID term,  $PostPNTR_t \times NTR\ Gap_i$ , with an interaction of the post-PNTR indicator and the Smoot-Hawley-based non-NTR tariff rates,  $PostPNTR_t \times NNTR_i$ . As indicated in the first column of Table 2, the DID term remains negative and statistically significant, with a magnitude somewhat larger in absolute value than that in our baseline result. Second, we re-estimate our baseline specification (equation 2) using the NTR gap observed in 1990, ten years prior to PNTR. As shown in column 2 of Table 2, the DID coefficient estimate remains negative and statistically significant, with a magnitude somewhat larger than that of our baseline result.

*Non-Linearity:* We estimate two non-linear specifications to determine whether the NTR gap has less of an effect on firms' employment decisions beyond some threshold level or, alternatively, whether the effect of the NTR gap grows disproportionately as it increases with higher values of the NTR gap. The first augments equation 2 with the interaction of the square of the NTR gap with the  $1\{PostPNTR_t\}$  dummy. The second constrains the relationship between employment and the NTR gap to be a two-segment spline.<sup>22</sup> Re-

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<sup>22</sup>The spline is estimated using a constrained OLS regressions that restricts the post-PNTR relationship between employment and the NTR gap to be two successive line segments starting at the origin and joined at a "knot." We grid over NTR gap knots in increments of 0.05 and report the specification that minimizes the Akaike Information Criterion (AIC),

sults are reported in columns three and four of Table 2. P-values testing the joint significance of the difference-in-differences coefficients in the quadratic specification and implied economic significance, computed using the two-step procedure as noted above, are reported in the final two rows of the table. In addition, Figure A.2 in the online appendix plots the relationship between the DID terms and log employment implied by each specification over the range of NTR gaps observed in the data.

As indicated in both the table and the figure, the results provide some support for the idea that employment loss accelerates with the NTR gap. On the other hand, column 3 of Table 2 reveals that while the coefficients for the NTR gap terms in the quadratic specification are jointly statistically significant at conventional levels, the square term is not itself statistically significant. In terms of economic significance, the nonlinear specifications yield economic impacts comparable to that implied by the baseline linear specification. The quadratic specification yields a relative decline in manufacturing employment of -0.12 log points and the spline specification yields a relative decline of -0.16 log points, compared to -0.15 log points in the baseline linear specification.

*Business cycles:* We estimate two alternate specifications that control explicitly for the potential influence of business cycle fluctuations on employment.<sup>23</sup> The first adds interactions of capital and skill intensity with real GDP, indexed to a base year of 1990, to our baseline specification (equation 2). The second follows Treffler (2004) by including industry-year-specific pre-  


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reported in the penultimate row of Table 2. Minimization of Schwarz’s Bayesian Information Criterion yields identical results.

<sup>23</sup>To the extent that aggregate shocks affect all industries equally, their effect on employment is captured by the year fixed effects included in equation 2. Furthermore, including interactions of initial capital and skill intensity with the full set of year dummies when estimating equation 3 allows for annual aggregate shocks to have differential effects on industries based on variation in those industry characteristics.

dictions of the the change in employment associated with growth in U.S. real GDP and the U.S. real effective exchange rate, as well as one and two-period lags of growth in these two variables. As shown in columns five and six of Table 2, inclusion of these additional business-cycle controls has little effect on our DID coefficient estimate either in terms of statistical or economic significance.

*Revealed Tariffs:* We re-estimate equation 2 using a measure of revealed tariffs in place of the applied NTR rates used in the baseline specification. We calculate *ad valorem* equivalent revealed NTR tariff rates by summing the duties collected for each eight-digit HS product by year and dividing this sum by the corresponding dutiable value. These revealed tariff measures capture changes in tariff rates due to NAFTA and other preferential trade agreements. As shown in column seven of Table 2, using these revealed tariff data does not lead to any material change in the statistical or economic significance of our results.<sup>24</sup>

*[Note: Location of Table 2 approximately here]*

### III The United States versus the EU

Comparison of outcomes in the United States versus the European Union provides an alternate test of the idea that PNTR drives the employment decline in the United States. In contrast to the United States, the European Union granted permanent most-favored-nation status to China in 1980 (Casarini 2006). As a result, there was little change in either the actual or expected EU tariffs on Chinese goods when the U.S. granted PNTR to China in 2000, and imports from China were not subject to the annual potential

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<sup>24</sup>As noted above, the revealed tariff data are available for fewer industries than are covered in the Feenstra, Romalis and Schott (2002) data. As a result, the the number of observations for this regression is reduced.

tariff increases present in the United States.<sup>25</sup> Comparing the United States and the EU therefore helps determine whether U.S. NTR gaps are spuriously correlated with other factors that may have affected employment in both the United States and EU, such as technological change, policy changes in China related to its entry to the WTO, or positive Chinese productivity shocks.

Our comparison makes use of data from the United Nations Industrial Development Organization’s (2013) INDSTAT 4 dataset, which tracks employment by country and four-digit International Standard Industrial Classification (ISIC) industries from 1997 to 2005.<sup>26</sup> We estimate a triple difference-in-differences specification that examines employment for industries with varying NTR gaps (first difference) after the imposition of PNTR (second difference) and across the United States and the EU (third difference):<sup>27</sup>

$$(4) \quad \ln(Emp_{ict}) = \theta PostPNTR_t * NTR\ Gap_i * US_c \\ + \delta_{ct} + \delta_{ci} + \delta_{it} + \alpha + \varepsilon_{ict}.$$

The dependent variable is log employment for four-digit ISIC industry  $i$  in

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<sup>25</sup>China was a Generalized System of Preferences (GSP) beneficiary in the EU before and after its accession to the WTO. According to European Commission (2003), Chinese import tariffs under the EU GSP program did not change when it joined the WTO. The EU renews GSP every decade and conducts annual revisions to their rates. These changes are generally made on a product-by-product rather than country-by-country basis, suggesting that they are not biased towards China. Nevertheless, we note that the majority of the EU’s GSP rate changes in recent years involve products in which Chinese exporters are active.

<sup>26</sup>The four-digit ISIC industries across which employment is reported are more aggregated than either the SIC or NAICS industries across which U.S. employment data is reported in the LBD. We aggregate NTR gaps to the six-digit HS level and then map them to the four-digit ISIC level using publicly available concordances from the World Bank. See section F of the online appendix for additional information regarding the UNIDO data.

<sup>27</sup>Data for the EU member countries are aggregated to the EU level, so that the regression includes observations for two “countries,” the United States and the European Union. See Section F of the online appendix for additional information regarding these data.

$c \in US, EU$  in year  $t$ .  $\theta$  is the coefficient for the triple-difference term of interest where  $US_c$  is an indicator variable that takes the value one for the United States.  $\delta_{ct}$ ,  $\delta_{ci}$  and  $\delta_{it}$  represent country $\times$ year, country $\times$ industry and industry  $\times$ year fixed effects.  $\alpha$  is the regression constant.

Results are reported in the first column of Table 3, with robust standard errors clustered by country $\times$ industry. As shown in the first row of the table,  $\theta$  is negative and statistically significant, indicating that PNTR is associated with a relative decline in manufacturing employment in the United States versus the EU. Separate difference-in-difference specifications for the the EU and the United States (columns 2 and 3) provide complementary evidence: PNTR is associated with statistically significant employment declines in the United States but not the EU.<sup>28</sup>

The results in Table 3 are evidence against the idea that post-PNTR employment loss in the United States is due to an unobserved shock affecting manufacturing employment globally, or a shock in China that affects its exports to the U.S. and EU equally. They also confirm the relationship between employment and the NTR gap for the United States using an entirely different dataset and industrial classification system for employment.

*[Note: Location of Table 3 approximately here]*

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<sup>28</sup>The results for the United States using UNIDO data in column 3 of Table 3 are comparable to those using U.S. Census data in column 1 of Table 1. In both cases, the point estimates for the DID term are negative and statistically significant, and they are of similar magnitude despite the use of different datasets. The substantially smaller number of observations in column 3 of Table 3 versus column 1 of Table 1 is due to the shorter time interval available in the UNIDO data (1997 to 2005 versus 1990 to 2007) as well as the fact that industry definitions in the UNIDO data are broader than those used by the U.S. Census.

## IV Potential Mechanisms

PNTR may have caused a decline in U.S. manufacturing employment via several mechanisms, including: (1) encouraging U.S. firms to start sourcing inputs or final goods from Chinese rather than domestic suppliers; (2) persuading Chinese firms to expand into the U.S. market; (3) motivating U.S. manufacturers either to invest in labor-saving production techniques or to produce more skill- and capital-intensive products that are more in line with U.S. comparative advantage; and (4) inducing U.S. firms to shift all or part of their operations offshore, perhaps in conjunction with other firms in their supply chains. In this section we provide evidence consistent with all of these mechanisms.

### A U.S. Imports

Given that PNTR entailed a change in U.S. trade policy *vis-a-vis* China, we examine whether it was associated with changes in U.S. imports from China versus other countries. As noted in the introduction, relative growth in Chinese imports could be due to U.S. firms sourcing goods from China, the expansion of Chinese exporters or offshoring by U.S. manufacturers.

We use customs data from the U.S. Census Bureau's Longitudinal Foreign Trade Transaction Database (LFTTD). As described in greater detail in Bernard, Jensen and Schott (2009), the LFTTD tracks all U.S. international trade transactions beginning in 1992. For each import transaction we observe the product traded, the U.S. dollar value and quantity shipped, the shipment date and the origin country. The data also contain codes identifying both the U.S. importer and the foreign supplier of the imported product.

We employ a generalized triple differences specification that compares products with varying NTR gaps (first difference) before and after PNTR (second

difference) and across source countries (third difference) for the years 1992 to 2007:

$$(5) \quad O_{hct} = \theta 1\{c = China\}_c \times PostPNTR_t \times NTRGap_h + \\ + \lambda Tariff_{hct} + \delta_{ct} + \delta_{ch} + \delta_{ht} + \alpha + \varepsilon_{hct}.$$

The left-hand side variable represents the log level of one of several dimensions of U.S. import activity aggregated to the eight-digit HS product by source country by year level.<sup>29</sup> These dimensions are import value, the number of U.S. firms importing product  $h$  from country  $c$  in year  $t$ , the number of country  $c$  firms exporting product  $h$  to the United States in year  $t$ , and the number of importer-exporter pairs engaged in U.S. imports of product  $h$  from country  $c$  in year  $t$ . The first term on the right-hand side is the primary term of interest: a triple interaction of an indicator for China, an indicator for the post-PNTR period, and the NTR gap for product  $h$ . Its coefficient,  $\theta$ , captures the impact of the change in U.S. policy.  $Tariff_{hct}$  represents the U.S. revealed import tariff for product  $h$  from country  $c$  in year  $t$ , computed as the ratio of duties collected to dutiable value using publicly available U.S. trade data.  $\delta_{ct}$ ,  $\delta_{ch}$  and  $\delta_{ht}$  represent country $\times$ year, country $\times$ product and product $\times$ year fixed effects.  $\alpha$  is the regression constant.<sup>30</sup>

Results are reported in Table 4, with robust standard errors clustered at the country $\times$ product level. Estimates of  $\theta$  are positive and statistically significant for all four dimensions of U.S. importing. As indicated in the bottom row of

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<sup>29</sup>As with SIC and NAICS industries, the eight-digit HS product codes are linked to time-invariant families using the concordance from Pierce and Schott (2012a).

<sup>30</sup>Although this specification omits observations where the left-hand side variable is equal to zero, we note that similar results are obtained in a previous version of this paper (Pierce and Schott 2012b) when examining changes in those variables normalized as suggested by Davis, Haltiwanger and Schuh (1996).

the table, these estimates imply that PNTR raises the relative import value of the affected products by 0.17 log points *vis a vis* imports of those products from other sources after the change in U.S. policy. The analogous responses for the number of U.S. importers, the number of Chinese exporters and the number of importer-exporter pairs are 0.15, 0.17 and 0.17 log points.

These results demonstrate that U.S. import value from China surges in the high-NTR-gap products most affected by PNTR, suggesting that the decline in U.S. employment is due in part to substitution of Chinese imports for U.S. output, either due to growth of Chinese exporters or offshoring/outsourcing by U.S. manufacturers.<sup>31</sup> Moreover, the relative increases in both the number of U.S. importers and the number of Chinese exporters are consistent with U.S. and Chinese firms being more willing to undertake irrecoverable investment in establishing bilateral trade relationships after PNTR, in line with the broad literature on investment under uncertainty. Relative to the existing literature on trade policy uncertainty (Handley 2014, Handley and Limao 2014, 2015), which focuses on exporting, the results with respect to U.S. importers highlight the potential importance of reactions to uncertainty by firms in the importing country.<sup>32</sup> We pursue these reactions further in the next section.

*[Note: Location of Table 4 approximately here]*

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<sup>31</sup>Our findings relate to Harrison and McMillan (2011), who show that offshore employment in low-wage countries is a substitute for domestic employment among U.S. manufacturers.

<sup>32</sup>Handley and Limao (2014) discusses welfare implications of eliminating trade policy uncertainty for the importing country, via the price index, but does not consider adjustments by firms in the importing country, such as offshoring.

## B Offshoring of Production by U.S. Firms

One way in which PNTR could lead to employment declines in the U.S. is via offshoring, in which U.S. firms locate production in China that would otherwise occur in the United States. We find evidence consistent with offshoring by U.S. firms using both Chinese data tracking the exports of Chinese firms and additional U.S. trade data that classifies U.S. imports according to whether they take place between arm’s-length or related parties.

### B.1 Evidence from Chinese Exports

We first examine whether PNTR is associated with changes in the pattern of Chinese exports using firm-level customs data from China’s National Bureau of Statistics (NBS) provided by Khandelwal, Schott and Wei (2013).<sup>33</sup> One advantage of these Chinese export data *vis a vis* the U.S. import data is the ability to classify Chinese exporters as domestic versus foreign-owned. As a result, they can shed light on whether China’s surge in high-NTR-gap exports to the United States may be due to offshoring by foreign firms versus market expansion by Chinese firms. Translated anecdotes from Chinese language news accounts provided in Section A.2 of the online appendix offer support for both of these channels. For example, Shanghai Securities News noted in 1999 that if China’s accession to the WTO led to PNTR being granted: “[T]his will help to build confidence among investors at home and abroad, especially among United States investors, because currently, China faces the issue every year of maintaining Most Favored Nation trading status (Shanghai Securities News

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<sup>33</sup>The Chinese data track China’s exports by firm, product, destination, country, and year from 2000 to 2005. For each firm-product-destination-year observation, we observe the nominal value of exports shipped as well as codes for the ultimate ownership of the firm and the type of export shipment.

1999).”

Following Khandelwal, Schott and Wei (2013), we use the ownership codes to classify firms into three groups: state-owned enterprises (“SOEs”), privately owned domestic firms (“domestic”) and privately owned foreign firms (“foreign”).<sup>34</sup> In addition, we decompose overall exports into “general” versus “processing & assembling” (“P&A”), where the latter refers to goods produced with intermediate inputs imported tariff-free on the condition that they not be sold domestically.<sup>35</sup>

We examine the effect of PNTR on Chinese exports using the same triple differences specification used for the U.S. import data above (equation 5), but with two differences. First, we replace the indicator for China as a source of imports with an indicator for the United States as a destination for exports. Second, we aggregate the Chinese data to the six-digit HS level in order to assign NTR gaps, as U.S. and Chinese product codes are not consistent at more disaggregated levels. Coefficient estimates and robust standard errors clustered by country×product are reported in Table 5.

The first column of the Panel A presents results for all firms and all trade types, and the positive and statistically significant coefficient indicates that PNTR is associated with an increase in Chinese exports to the U.S., relative to other countries. This result complements and confirms the trade effects reported in Section A using an independent dataset. That is, where the U.S. data indicate that U.S. imports from China relative to other sources increase with the change in U.S. policy, the Chinese data show that Chinese exports to the United States increase relative to other destinations with the change in

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<sup>34</sup>SOEs include collectives, and foreign firms include joint ventures.

<sup>35</sup>General and P&A exports account for more than 95 percent of exports in each year of the sample. Other export categories are omitted. Across the years for which the data are available, general exports represent approximately 43 percent of total exports.

U.S. policy.

Examining results by firm type, we find the strongest relationship between PNTR and exports among foreign-owned firms (column 4). Indeed, for these firms, higher NTR gaps are associated with increases in relative exports to the United States for both general exports (Panel B) and P&A exports (Panel C). While the country of foreign ownership is not reported in the NBS data, to the extent that some portion of these exporters are affiliates of U.S. firms, the results are consistent with offshoring by U.S. producers following PNTR.<sup>36</sup> Coefficient estimates for SOEs and privately owned domestic firms, while also positive for both types of exports, are generally statistically insignificant at conventional levels.

*[Note: Location of Table 5 approximately here]*

## **B.2 Evidence from U.S. Related Party Importers**

We further investigate the potential role of offshoring within firms using data on U.S. imports between related parties. A shift of domestic production by U.S. manufacturers to new or newly acquired affiliates in China in response to PNTR could result in an increase in related-party imports of products with higher NTR gaps from China, *vis a vis* other countries. We examine this mechanism using the “related-party” flag present in the U.S. import data, which

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<sup>36</sup>Noisy data on U.S. firms’ overseas employment posted on the BEA’s website provide some support for this interpretation, though it should be treated with caution. Available for seven highly aggregate manufacturing sectors, these data track U.S. multinationals’ employment in their overseas affiliates by country and year on a consistent basis starting in 1999, though 18 percent of cells are imputed or suppressed to protect confidential information. Nevertheless, using a triple differences specification similar to equation 5, we find that PNTR is associated with a relative increase in overseas manufacturing employment after PNTR, though the coefficient estimate is not statistically significant at conventional levels (p-value 0.27). The seven sectors are: food; chemicals; primary and fabricated metals; machinery; computers and electronic products; electrical equipment, appliances and components; and transportation equipment.

indicates whether the U.S. importer and the foreign exporter are “related” by ownership of at least 6 percent.<sup>37</sup>

Using the same specification (equation 5) employed in Section A, we find in Table 6 that higher NTR gaps are associated with statistically significant increases in the number of U.S. importers sourcing imports from related-parties in China, the number of Chinese exporters exporting to a related-party in the United States, and the number of related-party importer-exporter pairs. The relationship with respect to value, while positive, is not statistically significant at conventional levels, though we note that this lack of significance appears to be driven by a lag between the formation of the related-party importer-exporter pairs and the imports that flow between them.<sup>38</sup> Overall, these results indicate a relative increase in the number of Chinese affiliates from which U.S. firms source goods in response to PNTR, consistent with an expansion of offshoring activity.

*[Note: Location of Table 6 approximately here]*

## C Inducing Changes in U.S. Factor Intensity

PNTR may have affected U.S. manufacturing employment not only through the substitution of imports from China for U.S. production, but also by inducing firms facing increased import competition to decrease employment through

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<sup>37</sup>Growth of related-party trade is just one potential manifestation of offshoring. For example, it does not include the growth in trade associated with firms that produced and sold to arm’s-length customers in the United States prior to PNTR but that subsequently moved production to China while continuing to sell to their previous customers.

<sup>38</sup>For example, consideration of an alternate specification focusing on long differences – i.e., comparison of related party import growth in the six years prior to PNTR to that in the six years after PNTR – reveals a positive and statistically significant relationship between the NTR gap and Chinese export growth to the United States, post-PNTR. This specification is similar to that estimated in an earlier version of this paper, Pierce and Schott (2012b):  $\Delta \ln(O_{hct:t+6}) = \theta 1\{c = China\}_c \times PostPNTR_t \times NTR\ Gap_h + \lambda Tariff_{hct} + \delta_{ct} + \delta_{ch} + \delta_{ht} + \alpha + \varepsilon_{hct}$ , where  $t \in \{1995, 2001\}$ .

adjustment of their production processes or product mix. To examine this possibility, we analyze the relationship between PNTR and factor usage – i.e., skill and capital intensity – using quinquennial data collected in the U.S. Census of Manufactures (CM). We perform this analysis at both the industry *and* plant level to determine the extent to which changes in factor intensity are driven by entry and exit versus changes within continuing plants.<sup>39</sup>

For years ending in “2” and “7”, the CM contains plant characteristics including total employment, a breakdown of total employment into production and non-production workers, production worker hours and capital.<sup>40</sup> As in Section II we define skill intensity as the ratio of non-production workers to total employment and capital intensity as the ratio of capital to total employment. Our analysis makes use of the same generalized difference-in-differences specification defined in equation 2, with one important difference: because the CM tracks establishments’ attributes only every five years, the pre-PNTR period is defined as 1992 and 1997 and the post-PNTR period is defined as 2002 and 2007.

We first present industry-level results in Table 7 that capture adjustments due to entry and exit of plants with different factor intensities, as well as changes within continuing plants. As indicated in Columns 1 and 2 of the table, PNTR is associated with statistically and economically significant increases in both industry skill intensity and industry capital intensity. The gain in skill intensity arises from heterogeneous responses for the two types of workers tracked in our data. While we find negative and statistically significant relationships

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<sup>39</sup>Holmes and Stevens (2014) show that increased import competition from China can have heterogeneous effects among plants within an industry, with the biggest negative effect observed at large plants producing standardized goods. Small plants producing specialty goods are less affected.

<sup>40</sup>Real book value of capital is deflated using industry-level investment price indexes from Becker, Gray and Marvakov 2013.

between employment and the NTR gap for both non-production (column 3) and production workers (column 4), the implied impact of PNTR for production workers is more than one and a half times that for non-production workers. This result is consistent with research (e.g., Ebenstein et al. 2014) finding that the effect of import competition on wages is concentrated among production workers engaged in routine blue-collar production occupations.<sup>41</sup> As indicated in column 6, the gains in capital intensity arise from statistically significant declines in total employment (column 5) compared to a statistically insignificant response for capital (column 6).<sup>42</sup>

*[Note: Location of Table 7 approximately here]*

Next, we examine the extent to which the increases in industry-level capital and skill intensity associated with PNTR are driven by changes within continuing plants. Estimates from a series of plant-level regressions are reported in Table 8, with robust standard errors clustered by plants' major industry. These regressions differ from the industry-level regressions in two ways. First, they make use of plant-level NTR gaps, defined as the weighted-average NTR gap across all of the industries in which the plant is active in 1997. Second, they contain plant fixed effects as well as plant-level control variables such as age and total factor productivity in addition to the industry-level control variables used in the baseline specification.<sup>43</sup>

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<sup>41</sup>Results in column 7 show that the PNTR-related decline in production hours is similar in magnitude to that for total employment, ruling out the possibility that the decline in employment resulted from a contraction on the extensive margin (the number of employees) that was offset by an expansion on the intensive margin (the number of hours per worker).

<sup>42</sup>Results for total employment in column 5 are similar in terms of both statistical and economic significance to those reported in the baseline specification in Section II, despite use of a different dataset.

<sup>43</sup>We follow Foster, Haltiwanger and Syverson (2008) in measuring TFP as the log of deflated revenue minus the log of inputs, weighted by the average cost share for each input across industries (see Section B.4 of the online appendix for more detail). We note that productivity measures constructed from revenue information may be biased due to unob-

Results in the first two columns of Table 8 indicate that while PNTR is not associated with changes in skill intensity for continuing plants, it is associated with capital deepening. Indeed, as noted in the final row of column 2, the implied economic impact of PNTR on plant capital intensity is a relative increase of 0.09 log points. This relative capital deepening *within* plants is consistent with two mechanisms of employment loss: trade-induced technological change, as in Bloom, Draca and Van Reenen (2015), and trade-induced product upgrading, as in Bernard, Jensen and Schott (2006), Khandelwal (2010), and Schott (2003, 2008), with the former suggesting that PNTR may be associated with employment reductions beyond those attributable to replacement of U.S. production by Chinese imports.<sup>44</sup>

*[Note: Location of Table 8 approximately here]*

## D Input-Output Linkages

PNTR may also affect employment at U.S. manufacturing plants indirectly via their supply chains, i.e., the upstream firms from which they purchase their inputs or the downstream firms to which they sell their outputs. Indeed, recent theoretical research by Baldwin and Venables (2013) suggests that reductions in trade frictions for one portion of the supply chain may lead to co-offshoring of its suppliers and customers, leading to large, discontinuous off-

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served establishment-level variation in prices, which can be affected by changes in trade policy (Pierce 2011 and De Loecker et al. 2015).

<sup>44</sup>We provide anecdotal evidence supporting these mechanisms in Section A.3 of the online appendix. For example: “To beat the Chinese and other foreign competitors threatening [their] business, [the owners] invested several million dollars to double the production capacity of their plastic-part plant, PM Mold, with the latest in robotics and automation equipment. Now, [it] can make twice as many parts – and better ones at that – without adding to [its] work force (Neikirk 2002).”

shoring events.<sup>45</sup> In this sense, input-output linkages may amplify the negative relationship between PNTR and manufacturing employment, serving as important mechanism for the policy’s effect. Alternatively, plants benefiting from greater access to lower-priced Chinese inputs might expand operations relative to others whose input suppliers are less exposed to PNTR. More generally, a number of recent papers emphasize the importance of examining input-output linkages when estimating the impact of import competition, e.g. Amiti and Konings (2007), Goldberg et al. (2010), Acemoglu et al. (2014) and Razhev (2015).

We examine the transmission of PNTR through input-output linkages by computing plant-level up- and downstream NTR gaps using information from the BEA input-output tables and including them in a plant-level regression:

$$\begin{aligned}
 (6) \quad O_{pt} = & \sum_m \theta_d^m PostPNTR_t \times NTR\ Gap_p^m \\
 & + \gamma PostPNTR_t \times \mathbf{X}_i + \lambda \times \mathbf{X}_{it} + \mu \mathbf{X}_{pt} \\
 & + \delta_t + \delta_p + \alpha + \varepsilon_{pt},
 \end{aligned}$$

where  $O_{pt}$  represents either log employment of continuing plant  $p$  in year  $t$  or an indicator variable that takes a value of 1 if the plant dies between year  $t$  and year  $t + 1$  and 0 otherwise.  $NTR\ Gap_p^m$  represents the NTR gap for  $m = \{Own, Upstream, Downstream\}$ ; for each dependent variable, we report estimates for specifications that both exclude and include the up- and downstream NTR gaps.<sup>46</sup> All specifications use the annual plant-level data available

<sup>45</sup>Ellison, Glaeser and Kerr (2010), for example, find that proximity to suppliers and customers is an important determinant of the location of manufacturing activity.

<sup>46</sup>Section B.1 of the appendix provides a detailed description of calculation of the plant-level up- and downstream NTR gaps.

from the LBD.

Results in Table 9 provide evidence that PNTR's effect on employment can be transmitted, and potentially magnified, through supply chains. Columns one and three, which do not control for supply-chain linkages, indicate that higher exposure to PNTR in plants' own industry is associated with lower employment within continuing plants and a higher probability of plant death. By comparison, the results in columns two and four show that plants whose customers are more exposed to PNTR – as measured by the downstream NTR gap – also contract employment and are more likely to die.<sup>47</sup> This effect via downstream industries is consistent with either a contraction in output when plants' customers face negative demand shocks, or to co-offshoring as plants relocate to China to be closer to their customers. More generally, the results show that PNTR affects U.S. manufacturing employment along both the intensive and extensive margins, by reducing employment within continuing plants and by inducing plant exit.<sup>48</sup>

*[Note: Location of Table 9 approximately here]*

## V Conclusion

This paper finds a relationship between the sharp decline in U.S. manufacturing employment after 2000 and the United States' conferral of permanent

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<sup>47</sup>In terms of economic significance, the impact of PNTR implied by the results in column 2 is a relative -0.14 log point decline in employment in the post-PNTR period, with the own and downstream NTR gaps contributing roughly equally. Computation of economic significance excludes the impact of the statistically insignificant coefficient for the upstream NTR gap.

<sup>48</sup>The working version of this paper, Pierce and Schott (2012b), shows that anemic job creation accounts for approximately one quarter of the overall estimated impact of PNTR, with the remainder due to exaggerated job destruction. These trends provide a partial explanation for the post-2000 shift in job creation and destruction rates discussed in Faberman (2008).

normal trade relations on China, a policy that is notable for eliminating the possibility of future tariff increases – and the uncertainty with which they were associated – rather than reducing the tariffs actually applied to Chinese goods.

We measure the effect of PNTR as the gap between the the high non-NTR rates to which tariffs would have risen if annual renewal of China’s NTR status had failed and the lower NTR tariff rates that were locked in by PNTR. Using a generalized difference-in-differences specification, we show that industries with higher NTR gaps experience larger employment declines, along with disproportionate increases in U.S. imports from China, the number of U.S. firms importing from China and the number of Chinese firms exporting to the United States, especially foreign-owned Chinese firms. These results are robust to inclusion of variables proxying for a wide range of alternate explanations for the observed trends in employment and trade. Moreover, we demonstrate that the pattern of employment losses in the United States – which experienced the policy change – is not present in the European Union, which had granted China the equivalent of PNTR status in 1980. Additional analysis of the mechanisms by which the change in policy affected U.S. manufacturers reveals evidence consistent with offshoring by U.S. firms, reallocation within high-gap industries towards less labor-intensive plants, increases in the capital intensity of the most affected plants, and magnification of the effects of PNTR via downstream customers.

Having established a link between the change in trade policy and U.S. employment outcomes, this research raises several important, but challenging questions. To what extent can PNTR explain the diverging trends of value-added and employment in the U.S. manufacturing sector? What impact did PNTR have on U.S. prices and consumption patterns? To what extent did U.S. firms change the composition of their output in response to PNTR, and

how large were the associated transition costs? We hope to bring additional data to bear on these questions in future research.

## References

- [1] Acemoglu, Daron, David Autor, David Dorn, Gordon H. Hanson and Brendan Price. 2014. "Import Competition and the Great U.S. Employment Sag of the 2000s." *Journal of Labor Economics*, forthcoming.
- [2] Amiti, Mary and Jozef Konings. 2007. "Trade Liberalization, Intermediate Inputs and Productivity." *American Economic Review* 97 (5): 1611-38.
- [3] Autor, David H., David Dorn and Gordon H. Hanson. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review* 103 (6): 2121-68.
- [4] Bai, Xue, Kala Krishna and Hong Ma. 2015. *How You Export Matters: Export Mode, Learning and Productivity in China.* NBER Working Paper 21164.
- [5] Baker, Scott R., Nicholas Bloom and Stephen J. Davis. 2015. "Measuring Economic Policy Uncertainty." NBER Working Paper 21633.
- [6] Baldwin, Richard and Anthony J. Venables. 2013. "Spiders and Snakes: Off-Shoring and Agglomeration in the Global Economy." *Journal of International Economics* 90 (1): 245-54.
- [7] Becker, Randy, Wayne B. Gray and Jordan Marvakov. 2013. "NBER-CES Manufacturing Industry Database." Available at [www.nber.org/data/nberces5809.html](http://www.nber.org/data/nberces5809.html).
- [8] Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott. 2006. "Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of US Manufacturing Plants." *Journal of International Economics*

68 (1): 219-237.

- [9] Bernard, Andrew B., J. Bradford Jensen and Peter K. Schott. 2009. "Importers, Exporters and Multinationals: A Portrait of Firms in the U.S. that Trade Goods." In *Producer Dynamics: New Evidence from Micro Data*, edited by Timothy Dunne, J. Bradford Jensen and Mark J. Roberts. Chicago: University of Chicago Press.
- [10] Bloom, Nick, Stephen Bond and John Van Reenen. 2007. "Uncertainty and Investment Dynamics." *Review of Economic Studies* 74(2007): 391-415.
- [11] Bloom, Nick, Mirko Draca and John Van Reenen. 2015. "Trade Induced Technical Change: The Impact of Chinese Imports on Innovation, Diffusion and Productivity." *Review of Economic Studies*, forthcoming.
- [12] Brambilla, Irene, Amit K. Khandelwal and Peter K. Schott. 2009. "China's Experience Under the Multifiber Arrangement (MFA) and the Agreement on Textiles and Clothing (ATC)." In *China's Growing Roll in World Trade*, edited by Robert Feenstra and Shang-Jin Wei. Chicago: University of Chicago Press. Forthcoming.
- [13] Brandt, Loren, Johannes Van Biesebroeck, Luhang Wang and Yifan Wang. 2012. "WTO Accession and Performance of Chinese Manufacturing Firms." Center for Economic Policy Research Working Paper 9166.
- [14] Bureau of Economic Analysis. 1948-2010. "Real Value Added: Manufacturing." United States Department of Commerce. [www.bea.gov/industry/gdpbyind\\_data.htm](http://www.bea.gov/industry/gdpbyind_data.htm).
- [15] Bureau of Labor Statistics. 1948-2010. "Current Employment Statistics: National Manufacturing Employment, Not Seasonally Adjusted, CEU3000000001." United States Department of Labor. [http://data.bls.gov/timeseries/CEU3000000001?data\\_tool=XGtable](http://data.bls.gov/timeseries/CEU3000000001?data_tool=XGtable).

- [16] Casarini, Nicola. 2006. “The Evolution of the EU-China Relationship: From Constructive Engagement to Strategic Partnership.” Occasional Paper Number 64, European Union Institute for Security Studies.
- [17] Davis, Steven J., John C. Haltiwanger and Scott Schuh. 1996. *Job Creation and Destruction*. Cambridge: MIT Press.
- [18] De Loecker, Jan, Pinelopi K. Goldberg, Amit K. Khandelwal and Nina Pavcnik. 2015. “Prices, Markups and Trade Reform.” *Econometrica*, forthcoming.
- [19] Dey, Matthew, Susan N. Houseman and Anne E. Polivka. 2012. “Manufacturers’ Outsourcing to Staffing Services.” *Industrial & Labor Relations Review* 65 (3): 533-559.
- [20] Ebenstein, Avraham, Margaret McMillan, Yaohui Zhao and Chanchuan Zhang. 2011. “Understanding the Role of China in the ‘Decline’ of US Manufacturing.” [www.margaretsmcmillan.com/wp-content/uploads/2012/03/5\\_Ebenstein-et-al.-US-Manufacturing-and-China-November-2011.pdf](http://www.margaretsmcmillan.com/wp-content/uploads/2012/03/5_Ebenstein-et-al.-US-Manufacturing-and-China-November-2011.pdf).
- [21] Ebenstein, Avraham, Ann Harrison, Margaret McMillan and Shannon Phillips. 2014. “Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys.” *Review of Economics and Statistics* 96 (4): 581-595.
- [22] Ellison, Glenn, Edward Glaeser, and William R. Kerr. 2010. “What Causes Industry Agglomeration? Evidence from Coagglomeration Patterns.” *American Economic Review* 100 (3): 1195–1213.
- [23] European Commission. 2003. Overview of the Terms of China’s Accession to WTO. [http://trade.ec.europa.eu/doclib/docs/2003/october/tradoc\\_111955.pdf](http://trade.ec.europa.eu/doclib/docs/2003/october/tradoc_111955.pdf)
- [24] Faberman, R. Jason. 2008. “Job Flows, Jobless Recoveries and the Great

- Moderation.” Federal Reserve Bank of Philadelphia Working Paper Number 08-11.
- [25] Feenstra, Robert C., John Romalis and Peter K. Schott. 2002. “U.S. Imports, Exports and Tariff Data, 1989-2001.” NBER Working Paper 9387.
- [26] Foster, Lucia S., John C. Haltiwanger and Chad Syverson. 2008. “Reallocation, Firm Turnover and Efficiency: Selection on Productivity or Profitability.” *American Economic Review* 98 (1): 394-425.
- [27] Freeman, R., Katz, L., 1991. “Industrial Wage and Employment Determination in an Open Economy, in *Immigration, Trade and Labor Market*,” edited by John M. Abowd and Richard B. Freeman. Chicago: University of Chicago Press.
- [28] Goldberg, Pinelopi, Amit Khandelwal, Nina Pavcnik and Petia Topalova. 2010. “Imported Intermediate Inputs and Domestic Product Growth: Evidence from India.” *Quarterly Journal of Economics* 125 (4): 1727-67.
- [29] Groizard, Jose L., Priya Ranjan and Jose Antonio Rodriguez-Lopez. 2012. “Input Trade and Job Flows.” [www.bde.es/f/webpi/SES/seminars/2012/files/sie1215.pdf](http://www.bde.es/f/webpi/SES/seminars/2012/files/sie1215.pdf).
- [30] Guiso and Pirigi . 1999. “Investment and Demand Uncertainty.” *Quarterly Journal of Economics* 114 (1): 185-227.
- [31] Handley, Kyle. 2014. “Exporting Under Trade Policy Uncertainty: Theory and Evidence.” *Journal of International Economics* 94 (1): 50-66.
- [32] Handley, Kyle and Nuno Limao. 2014. “Policy uncertainty, Trade and Welfare: Evidence from the U.S. and China.” [www.terpconnect.umd.edu/~limao/tpu\\_submitted.pdf](http://www.terpconnect.umd.edu/~limao/tpu_submitted.pdf).
- [33] Handley, Kyle and Nuno Limao. 2015. “Trade and Investment under Policy Uncertainty: Theory and Firm Evidence.” *American Economic Journal: Economic Policy* 7 (4): 189-222.

- [34] Harrison, Ann and Margaret McMillan. 2011. "Offshoring Jobs? Multinationals and U.S. Manufacturing Employment." *The Review of Economics and Statistics* 93 (3): 857-875.
- [35] Hirsch, Barry T. and David A. Macpherson. 2003. "Union Membership and Coverage Database for the Current Population Survey." *Industrial and Labor Relations Review* 56 (2): 349-54.
- [36] Holmes, Thomas J. and John J. Stevens. 2014. "An Alternative Theory of the Plant Size Distribution with an Application to Trade." *Journal of Political Economy* 122 (2): 369-421.
- [37] Houseman, Susan, Christopher Kurz, Paul Lengermann and Benjamin Mandel. 2011. "Offshoring Bias in U.S. Manufacturing." *Journal of Economic Perspectives* 25 (2): 111-132.
- [38] Jarmin, Ron and Javier Miranda. 2002. "The Longitudinal Business Database." Center for Economic Studies Discussion Paper CES-WP-02-17.
- [39] Khandelwal, Amit. 2010. "The Long and Short (of) Quality Ladders." *Review of Economic Studies* 77 (4), 1450-1476.
- [40] Khandelwal, Amit K., Peter K. Schott and Shang-Jin Wei. 2013. "Trade Liberalization and Embedded Institutional Reform: Evidence from Chinese Exporters." *American Economic Review* 103 (6): 2169-95.
- [41] Kirkbride, Rob. 2001. "Furniture Makers Sink or Swim with the Foreign Flood." The Grand Rapids Press. April 29, 2001.
- [42] Knowlton, Brian. 2000. "Final Passage of Bill to Normalize U.S. Ties is Approved, 83 to 15: Senate Vote Introduces New Era in China Trade." *The New York Times*. September 20, 2000.
- [43] Mion, Giordano and Like Zhu. 2013. "Import Competition From and Outsourcing to China: A Curse or a Blessing for Firms." *Journal of Interna-*

- tional Economics 89 (1): 202-215.
- [44] Neikirk, William. 2002. "Abundance of Cheap Imports Hurts Economy." Chicago Tribune. December 17, 2002.
- [45] Nunn, Nathan. 2007. "Relationship-Specificity, Incomplete Contracts and the Pattern of Trade." *Quarterly Journal of Economics* 122 (2) 569-600.
- [46] Pierce, Justin R. 2011. "Plant-Level Responses to Antidumping Duties: Evidence from U.S. Manufacturers." *Journal of International Economics* 85 (2): 369-378.
- [47] Pierce, Justin R. and Peter K. Schott. 2012a. "Concording U.S. Harmonized System Codes Over Time." *Journal of Official Statistics* 28 (1): 53-68.
- [48] Pierce, Justin R. and Peter K. Schott. 2012b. "The Surprisingly Swift Decline of U.S. Manufacturing Employment." NBER Working Paper 18655.
- [49] Pindyck, Robert S. 1993. "Investments of Uncertain Cost." *Journal of Financial Economics* 34 (1): 53-76.
- [50] Razhev, Mark. 2015. "Input-Output Structure and Trade Elasticity." [http://scholar.princeton.edu/sites/default/files/razhev/files/jmp\\_razhev.pdf](http://scholar.princeton.edu/sites/default/files/razhev/files/jmp_razhev.pdf).
- [51] Revenga, A.L. 1992. "Exporting Jobs? The Impact of Import Competition on Employment and Wages in U.S. Manufacturing." *Quarterly Journal of Economics* 107 (1): 255-284.
- [52] Rob, Rafael and Nikolaos Vettas. 2003. "Foreign Direct Investment and Exports with Growing Demand." *Review of Economic Studies* 70(3): 629-648.
- [53] Rowley, Storer H. 1993. "China Woos Western Businesses, Snubs Clinton." Chicago Tribune. May 20, 1993.
- [54] Sachs, J.D., Shatz, H.J. 1994. "Trade and Jobs in U.S. Manufacturing." *Brookings Papers on Economic Activity* 1994 (1): 1-69.

- [55] Schott, Peter K. 2003. "One Size Fits All? Heckscher-Ohlin Specialization in Global Production." *American Economic Review* 93 (2): 686-708.
- [56] Schott, Peter K. 2008. "The Relative Sophistication of Chinese Exports." *Economic Policy* 53: 5-49.
- [57] Schwartz, Eduardo S. and Carlos Zozaya-Gorostiza. 2003. "Investment Under Uncertainty in Information Technology: Acquisition and Development Projects." *Management Science* 49 (1): 57-70.
- [58] Shanghai Securities News. 1999. "Outlook 2000." *Shanghai Securities News*. December 28, 1999.
- [59] St. Maxens, Thomas F. 2000. Statement of Thomas F. St. Maxens, St. Maxens and Company, on behalf of Mattel, Inc., El Segundo, CA. U.S.-China Bilateral Trade Agreement and the Accession of China to the WTO. Hearing before the Committee on Ways and Means, House of Representatives, One Hundred Sixth Congress, Second Session, February 16, 2000. Washington: U.S. Government Printing Office.
- [60] Trefler, Daniel. 2004. "The Long and Short of the Canada-U.S. Free Trade Agreement." *American Economic Review* 94 (4): 870-895.
- [61] United Nations Industrial Development Organization. 2013. INDSTAT 4 Database. United Nations. [www.unido.org/resources/statistics/statistical-databases/indstat4-2013-edition.html](http://www.unido.org/resources/statistics/statistical-databases/indstat4-2013-edition.html).
- [62] U.S. Department of the Treasury. 2012. Report to Congress on International Economic and Exchange Rate Policies. [www.treasury.gov/resource-center/international/exchange-rate-policies/Documents/Foreign Exchange Report May 2012.pdf](http://www.treasury.gov/resource-center/international/exchange-rate-policies/Documents/Foreign%20Exchange%20Report%20May%202012.pdf).
- [63] United States General Accounting Office. 1994. U.S. Government Policy Issues Affecting U.S. Business Activities in China. Report to the Chair-

man, Committee on Government Affairs, and the Honorable Joseph I. Lieberman, U.S. Senate.

- [64] U.S. Trade Deficit Review Commission. 2001. "Impact of U.S.-China Trade Relations on Workers, Wages and Employment." <http://govinfo.library.unt.edu/tdrc/research/research.html>
- [65] Utar, Hale and Luis B. Torres Ruiz. 2013. "International Competition and Industrial Evolution: Evidence form the Impact of Chinese Competition on Mexican Maquiladoras." *Journal of Development Economics* 105: 267-287.

	ln(Emp <sub>it</sub> )	ln(Emp <sub>it</sub> )	ln(Emp <sub>it</sub> )
Post x NTR Gap <sub>i</sub>	-0.714 ***	-0.601 ***	-0.469 ***
	0.193	0.191	0.147
Post x ln(K/Emp <sub>i,1990</sub> )		0.037	-0.016
		0.031	0.025
Post x ln(NP/Emp <sub>i,1990</sub> )		0.081	0.132 ***
		0.054	0.053
Post x Contract Intensity <sub>i</sub>			-0.181
			0.112
Post x ΔChina Import Tariffs <sub>i</sub>			-0.244 *
			0.140
Post x ΔChina Subsidies <sub>i</sub>			0.063
			0.088
Post x ΔChina Licensing <sub>i</sub>			-0.238
			0.164
Post x 1{Advanced Technology <sub>i</sub> }			-0.036
			0.045
MFA Exposure <sub>it</sub>			-0.342 ***
			0.060
NTR <sub>it</sub>			-0.455
			0.670
U.S. Union Membership <sub>it</sub>			-0.123
			0.203
Observations	5,700	5,700	5,700
R2	0.98	0.98	0.99
Fixed Effects	i,t	i,t	i,t
Employment Weighted	Yes	Yes	Yes
Implied Impact of PNTR	-0.229	-0.193	-0.151

Notes: Table reports results of OLS generalized difference-in-differences regressions. The dependent variable is the log of industry-year employment and the independent variable representing the effect of PNTR is the interaction of the NTR gap and a post-PNTR indicator. Additional controls include time-varying variables -- MFA exposure, NTR tariff rates, union membership rates -- as well as interactions of the post-PNTR indicator with time-invariant controls including the log of 1990 capital and skill intensity, contract intensity (Nunn 2007), changes in Chinese import tariffs, changes in Chinese production subsidies, changes in Chinese export licensing requirements and an indicator for whether the industry produces advanced technology products. Data span 1990 to 2007. Robust standard errors adjusted for clustering at the industry (i) level are displayed below each coefficient. Estimates for the year (t) and industry fixed effects as well as the constant are suppressed. Observations are weighted by 1990 industry employment. Final row reports the predicted relative change in the dependent variable implied by the difference-in-differences coefficient. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels. Number of observations has been rounded to nearest thousand due to Census Bureau disclosure avoidance procedures.

Table 1: Baseline Results (LBD)

	ln(Emp <sub>it</sub> )						
Post x NTR Gap <sub>i</sub>	-0.617 ***		-0.244		-0.475 ***	-0.461 ***	-0.484 ***
	0.152		0.429		0.147	0.146	0.164
Post x 1990 NTR Gap <sub>i</sub>		-0.410 ***					
		0.166					
Post x NTR Gap <sub>i</sub> <sup>2</sup>			-0.346				
			0.636				
Post x NTR Gap <sub>i</sub> (Slope 1)				-0.460			
				0.513			
Post x NTR Gap <sub>i</sub> (Intercept 2)				0.551			
				0.630			
Post x NTR Gap <sub>i</sub> (Slope 2)				-1.683			
				1.054			
Post x ln(K/Emp <sub>i,1990</sub> )	-0.026	-0.020	-0.015	0.414 **	-0.044 ***	-0.016	-0.009
	0.023	0.026	0.025	0.204	0.018	0.025	0.027
Post x ln(NP/Emp <sub>i,1990</sub> )	0.129 ***	0.132 ***	0.130 ***	-0.511 *	0.186 ***	0.130 ***	0.132 ***
	0.049	0.050	0.053	0.283	0.047	0.052	0.056
Post x Contract Intensity <sub>i</sub>	-0.191 *	-0.154	-0.184	1.306 *	-0.178	-0.178	-0.058
	0.103	0.108	0.114	0.738	0.112	0.113	0.120
Post x ΔChina Import Tariffs <sub>i</sub>	-0.230 *	-0.282 **	-0.269 *	-0.557	-0.248 *	-0.248 *	-0.157
	0.136	0.142	0.144	0.489	0.140	0.140	0.177
Post x ΔChina Subsidies <sub>i</sub>	0.068	0.051	0.073	-1.650 ***	0.064	0.066	-0.042
	0.085	0.086	0.092	0.691	0.088	0.088	0.117
Post x ΔChina Licensing <sub>i</sub>	-0.220	-0.217	-0.237	-1.319 **	-0.240	-0.236	-0.433 *
	0.155	0.161	0.166	0.658	0.164	0.165	0.224
Post x 1{Advanced Technology <sub>i</sub> }	-0.033	-0.050	-0.036	0.018	-0.038	-0.036	-0.052
	0.044	0.045	0.045	0.146	0.045	0.045	0.053
MFA Exposure <sub>it</sub>	-0.337 ***	-0.347 ***	-0.342 ***	-0.541 ***	-0.342 ***	-0.345 ***	-0.344 ***
	0.057	0.058	0.061	0.198	0.063	0.059	0.062
NTR <sub>it</sub>	-0.578	-0.501	-0.430	24.346 *	-0.724	-0.448	
	0.656	0.852	0.672	13.226	0.672	0.670	
U.S. Union Membership <sub>it</sub>	-0.124	-0.123	-0.110	15.049 *	-0.086	-0.124	-0.165
	0.195	0.203	0.199	7.792	0.200	0.203	0.209
ln(RGDP <sub>t</sub> ) x ln(K/Emp <sub>i,1990</sub> )					0.104		
					0.097		
ln(RGDP <sub>t</sub> ) x ln(NP/Emp <sub>i,1990</sub> )					-0.193		
					0.181		
Trefler Business Cycle <sub>it</sub>						0.242 **	
						0.106	
Revealed NTR <sub>it</sub>							0.495 *
							0.291
Observations	5,700	5,700	5,700	5,700	5,700	5,700	5,700
R2	0.99	0.99	0.99	.	0.99	0.99	0.99
Estimation	2SLS	OLS	OLS	OLS	OLS	OLS	OLS
Instrument	NNTR Rate	.	.	.	.	.	.
Fixed Effects	i,t						
Employment Weighted	Yes						
Joint Significance P-Value	.	.	0.008	0.011	.	.	.
Constrained Estimation?	No	No	No	Yes	No	No	No
Knot	.	.	.	0.45	.	.	.
AIC	.	.	.	13810	.	.	.
Implied Impact of PNTR	-0.198	-0.132	-0.120	-0.158	-0.153	-0.148	-0.155

Notes: Table reports results of OLS generalized difference-in-differences regressions of log industry employment on noted permutations of an interaction of the NTR gap with an indicator for the post-PNTR period. Additional controls include time-varying variables -- MFA exposure, NTR tariff rates, union membership rates -- as well as interactions of the post-PNTR indicator with time-invariant controls including the log of 1990 capital and skill intensity, contract intensity (Nunn 2007), changes in Chinese import tariffs, changes in Chinese production subsidies, changes in Chinese export licensing requirements and an indicator for whether the industry produces advanced technology products. Data span 1990 to 2007. Robust standard errors adjusted for clustering at the industry (i) level are displayed below each coefficient. Estimates for the year (t) and industry fixed effects as well as the constant are suppressed. Observations are weighted by 1990 industry employment. "Joint Significance" reports the p-value of a test of joint significance of the linear and polynomial NTR gap terms in column three and the intercept and slope terms in column four. Penultimate row reports the Akaike Information Criterion (AIC) for the two-segment spline estimated in the fourth column. Final row reports the predicted relative change in the dependent variable implied by the difference-in-differences coefficient. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels. Number of observations has been rounded to nearest thousand due to Census Bureau disclosure avoidance procedures.

Table 2: Robustness Exercises (LBD)

	ln(Emp <sub>it</sub> )	ln(Emp <sub>it</sub> )	ln(Emp <sub>it</sub> )
Post x NTR Gap <sub>i,1999</sub> x 1{c=US}	-0.641 ***		
	-0.247		
Post x NTR Gap <sub>i,1999</sub>		0.016	-0.649 ***
		-0.112	-0.270
Observations	1664	999	832
R2	0.997	0.994	0.982
Fixed Effects	ct, ci, it	i,t	i,t
Employment Weighted	Yes	Yes	Yes

Notes: First column displays results of an OLS generalized triple differences regression of the log of employment on a triple interaction of an indicator for the post-PNTR period, the NTR gap and an indicator for if the country is the U.S. The countries included are the U.S. and EU. The second and third columns display results of industry-level generalized difference-in-differences regression regressions for the EU and U.S., respectively. Data span 1998 to 2005. Estimates for country x year (ct), country x industry (ci) and industry x year (it) fixed effects (for column 1), and industry and year fixed effects (for columns 2 and 3), as well as the regression constant are not reported. Robust standard errors adjusted for clustering at the country x industry-level (for column 1) and industry-level (for columns 2 and 3) are displayed below each coefficient. Observations are weighted by 1998 employment. Superscript \*\*\* denotes statistical significance at the 1 percent level.

Table 3: Employment in the United States versus EU (UNIDO)

	ln(Value <sub>hct</sub> )	ln(Importers <sub>hct</sub> )	ln(Exporters <sub>hct</sub> )	ln(Pairs <sub>hct</sub> )
1{c=China} x Post x NTR Gap <sub>h</sub>	0.476 ***	0.461 ***	0.515 ***	0.517 ***
	0.102	0.051	0.058	0.061
ln(Tariff <sub>hct</sub> )	0.039 ***	0.024 ***	0.026 ***	0.028 ***
	0.010	0.003	0.003	0.004
MFA Phase 1 <sub>hct</sub>	0.100 *	0.039 *	0.067 ***	0.072 ***
	0.058	0.021	0.024	0.026
MFA Phase 2 <sub>hct</sub>	-0.101 ***	-0.021	-0.016	-0.030 *
	0.036	0.013	0.015	0.016
MFA Phase 3 <sub>hct</sub>	-0.066 *	0.070 ***	0.053 ***	0.041 ***
	0.039	0.014	0.016	0.017
MFA Phase 4 <sub>hct</sub>	-0.452 ***	0.034 ***	-0.069 ***	-0.085 ***
	0.026	0.009	0.011	0.011
Observations	1,396,000	1,396,000	1,396,000	1,396,000
R2	0.84	0.91	0.91	0.91
Fixed Effects	hc,ct,ht	hc,ct,ht	hc,ct,ht	hc,ct,ht
Implied Impact of PNTR	0.17	0.17	0.19	0.19

Notes: Table displays results of product (h)-country (c)-year (t) level OLS generalized triple difference-in-differences regression of noted dependent variable on interaction of China country indicator, post-PNTR indicator and NTR gap, along with country x year (ct), country x product (hc) and product x year (ht) fixed effects, the revealed tariff rate and indicators for the four phases of the Multi-Fibre Arrangement. Data span 1992 to 2007. Robust standard errors adjusted for clustering at the product x country level are displayed below each coefficient. Estimates for the fixed effects and constant are suppressed. Final row reports the predicted relative change in the dependent variable implied by the triple differences coefficient. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels. Number of observations has been rounded to nearest thousand due to Census Bureau disclosure avoidance procedures.

Table 4: PNTR and U.S. Imports (LFTTD)

Panel A: All Trade				
	All Firms	SOE	Domestic	Foreign
	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )
1{c=US} x Post x NTR Gap <sub>h</sub>	0.214 *	0.187	0.815 *	1.018 ***
	0.126	0.138	0.473	0.207
Observations	1,159,132	972,780	473,590	510,839
R2	0.84	0.75	0.71	0.76
Fixed Effects	hc,ht,ct	hc,ht,ct	hc,ht,ct	hc,ht,ct

Panel B: General Trade				
	All Firms	SOE	Domestic	Foreign
	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )
1{c=US} x Post x NTR Gap <sub>h</sub>	0.357 ***	0.333 **	0.728	0.919 ***
	0.129	0.150	0.475	0.226
Observations	1,112,173	945,902	467,854	419,451
R2	0.82	0.81	0.81	0.79
Fixed Effects	hc,ht,ct	hc,ht,ct	hc,ht,ct	hc,ht,ct

Panel C: Processing & Assembly Trade				
	All Firms	SOE	Domestic	Foreign
	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )	ln(V <sub>hct</sub> )
1{c=US} x Post x NTR Gap <sub>h</sub>	0.287	0.185	1.802	0.707 ***
	0.176	0.211	2.086	0.209
Observations	344,604	182,274	39,444	275,940
R2	0.86	0.85	0.85	0.85
Fixed Effects	hc,ht,ct	hc,ht,ct	hc,ht,ct	hc,ht,ct

Notes: Table displays results of product (h)-country (c)-year (t) level OLS generalized triple difference-in-differences regression of log Chinese export value on interaction of US country indicator, post-PNTR indicator and NTR gap, along with country x year (ct), country x product (hc) and product x year (ht) fixed effects and the NTR tariff rate. Data span 2000 to 2005. Robust standard errors adjusted for clustering at the product x country level are displayed below each coefficient. Estimates for the fixed effects and constant are suppressed. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels.

Table 5: PNTR and Chinese Exports (Chinese Data)

	ln(RP Value <sub>hct</sub> )	ln(RP Importers <sub>hct</sub> )	ln(RP Exporters <sub>hct</sub> )	ln(RP Pairs <sub>hct</sub> )
1{c=China} x Post x NTR Gap <sub>h</sub>	0.205	0.328 ***	0.379 ***	0.380 ***
	0.180	0.063	0.074	0.074
ln(Tariff <sub>hct</sub> )	-0.045 ***	0.001	0.002	0.002
	0.016	0.004	0.005	0.005
MFA Phase 1 <sub>hct</sub>	-0.151	0.005	0.022	0.016
	0.103	0.030	0.035	0.036
MFA Phase 2 <sub>hct</sub>	-0.246 ***	-0.049 ***	-0.030	-0.046 **
	0.067	0.019	0.022	0.022
MFA Phase 3 <sub>hct</sub>	-0.109	0.004	0.033	0.021
	0.073	0.020	0.025	0.025
MFA Phase 4 <sub>hct</sub>	-0.617 ***	0.029 **	-0.150 ***	-0.154 ***
	0.049	0.014	0.017	0.017
Observations	712,000	712,000	712,000	712,000
R2	0.82	0.88	0.87	0.87
Fixed Effects	hc,ct,ht	hc,ct,ht	hc,ct,ht	hc,ct,ht
Implied Impact of PNTR	0.06	0.10	0.12	0.12

Notes: Table displays results of product (h)-country (c)-year (t) level OLS generalized triple difference-in-differences regression of related-party trade variable on interaction of China country indicator, post-PNTR indicator and NTR gap, along with country x year (ct), country x product (hc) and product x year (ht) fixed effects, the revealed tariff rate and indicators for the four phases of the Multi-Fibre Arrangement. Data span 1992 to 2007. Robust standard errors adjusted for clustering at the product x country level are displayed below each coefficient. Estimates for the fixed effects and constant are suppressed. Final row reports the predicted relative change in the dependent variable implied by the triple differences coefficient. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels. Number of observations has been rounded to nearest thousand due to Census Bureau disclosure avoidance procedures.

Table 6: PNTR and Related-Party U.S. Imports (LFTTD)

	ln(NP/Emp <sub>it</sub> )	ln(K/Emp <sub>it</sub> )	ln(NProd <sub>it</sub> )	ln(Prod <sub>it</sub> )	ln(Emp <sub>it</sub> )	ln(K <sub>it</sub> )	ln(Hours <sub>it</sub> )
Post x NTR Gap <sub>i</sub>	0.159 ***	0.556 ***	-0.324 *	-0.531 ***	-0.481 **	-0.097	-0.567 ***
	0.062	0.157	0.186	0.222	0.218	0.230	0.228
Post x ln(K/Emp <sub>it,1990</sub> )	-0.049 ***		-0.031	0.019	0.006	-0.082 **	0.010
	0.018		0.031	0.042	0.039	0.041	0.041
Post x ln(NP/Emp <sub>it,1990</sub> )		-0.021	0.075	0.217 ***	0.181 **	0.200 ***	0.223 ***
		0.054	0.077	0.079	0.079	0.083	0.081
Post x Contract Intensity <sub>i</sub>	0.134 ***	0.172	-0.017	-0.299 *	-0.201	-0.193	-0.322 *
	0.045	0.130	0.159	0.178	0.169	0.158	0.179
Post x ΔChina Import Tariffs <sub>i</sub>	0.127 *	-0.213	-0.142	-0.467 **	-0.332	-0.507 ***	-0.495 **
	0.066	0.159	0.206	0.217	0.213	0.212	0.228
Post x ΔChina Subsidies <sub>i</sub>	0.061	0.298 ***	0.140	0.015	0.070	0.401 ***	-0.017
	0.054	0.085	0.106	0.133	0.121	0.129	0.143
Post x ΔChina Licensing <sub>i</sub>	-0.051	0.065	-0.314	-0.222	-0.265	-0.095	-0.156
	0.071	0.138	0.232	0.250	0.235	0.229	0.262
Post x 1{Advanced Technology <sub>i</sub> }	-0.044 **	-0.015	-0.010	-0.040	-0.018	-0.021	-0.043
	0.019	0.055	0.068	0.075	0.070	0.070	0.074
MFA Exposure <sub>it</sub>	0.072	0.048	-0.274 ***	-0.352 ***	-0.335 ***	-0.306 ***	-0.344 ***
	0.060	0.117	0.080	0.132	0.117	0.103	0.132
NTR <sub>it</sub>	-0.108	0.182	-1.246	-0.696	-1.094	-0.709	-0.781
	0.494	0.959	1.114	1.406	1.280	1.147	1.417
U.S. Union Membership <sub>it</sub>	0.298 **	0.241	0.170	-0.292	-0.158	-0.113	-0.273
	0.148	0.263	0.376	0.347	0.359	0.354	0.362
Observations	1,280	1,280	1,280	1,280	1,280	1,280	1,280
R2	0.97	0.97	0.98	0.98	0.98	0.98	0.98
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t	i,t
Employment Weighted	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Implied Impact of PNTR	0.051	0.178	-0.104	-0.170	-0.154	-0.031	-0.182

Notes: Table reports results of industry-year level OLS generalized difference-in-differences regression of noted industry outcome on the interaction of the NTR gap and a post-PNTR indicator. Additional controls include time-varying variables -- MFA exposure, NTR tariff rates, union membership rates -- as well as interactions of the post-PNTR indicator with time-invariant controls including the log of 1990 capital and skill intensity, contract intensity (Nunn 2007), changes in Chinese import tariffs, changes in Chinese production subsidies, changes in Chinese export licensing requirements and an indicator for whether the industry produces advanced technology products. NProd, Prod, Hours and K represent non-production workers, production workers, production hours and the real book value of capital. Data are from the CM and for census years 1992, 1997, 2002 and 2007. Robust standard errors adjusted for clustering at the industry level are displayed below each coefficient. Estimates for the year (t) and industry (i) fixed effects as well as the constant are suppressed. Observations are weighted by 1992 industry employment. Final row reports the predicted relative change in the dependent variable implied by the difference-in-differences coefficient. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels.

Table 7: Other Industry Outcomes (CM)

	ln(NP/Emp <sub>it</sub> )	ln(K/Emp <sub>it</sub> )	ln(NProd <sub>it</sub> )	ln(Prod <sub>it</sub> )	ln(Emp <sub>it</sub> )	ln(K <sub>it</sub> )	ln(Hours <sub>it</sub> )
Post x NTR Gap <sub>p</sub>	0.003	0.295 **	-0.240 *	-0.280 **	-0.276 ***	-0.419	-0.312 **
	0.082	0.139	0.123	0.142	0.112	0.268	0.139
Post x ln(K/Emp <sub>p,1990</sub> )	-0.039 ***		-0.027 **	-0.008	-0.009	-0.254 ***	-0.017
	0.006		0.013	0.014	0.012	0.023	0.013
Post x ln(NP/Emp <sub>p,1990</sub> )		0.013	-0.290 ***	0.109 ***	0.016	0.070 ***	0.106 ***
		0.021	0.024	0.020	0.018	0.028	0.020
Age <sub>p</sub>	0.022	0.092 ***	0.197 ***	0.213 ***	0.195 ***	0.244 ***	0.216 ***
	0.017	0.026	0.031	0.030	0.025	0.027	0.027
TFP <sub>p</sub>	-0.042 ***	-0.073 ***	-0.007	0.032	0.031 *	-0.037	0.046 **
	0.012	0.021	0.012	0.022	0.017	0.025	0.023
Post x Contract Intensity <sub>i</sub>	0.034	0.114	0.064	-0.214 *	-0.094	-0.369 **	-0.251 **
	0.058	0.097	0.117	0.128	0.102	0.168	0.123
Post x ΔChina Import Tariffs <sub>i</sub>	0.236 ***	-0.166	0.222	-0.388 **	-0.229	-0.294	-0.436 ***
	0.079	0.168	0.165	0.190	0.144	0.288	0.164
Post x ΔChina Subsidies <sub>i</sub>	0.014	0.239 **	0.150	0.141	0.103	0.453 ***	0.103
	0.052	0.103	0.097	0.123	0.086	0.174	0.111
Post x ΔChina Licensing <sub>i</sub>	0.180 ***	0.155	-0.210	-0.550 **	-0.387 **	0.064	-0.460 **
	0.072	0.170	0.201	0.252	0.188	0.267	0.214
Post x 1{Advanced Technology <sub>i</sub> }	-0.048 ***	-0.015	0.051	-0.130 **	-0.057	-0.013	-0.107 *
	0.020	0.054	0.043	0.063	0.048	0.079	0.063
MFA Exposure <sub>it</sub>	0.085	0.081	-0.139	-0.191 *	-0.185 *	-0.184	-0.201 **
	0.058	0.066	0.089	0.100	0.095	0.116	0.101
NTR <sub>it</sub>	-0.849	-0.949	0.015	1.827	0.868	0.904	1.666
	0.582	0.681	0.844	1.220	0.903	1.080	1.208
U.S. Union Membership <sub>it</sub>	0.268 *	-0.009	0.591 ***	0.179	0.304	-0.262	0.109
	0.145	0.240	0.237	0.252	0.223	0.263	0.259
Observations	257,503	257,503	257,503	257,503	257,503	257,503	257,503
R2	0.78	0.73	0.93	0.93	0.95	0.91	0.92
Fixed Effects	p,t	p,t	p,t	p,t	p,t	p,t	p,t
Employment Weighted	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Implied Impact of PNTR	0.001	0.094	-0.077	-0.089	-0.088	-0.134	-0.100

Notes: Table reports results of plant-year level OLS generalized difference-in-differences regression of noted plant outcome on the interaction of the NTR gap and a post-PNTR indicator. Additional controls include time-varying variables -- MFA exposure, NTR tariff rates, union membership rates, plant age, plant TFP (index method) -- as well as interactions of the post-PNTR indicator with time-invariant controls including the log of capital and skill intensity in the first year the plant is observed, contract intensity (Nunn 2007), changes in Chinese import tariffs, changes in Chinese production subsidies, changes in Chinese export licensing requirements and an indicator for whether the industry produces advanced technology products. NProd, Prod, Hours and K represent non-production workers, production workers, production hours and the real book value of capital. Data are from the CM and for census years 1992, 1997, 2002 and 2007. Robust standard errors adjusted for clustering at the level of the plants' major industries are displayed below each coefficient. Estimates for the year (t) and plant (p) fixed effects as well as the constant are suppressed. Observations are weighted by employment in the first year the plant is observed. Final row reports the predicted relative change in the dependent variable implied by the difference-in-differences coefficient. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels.

Table 8: Plant Outcomes (CM)

	$\ln(\text{Emp}_{it})$	$\ln(\text{Emp}_{it})$	$1\{\text{Death}_{it+1}\}$	$1\{\text{Death}_{it+1}\}$
Post x NTR Gap <sub>p</sub>	-0.380 ***	-0.208 **	0.064 ***	0.042 **
	0.089	0.090	0.020	0.019
Post x NTR Gap <sub>p</sub> <sup>Upstream</sup>		-0.280		-0.022
		0.427		0.082
Post x NTR Gap <sub>p</sub> <sup>Downstream</sup>		-0.691 ***		0.103 ***
		0.159		0.041
Post x $\ln(K/\text{Emp}_{p,1990})$	-0.082 ***	-0.070 ***	-0.006 **	-0.009 ***
	0.016	0.015	0.003	0.003
Post x $\ln(NP/\text{Emp}_{p,1990})$	0.052 *	0.034	-0.016 ***	-0.013 ***
	0.031	0.030	0.006	0.005
Post x Contract Intensity <sub>i</sub>	-0.189 ***	-0.218 ***	0.003	0.010
	0.081	0.081	0.013	0.014
Post x $\Delta$ China Import Tariffs <sub>i</sub>	-0.396 ***	-0.278 ***	-0.006	-0.027
	0.104	0.109	0.020	0.018
Post x $\Delta$ China Subsidies <sub>i</sub>	0.022	0.022	0.023 *	0.023 **
	0.073	0.069	0.012	0.011
Post x $\Delta$ China Licensing <sub>i</sub>	-0.121	-0.036	0.007	-0.002
	0.146	0.135	0.022	0.023
Post x $1\{\text{Advanced Technology}_i\}$	-0.056 **	-0.055 **	0.007	0.005
	0.028	0.027	0.005	0.004
MFA Exposure <sub>it</sub>	-0.193 ***	-0.167 ***	0.037 ***	0.035 ***
	0.064	0.053	0.014	0.013
NTR <sub>it</sub>	0.555	0.524	0.031	0.039
	0.513	0.513	0.052	0.048
U.S. Union Membership <sub>it</sub>	0.112	0.164	0.012	0.003
	0.132	0.133	0.014	0.012
Observations	1,181,142	1,181,142	2,079,616	2,079,616
R2	0.95	0.95	0.79	0.79
Fixed Effects	p,t	p,t	p,t	p,t
Employment Weighted	Yes	Yes	Yes	Yes
Implied Impact of PNTR	-0.117	-0.143	.	.

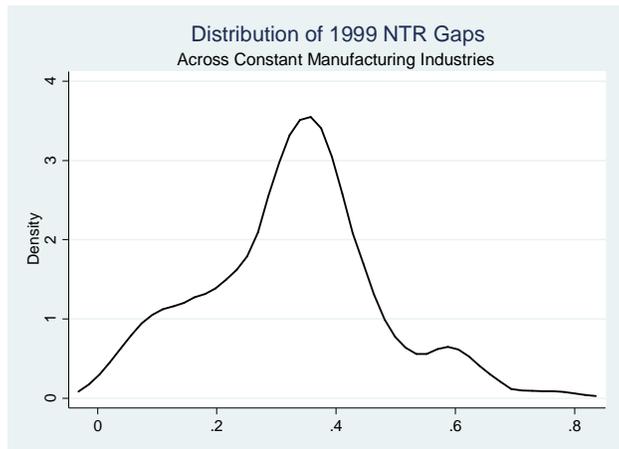
Notes: Table reports results of plant-year level OLS generalized difference-in-differences regressions of either log plant-year employment or an indicator for plant death on the interaction of a post-PNTR indicator and the own, upstream and downstream NTR gaps. Additional controls include time-varying variables -- MFA exposure, NTR tariff rates, union membership rates, plant age, plant TFP (index method) -- as well as interactions of the post-PNTR indicator with time-invariant controls including the log of capital and skill intensity in the first year the plant is observed, contract intensity (Nunn 2007), changes in Chinese import tariffs, changes in Chinese production subsidies, changes in Chinese export licensing requirements and an indicator for whether the industry produces advanced technology products. Data span 1990 to 2007. Robust standard errors adjusted for clustering at the level of the plants' major industries are displayed below each coefficient. Estimates for the year (t) and plant (p) fixed effects as well as the constant are suppressed. Observations are weighted by plant employment in the first year that it is observed in the sample. Final row reports the predicted relative change in the dependent variable implied by the difference-in-differences coefficient. First two columns restricted to the intensive margin of plants active in all years of the sample. Last two columns contain all observations. Superscripts \*\*\*, \*\* and \* represent statistical significance at the 1, 5 and 10 percent levels.

Table 9: Plant Input-Output Linkages (LBD)



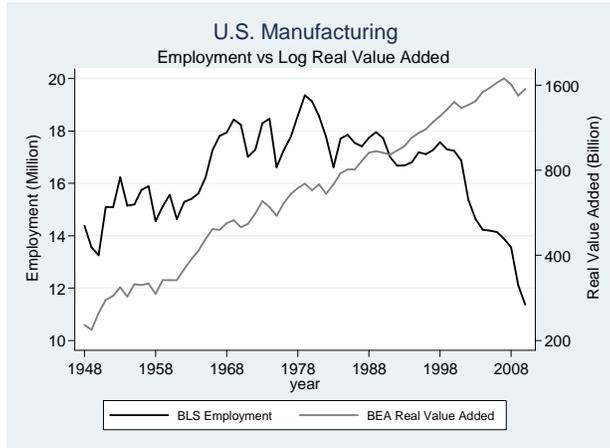
Notes: Figure displays percent of New York Times, Wall Street Journal and Washington Post articles discussing the uncertainty of China's NTR status.

Figure 1: China MFN Uncertainty Index



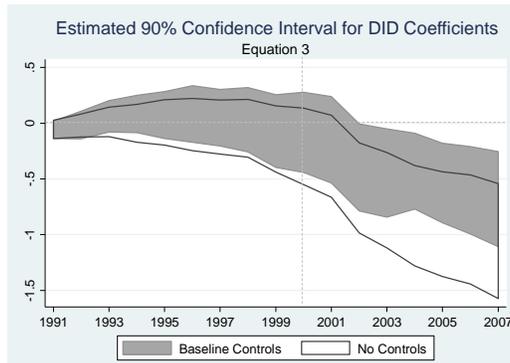
Notes: Figure displays the distribution of the NTR gaps across constant-manufacturing industries in 1999.

Figure 2: Distribution of NTR Gaps Across Industries



Notes: Figure compares annual manufacturing employment as of March according to the U.S. Bureau of Labor Statistics (series CEU3000000001) to real value added as measured by the Bureau of Economic Analysis.

Figure 3: U.S. Manufacturing Employment versus Value Added



Notes: Figure displays the 90 percent confidence interval (CI) for the estimated difference-in-differences (DID) coefficients for interactions of year dummies with the NTR gap from equation 3. Shaded CI represents the specification which includes all baseline covariates. Unshaded CI represents the specification which includes only the DID coefficients and the fixed effects. Baseline covariates include time-varying variables – MFA exposure, NTR tariff rates, union membership rates – as well as interactions of year dummies with time invariant controls including the log of 1990 capital and skill intensity, contract intensity (Nunn 2007), changes in Chinese import tariffs, changes in Chinese production subsidies, changes in Chinese export licensing requirements and an indicator for whether the industry produces advanced technology products. Observations are weighted by 1990 industry employment. Confidence interval is based on robust standard errors adjusted for clustering at the industry level.

Figure 4: Estimated Timing of the PNTR Effect (LBD)